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**Robust Summaries of Reliable Studies for  
Pyridine and Pyridine Derivatives HPV Category**

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Appendix A

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## 2.1 MELTING POINT

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: -41.6 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Buhler, D. R. and D. J. Reed. 1990. Nitrogen and Phosphorus Solvents. p. 259. In Ethel Browning's Toxicity and Metabolism of Industrial Solvents. Volume II, 2<sup>nd</sup> edition. Elsevier, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 74  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: 3.66 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Lide, D. R. and H. P. R. Frederikse, eds. 1995. CRC Handbook of Chemistry and Physics, 75<sup>th</sup> edition. CRC Press, Boca Raton, FL, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 224  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: 3.6 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group)..

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Reinhardt, C. F. 1981. Heterocyclic and Miscellaneous Nitrogen Compounds. pp. 2719 - 2727. In Patty's Industrial Hygiene and Toxicology, 3<sup>rd</sup> revised edition. Clayton, G. D. and F. E. Clayton, eds. J. Wiley & Sons, New York, NY, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 230  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: -18.3 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Lewis, R. J., Sr. 1993. Hawley's Condensed Chemical Dictionary, 12<sup>th</sup> ed. p. 915. Van Nostrand Reinhold Company, New York, NY, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 281  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: -70 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Reliable with restrictions; secondary literature source.  
Remarks:

### References

Budavari, S., ed. 1996. The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals, 12<sup>th</sup> edition. p. 1175. Merck Research Laboratories, Whitehouse Station, NJ, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 360  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: -66.8 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 361  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: 50 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Weast, R. C., ed. 1989. CRC Handbook of Chemistry and Physics, 69<sup>th</sup> edition. p. C-375. CRC Press, Boca Raton, FL, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 183  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: Picolino nitrile (CAS RN 100-70-9; Picolinonitrile)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Melting Point: 29 °C  
Decomposition: Not stated  
Sublimation: Not stated  
Remarks:

### Conclusions

The melting point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 203  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 106.3 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in reliable reference textbook.

### References

Howard, P. H. and W. M. Meylan, eds. 1997. Handbook of Physical Properties of Organic Chemicals. p. 203. Lewis Publishers, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 1  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 115.2 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in reliable reference textbook.

### References

Buhler, D. R. and D. J. Reed. 1990. Nitrogen and Phosphorus Solvents. p. 259. In Ethel Browning's Toxicity and Metabolism of Industrial Solvents. Volume II, 2<sup>nd</sup> edition. Elsevier, New York, NY, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 74  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 145 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Reliable with restrictions; the endpoint was obtained in a reliable reference text.  
Remarks:

### References

Budavari, S., ed. 1996. The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals, 12<sup>th</sup> edition. p. 1175. Merck & Co., Inc., Rahway, NJ, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 226  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 145 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; information provided in a reliable reference text.

### References

Reinhardt, C. F. 1981. Heterocyclic and Miscellaneous Nitrogen Compounds. pp. 2719 - 2727. In Patty's Industrial Hygiene and Toxicology, 3<sup>rd</sup> revised edition. Clayton, G. D. and F. E. Clayton, eds. J. Wiley & Sons, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 230  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 144.9 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Goe, G. L. 1982. Kirk-Othmer Encyclopedia of Chemical Technology, 3<sup>rd</sup> edition. 19:454-483. John Wiley & Sons, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 242  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 143-144 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Reliable with restrictions; the endpoint was obtained in a reliable reference text.  
Remarks:

### References

Budavari, S., ed. 1996. The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals, 12<sup>th</sup> edition. p 1175. Merck Research Laboratories, Whitehouse Station, NJ, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 282  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 143.9 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Goe, G. L. 1982. Kirk-Othmer Encyclopedia of Chemical Technology, 3<sup>rd</sup> edition. 19:454-483. John Wiley & Sons, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 304  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 128 - 129 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Reliable with restrictions; the endpoint was obtained in a reliable reference text.  
Remarks:

### References

Budavari, S., ed. 1996. The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals, 12<sup>th</sup> edition. p 1175. Merck Research Laboratories, Whitehouse Station, NJ, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 360  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 128.8 °C  
Pressure: 760 mmHg  
Pressure Unit: mmHg  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in a reliable reference text.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 361  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Nicotinonitrile (CAS RN 100-54-9)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 240 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; information provided in a reliable reference text.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 183  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Picolinonitrile (CAS RN 100-70-9)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Boiling Point: 222 °C  
Pressure: Not stated  
Pressure Unit: Not stated  
Decomposition: Not stated  
Remarks:

### Conclusions

The boiling point was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; information provided in a reliable reference text.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 203  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Vapor Pressure: 32.1 mmHg  
Temperature: 25 °C  
Decomposition: Not stated  
Remarks:

### Conclusions

The vapor pressure was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in reliable reference textbook.

### References

Howard, P. H. and W. M. Meylan, eds. 1997. Handbook of Physical Properties of Organic Chemicals. p. 203 Lewis Publishers, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 1  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Vapor Pressure: 20 mmHg  
Temperature: 25 °C  
Decomposition: Not stated  
Remarks:

### Conclusions

The vapor pressure was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in reliable reference textbook.

### References

Buhler, D. R. and D. J. Reed. 1990. Nitrogen and Phosphorus Solvents. p. 259. In Ethel Browning's Toxicity and Metabolism of Industrial Solvents. Volume II, 2<sup>nd</sup> edition. Elsevier, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 74  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Vapor pressure determined using a least squares regression equation developed by Cox (1936).  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Vapor Pressure: 59.971 kPa (7.99 mm Hg)  
Temperature: 400 °K  
Decomposition: Not stated  
Remarks:

### Conclusions

The vapor pressure was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in a reliable reference text.

### References

Chao, J., C. T. Lin and T. H. Chung. 1983. Vapor Pressure of Coal Chemicals. *J. Phys. Chem. Ref. Data.* 12(4):1033-1063.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 227  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Vapor Pressure: 10 mmHg  
Temperature: 24.4 °C  
Decomposition: Not stated  
Remarks:

### Conclusions

The vapor pressure was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restriction; the endpoint was provided in a reliable reference text.

### References

Sax, N. I. 1984. Dangerous Properties of Industrial Materials. 6<sup>th</sup> edition. p. 1923. Van Nostrand Reinhold Co., New York, NY, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 364  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Vapor pressure determined using a least squares regression equation developed by Cox (1936).  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Vapor Pressure: 94.920 kPa (12.6 mm Hg)  
Temperature: 400 °K  
Decomposition: Not stated  
Remarks:

### Conclusions

The vapor pressure was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in a reliable reference text.

### References

Chao, J., C. T. Lin and T. H. Chung. 1983. Vapor Pressure of Coal Chemicals. *J. Phys. Chem. Ref. Data.* 12(4):1033-1063.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 363  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Log  $K_{ow}$ : 0.84  
Temperature: Not stated  
Remarks:

### Conclusions

The partition coefficient was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in reliable reference textbook.

### References

Howard, P. H. and W. M. Meylan, eds. 1997. Handbook of Physical Properties of Organic Chemicals. p. 203. Lewis Publishers, New York, NY, U. S.

### Other Available Reports

#### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 1  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Log  $K_{ow}$ : 0.64  
Temperature: Not stated  
Remarks:

### Conclusions

The partition coefficient was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in reliable reference textbook.

### References

Buhler, D. R. and D. J. Reed. 1990. Nitrogen and Phosphorus Solvents. p. 259. In Ethel Browning's Toxicity and Metabolism of Industrial Solvents. Volume II, 2<sup>nd</sup> edition. Elsevier, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 74  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: 4-Methyl pyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Log  $K_{ow}$ : 1.22  
Temperature: Not stated  
Remarks:

### Conclusions

The partition coefficient was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint provided in a reliable review article.

### References

Leo, A., C. Hansch and D. Elkins. 1971. Partition Coefficients and Their Uses. Chemical Reviews 71(6):525-616.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 228  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Log  $K_{ow}$ : 1.11  
Temperature: Not stated  
Remarks:

### Conclusions

The partition coefficient was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; information provided in a reliable reference text.

### References

Hansch, C., A. Leo and D. Hoekman. 1995. Exploring QSAR: Hydrophobic, Electronic and Steric Constants. p. 20. American Chemical Society; ACS Professional Reference Book, ACS, Washington, DC, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 366  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: A regression equation was provided to calculate values for  $K_{ow}$ .  
GLP: No  
Year: 1990  
Remarks:

### Results

Log  $K_{ow}$ : 1.110 (literature value) and 2.581 (regression value)  
Temperature: Not stated  
Remarks: The article provided regression equations for the calculation of  $K_{ow}$  using on molecular descriptors and physicochemical properties. The value of 1.110 was given in the table as an “average”  $K_{ow}$  found in the literature. The “regression-equation” derived value for  $K_{ow}$  was 2.581.

### Conclusions

The partition coefficient was provided in a reliable resource book providing literature-derived and regression-derived values for  $K_{ow}$  (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; information provided in a reliable reference text

**References**

Warne, M. S., D. W. Connell, D. W. Hawker and G. Scheuermann. 1990. Prediction of Aqueous Solubility and the Octanol-Water Partition Coefficient for Lipophilic Organic Compounds Using Molecular Descriptors and Physicochemical Properties. *Chemosphere*, 21(7):877-888.

**Other Available Reports**

**Other**

Last Changed: December 17, 2003

Order Number for Sorting: 367

Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: 1.00E + 006 mg/l  
Solubility: 1.00E + 006 mg/l  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in reliable reference textbook.

### References

Howard, P. H. and W. M. Meylan, eds. 1997. Handbook of Physical Properties of Organic Chemicals. p. 203. Lewis Publishers, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 1  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Not stated  
Solubility: Miscible  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions, endpoint provided by a reliable reference text.

### References

Buhler, D. R. and D. J. Reed. 1990. Nitrogen and Phosphorus Solvents. p. 259. In Ethel Browning's Toxicity and Metabolism of Industrial Solvents. Volume II, 2<sup>nd</sup> edition. Elsevier, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 74  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Qualitatively characterized as “soluble in water”  
Solubility: Qualitatively characterized as “soluble in water”  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

**Reliability:** 2D  
Reliability: Reliable with restrictions; the endpoint was obtained in a reliable reference text.  
Remarks:

### References

Budavari, S., ed. 1996. The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals, 12<sup>th</sup> edition. p. 1175. Merck & Co., Inc., Rahway, NJ, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 226  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Qualitatively stated as “infinite solubility”  
Solubility: Qualitatively stated as “infinite solubility”  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Reinhardt, C. F. 1981. Heterocyclic and Miscellaneous Nitrogen Compounds. pp. 2719 - 2727. In Patty's Industrial Hygiene and Toxicology, 3<sup>rd</sup> revised edition. Clayton, G. D. and F. E. Clayton, eds. J. Wiley & Sons, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 230  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Compound described as “miscible” at 20 °C  
Solubility: Compound described as “miscible” at 20 °C  
pH value and concentration: Not stated  
pKa value at 25 °C: 5.98  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint was subjectively described as miscible, but should provide some judgment regarding solubility (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Goe, G. L. 1982. Kirk-Othmer Encyclopedia of Chemical Technology, 3<sup>rd</sup> edition. 19:454-483. John Wiley & Sons, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 242  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Compound described as “miscible” at 20 °C  
Solubility: Compound described as “miscible” at 20 °C  
pH value and concentration: Not stated  
pKa value at 25 °C: 5.63  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint was subjectively described as miscible, but should provide some judgment regarding solubility (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; secondary literature source.

### References

Goe, G. L. 1982. Kirk-Othmer Encyclopedia of Chemical Technology, 3<sup>rd</sup> edition. 19:454-483. John Wiley & Sons, New York, NY, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 304  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Qualitatively characterized as “miscible with water”  
Solubility: Qualitatively characterized as “miscible with water”  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Reliability: Reliable with restrictions; the endpoint was obtained in a reliable reference text.  
Remarks:

### References

Budavari, S., ed. 1996. The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals, 12<sup>th</sup> edition. p. 1175. Merck Research Laboratories, Whitehouse Station, NJ, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 282  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Qualitatively characterized as “freely soluble in water”  
Solubility: Qualitatively characterized as “freely soluble in water”  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Reliability: Reliable with restrictions; the endpoint was obtained in a reliable reference text.  
Remarks:

### References

Budavari, S., ed. 1996. The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals, 12<sup>th</sup> edition. p. 1175. Merck Research Laboratories, Whitehouse Station, NJ, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 360  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: Qualitatively characterized as “very” water soluble  
Solubility: Qualitatively characterized as “very” water soluble  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; endpoint given in a reliable reference text.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 361  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Nicotinonitrile (CAS RN 100-54-9)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: No value given in tabulated information.  
Solubility: Tabulated information indicated that the material is soluble in water.  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; information provided in a reliable reference text.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 183  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Picolinonitrile (CAS RN 100-70-9)  
Purity: Not stated  
Remarks:

### Method

Method/Guideline followed: Not stated  
GLP: Not stated  
Year: Not stated  
Remarks:

### Results

Value: No value given in tabulated information.  
Solubility: Tabulated information indicated that the material is soluble in water.  
pH value and concentration: Not stated  
pKa value at 25 °C: Not stated  
Remarks:

### Conclusions

The water solubility was provided in a reliable resource book. The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2D  
Remarks: Reliable with restrictions; information provided in a reliable reference text.

### References

Weast, R. C., ed. 1988. CRC Handbook of Chemistry and Physics, 1<sup>st</sup> Student Edition. p. C-474. CRC Press, Inc., Boca Raton, FL, U. S.

### Other Available Reports

### Other

Last Changed: December 17, 2003  
Order Number for Sorting: 203  
Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method measuring substance depletion and inorganic N released.

Test Type: Aerobic biodegradation in soil.

GLP: Not stated

Year: 1985

Contact Time: 64 days

Inoculum: The test soil was a Fincast silt loam which had a water pH of 6.7, organic carbon content of 12 g/kg, total N content of 1300 mg/kg, CEC of 0.15 mol (+)/kg and contained 0.25 kg H<sub>2</sub>O/kg dry soil at -0.03 MPa.

Remarks: Test chambers were prepared in duplicate and dosed at 200 mmol/kg. At 3 to 4 day intervals the soils were adjusted for loss of moisture. After 0, 1, 2, 4, 8, 16, 32 and 64 days of incubation, the foam stoppers and soil from replicate chambers were extracted and analyzed. In addition, a sterile treatment was extracted and analyzed after 7 days of incubation.

#### Results

Degradation: Pyridine concentration in the test soil was below the limit of detection (not given) after 8 days of incubation. Accumulation of inorganic nitrogen at day 16 was equivalent to 54% of the extractable pyridine.

Results: The measured day 0 concentration of pyridine was 96.7% of amount added. The measured concentrations of pyridine on days 1, 2 and 4 were 51.4, 31.5 and 11.7% of amount added. The test substance concentration was below the limit of detection (not given) on day 8. The measured test substance concentration in the sterile control was 93.2% of amount added. Accumulation of inorganic nitrogen at days 16, 32 and 64 was equivalent to 54.0, 67.0 and 58.1% of the extractable pyridine.

Kinetic: Not stated.

Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Sims, G. K. and L. E. Sommers. 1985.  
Degradation of Pyridine Derivatives in Soil:  
Chemical and Biological Assessment. J. Environ.  
Qual. **14**:580 - 584.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

54

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: OECD Guidelines of Testing of Chemicals, Guidelines: 303A Coupled Units Test; 302B Zahn-Wellens Test; 301C MITI Test; 301B CO<sub>2</sub> Evolution Test; 301A OECD Screening Test; 301D Closed Bottle Test

Test Type: 303A: Dissolved organic carbon (DOC) and chemical oxygen demand (COD) removal during wastewater treatment simulation;  
302B: DOC and COD removal;  
301C: DOC and biological oxygen demand (BOD) removal;  
301B: CO<sub>2</sub> evolution;  
301A: DOC die-away and  
301D: Dissolved oxygen uptake.

GLP: Not stated  
Year: 1979  
Contact Time: 303A: variable; 302B: 14 days; 301C: 14 days;  
301B: 28 days; 301A: 19 days; 301D: 30 days;  
Inoculum: 303A: effluent of sludge at 2.5 g/l; 302B: sludge at 1 g/l; 301C: sludge at 30 mg/l; 301B: effluent after acclimation; 301A: effluent at 0.05% and 301D: 1 drop of effluent/liter.  
Remarks: Results of various studies were presented in a correlation of biodegradability determinations. Specific details of the testing of pyridine were not presented.

#### Results

Degradation: 303A: 99 ± 2 % removal, 1 day “working in period”;  
302B: 97% DOC removal after 6 days;  
301C: 15% DOC removal, 11% BOD removal;  
301B: 58% CO<sub>2</sub> evolution, 97% DOC removal;  
301A: 0% DOC removal and  
301D 0% dissolved oxygen uptake.

Results: 303A: 99 ± 2 % removal, 1 day “working in period”;  
302B: 97% DOC removal after 6 days;

301C: 15% DOC removal, 11% BOD removal;  
301B: 58% CO<sub>2</sub> evolution, 97% DOC removal;  
301A: 0% DOC removal and  
301D 0% dissolved oxygen uptake.

Kinetic: Not stated.

Breakdown Products: Not stated.

Remarks:

### **Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### **Data Quality**

Reliability: 2A

Remarks: Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### **References**

Gerike, P. and W. K. Fischer. 1979. A Correlation Study of Biodegradable Determinations with Various Chemicals in Various Tests. *Ecotoxicology and Environmental Safety* **3**:159-173.

### **Other Available Reports**

#### **Other**

Last Changed: December 17, 2003

Order Number for Sorting: 56

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: OECD Guidelines of Testing of Chemicals  
Guidelines: 303A Coupled Units Test; 302B; 301B  
CO<sub>2</sub> Evolution Test; 301A OECD Screening Test;  
301D Closed Bottle Test: AFNOR Test;  
Test Type: 303A Dissolved organic carbon (DOC) and  
chemical oxygen demand (COD) removal during  
wastewater treatment simulation.  
301B CO<sub>2</sub> evolution;  
301A DOC die-away;  
301D Dissolved oxygen uptake and  
AFNOR DOC removal  
GLP: Not stated  
Year: 1980  
Contact Time: Variable  
Inoculum: Not stated.  
Remarks: Results of various studies were presented in a  
correlation of biodegradability determinations.  
Specific details of the testing of pyridine were not  
presented.

#### Results

Degradation:  
Results: 303A: 99 ± 2 % removal, 1 day “working in  
period”;  
301B: 58% CO<sub>2</sub> evolution, 97% DOC removal in  
28 days;  
301A: 91% DOC removal in 19 days;  
301D: 0% dissolved oxygen uptake in 30 days and  
AFNOR: 46% removal in 28 days; 65% removal in  
42 days.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Gerike, P. and W. K. Fischer. 1979. A Correlation Study of Biodegradable Determinations with Various Chemicals in Various Tests. *Ecotoxicology and Environmental Safety* **5**:45-55.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

58

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-guideline specific study using soil suspensions under aerobic and anaerobic conditions.

Test Type: aerobic and anaerobic biodegradation

GLP: No

Year: 1972

Contact Time: 256 days

Inoculum: Fertile garden soil

Remarks: The test substance was tested at 1 mM in an aqueous suspension of 0.5% fertile garden soil, 20 ppm each of yeast extract, peptone and glucose, 4-ppm ammonium sulfate and 180 ppm potassium phosphate adjusted to pH 7.0. Solutions were incubated in 100 × 15 mm diameter culture tubes. Aerobic tubes contained 5 ml of solution and were loosely capped. Anaerobic tubes contained 11.5 ml of solution and were tightly capped. At intervals of approximately 2, 4, 8, 16, 32, 64, 128, 160 and 256 days, 1-ml samples were removed, diluted and filtered to remove suspended matter. The absorption spectra recorded from 210 to 330 nm was compared to that obtained from similar solutions to which 200 ppm HgCl<sub>2</sub> had been added to suppress microbial activity. The number of days required for disappearance of characteristic peaks was determined.

#### Results

Degradation: Aerobic: Complete disappearance of test substance was obtained within > 66 < 170 days.  
Anaerobic: Complete disappearance of test substance required > 32 < 66 days.

Results: Aerobic: Complete disappearance of test substance was obtained within > 66 < 170 days.  
Anaerobic: Complete disappearance of test substance required > 32 < 66 days.

Kinetic: Not stated

Breakdown Products: Not stated

Remarks:

**Conclusions**

The aerobic and anaerobic biodegradation of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Naik, M. N., R. B. Jackson, J. Stokes and R. J. Swaby. 1972. Microbial Degradation and Phytotoxicity of Picloram and Other Substituted Pyridines. *Soil Biol. Biochem.* 4:313 - 323.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

61

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Modified OECD Screening Test.  
Modified Sturm Test.  
Enrichment Culture Test.  
Test Type: Modified OECD Screening Test – dissolved organic carbon (DOC) removal.  
Modified Sturm Test – Carbon Dioxide (CO<sub>2</sub>) Evolution.  
Enrichment Culture Test - dissolved organic carbon (DOC) removal.  
GLP: Not stated  
Year: 1983  
Contact Time: Modified OECD Screening Test – 21 days  
Modified Sturm Test – 8 days  
Enrichment Culture Test – 13 days  
Inoculum: Not stated  
Remarks: The article reports the results obtained in the evaluation of soluble and insoluble compounds using different biodegradability methods. Specific details of the testing of pyridine were not presented.

#### Results

Degradation: Pyridine was reported to be biodegradable under the conditions tested.  
Results: Modified OECD Screening Test: The percent biodegradation on days 7, 14 and 21 were 34, 95 and 100%, respectively.  
Modified Sturm Test: The percent biodegradation on days 2 and 8 were 64% and 94, respectively.  
Enrichment Culture Test: The percent biodegradation on days 7, 11 and 13 were 40, 95 and 98%, respectively  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry

Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Ruffo, C, E. Galli, A. and A. Arpino. 1983. Comparison of Methods for the Biodegradability Evaluation of Soluble and Insoluble Organochemicals. *Ecotoxicology and Environmental Safety*. **8**:275 – 279.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

62

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-guideline specific study of biodegradation of the test substance in soil suspensions

Test Type: aerobic biodegradability

GLP: No

Year: 1986

Contact Time: 7 days

Inoculum: Soil suspension

Remarks: Degradation experiments were carried out in 500 mL Erlenmeyer flasks. Flasks were prepared to contain 150 ml of basal salts medium amended with yeast extract and potassium phosphate buffer adjusted to pH 7.0. To each replicate flask (note – replication noted in article, but did not specify how many replicates) 1 ml of pyridine solution was added to give a final substrate concentration of approximately 1 mM. Flasks were inoculated with 1 ml of a dilute soil suspension prepared by suspending 15 g soil (Fincastle silt loam) in 1 l of mineral salts medium and continuously stirring while 1-ml aliquots were removed. Flasks were incubated at 24 °C for up to 30 days. Subsamples were removed from each flask before and after inoculation and periodically throughout the incubation. Pyridine concentrations were monitored by UV spectrophotometry during the incubation period. The disappearance of pyridine from solutions plus the mineralization of pyridine N was taken as evidence of degradation.

#### Results

Degradation: Degradation achieved 63% in the soil suspension based on release of inorganic nitrogen in the test solutions. UV analysis showed disappearance of test compound in solution was 100% after 7 days.

Results: The amount of pyridine lost from the test solutions determined by UV analysis was 100% within 7 days. 63% was determined to be biodegraded, 16% lost through volatilization and 15.6% sorbed by soil.

Kinetic: Not stated  
Breakdown Products: Not stated  
Remarks:

**Conclusions**

The biodegradability of the test substance in a soil suspension has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability: 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Sims, G. K. and L. E. Sommers. 1986.  
Biodegradation of Pyridine Derivatives in Soil Suspensions. Environ. Toxicol. Chem. 3:503 - 509.

**Other Available Reports**

**Other**

Last Changed: December 17, 2003  
Order Number for Sorting: 65  
Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks: Purchased from Aldrich Chemical Co.

#### Method

Method/Guideline followed: Assessment of degradation based on net gas production ( $\text{CH}_4 + \text{CO}_2$ ).  
Test Type: Anaerobic biodegradation.  
GLP: Not stated  
Year: 1988  
Contact Time: 60 days  
Inoculum: Anaerobic digester sludge with an average solids content of 2.5%, 65% volatile.  
Remarks: Test chemical was tested at 50 mg carbon per liter. Ethanol and 4-cresol were used as positive controls. Test chambers were incubated at 35 °C. Total gas production was measured weekly with a hand-held pressure meter. Net (blank corrected) gas production was expressed as a percentage of the theoretical gas production calculated from the stoichiometry of the test chemical mineralization to  $\text{CH}_4 + \text{CO}_2$ .

#### Results

Degradation:  $58 \pm 12.6\%$  of theoretical gas production produced.  
Results: A lag period of 30 day was observed  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability: 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Battersby, N. S. and V. Wilson. 1988.  
Survey of the Anaerobic Biodegradation Potential  
of Organic Chemicals in Digesting Sludge.  
Environ. Toxicol. Chem. 55:433 - 439

**Other Available Reports**

**Other**

Last Changed: December 17, 2003

Order Number for Sorting: 66

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks: Report stated that “reagent grade” pyridine was used

#### Method

Method/Guideline followed: A non-specific guideline study was described which employed a river water die-away methodology.

Test Type: Aerobic biodegradation  
GLP: No  
Year: 1988  
Contact Time: 6 to 10 days  
Inoculum: Green River water (Kentucky)  
Remarks: The biodegradability of the test substance was tested at 6 test concentrations (0.2, 1.0, 5.0, 20, 100 and 500 mg/L) in unfiltered Green River water (Kentucky). The water quality of Green River was characterized as follows: total organic carbon (TOC) was  $2.72 \pm 15$  mg/L; total solids were  $331 \pm 6$  mg/L; alkalinity was  $96.7 \pm 0.1$  mg/L as  $\text{CaCO}_3$ ; hardness was  $156.8 \pm 1.4$  mg/L as  $\text{CaCO}_3$ ; conductivity was  $279.0 \pm 3.1$   $\mu\text{mhos/cm}$  and pH was  $7.81 \pm 0.02$ .

Control solutions were maintained concurrently at the same test concentrations, only prepared in sterilized, reconstituted water. The water quality of the control water was characterized as follows: total organic carbon (TOC) was  $0.10 \pm 0.04$  mg/L; total solids were  $212 \pm 6$  mg/L; alkalinity was  $50.8 \pm 0.4$  mg/L as  $\text{CaCO}_3$ ; hardness was  $88.1 \pm 1.3$  mg/L as  $\text{CaCO}_3$ ; conductivity was  $279.6 \pm 1.2$   $\mu\text{mhos/cm}$  and pH was  $7.70 \pm 0.02$ .

The concentrated test solutions were initially prepared with sterilized, distilled water, then added to aliquots of respective dilution water. The subsequent dilution by the concentrated prepared chemical solutions was not more than 12% (v/v). All test solutions were incubated at 20 °C in the dark for up to 10 days. Samples of test solution were removed daily for 10 days and analyzed by HPLC for pyridine concentrations.

## Results

Degradation: Complete removal of pyridine from the test solutions occurred for initial concentrations of 0.2, 1.0, 5.0 and 20 mg/l. Degradation could be considered to be 100% at those concentrations.

Results: At 0.2 mg/l, 100% biodegradation occurred within 4 days; at 1.0 mg/l, 100% biodegradation occurred within 6 days; at 5.0 mg/l, 100% biodegradation occurred within 7 days; and at 20 mg/l, 100% biodegradation occurred within 8 days. At higher concentrations, biodegradation proceeded more slowly; at 100 mg/l, biodegradation achieved approx. 66% within 10 days and at 500 mg/l, biodegradation achieved approx. 15% within 10 days. Pyridine concentrations were presumed to be toxic to the microorganisms at those two levels. The test substance concentrations in the control solutions did not drop by more than 10% during the treatment period.

Kinetic: Zero order

Breakdown Products: Not stated

Remarks: After the initial test substance concentration fell below detection limits in the 20 mg/L test solution, approximately 60 mL of the original test solution was spiked with 200 mL of fresh test solution, effectively raising the test substance concentration to from 0 to 13 mg/L. This spiked test solution was sampled again for biodegradation every 3 to 5 hours. Within 38 hours, the test substance again fell below detection limits, suggesting that the degradation of test substance was due to an inducible, microbial process.

## Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability: 2A

Remarks: Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Cassidy, R. A., W. J. Birge and J. A. Black. 1988.  
Biodegradation of Three Azaarene Congeners in  
River Water. Environ. Toxicol. Chem. 7:99 - 105.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

67

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks: Purchased from Tokyo Kasei (Tokyo, Japan).

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion.  
Test Type: Anaerobic biodegradation.  
GLP: Not stated  
Year: 1997  
Contact Time: 200 days  
Inoculum: Estuarine sediment and overlying site water.  
Remarks: Biodegradation of 4-methylpyridine was evaluated in sediment slurries (30-mL, 10% solids, w/v) under sulfate reducing conditions (Na<sub>2</sub>S solution added as a reducing agent). The sediment (<1mm, sieved) and overlying water (pH 7.48, salinity 13%, sulfate concentration 13.5 mM) water were collected from the estuary of Tansui River (Guandu, Taipei). Experiments were run in duplicate and included controls sediments. Testing was conducted at 70 – 80 µM. Test chambers were incubated in the dark at 23 – 25 °C. Samples for analysis were removed using a syringe and needle periodically. Substrate concentration was measured using HPLC.

#### Results

Degradation: None reported.  
Results: 4-Methylpyridine was persistent in the anoxic sediment.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability: 2B  
Remarks: Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Lui, S. M., C. H. Wu and H. J. Huang. 1989.  
Toxicity and Anaerobic Biodegradability of  
Pyridine and Its Derivatives Under Sulfidogenic  
Conditions. Chemosphere 10:2345 - 2357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

245

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-guideline specific study of biodegradation of the test substance in soil suspensions

Test Type: aerobic biodegradability

GLP: No

Year: 1986

Contact Time: 24 days

Inoculum: Soil suspension

Remarks: Degradation experiments were carried out in 500-mL Erlenmeyer flasks. Flasks were prepared to contain 150 ml of basal salts medium amended with yeast extract and potassium phosphate buffer adjusted to pH 7.0. To each replicate flask (note – replication noted in article, but did not specify how many replicates) 1 ml of 4-methylpyridine solution was added to give a final substrate concentration of approximately 1 mM. Flasks were inoculated with 1 ml of a dilute soil suspension prepared by suspending 15 g soil (Fincastle silt loam) in 1 l of mineral salts medium and continuously stirring while 1-ml aliquots were removed. Flasks were incubated at 24 °C for up to 30 days. Subsamples were removed from each flask before and after inoculation and periodically throughout the incubation. 4-Methylpyridine concentrations were monitored by UV spectrophotometry during the incubation period. The disappearance of 4-methylpyridine from solutions plus the mineralization of pyridine-N was taken as evidence of degradation.

#### Results

Degradation: UV analysis indicated a 100% loss of 4-methylpyridine from the test solutions by 24 days, while inorganic nitrogen released to the test solutions accounted for 68% degradation.

Results: 4-Methylpyridine appeared to be degraded in the test. The amount of 4-methylpyridine lost from the test solutions determined by UV analysis was 100%

within 24 days. 68% was determined to be biodegraded based on release of inorganic nitrogen in the test solutions, while 11% was lost through volatilization and 3.0% sorbed by soil.

Kinetic:

Not stated

Breakdown Products:

Not stated

Remarks:

### **Conclusions**

The biodegradability of the test substance in soil suspension has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### **Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### **References**

Sims, G. K. and L. E. Sommers. 1986. Biodegradation of Pyridine Derivatives in Soil Suspensions. Environ. Toxicol. Chem. 3:503 - 509.

### **Other Available Reports**

#### **Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

246

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: No specific guideline followed; methods used similar to die-away study using sewage inoculum and polluted river water.  
Test Type: aerobic biodegradation  
GLP: No  
Year: 1954  
Contact Time: 18 days  
Inoculum: Various river waters  
Remarks: Experiments consisted of adding test substance to carboys (size/volume not stated) containing Ohio River water and stored at 20 °C. Samples were removed periodically and analyzed for test substance. After the test substance disappeared, additional test substance was added and disappearance of that portion was monitored.

#### Results

Degradation: Degradation of 90% (from 1 ppm to 0.1 ppm) occurred after 14 days.  
Results: 90% after 14 days  
Kinetic: Not stated  
Breakdown Products: Not stated  
Remarks: It was found that sewage inoculations failed to degrade the test substance, but when the solutions were seeded with 5% v/v from river water studies, the test substance disappeared after 5 days.

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability: 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Ettinger, M. B., R. J. Lishka and R. C. Kroner.  
1954. Persistence of Pyridine Bases in Polluted  
Water. Industrial and Engineering Chemistry.  
46:791 - 793.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

248

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-guideline specific study using soil suspensions under aerobic and anaerobic conditions.

Test Type: aerobic and anaerobic biodegradation

GLP: No

Year: 1972

Contact Time: 256 days

Inoculum: Fertile garden soil

Remarks: The test substance was tested at 1 mM in an aqueous suspension of 0.5% fertile garden soil, 20 ppm each of yeast extract, peptone and glucose, 4-ppm ammonium sulfate and 180 ppm potassium phosphate adjusted to pH 7.0. Solutions were incubated in 100 × 15 mm diameter culture tubes. Aerobic tubes contained 5 ml of solution and were loosely capped. Anaerobic tubes contained 11.5 ml of solution and were tightly capped. At intervals of approximately 2, 4, 8, 16, 32, 64, 128, 160 and 256 days, 1-ml samples were removed, diluted and filtered to remove suspended matter. The absorption spectra recorded from 210 to 330 nm was compared to that obtained from similar solutions to which 200 ppm HgCl<sub>2</sub> had been added to suppress microbial activity. The number of days required for disappearance of characteristic peaks was determined.

#### Results

Degradation: Aerobic: Complete disappearance of test substance was obtained within > 66 < 170 days.  
Anaerobic: Complete disappearance of test substance required > 32 < 66 days.

Results: Aerobic: Complete disappearance of test substance was obtained within > 66 < 170 days.  
Anaerobic: Complete disappearance of test substance required > 32 < 66 days.

Kinetic: Not stated

Breakdown Products: Not stated

Remarks:

**Conclusions**

The aerobic and anaerobic biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Naik, M. N., R. B. Jackson, J. Stokes and R. J. Swaby. 1972. Microbial Degradation and Phytotoxicity of Picloram and Other Substituted Pyridines. *Soil Biol. Biochem.* 4:313 - 323.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

249

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks: Soil contaminated with pyridine derivatives were obtained from a chemical plant.

#### Method

Method/Guideline followed: Non-specific test method for substrate depletion.  
Test Type: Aerobic and anaerobic biodegradation in soil.  
GLP: Not stated  
Year: 1991  
Contact Time: 3 months  
Inoculum: Surface and subsurface soils contaminated with pyridine derivatives were obtained from a chemical plant. In addition, an unpolluted surface and subsurface soils were used.  
Remarks: Test soils were incubated aerobically or anaerobically at 28 °C. Anaerobic biodegradation was evaluated under denitrifying and sulfate-reducing conditions. Substrate depletion was monitored by HPLC.

#### Results

Degradation: Transformation of 4-methylpyridine varied with test soils and conditions.

Results:

Test Soil /Conditions	% of Initial Substrate Remaining
Unpolluted surface/ Aerobic	0%
Unpolluted surface/Denitrifying	50%
Unpolluted surface Sulfate-reducing	90%
Unpolluted subsurface/ Aerobic	80%
Unpolluted subsurface/Denitrifying	70%
Unpolluted subsurface Sulfate-reducing	70%
Polluted surface/ Aerobic	0%
Polluted surface/Denitrifying	40%
Polluted surface Sulfate-reducing	10%
Polluted subsurface/ Aerobic	0%
Polluted subsurface/Denitrifying	80%
Polluted subsurface Sulfate-reducing	10%

Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2B

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Kaiser, J. P. and J. M Bollag. 1991.  
Influence of Soil Inoculum and Redox Potential on the Degradation of Several Pyridine Derivatives. Soil. Biol. Biochem. 24(4):351 – 357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

250

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method for measuring substrate depletion.  
Test Type: Anaerobic biodegradation.  
GLP: Not stated  
Year: 1992  
Contact Time: 90 days  
Inoculum: Enriched culture from subsurface soil that had been contaminated with various pyridine derivatives.  
Remarks: The test measured the disappearance of 4-picoline in a selectively enriched culture of soil organisms under anaerobic, sulfate reducing conditions at 28°C in the dark. Substrates were measured by high performance liquid chromatography (HPLC). In addition, sulfide production was measured by the methylene blue assay and the amount of ammonia was determined by the Nessler method.

#### Results

Degradation: The initial concentration of 4-picoline was 0.4 mM. After approximately 45 days of incubation, the test substance concentration was below the limit of detection (not given).  
Results: Concurrent with the transformation of 4-picoline was the detection of a metabolite identified as 2-hydroxy-4-picoline. Only small amounts of sulfide were produced during the initial stages of 4-picoline transformation. After 3 months of incubation, 2-hydroxy-4-picoline was completely mineralized to carbon dioxide and ammonia as determined by the amounts of sulfide and ammonia measured in the medium.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry

Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Kaiser, J. P., R. D. Minard and J. M. Bollag. 1992. Transformation of 3- and 4-Picoline under Sulfate-Reducing Conditions. *Appl. Environ. Microbiol.* **59**:701 – 705.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

251

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine ( $\lambda$ -picoline)  
(CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Used method described by Bunch and Chambers. 1967. J. Water Poll. Cont. Fed. 39:181.  
Test Type: Aerobic biodegradability  
GLP: No  
Year: 1973  
Contact Time: 7 days  
Inoculum: Settled raw sewage  
Remarks: The method indicates triplicate flasks were prepared to contain 90 ml nutrient medium, 5 mg yeast extract, then spiked with either test compound or reference compound to achieve 20 mg/l in the flasks. The reference compound was phenol. The flasks were incubated at ambient temperature ( $25 \pm 5$  °C). The initial concentration of the test and reference substances were measured and again after 7 days of incubation. At the end of the 7-day period, 10 ml of solution were removed from each flask and placed in similar flasks of medium as originally prepared to contain 20 mg/l of test or reference compound. The subculturing step is repeated three times for a total time of 28 days, 7 days for the original flasks plus 7 days for each of three successive subcultures. The comparison between the test and reference substances provides an assessment of the degree of biodegradability as well as an indication of the time required for adaptation. Analysis of test substance concentrations was done by UV spectrophotometry.

#### Results

Degradation: The test substance was biodegraded under the conditions of the test. An adaptation period of approximately 14 days was required before complete biodegradation was achieved.  
Results: The original culture was degraded by 30% after 7 days.

Kinetic:	The first subculture was degraded by 99.5% after 7 days;
Breakdown Products:	The second subculture was degraded by 99.5% after 7 days; and
Remarks:	The third subculture was degraded by 99.5% after 7 days.
	Not stated
	Not stated

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:	2A
Remarks:	Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Karnatz, F. A., R. A. Kattau and P. MacKell. 1973. Biodegradability Tests. Report number 73-22. Reilly Tar & Chemical Corp., Indianapolis, IN, U. S.

**Other Available Reports**

**Other**

Last Changed:	December 17, 2003
Order Number for Sorting:	252
Remarks:	

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method measuring substance depletion and inorganic N released.  
Test Type: Aerobic biodegradation in soil.  
GLP: Not stated  
Year: 1985  
Contact Time: 64 days  
Inoculum: The test soil was a Fincast silt loam which had a water pH of 6.7, organic carbon content of 12 g/kg, total N content of 1300 mg/kg, CEC of 0.15 mol (+)/kg and contained 0.25 kg H<sub>2</sub>O/kg dry soil at – 0.03 MPa.  
Remarks: Test chambers were prepared in duplicate and dosed at 200 mmol/kg. At 3 to 4 day intervals the soils were adjusted for loss of moisture. After 0, 1, 2, 4, 8, 16, 32 and 64 days of incubation, the foam stoppers and soil from replicate chambers were extracted and analyzed. In addition, a sterile treatment was extracted and analyzed after 7 days of incubation.

#### Results

Degradation: 4-Methylpyridine concentration in the test soil was below the limit of detection (not given) after 32 days of incubation. Accumulation of inorganic nitrogen at day 32 was equivalent to 69.2% of the extractable pyridine.  
Results: The measured day 0 concentration of 4-methylpyridine was 83.7% of amount added. The measured concentrations of 4-methylpyridine on days 1, 2, 4, 8 and 16 were 80.8, 76.0, 60.5, 42.8 and 29.3% of the amount dosed. The test substance concentration was below the limit of detection (not given) on day 32. The measured test substance concentration in the sterile control was 86.1% of the amount added. Accumulation of inorganic nitrogen at days 16, 32 and 64 was equivalent to 41.2, 69.2 and 74.4% of the extractable 4-methylpyridine.  
Kinetic: Not stated.  
Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Sims, G. K. and L. E. Sommers. 1985.  
Degradation of Pyridine Derivatives in Soil:  
Chemical and Biological Assessment. J. Environ.  
Qual. 14:580 – 584.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

258

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks: Purchased from Aldrich Chemical Co.

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion.

Test Type: Anaerobic biodegradation.

GLP: Not stated

Year: 1989

Contact Time: 8 months

Inoculum: Aquifer solids and water from a site adjacent to a landfill.

Remarks: Biodegradation of 4-methylpyridine was evaluated under sulfate-reducing and methanogenic conditions. Experiments were conducted in duplicate and included sterile controls. Initial substrate concentrations were in the range of 0.14 to 0.25 mM. Test chambers were incubated in the dark at room temperature. Samples for analysis were aseptically and anaerobically removed using a syringe and needle immediately after the addition of the test substance and periodically thereafter. Substrate concentration was measured using reversed-phase high-pressure liquid chromatography (HPLC).

#### Results

Degradation: Under sulfate-reducing conditions, the percent of substrate remaining after 1, 3 and 8 months was 75, 47 and 65%, respectively. Under methanogenic conditions, the percent of substrate remaining after 1, 3 and 8 months was 97, 93 and < 10%, respectively.

Results: The results represent the average substrate concentration in non-sterile replicates relative to the sterile controls.

Kinetic: Not stated.

Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Kuhn, E. P. and J. M. Sulfito. 1989.  
Microbial Degradation of Nitrogen, Oxygen and Sulfur Heterocyclic Compound Under Anaerobic Conditions: Studies with Aquifer Samples.  
Environ. Toxicol. Chem. 8:1149 - 1158.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

260

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Picoline (CAS RN 108-99-6)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method used to assess degradation in a soil-nutrient medium slurry  
Test Type: Aerobic soil biodegradation  
GLP: No  
Year: 1989  
Contact Time: Various, up to approximately 38 days  
Inoculum: Soil bacteria  
Remarks: The article described a study of the effects of temperature, pH, sodium chloride concentration, phosphorus concentration, nitrogen concentration and alternate carbon substrates on the aerobic biodegradation of 3-picoline. A cross-acclimation study was also conducted to investigate the ability of a culture adapted to one substrate to also degrade 3-picoline. The other substrates utilized as inoculums for this investigation were 2-picoline, 2,4-lutidine, and 2,6-lutidine. Concentrations of the test substance were determined in slurry samples using HPLC.

#### Results

Degradation: Degradation of the test substance appeared to be complete for 3-picoline.  
Results: At 20, 30, and 40°C, concentrations of the test substance decreased to 0 (not detected) from 131.8, 136.6, and 134.9 ppm, respectively in 9 to 11 days. At a pH of 4.9 through 8.4, concentrations of the 3-picoline decreased to 0 (not detected) from 50.2 through 73.3 ppm within 5 to 13 days. The fastest degradation occurred at a pH of 7.0 with the degradation at a pH of 4.9 and 8.4 being considerably slower. Degradation of the test substance occurred at all tested sodium chloride concentrations (0 to 20.0 g/l) within 9 to 12 days. Degradation of the test substance occurred efficiently (within 6 to 8 days) when 10 to 500 µM phosphate was added. Degradation of the test substance was virtually unaffected (between 9 and 11 days) at ammonium chloride concentrations of 0

to 500 µM. Degradation of the test substance was relatively fast (within 9 days) when no additional carbon source was present. However, glucose and acetate strongly inhibited its degradation (complete degradation within 48 days). The test substance degraded completely in 10, 5, 13 and 16 days when the culture was inoculated with 2-picoline, 3-picoline, 2,4-lutidine and 2,6-lutidine, respectively.

Kinetic:

Day	3-Picoline Concentration (ppm)				
	10°C	20°C	30°C	40°C	50°C
0	129.5	131.8	136.6	134.9	65.6
2	122.8	121.9	130.4	132.4	60.6
4	124.7	81.8	82.4	129.1	62.6
6	125.2	36.4	36.4	124.3	60.6
9	133.6	0	0	69.7	62.1
11	130.8			0	66.6
13	140.8				64.0
15	47.2				55.2

Day	3-Picoline Concentration (ppm)				
	pH 4.9	pH 6.0	pH 6.9	pH 7.6	pH 8.4
0	73.3	56.2	50.2	65.3	58.9
2	64.2	60.0	48.5	67.1	60.8
3	66.2	56.9	29.8	60.7	61.6
5	60.7	20.9	0	34.1	50.3
7	58.1	0		30.3	48.5
10	34.9			0	14.5
13	0				0

Day	3-Picoline Concentration (ppm)			
	0 g/l NaCl	1.0 g/l NaCl	10.0 g/l NaCl	20.0 g/l NaCl
0	113.1	142.7	115.9	127.4
2	126.7	139.9	122.0	116.5
5	82.3	67.5	46.7	100.6
6	33.8	0	0	23.6
12	0			0

Day	3-Picoline Concentration (ppm)			
	0 $\mu\text{M}$ $\text{KH}_2\text{PO}_4$	25 $\mu\text{M}$ $\text{KH}_2\text{PO}_4$	100 $\mu\text{M}$ $\text{KH}_2\text{PO}_4$	200 $\mu\text{M}^*$ $\text{KH}_2\text{PO}_4$
0	46.7	50.1	53.7	52.4
3	44.1	41.3	51.1	45.2
4	23.2	27.3	35.2	19.0
6	33.8	11.3	29.2	11.6
8	21.0	0	0	0
17	0			

\* Data for 500 $\mu\text{M}$   $\text{KH}_2\text{PO}_4$  illegible on copy of report available

Day	3-Picoline Concentration (ppm)			
	0 $\mu\text{M}$ $\text{NH}_4^+$	10 $\mu\text{M}$ $\text{NH}_4^+$	100 $\mu\text{M}$ $\text{NH}_4^+$	500 $\mu\text{M}$ $\text{NH}_4^+$
0	135.1	147.6	142.0	144.8
4	80.9	105.2	105.0	99.5
6	83.1	97.7	99.8	80.5
9	24.8	16.8	28.6	0
11	0	0	0	

Day	3-Picoline Concentration (ppm)				
	No Carbon	Ethanol	Glucose	Acetate	Benzoate
0	110.4	133.2	139.8	121.8	109.8
6	73.0	119.4	126.6	120.6	112.3
9	0	101.0	119.6	112.6	102.9
16		98.2	113.9	106.9	0
23		0	109.5	--	
37			81.4	90.0	
44			36.0	41.8	
48			0	0	

Day	3-Picoline Concentration (ppm)			
	2-Picoline	3-Picoline	2,4-lutidine	2,6-lutidine
0	135.2	103.1	129.9	132.2
2-3	132.2	64.8	130.2	121.2
5	91.4	0	129.0	114.4
7-8	62.9		118.7	74.1
10-12	0		45.1	2.8
13			0	0

Breakdown Products:  
Remarks:

Not stated

**Conclusions**

The degradation of the test substance was adequately characterized by the study (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Bollag, J.-M. and J.-P. Kaiser. 1990. Biorestorative Procedures for Pyridine-Contaminated Environmental Sites, Revised Progress Report for the Period June 1, 1989 to November 30, 1989. Laboratory of Soil Biochemistry, The Pennsylvania State University, Philadelphia, PA, U. S.

**Other Available Reports**

**Other**

Last Changed:

June 26, 2001

Order Number for Sorting:

288

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-guideline specific study of biodegradation of the test substance in soil suspensions

Test Type: aerobic biodegradability

GLP: No

Year: 1986

Contact Time: 30 days

Inoculum: Soil suspension

Remarks: Degradation experiments were carried out in 500-mL Erlenmeyer flasks. Flasks were prepared to contain 150 ml of basal salts medium amended with yeast extract and potassium phosphate buffer adjusted to pH 7.0. To each replicate flask (note – replication noted in article, but did not specify how many replicates) 1 ml of 3-methylpyridine solution was added to give a final substrate concentration of approximately 1 mM. Flasks were inoculated with 1 ml of a dilute soil suspension prepared by suspending 15 g soil (Fincastle silt loam) in 1 l of mineral salts medium and continuously stirring while 1-ml aliquots were removed. Flasks were incubated at 24 °C for up to 30 days. Subsamples were removed from each flask before and after inoculation and periodically throughout the incubation. 3-Methylpyridine concentrations were monitored by UV spectrophotometry during the incubation period. The disappearance of 3-methylpyridine from solutions plus the mineralization of pyridine-N was taken as evidence of degradation.

#### Results

Degradation: Based on release of inorganic nitrogen, degradation achieved < 1% in the soil suspension. Based on UV analysis, 58% of test compound was lost by 30 days.

Results: 3-Methylpyridine did not appear to be appreciably degraded. The amount of 3-methylpyridine lost from the test solutions determined by UV analysis

was 58% in 24 days. Less than 1% was degraded according to release of inorganic nitrogen to the solutions, while 45% was lost through volatilization and 4.4% sorbed by soil.

Kinetic:

Not stated

Breakdown Products:

Not stated

Remarks:

### **Conclusions**

The biodegradability of the test substance in a soil suspension has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### **Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### **References**

Sims, G. K. and L. E. Sommers. 1986.  
Biodegradation of Pyridine Derivatives in Soil Suspensions. Environ. Toxicol. Chem. 3:503 - 509.

### **Other Available Reports**

#### **Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

296

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: No specific guideline followed; methods used similar to die-away study using sewage inoculum and polluted river water.  
Test Type: aerobic biodegradation  
GLP: No  
Year: 1954  
Contact Time: 18 days  
Inoculum: Ohio River water  
Remarks: Experiments consisted of adding test substance to carboys (size/volume not stated) containing Ohio River water and stored at 20 °C. Samples were removed periodically and analyzed for test substance. After the test substance disappeared, additional test substance was added and disappearance of that portion was monitored.

#### Results

Degradation: Degradation attained approximately 100% after 14 days. Additions of test substance after the disappearance of the initial dose were rapidly biodegraded within two days.  
Results: 100% after 14 days  
Kinetic: Not stated  
Breakdown Products: Not stated  
Remarks: After an initial lag phase of approximately 9 days, biodegradation was rapid. Subsequent additions of test compound resulted in rapid degradation of 100% with no or little lag phase.

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Ettinger, M. B., R. J. Lishka and R. C. Kroner. 1954. Persistence of Pyridine Bases in Polluted Water. Industrial and Engineering Chemistry. 46:791 - 793.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

297

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
 Purity: Not stated  
 Remarks: Soil contaminated with pyridine derivatives were obtained from a chemical plant.

#### Method

Method/Guideline followed: Non-specific test method for substrate depletion.  
 Test Type: Aerobic and anaerobic biodegradation in soil.  
 GLP: Not stated  
 Year: 1991  
 Contact Time: 3 months  
 Inoculum: Surface and subsurface soils contaminated with pyridine derivatives were obtained from a chemical plant. In addition, an unpolluted surface and subsurface soils were used.  
 Remarks: Test soils were incubated aerobically or anaerobically at 28 °C. Anaerobic biodegradation was evaluated under denitrifying and sulfate-reducing conditions. Substrate depletion was monitored by HPLC.

#### Results

Degradation: Transformation of 3-methylpyridine varied with test soils and conditions.

Results:

Test Soil /Conditions	% of Initial Substrate Remaining
Unpolluted surface/ Aerobic	70%
Unpolluted surface/Denitrifying	60%
Unpolluted surface Sulfate-reducing	90%
Unpolluted subsurface/ Aerobic	80%
Unpolluted subsurface/Denitrifying	100%
Unpolluted subsurface Sulfate-reducing	100%
Polluted surface/ Aerobic	0%
Polluted surface/Denitrifying	50%
Polluted surface Sulfate-reducing	60%
Polluted subsurface/ Aerobic	0%
Polluted subsurface/Denitrifying	100%
Polluted subsurface Sulfate-reducing	0%

Kinetic: Not stated.  
 Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Kaiser, J. P. and J. M Bollag. 1991.  
Influence of Soil Inoculum and Redox Potential on the Degradation of Several Pyridine Derivatives. Soil. Biol. Biochem. 24(4):351 – 357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

299

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method for measuring substrate depletion.  
Test Type: Anaerobic biodegradation.  
GLP: Not stated  
Year: 1992  
Contact Time: 30 days  
Inoculum: Enriched culture from subsurface soil that had been contaminated with various pyridine derivatives.  
Remarks: The test measured the disappearance of 3-Picoline in a selectively enriched culture of soil organisms under anaerobic, sulfate reducing conditions at 28°C in the dark. Substrates were measured by high performance liquid chromatography (HPLC). In addition, sulfide production was measured by the methylene blue assay and the amount of ammonia was determined by the Nessler method.

#### Results

Degradation: The initial concentration of 3-picoline was 0.4 mM. After 30 days of incubation, the test substance concentration was below the limit of detection (not given).  
Results: Disappearance of 3-picoline with a concomitant production of sulfide was observed. Agreement between the predicted and measured amounts of sulfide reduced and ammonia released into the culture medium indicated that 3-picoline was completely mineralized to carbon dioxide and ammonia.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Kaiser, J. P., R. D. Minard and J. M. Bollag. 1992 Transformation of 3- and 4-Picoline under Sulfate-Reducing Conditions. Appl. Environ. Microbiol. **59**:701 – 705.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

300

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Picoline (CAS RN 108-99-6)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: BOD<sub>5</sub> and non-standard continuous flow method  
Test Type: Oxygen uptake and test substance removal  
GLP: Not stated  
Year: 1976  
Contact Time: BOD<sub>5</sub>: 5 days; continuous flow: retention times up to 312 hours  
Inoculum: Activated sludge organisms  
Remarks: A standard BOD<sub>5</sub> test was used to evaluate biodegradability in wastewater. In addition, removal during a pilot plant biological treatment system consisting of a recirculating trickling filter, followed by activated sludge aeration was evaluated. Methods for the analysis of the test substance were not presented. Evaluations were performed at 163, 413 and 746 mg/l of 3-picoline.

#### Results

Degradation: 31.0% of calculated oxygen demand by BOD<sub>5</sub>.  
Results: 31.0% of calculated oxygen demand by BOD<sub>5</sub>.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks: In addition to the BOD test, the test substance was measured for biodegradability in a pilot treatment plant system. Under continuous flow conditions with retention times of up to 312 hours, 93.8% removal of the test substance was observed. This suggests that the test substance would be degraded under sewage treatment plant conditions.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

Removal of the test substance during an optimized biological treatment process has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Bolye, J. M. and A. R. Miller. 1976. Treatment of Wastewater: Controlled Experiment on Biodegradability of 3-Picoline. US EPA Document number 878214725. Reilly Tar & Chemical Corporation, Indianapolis, IN, U. S.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

308

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine ( $\beta$ -picoline)  
(CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Used method described by Bunch and Chambers. 1967. J. Water Poll. Cont. Fed. 39:181.  
Test Type: Aerobic biodegradability  
GLP: No  
Year: 1973  
Contact Time: 7 days  
Inoculum: Settled raw sewage  
Remarks: The method indicates triplicate flasks were prepared to contain 90 ml nutrient medium, 5 mg yeast extract, then spiked with either test compound or reference compound to achieve 20 mg/l in the flasks. The reference compound was phenol. The flasks were incubated at ambient temperature ( $25 \pm 5$  °C). The initial concentration of the test and reference substances were measured and again after 7 days of incubation. At the end of the 7-day period, 10 ml of solution were removed from each flask and placed in similar flasks of medium as originally prepared to contain 20 mg/l of test or reference compound. The subculturing step is repeated three times for a total time of 28 days, 7 days for the original flasks plus 7 days for each of three successive subcultures. The comparison between the test and reference substances provides an assessment of the degree of biodegradability as well as an indication of the time required for adaptation. Analysis of test substance concentrations was done by UV spectrophotometry.

#### Results

Degradation: The test substance was biodegraded under the conditions of the test. An adaptation period of approximately 14 days was required before complete biodegradation was achieved.  
Results: The original culture was degraded by 47.5% after 7 days.

Kinetic:	The first subculture was degraded by 51.5% after 7 days;
Breakdown Products:	The second subculture was degraded by 99.5% after 7 days; and
Remarks:	The third subculture was not performed.
	Not stated
	Not stated

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:	2A
Remarks:	Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Karnatz, F. A., R. A. Kattau and P. MacKell. 1973. Biodegradability Tests: Report number 73-22. Reilly Tar & Chemical Corp., Indianapolis, IN, U. S.

**Other Available Reports**

**Other**

Last Changed:	December 17, 2003
Order Number for Sorting:	309
Remarks:	

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks: Purchased from Tokyo Kasei (Tokyo, Japan).

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion.  
Test Type: Anaerobic biodegradation.  
GLP: Not stated  
Year: 1997  
Contact Time: 200 days  
Inoculum: Estuarine sediment and overlying site water.  
Remarks: Biodegradation of 3-methylpyridine was evaluated in sediment slurries (30-mL, 10% solids, w/v) under sulfate reducing conditions (Na<sub>2</sub>S solution added as a reducing agent). The sediment (<1mm, sieved) and overlying water (pH 7.48, salinity 13%, sulfate concentration 13.5 mM) water were collected from the estuary of Tansui River (Guandu, Taipei). Experiments were run in duplicate and included controls sediments. Testing was conducted at 70 - 80 µM. Test chambers were incubated in the dark at 23 – 25 °C. Samples for analysis were removed using a syringe and needle periodically. Substrate concentration was measured using HPLC.

#### Results

Degradation: None reported.  
Results: 3-Methylpyridine was persistent in the anoxic sediment.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability: 2B  
Remarks: Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Lui, S. M., C. H. Wu and H. J. Huang. 1989.  
Toxicity and Anaerobic Biodegradability of  
Pyridine and its Derivatives Under Sulfidogenic  
Conditions. Chemosphere. 10:2345 - 2357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

311

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine ( $\beta$ -picoline)  
(CAS RN 108-99-6; 3-Picoline)  
Purity: Not specified other than “reagent grade” chemicals used.  
Remarks:

#### Method

Method/Guideline followed: Not a guideline study, but methods used were similar to a semi-continuous activated sludge test.  
Test Type: Aerobic biodegradation  
GLP: No  
Year: 1997  
Contact Time: 48 hours (given as hydraulic retention time)  
Inoculum: Activated sludge  
Remarks: The test used a mixed composition of heterocyclic bases in a completely mixed activated sludge (CMAS) reactor. Compound-specific analysis of the effluent liquor was made by gas chromatography and Total Organic Carbon (TOC) removal was determined with a TOC analyzer. The CMAS reactors were operated at different hydraulic retention times (HRT) to identify optimum HRTs for biodegradation. The microbial status of the reactor was monitored using nutrient agar plates.

#### Results

Degradation: Degradation was optimized at a HRT of 48 hours. Degradation was presented as percent TOC removal, with 96% removal occurring under the conditions of the test.  
Results: 96% removal of TOC in 48 hours.  
Kinetic: Not stated  
Breakdown Products: Not stated  
Remarks: Additional information was provided as follows:  
At an influent concentration of 8.6 mg/l of the test substance, no detectable test substance was found in the effluent. While the test cannot claim ready biodegradability status, it does show that activated sludge microorganisms break down the test substance.

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Pandey, R. A. and S. Sandhya. 1997. Microbial Degradation of Heterocyclic Bases in a Completely Mixed Activated Sludge Process. J. Environ. Sci. Health. A32(5):1325 - 1338.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

312

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks: Purchased from Aldrich Chemical Co.

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion.

Test Type: Anaerobic biodegradation.

GLP: Not stated

Year: 1989

Contact Time: 8 months

Inoculum: Aquifer solids and water from a site adjacent to a landfill.

Remarks: Biodegradation of 3-methylpyridine was evaluated under sulfate reducing and methanogenic conditions. Experiments were conducted in duplicate and included sterile controls. Initial substrate concentrations were in the range of 0.14 to 0.25 mM. Test chambers were incubated in the dark at room temperature. Samples for analysis were aseptically and anaerobically removed using a syringe and needle immediately after the addition of the test substance and periodically thereafter. Substrate concentration was measured using reversed-phase high-pressure liquid chromatography (HPLC).

#### Results

Degradation: Under sulfate reducing conditions, the percent of substrate remaining after 1, 3 and 8 months was 89, 103 and < 74%, respectively. Under methanogenic conditions, the percent of substrate remaining after 1, 3 and 8 months was 101, 102 and 101%, respectively.

Results: The results represent the average substrate concentration in non-sterile replicates relative to the sterile controls.

Kinetic: Not stated.

Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Kuhn, E. P. and Joseph M. Sulfito. 1989. Microbial Degradation of Nitrogen, Oxygen and Sulfur Heterocyclic Compound Under Anaerobic Conditions: Studies with Aquifer Samples. Environ. Toxicol. Chem. 8:1149 - 1158.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

316

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method measuring substance depletion and inorganic N released.  
Test Type: Aerobic biodegradation in soil.  
GLP: Not stated  
Year: 1985  
Contact Time: 64 days  
Inoculum: The test soil was a Fincast silt loam which had a water pH of 6.7, organic carbon content of 12 g/kg, total N content of 1300 mg/kg, CEC of 0.15 mol (+)/kg and contained 0.25 kg H<sub>2</sub>O/ kg dry soil at – 0.03 MPa.  
Remarks: Test chambers were prepared in duplicate and dosed at 200 mmol/kg. At 3 to 4 day intervals the soils were adjusted for loss of moisture. After 0, 1, 2, 4, 8, 16, 32 and 64 days of incubation, the foam stoppers and soil from replicate chambers were extracted and analyzed. In addition, a sterile treatment was extracted and analyzed after 7 days of incubation.

#### Results

Degradation: 3-Methylpyridine concentration in the test soil was below the limit of detection (not given) after 32 days of incubation. Accumulation of inorganic nitrogen at day 32 was equivalent to 69.3% of the extractable 3-methylpyridine.  
Results: The measured day 0 concentration of 3-methylpyridine was 90.1% of amount added. The measured concentrations of 3-methylpyridine on days 1, 2, 4, 8 and 16 were 72.4, 60.0, 44.8, 30.1 and 2.7% of the amount dosed. The test substance concentration was below the limit of detection (not given) on day 32. The measured test substance concentration in the sterile control was 88.3% of the amount added. Accumulation of inorganic nitrogen at days 16, 32 and 64 was equivalent to 58.3, 69.3 and 65.3% of the extractable 3-methylpyridine.  
Kinetic: Not stated.  
Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Sims, G. K. and L. E. Sommers. 1985.  
Degradation of Pyridine Derivatives in Soil:  
Chemical and Biological Assessment. J. Environ.  
Qual. **14**:580 – 584.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

319

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Methylpyridine ( $\beta$ -Picoline)  
(CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: OECD Guidelines for testing of chemicals “Ready Biodegradability: CO<sub>2</sub> Evolution Test”.

Test Type: Aerobic biodegradation  
GLP: Yes  
Year: 1991  
Contact Time: 28 days  
Inoculum: Activated sludge  
Remarks: The CO<sub>2</sub> evolution test was carried out in 5-l brown jars holding approximately 3 l of the test solutions. Duplicate jars were used in each experimental group. Two jars contained nutrient medium and activated sludge and served as a biological control, two contained only medium and served as an abiotic control, two jars contained medium, activated sludge and aniline as a reference substance and two jars contained medium, activated sludge and test substance. The reference and test substance concentrations were sufficient to provide 20 mg carbon/l in each jar. The inoculum originated from an activated sludge domestic wastewater treatment plant located in Beerse, Belgium. A fresh sample was collected on the day of test initiation and the sludge was washed twice with tap water and once with dilution water (nutrient medium) to remove residual wastewater and potential inhibitory materials. The sludge was diluted to 30 mg suspended solids/l in the test solutions. Each jar was filled with medium and activated sludge and attached to aeration tubes and aerated with CO<sub>2</sub>-free air and gently stirred using magnetic stirrers for 72 hours to reduce the blank respiration rate. Either test substance or reference compound was added to the appropriate jars and CO<sub>2</sub> scrubbing bottles were filled with sodium hydroxide and attached in series to the air exit tubes from the jars. The test was carried out at 19 to 23 °C. On days 0, 1, 2, 3, 7, 10, 14, 17, 21, 24 and 28 samples from the jars were

removed, centrifuged and analyzed for dissolved organic carbon (DOC) using an organic carbon analyzer. At the same time, the first CO<sub>2</sub> scrubbing bottle was removed and the total inorganic carbon was analyzed. A new scrubbing bottle was added at the end of the series.

## Results

Degradation:

Based on measurements of dissolved organic carbon, 3-methylpyridine was degraded to approximately 95% by day 10. Biodegradation based on CO<sub>2</sub> evolution achieved approximately 85% by day 29.

Results:

Based on DOC, 95% degradation occurred within 10 days.

Based on CO<sub>2</sub> evolved, 85% degradation occurred within 28 days.

Kinetic:

Not stated

Breakdown Products:

Not stated

Remarks:

The pass level for a conclusion of “ready biodegradability” was attained based on DOC and CO<sub>2</sub> analysis. Although the 10-day window criterion for CO<sub>2</sub> evolution was nearly, but not quite, met, the authors concluded that the test substance was ready biodegradable. This reviewer concurs.

## Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability:

1A

Remarks:

Reliable without restriction; guideline study (OECD).

## References

Weytjens, D. 1991. The Biodegradability of  $\beta$ -Picoline (3-Methyl Pyridine) CO<sub>2</sub> Evolution Test. Report number BDAS/0016. Janssen Pharmaceutica N.V., Beerse, Belgium.

## **Other Available Reports**

### **Other**

Last Changed:	December 17, 2003
Order Number for Sorting:	320
Remarks:	

### 3.5 BIODEGRADATION

#### Test Substance

Identity:  $\beta$ -Picoline (3-Methyl pyridine)  
(CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Methods conformed to OECD Guidelines for Testing of Chemicals, Guideline no. 301B Ready Biodegradability, CO<sub>2</sub> Evolution Test.

Test Type: Aerobic biodegradation in water  
GLP: Yes  
Year: 1991  
Contact Time: 28 days  
Inoculum: Activated sludge collected from a domestic wastewater treatment plant.

Remarks: The experiment measured the biodegradability of the test substance using the CO<sub>2</sub> Evolution Test Method. The test contained 1) two replicate blank controls containing mineral solution and inoculum (no test substance added), 2) two replicate reference controls containing mineral solution, inoculum and aniline at 20 mg organic carbon per liter, 3) two replicate abiotic controls containing mineral solution and test substance at 20 mg organic carbon per liter, 4) two replicate treatments containing mineral solution, inoculum and test substance at 20 mg organic carbon per liter. All test chambers were aerated with CO<sub>2</sub> free air. Effluent gases were passed through a series of CO<sub>2</sub> traps containing 0.05 N NaOH. The CO<sub>2</sub> traps were routinely removed and analyzed to determine the inorganic carbon concentration of the trapping solution. In addition, biodegradation was monitored by measuring the dissolved organic carbon concentration (DOC) of the test solutions.

#### Results

Degradation: Based on evolved CO<sub>2</sub>,  $\beta$ -Picoline was degraded an average of approximately 85% by day 28. Based on the measured DOC of the test solution,  $\beta$ -Picoline was degraded approximately 98%. Approximately 14% and 11% biodegradation was

Results: observed in the abiotic treatment based on CO<sub>2</sub> production and DOC removal. The results of the blank and reference controls were within the acceptable limits for a valid test. Based on evolved CO<sub>2</sub>, the pass level for ready biodegradability of 60% was achieved, but not within a 10-day window of reaching 10%. Based on DOC removal, the pass level of 70% was achieved by day 8 of the study.

Kinetic: Not stated.

Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability: 1A

Remarks: Reliable without restrictions; guideline study (OECD).

**References**

Weytjens, D. and R. Wils. 1991. The Biodegradability of  $\beta$ -picoline (3-methyl pyridine) – CO<sub>2</sub> Evolution Test. Unpublished report no. BDAS/0016 in EPA Document number 86-930000171, submitted by Reilly Industries, Inc., Indianapolis, IN, U.S.A.

**Other Available Reports**

**Other**

Last Changed: December 17, 2003

Order Number for Sorting: 323

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Picoline (CAS RN 109-06-8)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method used to assess degradation in a soil-nutrient medium slurry  
Test Type: Aerobic soil biodegradation  
GLP: No  
Year: 1989  
Contact Time: Various, up to approximately 38 days  
Inoculum: Soil bacteria  
Remarks: The article described a study of the effects of temperature, pH, sodium chloride concentration, phosphorus concentration, nitrogen concentration and alternate carbon substrates on the aerobic biodegradation of 2-picoline. A cross-acclimation study was also conducted to investigate the ability of a culture adapted to one substrate to also degrade 2-picoline. The other substrates utilized as inoculums for this investigation were 3-picoline, 2,4-lutidine, and 2,6-lutidine. Concentrations of the test substance were determined in slurry samples using HPLC.

#### Results

Degradation: Degradation of the test substance appeared to be complete for 2-picoline.  
Results: At 20, 30, and 40°C, concentrations of the test substance decreased to 0 (not detected) from 43.6, 49.4, and 33.5 ppm, respectively, in 6, 9 and 13 days, respectively. At a pH of 5.4 through 8.5, concentrations of the 2-picoline decreased to 0 (not detected) from 43.1 to 60.3 ppm within 5 to 10 days. Degradation of the test substance occurred at all tested sodium chloride concentrations (0 to 20.0 g/l) within 9 days. Degradation of the test substance occurred within 6 to 8 days when 10 to 500 µM phosphate was added. Degradation of the test substance was virtually unaffected (between 6 and 9 days) at ammonium chloride concentrations of 0 to 500 µM. Degradation of the test substance was relatively fast (within 9 days) when no additional carbon source was present and increased

slightly (up to 13 days) with the addition of another carbon source. The test substance degraded completely in 7, 5, 13 and 12 days when the culture was inoculated with 2-picoline, 3-picoline, 2,4-lutidine and 2,6-lutidine, respectively.

Kinetic:

Day	2-Picoline Concentration (ppm)				
	10°C	20°C	30°C	40°C	50°C
0	51.5	43.6	49.4	33.5	45.6
2	47.9	43.2	43.9	32.6	47.7
4	54.1	25.6	33.8	30.2	46.0
6	45.4	0	8.0	26.2	36.5
9	41.2		0	18.0	49.4
11	36.7			14.0	44.9
13	39.8			0	46.3
15	47.2				48.3

Day	2-Picoline Concentration (ppm)				
	pH 5.4	PH 6.1	pH 6.8	pH 7.8	pH 8.5
0	55.1	60.3	56.0	43.1	58.0
2	50.3	41.5	30.3	36.1	57.8
3	43.6	13.9	10.9	6.7	51.7
5	25.7	0	0	0	25.6
7	13.8				21.0
10	0				0

Day	2-Picoline Concentration (ppm)			
	0 g/l NaCl	1.0 g/l NaCl	10.0 g/l NaCl	20.0 g/l NaCl
0	98.8	83.9	89.4	77.7
2	81.4	65.1	71.2	67.9
5	49.4	24.2	29.3	26.6
9	0	0	0	0

Day	2-Picoline Concentration (ppm)			
	0 $\mu$ M KH <sub>2</sub> PO <sub>4</sub>	25 $\mu$ M KH <sub>2</sub> PO <sub>4</sub>	100 $\mu$ M KH <sub>2</sub> PO <sub>4</sub>	500 $\mu$ M KH <sub>2</sub> PO <sub>4</sub>
0	42.4	40.4	41.4	36
1	40.3	38.6	39.2	35
3	26.5	30.8	30.7	29
6	14.6	0	5.1	1
8	5.6		0	0
13	0			

Day	2-Picoline Concentration (ppm)			
	0 $\mu\text{M}$ $\text{NH}_4^+$	10 $\mu\text{M}$ $\text{NH}_4^+$	100 $\mu\text{M}$ $\text{NH}_4^+$	500 $\mu\text{M}$ $\text{NH}_4^+$
0	118.7	113.9	107.9	110.9
2	97.8	112.7	111.3	95.9
4	112.1	74.9	65.3	62.0
6	68.9	118	5.0	0
9	0	0	0	

Day	2-Picoline Concentration (ppm)				
	No Carbon	Ethanol	Glucose	Acetate	Benzoate
0	104.5	111.3	88.3	97.5	100.5
2	101.3	118.2	89.1	96.9	95.5
4	93.7	122.9	84.0	95.7	103.3
6	16.5	107.2	81.7	52.6	91.7
9	0	55.7	30.8	0	78.5
11		0	82.0		38.9
13			0		0

Day	2-Picoline Concentration (ppm)			
	2-Picoline	3-Picoline	2,4-lutidine	2,6-lutidine
0	83.1	83.3	92.5	80.8
2-3	70.4	56.8	90.0	80.3
5	18.9	0	98.0	54.7
7-8	0		94.4	52.8
10-12			53.2	0
13			0	

Breakdown Products:

Not stated

Remarks:

**Conclusions**

The degradation of the test substance was adequately characterized by the study (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Bollag, J.-M. and J.-P. Kaiser. 1990. Biorestorative Procedures for Pyridine-Contaminated Environmental Sites, Revised Progress Report for the period June 1, 1989 to November 30, 1989. Laboratory of Soil Biochemistry, The Pennsylvania State University, Philadelphia, PA, U. S.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

234

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine ( $\alpha$ -Picoline)  
(CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Used method described by Bunch and Chambers. 1967. J. Water Poll. Cont. Fed. 39:181.  
Test Type: Aerobic biodegradability  
GLP: No  
Year: 1973  
Contact Time: 7 days  
Inoculum: Settled raw sewage  
Remarks: The method indicates triplicate flasks were prepared to contain 90 ml nutrient medium, 5 mg yeast extract, then spiked with either test compound or reference compound to achieve 20 mg/l in the flasks. The reference compound was phenol. The flasks were incubated at ambient temperature ( $25 \pm 5$  °C). The initial concentration of the test and reference substances were measured and again after 7 days of incubation. At the end of the 7-day period, 10 ml of solution were removed from each flask and placed in similar flasks of medium as originally prepared to contain 20 mg/l of test or reference compound. The subculturing step is repeated three times for a total time of 28 days, 7 days for the original flasks plus 7 days for each of three successive subcultures. The comparison between the test and reference substances provides an assessment of the degree of biodegradability as well as an indication of the time required for adaptation. Analysis of test substance concentrations was done by UV spectrophotometry.

#### Results

Degradation: The test substance was biodegraded under the conditions of the test.  
Results: The original culture was degraded by 94% after 7 days.  
The first subculture was degraded by 97.5% after 7 days;

The second subculture was degraded by 99.5% after 7 days; and

The third subculture was degraded by 99.5% after 7 days.

Kinetic:

Not stated

Breakdown Products:

Not stated

Remarks:

### **Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### **Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### **References**

Karnatz, F. A., R. A. Kattau and P. MacKell. 1973. Biodegradability Tests. Report number 73-22. Reilly Tar & Chemical Corp., Indianapolis, IN, U. S.

### **Other Available Reports**

#### **Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

370

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-guideline specific study using soil suspensions under aerobic and anaerobic conditions.

Test Type: aerobic and anaerobic biodegradation

GLP: No

Year: 1972

Contact Time: 256 days

Inoculum: Fertile garden soil

Remarks: The test substance was tested at 1 mM in an aqueous suspension of 0.5% fertile garden soil, 20 ppm each of yeast extract, peptone and glucose, 4-ppm ammonium sulfate and 180 ppm potassium phosphate adjusted to pH 7.0. Solutions were incubated in 100 × 15 mm diameter culture tubes. Aerobic tubes contained 5 ml of solution and were loosely capped. Anaerobic tubes contained 11.5 ml of solution and were tightly capped. At intervals of approximately 2, 4, 8, 16, 32, 64, 128, 160 and 256 days, 1-ml samples were removed, diluted and filtered to remove suspended matter. The absorption spectra recorded from 210 to 330 nm was compared to that obtained from similar solutions to which 200 ppm HgCl<sub>2</sub> had been added to suppress microbial activity. The number of days required for disappearance of characteristic peaks was determined.

#### Results

Degradation: Aerobic: Complete disappearance of test substance was obtained within > 14 < 33 days.  
Anaerobic: Complete disappearance of test substance required > 97 days.

Results: Aerobic: Complete disappearance of test substance was obtained within > 14 < 33 days.  
Anaerobic: Complete disappearance of test substance required > 97 days.

Kinetic: Not stated

Breakdown Products: Not stated

Remarks:

**Conclusions**

The aerobic and anaerobic biodegradation of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Naik, M. N., R. B. Jackson, J. Stokes and R. J. Swaby. 1972. Microbial Degradation and Phytotoxicity of Picloram and Other Substituted Pyridines. Soil Biol. Biochem. 4:313 - 323.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

372

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-specific method measuring substance depletion and inorganic N released.  
Test Type: Aerobic biodegradation in soil.  
GLP: Not stated  
Year: 1985  
Contact Time: 64 days  
Inoculum: The test soil was a Fincast silt loam which had a water pH of 6.7, organic carbon content of 12 g/kg, total N content of 1300 mg/kg, CEC of 0.15 mol (+)/kg and contained 0.25 kg H<sub>2</sub>O/ kg dry soil at – 0.03 MPa.  
Remarks: Test chambers were prepared in duplicate and dosed at 200 mmol/kg. At 3 to 4 day intervals the soils were adjusted for loss of moisture. After 0, 1, 2, 4, 8, 16, 32 and 64 days of incubation, the foam stoppers and soil from replicate chambers were extracted and analyzed. In addition, a sterile treatment was extracted and analyzed after 7 days of incubation.

#### Results

Degradation: 2-Methylpyridine concentration in the test soil was below the limit of detection (not given) after 16 days of incubation. Accumulation of inorganic nitrogen at day 16 was equivalent to 49.3% of the extractable 2-methylpyridine.  
Results: The measured day 0 concentration 2-Methylpyridine was 90.1% of amount added. The measured concentrations of 2-methylpyridine on days 1, 2, 4 and 8 were 70.0, 60.1, 35.7 and 0.5% of the amount dosed. The test substance concentration was below the limit of detection (not given) on day 16. The measured test substance concentration in the sterile control was 86.1% of the amount added. Accumulation of inorganic nitrogen at days 16, 32 and 64 was equivalent to 49.3, 67.3 and 68.3% of the extractable 2-methylpyridine.  
Kinetic: Not stated.  
Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Sims, G. K. and L. E. Sommers. 1985.  
Degradation of Pyridine Derivatives in Soil:  
Chemical and Biological Assessment. J. Environ.  
Qual. **14**:580 – 584.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

374

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks: Soil contaminated with pyridine derivatives was obtained from a chemical plant.

#### Method

Method/Guideline followed: Non-specific test method for substrate depletion.  
Test Type: Aerobic and anaerobic biodegradation in soil.  
GLP: Not stated  
Year: 1991  
Contact Time: 3 months  
Inoculum: Surface and subsurface soils contaminated with pyridine derivatives were obtained from a chemical plant. In addition, an unpolluted surface and subsurface soils were used.  
Remarks: Test soils were incubated aerobically or anaerobically at 28 °C. Anaerobic biodegradation was evaluated under denitrifying and sulfate-reducing conditions. Substrate depletion was monitored by HPLC.

#### Results

Degradation: Transformation of 2-methylpyridine varied with test soils and conditions.

Results:

Test Soil /Conditions	% of Initial Substrate Remaining
Unpolluted surface/ Aerobic	0%
Unpolluted surface/Denitrifying	90%
Unpolluted surface Sulfate-reducing	90%
Unpolluted subsurface/ Aerobic	80%
Unpolluted subsurface/Denitrifying	100%
Unpolluted subsurface Sulfate-reducing	90%
Polluted surface/ Aerobic	0%
Polluted surface/Denitrifying	60%
Polluted surface Sulfate-reducing	70%
Polluted subsurface/ Aerobic	0%
Polluted subsurface/Denitrifying	70%
Polluted subsurface Sulfate-reducing	70%

Kinetic: Not stated.  
Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Kaiser, J. P and J. M Bollag. 1991.  
Influence of Soil Inoculum and Redox Potential on the Degradation of Several Pyridine Derivatives. Soil. Biol. Biochem. 23(4):351-357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

375

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks: Purchased from Aldrich Chemical Co.

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion.

Test Type: Anaerobic biodegradation.

GLP: Not stated

Year: 1989

Contact Time: 8 months

Inoculum: Aquifer solids and water from a site adjacent to a landfill.

Remarks: Biodegradation of 2-methylpyridine was evaluated under sulfate reducing and methanogenic conditions. Experiments were conducted in duplicate and included sterile controls. Initial substrate concentrations were in the range of 0.14 to 0.25 mM. Test chambers were incubated in the dark at room temperature. Samples for analysis were aseptically and anaerobically removed using a syringe and needle immediately after the addition of the test substance and periodically thereafter. Substrate concentration was measured using reversed-phase high-pressure liquid chromatography (HPLC).

#### Results

Degradation: Under sulfate reducing conditions, the percent of substrate remaining after 1, 3 and 8 months was 97, 46 and < 8%, respectively. Under methanogenic conditions, the percent of substrate remaining after 1, 3 and 8 months was 105, 107 and 97%, respectively.

Results: The results represent the average substrate concentration in non-sterile replicates relative to the sterile controls.

Kinetic: Not stated.

Breakdown Products: Not stated.

Remarks:

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Kuhn, E. P. and J. M. Sulfito. 1989.  
Microbial Degradation of Nitrogen, Oxygen and Sulfur Heterocyclic Compound Under Anaerobic Conditions: Studies with Aquifer Samples.  
Environ. Toxicol. Chem. **8**:1149 - 1158.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

376

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Picoline (CAS RN 109-06-8; 2-Methylpyridine)  
Purity: Not stated  
Remarks: Test substance present in contaminated groundwater and surface soil collected from American Creosote Works site, Pensacola, FL.

#### Method

Method/Guideline followed: Shake flask  
Test Type: Aerobic biodegradation monitoring substrate depletion.  
GLP: Not stated  
Year: 1991  
Contact Time: 14 days  
Inoculum: Creosote-adapted microorganisms from contaminated surface soil.  
Remarks: The test measured the disappearance of 2-methylpyridine present in environmental samples taken from a contaminated site. The creosote-adapted inoculum was the supernatant prepared from a suspension of contaminated surface soil collected from American Creosote Works site, Pensacola, FL with phosphate buffer solution. The 125-mL Erlenmeyer flasks containing 25 mL groundwater medium (filtered groundwater and Bushnell-Haas medium) and 1 mL of contaminated soil inoculum were prepared in duplicate for each sampling interval and incubated at 30 °C with shaking (200rpm) in the dark for 14 days. A killed control was also prepared of each sampling interval and maintained concurrently under the same test conditions. On Days 0, 1, 3, 5, 8 and 14 of incubation, the entire contents of the two active and one killed control flask were extracted and analyzed for the test substance. Initial concentration samples were extracted immediately after preparation. Analysis was performed by gas chromatography.

#### Results

Degradation: 2-Methylpyridine was not detected in the test system after 14 days of incubation.  
Results: The initial concentration of 2-methylpyridine was 0.3 µg/ml. The measured concentrations of

2-methylpyridine on days 1, 3, 5 and 8 were 0.2, 0.2, 0.2 and 0.1 µg/ml, respectively. The test substance concentration was below the limit of detection (not given) on day 14. The measured test substance concentration in the sterile control on day 14 was 0.3 µg/ml.

Kinetic:

Not stated.

Breakdown Products:

Not stated.

Remarks:

### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### References

Mueller, J. G., D. P. Middaugh, S. E. Lantz and P. J. Chapman. 1991. Biodegradation of Creosote and Pentachlorophenol in Contaminated Groundwater: Chemical and Biological Assessment. *Appl. Environ. Microbiol.* **57**:1277 – 1285.

### Other Available Reports

#### Other

Last Changed:

December 17, 2003

Order Number for Sorting:

377

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks: Purchased from Tokyo Kasei (Tokyo, Japan).

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion.  
Test Type: Anaerobic biodegradation.  
GLP: Not stated  
Year: 1997  
Contact Time: 200 days  
Inoculum: Estuarine sediment and overlying site water.  
Remarks: Biodegradation of 2-methylpyridine was evaluated in sediment slurries (30-mL, 10% solids, w/v) under sulfate reducing conditions (Na<sub>2</sub>S solution added as a reducing agent). The sediment (<1mm, sieved) and overlying water (pH 7.48, salinity 13%, sulfate concentration 13.5 mM) water were collected from the estuary of Tansui River (Guandu, Taipei). Experiments were run in duplicate and included controls sediments. Testing was conducted at 70 - 80 µM. Test chambers were incubated in the dark at 23 – 25 °C. Samples for analysis were removed using a syringe and needle periodically. Substrate concentration was measured using HPLC.

#### Results

Degradation: None reported.  
Results: 3-Methylpyridine was persistent in the anoxic sediment.  
Kinetic: Not stated.  
Breakdown Products: Not stated.  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability: 2B  
Remarks: Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Lui, S. M., C. H. Wu and H. J. Huang. 1989.  
Toxicity and Anaerobic Biodegradability of  
Pyridine and its Derivatives Under Sulfidogenic  
Conditions. Chemosphere. 10:2345 - 2357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

379

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine ( $\alpha$ -picoline)  
(CAS RN 109-06-8; 2-Picoline)  
Purity: Not specified other than “reagent grade” chemicals used.  
Remarks:

#### Method

Method/Guideline followed: Not a guideline study, but methods used were similar to a semi-continuous activated sludge test.  
Test Type: Aerobic biodegradation  
GLP: No  
Year: 1997  
Contact Time: 48 hours (given as hydraulic retention time)  
Inoculum: activated sludge  
Remarks: The test used a mixed composition of heterocyclic bases in a completely mixed activated sludge (CMAS) reactor. Compound-specific analysis of the effluent liquor was made by gas chromatography. And Total Organic Carbon (TOC) removal was determined with a TOC analyzer. The CMAS reactors were operated at different hydraulic retention times (HRT) to identify optimum HRTs for biodegradation. The microbial status of the reactor was monitored using nutrient agar plates.

#### Results

Degradation: Degradation was optimized at a HRT of 48 hours. Degradation was presented as percent TOC removal, with 96% removal occurring under the conditions of the test.  
Results: 96% removal of TOC in 48 hours.  
Kinetic: Not stated  
Breakdown Products: Not stated  
Remarks: Additional information was provided as follows:  
At an influent concentration of 12.5 mg/l of the test substance, no detectable test substance was found in the effluent. While the test cannot claim ready biodegradability status, it does show that the test substance is broken down by activated sludge microorganisms.

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2A

Remarks:

Acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Pandey, R. A. and S. Sandhya. 1997. Microbial Degradation of Heterocyclic Bases in a Completely Mixed Activated Sludge Process. J. Environ. Sci. Health. A32(5):1325 - 1338.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

380

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Non-guideline specific study of biodegradation of the test substance in soil suspensions

Test Type: aerobic biodegradability

GLP: No

Year: 1986

Contact Time: 24 days

Inoculum: Soil suspension

Remarks: Degradation experiments were carried out in 500-mL Erlenmeyer flasks. Flasks were prepared to contain 150 ml of basal salts medium amended with yeast extract and potassium phosphate buffer adjusted to pH 7.0. To each replicate flask (note – replication noted in article, but did not specify how many replicates) 1 ml of 2-methylpyridine solution was added to give a final substrate concentration of approximately 1 mM. Flasks were inoculated with 1 ml of a dilute soil suspension prepared by suspending 15 g soil (Fincastle silt loam) in 1 l of mineral salts medium and continuously stirring while 1-ml aliquots were removed. Flasks were incubated at 24 °C for up to 30 days. Subsamples were removed from each flask before and after inoculation and periodically throughout the incubation. 2-Methylpyridine concentrations were monitored by UV spectrophotometry during the incubation period. The disappearance of 2-methylpyridine from solutions plus the mineralization of pyridine-N was taken as evidence of degradation.

#### Results

Degradation: UV analysis indicated a 100% loss of 2-methylpyridine from the test solutions by 24 days, while inorganic nitrogen released to the test solutions accounted for 56% degradation.

Results: 2-Methylpyridine appeared to be degraded in the test. The amount of 2-methylpyridine lost from the test solutions determined by UV analysis was 100%

within 24 days. 56% was determined to be biodegraded based on release of inorganic nitrogen in the test solutions, while 15% was lost through volatilization and 4.8% sorbed by soil.

Kinetic:

Not stated

Breakdown Products:

Not stated

Remarks:

### **Conclusions**

The biodegradation of the test substance in a soil suspension has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### **Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### **References**

Sims, G. K. and L. E. Sommers. 1986.  
Biodegradation of Pyridine Derivatives in Soil Suspensions. Environ. Toxicol. Chem. 3:503 - 509.

### **Other Available Reports**

#### **Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

388

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Cyanopyridine  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: Not stated  
Remarks: Purchased from Aldrich Chemical Co.

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion.  
Test Type: Anaerobic biodegradation.  
GLP: Not stated  
Year: 1997  
Contact Time: 200 days  
Inoculum: Estuarine sediment and overlying site water.  
Remarks: Biodegradation of 3-cyanopyridine was evaluated in sediment slurries (30-mL, 10% solids, w/v) under sulfate reducing conditions (Na<sub>2</sub>S solution added as a reducing agent). The sediment (<1mm, sieved) and overlying water (pH 7.48, salinity 13%, sulfate concentration 13.5 mM) water were collected from the estuary of Tansui River (Guandu, Taipei). Experiments were run in duplicate and included controls sediments. Testing was conducted at 64.3 μM. Test chambers were incubated in the dark at 23 – 25 °C. Samples for analysis were removed using a syringe and needle periodically. Substrate concentration was measured using HPLC.

#### Results

Degradation: The reported transformation rate of 3-cyanopyridine was 9.41 day<sup>-1</sup>. This biodegradation rate provides a degradation half-life of < 1 day and would be considered to be biodegradable under anaerobic conditions.  
Results: 3-Cyanopyridine was transformed to an intermediate product in 19 days with a lag phase of 4 days.  
Kinetic: The pseudo-first-order rate constant for 3-cyanopyridine was 9.41 day<sup>-1</sup>. This rate indicates a biodegradation half-life of < 1 day.  
Breakdown Products: Not stated.  
Remarks: In this article there were no comparisons to reference substances run concurrently with the test article. However, the biodegradation half-life is

consistent with that of phenol, a compound recommended by EPA (EPA-600/9-79-012) for use as a biodegradable reference substance in anaerobic biodegradation studies.

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Lui, S. M., C. H. Wu and H. J. Huang. 1989. Toxicity and Anaerobic Biodegradability of Pyridine and Its Derivatives Under Sulfidogenic Conditions. *Chemosphere*. 10:2345 – 2357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

188

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 3-Pyridinecarbonitrile  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Used method described by Bunch and Chambers. 1967. J. Water Poll. Cont. Fed. 39:181.  
Test Type: Aerobic biodegradability  
GLP: No  
Year: 1973  
Contact Time: 7 days  
Inoculum: Settled raw sewage  
Remarks: The method indicates triplicate flasks were prepared to contain 90 ml nutrient medium, 5 mg yeast extract, then spiked with either test compound or reference compound to achieve 20 mg/l in the flasks. The reference compound was phenol. The flasks were incubated at ambient temperature ( $25 \pm 5$  °C). The initial concentration of the test and reference substances were measured and again after 7 days of incubation. At the end of the 7-day period, 10 ml of solution were removed from each flask and placed in similar flasks of medium as originally prepared to contain 20 mg/l of test or reference compound. The subculturing step is repeated three times for a total time of 28 days, 7 days for the original flasks plus 7 days for each of three successive subcultures. The comparison between the test and reference substances provides an assessment of the degree of biodegradability as well as an indication of the time required for adaptation. Analysis of test substance concentrations was done by UV spectrophotometry.

#### Results

Degradation: The test substance was biodegraded under the conditions of the test.  
Results: The original culture was degraded by 97.5% after 7 days.  
The first subculture was degraded by 91.0% after 7 days;

The second subculture was degraded by 95.5% after 7 days; and

The third subculture was degraded by 98.5% after 7 days.

Kinetic:

Not stated

Breakdown Products:

Not stated

Remarks:

### **Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### **Data Quality**

Reliability:

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### **References**

Karnatz, F. A., R. A. Kattau and P. MacKell. 1973. Biodegradability Tests. Report number 73-22. Reilly Tar & Chemical Corp., Indianapolis, IN, U. S.

### **Other Available Reports**

#### **Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

190

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Pyridinecarbonitrile  
(CAS RN 100-70-9; Picolinonitrile)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Used method described by Bunch and Chambers. 1967. J. Water Poll. Cont. Fed. 39:181.  
Test Type: Aerobic biodegradability  
GLP: No  
Year: 1973  
Contact Time: 7 days  
Inoculum: Settled raw sewage  
Remarks: The method indicates triplicate flasks were prepared to contain 90 ml nutrient medium, 5 mg yeast extract, then spiked with either test compound or reference compound to achieve 20 mg/l in the flasks. The reference compound was phenol. The flasks were incubated at ambient temperature ( $25 \pm 5$  °C). The initial concentration of the test and reference substances were measured and again after 7 days of incubation. At the end of the 7-day period, 10 ml of solution were removed from each flask and placed in similar flasks of medium as originally prepared to contain 20 mg/l of test or reference compound. The subculturing step is repeated three times for a total time of 28 days, 7 days for the original flasks plus 7 days for each of three successive subcultures. The comparison between the test and reference substances provides an assessment of the degree of biodegradability as well as an indication of the time required for adaptation. Analysis of test substance concentrations was done by UV spectrophotometry.

#### Results

Degradation: The test substance was only partially biodegraded under the conditions of the test. The inoculum never achieved sufficient adaptation to completely degrade the test substance.  
Results: The original culture was degraded by 29.5% after 7 days;

	the first subculture was degraded by 20% after 7 days;
	the second subculture was degraded by 47.5% after 7 days; and
	the third subculture was degraded by 61% after 7 days.
Kinetic:	Not stated
Breakdown Products:	Not stated
Remarks:	While the authors stated that only “insignificant” degradation occurred, the data appear to indicate that the test substance would likely be ultimately biodegradable since the third subculture achieved 61% degradation after 7 days. This is approaching a rate that could be considered readily biodegradable in a more contemporary test.

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:	2A
Remarks:	Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Karnatz, F. A., R. A. Kattau and P. MacKell. 1973. Biodegradability Tests. Report number 73-22. Reilly Tar & Chemical Corp., Indianapolis, IN, U. S.

**Other Available Reports**

**Other**

Last Changed:	December 17, 2003
Order Number for Sorting:	210
Remarks:	

### 3.5 BIODEGRADATION

#### Test Substance

Identity: 2-Cyanopyridine  
(CAS RN 100-70-9; Picolinonitrile)  
Purity: Not stated  
Remarks: Purchased from Aldrich Chemical Co.

#### Method

Method/Guideline followed: Assessment of degradation based on substrate depletion  
Test Type: Anaerobic biodegradation  
GLP: Not stated  
Year: 1997  
Contact Time: 200 days  
Inoculum: Estuarine sediment and overlying site water.  
Remarks: Biodegradation of 2-cyanopyridine was evaluated in sediment slurries (30-mL, 10% solids, w/v) under sulfate reducing conditions (Na<sub>2</sub>S solution added as a reducing agent). The sediment (<1mm, sieved) and overlying water (pH 7.48, salinity 13%, sulfate concentration 13.5 mM) water were collected from the estuary of Tansui River (Guandu, Taipei). Experiments were run in duplicate and included controls sediments. Testing was conducted at 59.8 μM. Test chambers were incubated in the dark at 23 – 25 °C. Samples for analysis were removed using a syringe and needle periodically. Substrate concentration was measured using HPLC.

#### Results

Degradation: The reported transformation rate of 2-cyanopyridine was 1.01 day<sup>-1</sup>. This biodegradation rate provides a degradation half-life of < 1 day and would be considered to be biodegradable under anaerobic conditions.  
Results: 2-Cyanopyridine was transformed to an intermediate product in 59 days without a lag phase.  
Kinetic: The pseudo-first-order rate constant for 2-cyanopyridine was 1.01 day<sup>-1</sup>. This rate indicates a biodegradation half-life of < 1 day.  
Breakdown Products: Not stated.  
Remarks: In this article there were no comparisons to reference substances run concurrently with the test article. However, the biodegradation half-life is consistent with that of phenol, a compound recommended by EPA (EPA-600/9-79-012) for use

as a biodegradable reference substance in anaerobic biodegradation studies.

**Conclusions**

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Lui, S. M., C., H. Wu and H. J. Huang. 1989. Toxicity and Anaerobic Biodegradability of Pyridine and its Derivatives Under Sulfidogenic Conditions. Chemosphere 10:2345 - 2357.

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order Number for Sorting:

214

Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: ~95% or greater  
Remarks:

##### Method

Method/guideline followed: Method described by Broderius and Kahn (1985)  
Type: Acute, continuous flow-through  
GLP: Not stated  
Year: 1994  
Species/Strain/Supplier: Fathead minnow/*Pimephales promelas*/Not stated  
Analytical Monitoring: Yes; HPLC and GC  
Exposure Period: 96 hours  
Statistical Methods: The LC<sub>50</sub> was determined from mortality data fitted mathematically by the trimmed Spearman-Kärber method.  
Remarks: The study measured the acute toxicity of the test substance to 26- to 34-day old laboratory-cultured juvenile fathead minnows during a 96-hour exposure period in continuous flow-through systems held at 25°C. The test substance was tested in duplicate at four to five unspecified test concentrations. Two control replicates were maintained concurrently. Test solutions were continuously renewed and measured daily. This test was conducted without the use of a solvent carrier. Dilution water was taken directly from Lake Superior and, following sand filtration, could be characterized by water hardness, alkalinity and pH of approximately 45 mg/l as CaCO<sub>3</sub>, 42 mg/l as CaCO<sub>3</sub> and 7.8, respectively. Mortality was observed and recorded daily.

##### Results

Nominal concentrations (mg/l): Not stated  
Measured concentrations (mg/l): Not stated  
Unit: mg/l  
Element Value: 96-hour LC<sub>50</sub>  
Statistical Results:  
Result: 96-hour LC<sub>50</sub> = 99.0 mg/l  
Remarks:

**Conclusions**

The acute toxicity of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2A

Remarks:

Reliable with restriction; Acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Broderius, S.J. and M. Kahl. 1985. Acute toxicity of organic chemical mixtures to the fathead minnow. *Aquatic Toxicology* 6:307-322.

\*\* Broderius, S.J., M.D. Kahl and M.D. Hoglund. 1995. Use of Joint Toxic Response to Define the Primary Mode of Toxic Action for Diverse Industrial Organic Chemicals. *Environmental Toxicology and Chemistry* 14(9):1591-1605. \*\*

**Other Available Reports**

**Other**

Last Changed:

October 10, 2003

Order number for sorting:

435

Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

##### Method

Method/guideline followed: Standard Methods for the Examination of Water and Wastewater, 13<sup>th</sup> edition and US EPA.  
Type: Acute flow-through  
GLP: No  
Year: 1974  
Species/Strain/Supplier: Sheepshead minnow (*Cyprinodon variegatus*)/Not stated/local ponds  
Analytical Monitoring: Yes  
Exposure Period: 96 hours  
Statistical Methods: LC<sub>50</sub> values were not calculated statistically, but derived graphically by interpolation.  
Remarks: The experiment measured the acute toxicity of the test substance to Sheepshead minnow under flow-through test conditions. Five (undisclosed) test concentrations were tested in duplicate in this study. Solvent and negative controls were also maintained concurrently. Test animals were obtained from local estuarine ponds. Test vessels were 5-gallon glass aquaria with each aquarium containing 10 fish. The flow rate was sufficient to change the water in the test vessels every six hours. The fish biomass loading was < 1.0 g fish/liter of seawater. Dilution water was derived from a local canal that contained seawater at 22 ± 2 ppt salinity. Temperature of the test water was maintained at 27 ± 2 °C. Mortality was assessed at 8, 24, 48 and 96 hours.

##### Results

Nominal concentrations (mg/l): Not stated  
Measured concentrations (mg/l): Not stated  
Unit: mg/l  
Element Value: LC<sub>50</sub>  
Statistical Results: Not calculated.  
Results: 48-hour LC<sub>50</sub> = 1050 mg/l  
72-hour LC<sub>50</sub> = 799 mg/l  
96-hour LC<sub>50</sub> = 400 mg/l  
Remarks:

**Conclusions**

The acute toxicity of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2C

Remarks:

Reliable with restrictions; comparable to guideline study with acceptable restrictions.

**References**

Mangum, D. C. and C. P. Ward. 1974. Toxicities of Raw Materials, Products and Wastes to the Estuarine Minnow, *Cyprinodon variegatus*. EPA Document number 878214753. Dow Chemical Company, Midland, MI., U. S.

**Other Available Reports**

**Other**

Last Changed:

October 30, 2003

Order number for sorting:

263

Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

##### Method

Method/guideline followed: OECD Guideline No. 203 Fish, Acute Toxicity Test.  
Type: Acute, static renewal  
GLP: Yes  
Year: 1991  
Species/Strain/Supplier: Zebra fish (*Brachydanio rerio*)/Not stated/Local fish hatchery  
Analytical Monitoring: No  
Exposure Period: 96 hours  
Statistical Methods: None  
Remarks: The study measured the acute toxicity of the test substance to Zebra fish during a 96-hour static-renewal exposure period. Fish in holding were fed a commercial fish food. Fish were acclimated to the water used in the test for 12 days prior to testing. Mean body weight and mean length of 30 fish used in testing were 0.42 g and 3.3 cm, respectively. Dilution water was reconstituted water made according to EEC directive. Dilution water characteristics were within the EEC directives for pH ( $7.9 \pm 0.3$ ), dissolved oxygen ( $\geq 74\%$  saturation at 20 °C) and hardness ( $250 \pm 50$  mg/l as  $\text{CaCO}_3$ ). Test vessels were 8.3-l all-glass aquarium filled with 5 l of dilution water. They were fitted with aeration tubes, covered with a glass pane during the test and held in a water-bath at  $22 \pm 2$  °C under a 16 h light/8 h dark photoperiod. Solutions of the test substance were prepared by adding an aliquot of a 10 g test substance/l stock solution to each test chamber. Test solutions were prepared fresh each day of the test. The pH, dissolved oxygen concentration and temperature of the test media were measured at the beginning and the end of the test. Fish were inspected at the beginning of the test and after approximately 2, 4, 24, 48, 72 and 96 hours for lethality and any behavior different from the control group.

## Results

Nominal concentrations (mg/l): 0 (control), 100, 180, 320, 560, 1000 mg/l  
Measured concentrations (mg/l): Not measured  
Unit: mg/l  
Element Value: 96-hour LC<sub>50</sub> = Lies between 560 and 1000 mg/l  
Statistical Results: Data were not analyzed statistically.  
Result: The 96-hour LC<sub>50</sub> lies between 560 and 1000 mg/l  
Remarks: The 96-hour NOEC with respect to behavior was 320 mg/l and the 96-hour NOEC with respect to mortality was 560 mg/l.

## Conclusions

The acute toxicity of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1A  
Remarks: Reliable without restriction; guideline study (OECD)

## References

Weytjens, D. and R. Wils. 1991. The Acute Toxicity of  $\beta$ -picoline (3-Methylpyridine) in the Zebra Fish (*Brachydanio rerio*). Unpublished report no. AFBr/0010 in EPA Document number 86-930000171, submitted by Reilly Industries, Inc., Indianapolis, IN, U.S.A.

## Other Available Reports

### Other

Last Changed: December 17, 2003  
Order number for sorting: 323  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: 98%  
Remarks:

##### Method

Method/guideline followed: Not stated  
Type: Acute flow-through  
GLP: Not stated  
Year: 1983  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)/Not stated/Not stated  
Analytical Monitoring: Yes, Gas-Liquid Chromatography  
Exposure Period: 96 hours  
Statistical Methods: Not stated  
Remarks: Fathead minnows of 30 - 31 days old exposed to five test concentrations and a control. Mean fish length was 21.8 mm, mean fish weight was 0.15 g and fish biomass loading was 1.5 g/l. Test conditions were: temperature 25.6 °C; dissolved oxygen 7.0 mg/l; hardness 46 mg/l as CaCO<sub>3</sub>; alkalinity 309 mg/l as CaCO<sub>3</sub>; and pH 7.88. Test vessels held 2 liters of water and flow rate through the vessels was 18 volume additions per day. Test solutions were analytically measured for the test substance daily.

##### Results

Nominal concentrations (mg/l): 0 (control), 218, 335, 515, 793 and 1220 mg/l.  
Measured concentrations (mg/l): < 15, 230, 333, 475, 718 and 1119 mg/l.  
Unit: mg/l  
Element Value: 96-hour LC<sub>50</sub> = 897 mg/l  
Statistical Results: 96-hour LC<sub>50</sub> = 897 mg/l  
Result: 96-hour LC<sub>50</sub> = 897 mg/l  
Remarks: The 96-hour EC<sub>50</sub> also was determined to be 772 mg/l. Behavioral effects noted at 718 mg/l included loss of schooling behavior, swimming near surface, hypoactivity and unresponsiveness to external stimuli, convulsive movements and loss of equilibrium prior to death. Affected fish became darkly colored. Complete mortality occurred at 1119 mg/l within 3 hours. The NOEC including mortality and abnormal effects was 475 mg/l.

Overall percent recovery of test substance in test solutions was 99.4%. Increased alkalinity values were attributed to a reaction between the titrant and toxicant, which delayed the titration endpoint.

**Conclusions**

The acute toxicity of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; secondary literature source.

**References**

Geiger, D. L., S. H. Poirier, L. T. Brooke and D. J. Call, eds. 1986. Acute Toxicities of Organic Chemicals to Fathead Minnows (*Pimephales promelas*). Volume III, p. 125. Center Lake Superior Environmental Studies, University of Wisconsin-Superior, WI, U. S.

**Other Available Reports**

**Other**

Last Changed:

October 30, 2003

Order number for sorting:

392

Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: Pyridine, alkyl derivs. (CAS RN 68391-11-7)  
Purity: Not stated  
Remarks:

##### Method

Method/guideline followed: Guideline was not cited, but the methods appear to be consistent with OECD and/or EPA guidelines for testing chemicals on fish.

Type: Static acute  
GLP: Yes  
Year: 1997  
Species/Strain/Supplier: Rainbow trout (*Oncorhynchus mykiss*)/Not stated/Mt. Lassen Trout Farms, Inc.

Analytical Monitoring: No  
Exposure Period: 96 hours  
Statistical Methods: A computer program (Wheat 1989) using moving average angle, probit, logit and non-linear interpolation was used to calculate LC<sub>50</sub> values.

Remarks: The acute toxicity test was initiated by impartially distributing 10 juvenile rainbow trout (mean standard length 34 mm, mean wet weight 0.44 g) to each test vessel. Treatment groups were not replicated. Test vessels were 10-l glass jars holding 9 l of test solution. All test vessels were covered during the test. Test solutions were prepared by adding varying volumes of a primary stock solution to 9 l of dilution water and stirring vigorously. Dilution water was moderately hard freshwater (hardness of 68 mg/l as CaCO<sub>3</sub>; alkalinity of 10 mg/l as CaCO<sub>3</sub>; and specific conductance of 427 µmhos/cm) from the town of Jupiter, Florida that had been aerated and passed through activated carbon prior to use. Test vessels were held in a constant temperature water bath under a photoperiod of 16 h light and 8 h dark. Test solutions were aerated after 32 hours until the end of the test to maintain dissolved oxygen concentrations. Survival and abnormal behavior/appearance was monitored daily. Water quality (pH and dissolved oxygen) was measured in each test vessel daily. Specific conductance, total alkalinity and total hardness of the dilution water were measured at the beginning and end of the test.

Temperature ranged from 14 to 14.8 °C, dissolved oxygen fell below 60% saturation after approximately 32 hours and aeration was initiated; thereafter it remained above 60% saturation. Test solution pH values ranged from 6.9 to 8.6 and increased with higher test concentrations. Hardness ranged from 64 to 68 mg/l and alkalinity ranged from 10 to 11 mg/l. Specific conductance ranged from 427 to 465 µmhos/cm.

## Results

Nominal concentrations (mg/l): 0 (control), 6.25, 12.5, 25, 50 and 100 mg/l based on whole material.  
Measured concentrations (mg/l): Not measured  
Unit: mg/l  
Element Value: LC<sub>50</sub> (95% confidence limits )  
Statistical Results: 96-hour LC<sub>50</sub> = 40 mg/l (95% confidence limits = 25 and 100 mg/l)  
Result: 96-hour LC<sub>50</sub> = 40 mg/l  
Remarks: Complete mortality occurred at the highest concentration (100 mg/l) and 80% mortality occurred at the next highest concentration (50 mg/l). Fish exposed to 50 mg/l exhibited dark coloration, swimming at the surface and loss of equilibrium. The NOEC was 25 mg/l.

## Conclusions

The acute toxicity of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1A  
Remarks: Reliable without restriction, guideline study (OECD).

## References

Groetsch, K. J. and H. Liu. 1996. Pyridine, alkyl derivs. (CAS RN 68391-11-7): Acute toxicity to rainbow trout, *Oncorhynchus mykiss*, under static test conditions. Study No. J9610011a. Toxicon Environmental Sciences, Jupiter, FL, U. S.

## Other Available Reports

### Other

Last Changed: October 30, 2003  
Order number for sorting: 430  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: 2-Cyanopyridine (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: ~95% or greater  
Remarks:

##### Method

Method/guideline followed: Method described by Broderius and Kahn (1985)  
Type: Acute, continuous flow-through  
GLP: Not stated  
Year: 1994  
Species/Strain/Supplier: Fathead minnow/*Pimephales promelas*/Not stated  
Analytical Monitoring: Yes; HPLC and GC  
Exposure Period: 96 hours  
Statistical Methods: The LC<sub>50</sub> was determined from mortality data fitted mathematically by the trimmed Spearman-Kärber method.  
Remarks: The study measured the acute toxicity of the test substance to 26- to 34-day old laboratory-cultured juvenile fathead minnows during a 96-hour exposure period in continuous flow-through systems held at 25°C. The test substance was tested in duplicate at four to five unspecified test concentrations. Two control replicates were maintained concurrently. Test solutions were continuously renewed and measured daily. Dilution water was taken directly from Lake Superior and, following sand filtration, could be characterized by water hardness, alkalinity and pH of approximately 45 mg/l as CaCO<sub>3</sub>, 42 mg/l as CaCO<sub>3</sub> and 7.8, respectively. Mortality was observed and recorded daily.

##### Results

Nominal concentrations (mg/l): Not stated  
Measured concentrations (mg/l): Not stated  
Unit: mg/l  
Element Value: 96-hour LC<sub>50</sub>  
Statistical Results:  
Result: 96-hour LC<sub>50</sub> = 726 mg/l  
Remarks:

**Conclusions**

The acute toxicity of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):  
Remarks:

2A  
Reliable with restriction; Acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Broderius, S.J. and M. Kahl. 1985. Acute toxicity of organic chemical mixtures to the fathead minnow. *Aquatic Toxicology* 6:307-322.

\*\* Broderius, S.J., M.D. Kahl and M.D. Hoglund. 1995. Use of Joint Toxic Response to Define the Primary Mode of Toxic Action for Diverse Industrial Organic Chemicals. *Environmental Toxicology and Chemistry* 14(9):1591-1605. \*\*

**Other Available Reports**

**Other**

Last Changed:  
Order number for sorting:  
Remarks:

October 10, 2003  
435

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: The article cites concept rules of the Dutch Standardization Institute (Adema, 1978) as being followed in this study.

Type: Acute static  
GLP: No  
Year: 1978  
Species/Strain/Supplier: *Daphnia magna*/Not stated/Not stated  
*Daphnia pulex*/ Not stated/Not stated  
*Daphnia cucullata*/ Not stated/Not stated

Analytical Monitoring: No  
Exposure Period: 48 hours  
Statistical Methods: Not stated  
Remarks: The article describes data for testing Pyridine on three species of *Daphnia*, with results of testing *Daphnia magna* at three different laboratories. No specifications on the employed method were provided in the article, only to state that *D. magna* and *D. pulex* were < 24 hours old but *D. cucullata* were  $11 \pm 1$  day old at testing.

### Results

Nominal concentrations (mg/l): Not stated  
Measured concentrations (mg/l): Not measured  
Unit: mg/l  
EC<sub>50</sub> (48 hour): See Result, below:  
LC<sub>50</sub> (48 hour): Not stated  
NOEC (48 hour): Not stated  
Result: LC<sub>50</sub> for *Daphnia magna* at three laboratories:  
1: 1165 mg/l  
2: 1755 mg/l  
3: 1130 mg/l  
LC<sub>50</sub> for other daphnid species:  
1: *Daphnia pulex* = 575 mg/l  
2: *Daphnia cucullata* = 2470 mg/l

Remarks:

**Conclusions**

The acute toxicity of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; method used cited a national standard test procedure, but provided few details.

**References**

Adema, D. M. M. 1978. *Daphnia magna* as test organism in acute and chronic toxicity experiments. *Hydrobiologia* 59(2):125-134

\*\* Canton, J. H. and D. M. M. Adema. 1978. Reproducibility of Short-Term and Reproduction Toxicity Experiments with *Daphnia magna* and Comparison of the Sensitivity of *Daphnia magna* with *Daphnia pulex* and *Daphnia cucullata* in Short-Term Experiments. *Hydrobiologia* 59(2):135-140. \*\*

**Other Available Reports**

**Other**

Last Changed:

December 17, 2003

Order number for sorting:

149

Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: OECD Guideline No. 202: *Daphnia* sp., Acute Immobilization Test and Reproduction Test.  
Type: Acute static  
GLP: Yes  
Year: 1991  
Species/Strain/Supplier: *Daphnia magna* Straus/Not stated/State University of Ghent  
Analytical Monitoring: No  
Exposure Period: 48 hours  
Statistical Methods: No statistics applied to data  
Remarks: The experiment measured the 48-hour acute toxicity of the test substance to *Daphnia magna* over a 48-hour exposure period. Dilution water was reconstituted water prepared according to ISO-6341, 1982, with micronutrients. The pH was  $7.7 \pm 0.1$ , the water was O<sub>2</sub>-saturated and the hardness was  $250 \pm 25$  mg/l as CaCO<sub>3</sub>. Daphnids were < 24 hours old at the start of the test. Test vessels were 80-ml all glass tubes containing 50 ml of test solution. Test solutions were prepared by adding an aliquot of a stock solution (1.0077 g  $\beta$ -picoline/l) to the dilution water. Four replicate test tubes were used per concentration and each test tube held 5 daphnids. The pH, dissolved oxygen concentration and temperature of the test medium in each test tube were measured at the start and end of the test. At 24 and 48 hours of the test, daphnids were evaluated for immobility. Daphnids not able to swim within 15 seconds after gentle agitation of the test tube were considered immobile.

### Results

Nominal concentrations (mg/l): 0 (control), 100, 180, 320, 560 and 1000 mg/l.  
Measured concentrations (mg/l): Not measured  
Unit: mg/l  
EC<sub>50</sub> (48 hour): 320 mg/l  
LC<sub>50</sub> (48 hour): Not determined  
NOEC (48 hour): 180 mg/l

**Result:** The 48-hour EC<sub>50</sub> concentration was 320 mg/l  
**Remarks:** After 24 hours, the EC<sub>50</sub> was in the range of 180 to 320 mg/l. At 48 hours, the EC<sub>50</sub> was 320 mg/l. The authors stated that the toxicity was greater after 24 hours because of disappearance of the test substance. The authors stated that the test substance was volatile.

The water quality was within the prescribed ranges throughout the study period. The pH, dissolved oxygen concentration and temperature measured in all test tubes at test initiation and termination ranged from 7.74 to 8.34, 8.2 to 9.1 mg/l and 19.6 to 20.1°C, respectively.

**Conclusions** The 48-hour acute toxicity of the test substance to *Daphnia magna* has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

**Reliability (Klimisch):** 1A  
**Remarks:** Reliable without restriction; guideline study (OECD).

**References**

Weytjens, D. and R. Wils. 1991. The Acute Toxicity of β-picoline (3-methyl pyridine) in the Water-Flea (*Daphnia magna*). Unpublished report no. ADK6/0012 in EPA Document number 86-930000171, submitted by Reilly Industries, Inc., Indianapolis, IN, U.S.A.

**Other Available Reports**

**Other**

**Last Changed:** October 30, 2003  
**Order number for sorting:** 323  
**Remarks:**

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: Pyridine, alkyl derivs. (CAS RN 68391-11-7)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Guideline was not cited, but the methods appear to be consistent with OECD and/or EPA guidelines for testing chemicals with daphnids.

Type: Static acute  
GLP: Yes  
Year: 1997  
Species/Strain/Supplier: *Daphnia magna*/Not stated/US EPA Duluth Laboratory  
Analytical Monitoring: No  
Exposure Period: 48 hours  
Statistical Methods: A computer program (Wheat 1989) using the probit method was used to calculate LC<sub>50</sub> value and 95% confidence intervals.

Remarks: The acute toxicity test was initiated by impartially distributing 5 daphnids to each test vessel. Treatments were replicated four times, for a total of 20 daphnids per experimental group. Test vessels were 300-ml glass crystallizing dishes holding 200 ml of test solution. All test vessels were covered during the test and placed in a temperature-controlled environmental chamber under fluorescent lighting regulated at a 16 h light/8 hour dark photoperiod. Temperature was controlled at 20 ± 1 °C. Test solutions were prepared by adding aliquots of a primary stock solution to dilution water and stirring vigorously. Dilution water was moderately hard freshwater (hardness of 68 mg/l as CaCO<sub>3</sub>; alkalinity of 12 mg/l as CaCO<sub>3</sub>; and specific conductance of 438 µmhos/cm) from the town of Jupiter, Florida that had been aerated and passed through activated carbon prior to use. Survival and abnormal behavior/appearance was monitored daily. At test initiation, pH and dissolved oxygen measurements were taken in a composite solution from each treatment level. At the end of the test, pH and dissolved oxygen was measured in each replicate chamber. Temperature was measured daily in one control replicate.

Specific conductance, total alkalinity and total hardness of the dilution water were measured at the beginning of the test. Temperature ranged from 20.1 to 21.0 °C, dissolved oxygen ranged from 7.4 to 8.9 mg/l and pH ranged from 7.1 to 9.1. The pH of the exposure solutions containing pyridine bases increased directly with concentration.

## Results

Nominal concentrations (mg/l): 0 (control), 31.3, 62.5, 125, 250, 500 mg/l based on whole material.

Measured concentrations (mg/l): Not Measured

Unit: mg/l

EC<sub>50</sub> (48 hour): 68.8 mg/l

LC<sub>50</sub> (48 hour): Not Determined

NOEC (48 hour): < 31.3 mg/l

Result: The 48-hour EC<sub>50</sub> was 68.8 mg/l with 95% confidence limits of 54.2 and 85.9 mg/l. The slope of the dose-response plot was 3.84.

Remarks: At the end of the test, percent mortality in the treatments was 0% (control), 10% (31.3 mg/l), 45% (62.5 mg/l), 80% (125 mg/l), 100% (250 mg/l) and 100% (500 mg/l). Twelve of 20 daphnids in the 250 mg/l treatment group appeared lethargic after 24 hours exposure. The 250 and 500 mg/l test solutions exhibited a reddish-orange color.

## Conclusions

The acute toxicity of the test substance to *Daphnia magna* has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch):

1A

Remarks:

Reliable without restriction, guideline study (OECD).

## References

Groetsch, K. and H. Liu. 1997. Pyridine, alkyl derivs. (CAS RN 68391-11-7): Acute Toxicity to the Water Flea, *Daphnia magna*, Under Static Conditions. Report number J9610011b. Toxicon Environmental Sciences, Inc., Jupiter, FL, U. S.

## Other Available Reports

### Other

Last Changed:

October 30, 2003

Order number for sorting:

431

Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: OECD Guideline No. 201: Alga, Growth Inhibition Test.  
Type: Static growth inhibition  
GLP: Yes  
Year: 1991  
Species/Strain/Supplier: *Selenastrum capricornutum*/CCAP 278/4/CCAP, U.K.  
Element Basis: Results based on growth rate.  
Analytical Monitoring: No  
Exposure Period: 72 hours  
Statistical Methods: Not stated  
Remarks: The experiment measured the toxicity of the test substance to the green alga, *Selenastrum capricornutum*, based on inhibition of the growth rate. The growth medium used in the test was prepared according to the OECD guideline. The medium was filter-sterilized with a 0.45 µm membrane filter. The algae were cultured at the testing facility for several weeks in Boltz Basal Medium (BBM). Test vessels were all-glass 100-ml Erlenmeyer flasks containing 50 ml of test solution. Triplicate flasks were used at each test concentration. Test solutions were prepared by adding an aliquot from each of five stock solutions (1, 3.2, 10, 32 and 100 g test substance/l) to the appropriate test flasks. Flasks were inoculated with algal cells to achieve an initial cell density of 10<sup>4</sup> cells/ml. Flasks were incubated in an environmental cabinet under continuous illumination at a temperature of 25 ± 1 °C. Flasks were continuously shaken on a shaker table at 100 rph. Cell counts were made after 3 days of incubation using a Neubauer counting chamber. The average specific growth rate (µ) was calculated for each flask and the average growth rate for each treatment was compared to the control group. The pH of the test solutions was measured in an extra replicate flask at the beginning of the test and in

each replicate flask at the end of the test. The pH remained between 7.17 and 8.01 throughout the study period.

## Results

Nominal concentrations (mg/l): 0 (control), 10, 32, 100, 320 and 1000 mg test substance/l.  
Measured concentrations (mg/l): Not measured  
Unit: mg/l  
Element value: 72-hour EC<sub>50</sub> = 320 mg/l  
Result: 72-hour EC<sub>50</sub> = 320 mg/l  
Satisfactory control response: The control response met the validity criterion of the guideline.  
Statistical results: No statistical analyses were apparent.  
Remarks: The reduction in the average specific growth rate starts at a concentration of 10 mg test substance/l. The reduction gradually increased with increasing dose to stop the growth completely at a concentration of 1000 mg test substance/l.

## Conclusions

The toxicity of the test substance to the green alga *Selenastrum capricornutum* has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1A  
Remarks: Reliable without restriction; guideline study (OECD).

## References

Weytjens, D. and R. Wils. 1991. The Acute Toxicity of  $\beta$ -picoline on the Growth of Unicellular Green Alga (*Selenastrum capricornutum*). . Unpublished report no. AASc/0002 in EPA Document number 86-930000171, submitted by Reilly Industries, Inc., Indianapolis, IN, U.S.A.

## Other Available Reports

### Other

Last Changed: October 30, 2003  
Order number for sorting: 323  
Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Fixed-dose procedure as described by van de Heuvel et al 1990.  
Up-and-down method as described by Bruce (1985 and 1987)

Type: Fixed-dose procedure and up-and-down method  
GLP: Not stated  
Year: 1991  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male and female  
No. of animals per sex per dose: Described below  
Vehicle: Not stated  
Route of administration: Oral  
Remarks: Two test methods were used, as described below. For both studies, rats were fasted for 16 to 20 hours before test substance administration. The prefasted weights were 190 to 300 g.  
Fixed-dose procedure: Groups of ten rats (five males and five females) were administered the test substance at concentrations of 5, 50, 500 and 2000 mg/kg. Rats were observed for signs of toxicity for 14 days post dose and were autopsied at the end of the study. Depending on the outcome of the first dose, a second dose group was used.  
Up-and-down method: Female rats were dosed, one at a time, starting with the first rat at the best estimate of the LD<sub>50</sub>. If the first rat was alive at the end of 24 hours, the next rat was given a higher dose. If the first rat died, then the next rat received a lower dose. The dose for the next rat was increased or decreased by a factor of 1.3. The dosing options were repeated until four rats had been treated after reversal of the initial outcome. Rats were observed for signs of toxicity for 14 days post dose and were autopsied at the end of the study. Only females were used because they are generally equal in sensitivity or more sensitive to males.

## Results

Value: Up-and-down method  $LD_{50} = 337$  mg/kg  
(95% confidence limit of 245 – 465 mg/kg)

Number of deaths: Not stated

Remarks: Fixed-dose procedure: The following clinical signs were observed during the 14-day observation period: decreased motor activity, respiratory effects, tremors, blanching and piloerection. These clinical signs were observed within one-day post dose and lasted for one day. No autopsy findings were noted.

Up-and-down method: The following clinical signs were observed during the 14-day observation period: decreased motor activity, respiratory effects, tremors, blanching, piloerection, ataxia and salivation. These clinical signs were observed within one-day post dose and lasted for one day. Stomach and intestinal hemorrhage with ulcers was noted at autopsy.

Based on the results from both procedures, the test substance was considered harmful according to EC criteria.

## Conclusions

Remarks: The acute oral  $LD_{50}$  has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1B

Remarks: Reliable without restriction; comparable to guideline study.

## References

Yam, J., P. J. Reer and R. D. Bruce. 1991. Comparison of the Up-and-Down Method and the Fixed-Dose Procedure for Acute Oral Toxicity Testing. *Fd. Chem. Toxic.* 29(4):259 - 263.

## Other

Last changed: December 17, 2003

Order number for sorting: 10

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/Guideline followed: Not stated  
Type: Acute toxicity  
GLP: Not stated  
Year: 1989  
Species/Strain: ddY mice  
Sex: Male and female  
No. of animals per sex per dose: 10 mice per dose (article does not specify proportion of male and female animals)  
Vehicle: None  
Route of administration: Oral  
Remarks: Animals were fasted from food for 15 hours prior to dosing and six hours following dosing. Animals were monitored for the number of deaths for 14 days following dose administration. Necropsies were performed immediately after death or at terminal sacrifice on day 14. The LD<sub>50</sub> was calculated using the Litchfield and Wilcoxon method (Litchfield, J. T. and F. Wilcoxon. 1949. J. Pharmacol. Ther. 96:99).

#### Results

Value: LD<sub>50</sub> (males) = 633 mg/kg  
(95% confidence limits = 550 to 728 mg/kg)  
LD<sub>50</sub> (females) = 536 mg/kg  
(95% confidence limits = 476 to 600 mg/kg)  
Number of deaths: Not stated.  
Remarks: Symptoms produced were hypoactivity and diarrhea. Necropsy findings included congestion of brain and kidney.

#### Conclusions

Remarks: The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Hasegawa, R, Y. Nakaji, Y. Kurokawa and M. Tobe. 1989. Acute Toxicity Tests on 113 Environmental Chemicals. Sci. Rep. Res. Inst. Tohoku Univ., -C. 36(1 - 4):10 - 16.

**Other Available Reports**

**Other**

Last changed:

December 17, 2003

Order number for sorting:

10a1

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: EPA TSCA, 40 CFR, Part 798, Subpart A, general toxicity testing, acute oral toxicity, 798.1175, July 1989  
Type: LD<sub>50</sub>  
GLP: Yes  
Year: 1992  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male and female  
No. of animals per sex per dose: 5  
Vehicle: USP water  
Route of administration: Oral (intubation)  
Remarks: Based on the results of a range-finding study, groups of ten rats (five male and five female), 49 to 74 days old and weighing between 200 and 300 g, were administered a single dose of the test substance via oral intubation at concentrations of 0.30, 0.55 and 0.80 g/kg. The test substance was diluted in USP water for administration. Rats were acclimated to the laboratory for four days prior to test substance administration. Rats were fasted from food the night prior to dosing and were allowed access to food and water immediately after dosing. Rats were observed for signs of toxicity for 14 days post dose and body weights were recorded on days 0 (day of dosing), 7 and 14. A gross necropsy was performed on all animals.

#### Results

Value: LD<sub>50</sub> = 0.74 g/kg  
Number of deaths: 0.30 g/kg = 0/10  
0.55 g/kg = 0/10  
0.80 g/kg = 7/10  
Remarks: Rats in the 0.80 g/kg dose groups showed the following clinical signs during the observation period: catalepsy, tremors and lethargy. One surviving male appeared emaciated from day 7 to day 10. Surviving rats gained weight during the observation period. The rats that died between

day 1 and day 6 post dose lost weight. Gross necropsy findings in rats of this dose group included hemorrhaging in the stomach and small intestines; adhesion of the stomach, small intestine and spleen to the abdominal cavity wall; brownish fluid in the abdominal cavity and discoloration of the kidneys. Clinical signs observed in rats treated with 0.55 g/kg of the test substance included somnolence, catalepsy, lethargy and tremors during the initial four-hour observation period. No other clinical signs of toxicity were noted throughout the observation period. One rat lost body weight during the observation period. Gross necropsy findings in rats of this dose group included adhesion of the stomach and spleen and thickening of the forestomach mucosa. All animals in the 0.30 g/kg dose group gained weight and no signs of toxicity were observed during the observation period or at gross necropsy.

**Conclusions**

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

1A

Remarks:

Reliable without restriction; guideline study.

**References**

Fitzgerald, G. B. 1992. Acute oral toxicity study (LD<sub>50</sub>). Report number 92G-0563. Toxikon Corp., Woburn, MA., U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

11

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: LD<sub>50</sub> test based on OECD Guideline No. 401, Acute oral toxicity, 1981  
Fixed-dose procedure based on British Toxicology Society, 1984

Type: LD<sub>50</sub> and fixed-dose procedure  
GLP: Not stated  
Year: 1988 - 1989  
Species/Strain: Rat/Sprague-Dawley used in the LD<sub>50</sub> test  
Rat/Sprague-Dawley, Wistar or Fischer 344 rats were used in the fixed-dose procedure tests

Sex: Male and female  
No. of animals per sex per dose: Described below  
Vehicle: Not stated  
Route of administration: Oral (gavage)  
Remarks: Thirty-three laboratories from 11 OECD countries conducted acute oral toxicity tests with the test substance; one laboratory conducted an LD<sub>50</sub> test while the other laboratories conducted the fixed-dose procedure test. For both procedures, young adult rats were acclimated to the laboratory for at least five days prior to dosing. Rats were fasted overnight prior to test substance administration and for three to four hours post dose. Groups of ten rats (five males and five females) were administered the test substance at concentrations of 5, 50, 500 and 2000 mg/kg. Where this LD<sub>50</sub> study differs from the 1981 OECD guideline is that the limit dose of 2000 mg/kg was used instead of 5000 mg/kg. In the case of the fixed-dose procedure, administration of lethal doses was avoided and, depending on the outcome of the first dose, a second dose group was used. Rats were observed for signs of toxicity for 14 days post dose and were autopsied at the end of the study.

## Results

Value: Male LD<sub>50</sub> = 405 mg/kg  
Female LD<sub>50</sub> = 488 mg/kg  
(95% Confidence Limits = 388 – 615 mg/kg)  
Combined LD<sub>50</sub> = 445 mg/kg  
(95% Confidence Limits = 392 – 504 mg/kg)

Number of deaths: Not stated

Remarks: LD<sub>50</sub> procedure:  
The following signs of toxicity were noted: ptosis, posture, respiratory effects, lethargy, tremors, prostrate coma and salivation. These clinical signs were observed within one day post dose and lasted for five days. Autopsy findings included congestion of stomach blood vessels.  
Fixed-dose procedure:  
Classification = toxic or harmful  
The following signs of toxicity were noted: ptosis, posture, respiratory effects, diarrhea and diuresis, lethargy, ataxia, abnormal gait, tremors, convulsions, prostrate coma, salivation and lacrimation. These clinical signs were observed within one day post dose and lasted between one and 11 days. Autopsy findings included acute hemorrhage of the stomach, intestine, thymus and urinary bladder; stomach necrosis; ulceration and adhesions with the spleen and liver; and congestion of the kidney.

## Conclusions

Remarks: The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1A  
Remarks: Reliable without restriction; guideline study.

**References**

van den Heuvel, M. J., D. G. Clark, R. J. Fielder, P. P. Koundakjian, G. J. A. Oliver, D. Pelling, N. J. Tomlinson and A. P. Walker. 1990. The International Validation of a Fixed-Dose Procedure as an Alternative to the Classical LD<sub>50</sub> Test. *Fd. Chem. Toxic.* 28(7):469 - 482.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

14

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: Gamma picoline (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1973  
Species/Strain: Rat/Sprague-Dawley  
Sex: Female  
No. of animals per sex per dose: 4 rats per dose  
Vehicle: Not stated  
Route of administration: Oral (gavage)  
Remarks: Groups of four female rats were administered a single dose of the test substance at concentrations of 0.125, 0.25, 0.5, 1.0 and 2.0 g/kg. The rats were fasted overnight prior to dosing and after dosing food was available *ad libitum*. The rats were weighed the day following dosing and at weekly intervals for two weeks thereafter. The LD<sub>50</sub> was calculated using the method of Weil, C.S. (1952). Tables for Convenient Calculations of Median Effective Dose (LD<sub>50</sub> or ED<sub>50</sub>) and Instructions in Their Use. Biometrics 8:249 - 263.

#### Results

Value: LD<sub>50</sub> = 0.841 g/kg  
(95% Confidence Limits of 0.595 – 1.19 g/kg)  
Number of deaths:  
0.125 g/kg = 0/4  
0.25 g/kg = 0/4  
0.5 g/kg = 0/4  
1.0 g/kg = 3/4  
2.0 g/kg = 4/4  
Remarks:

#### Conclusions

Remarks: The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2C

Remarks:

Reliable with restrictions; comparable to guideline study with acceptable restrictions.

**References**

Pullin, T. G., H. N. Edwards and R. L. Schwebel. 1984. Acute toxicological Properties of Gamma Picoline (4-Methyl pyridine) with Cover Letter. EPA Doc. No. 878214752, Dow Chemical Company, Freeport, TX, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

265

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: 0.4 mole fraction  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1972  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male and female  
No. of animals per sex per dose: 2 or 3  
Vehicle: None  
Route of administration: Oral (gavage)  
Remarks: Groups of five rats (mixed sex) were administered a single dose of the undiluted test substance via stomach tube at concentrations of 631, 794, 1000 and 1260 mg/kg. Males and females were in the weight ranges of 200 – 265 g and 200 – 260 g, respectively. Rats were observed for signs of toxicity and the viscera of the rats were examined macroscopically. Surviving rats were sacrificed seven days after dosing. LD<sub>50</sub> was calculated according to the method of E. J. de Beer.

#### Results

Value: LD<sub>50</sub> = 700 mg/kg  
(lower and upper limits = 620 – 800 mg/kg)  
Number of deaths: 631 mg/kg = 1/5  
794 mg/kg = 2/5  
1000 mg/kg = 3/5  
1260 mg/kg = 5-5  
Remarks: Rats that died prior to scheduled sacrifice did so within two days post dose. Toxic signs included reduced appetite and activity (for one to three days in survivors), ocular discharge containing blood, increasing weakness, collapse and death. Autopsy findings in those rats that died prior to scheduled sacrifice included hemorrhagic lungs, liver discoloration and acute gastrointestinal inflammation. The viscera of rats that survived the observation period appeared normal by macroscopic examination. The compound was classified as

mildly toxic by oral ingestion in male and female rats.

**Conclusions**

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Initial submission: Toxicological Investigation of: 0.4 Mole Fraction 4-Methylpyridine – Lot: QET 195729 (Final Report) with Cover Letter Dated 081792. EPA Document number 88-920007597. Monsanto Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

267

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1972  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male and female  
No. of animals per sex per dose: 2 or 3  
Vehicle: None  
Route of administration: Oral (gavage)  
Remarks: Groups of five rats (mixed sex) were administered a single dose of the undiluted test substance via stomach tube at concentrations of 501, 631, 794 and 1000 mg/kg. Males and females were in the weight ranges of 200 – 280 g and 200 – 230 g, respectively. Rats were observed for signs of toxicity and the viscera of the rats were examined macroscopically. Surviving rats were sacrificed seven days after dosing. LD<sub>50</sub> was calculated according to the method of E. J. de Beer.

#### Results

Value: LD<sub>50</sub> = 700 mg/kg  
(lower and upper limits = 620 – 800 mg/kg)  
Number of deaths: 501 mg/kg = 1/5  
631 mg/kg = 2/5  
794 mg/kg = 3/5  
1000 mg/kg = 5/5  
Remarks: Rats that died prior to scheduled sacrifice did so within one to three days post dose. Toxic signs included reduced appetite and activity (for one to three days in survivors), increasing weakness, ocular discharge containing blood and collapse. Autopsy findings in those rats that died prior to scheduled sacrifice included hemorrhagic lungs, liver discoloration and acute gastrointestinal inflammation. The viscera of rats that survived the observation period appeared normal by macroscopic examination. The compound was classified as

mildly toxic by oral ingestion in male and female rats.

**Conclusions**

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Initial submission: 4-Methylpyridine – Neat – Lot: QET 195729 (Final Report) with Cover Letter Dated 112691. EPA Document number 88-920000385. Monsanto Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

269

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1972  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male and female  
No. of animals per sex per dose: 2 or 3  
Vehicle: None  
Route of administration: Oral (stomach tube)  
Remarks: Groups of five rats (mixed sex) were administered a single dose of the undiluted test substance via stomach tube at concentrations of 501, 631, 794 and 1000 mg/kg. Males and females were in the weight range of 200 – 260 g. Rats were observed for signs of toxicity and the viscera of the rats were examined macroscopically. Surviving rats were sacrificed seven days after dosing.

#### Results

Value: LD<sub>50</sub> = 710 mg/kg  
(lower and upper limits = 620 and 820 mg/kg)  
Number of deaths: 501 mg/kg = 1/5  
631 mg/kg = 2/5  
794 mg/kg = 3/5  
1000 mg/kg = 4/5  
Remarks: Rats that died prior to scheduled sacrifice did so within one to four days, with the most deaths occurring within three days. Toxic signs included reduced appetite and activity (for one to four days in survivors), ocular discharge containing blood, increasing weakness and collapse. Autopsy findings in those rats that died prior to scheduled sacrifice included hemorrhagic lungs, liver discoloration and acute gastrointestinal inflammation. The viscera of rats that survived the observation period appeared normal by macroscopic examination. The compound was classified as

mildly toxic by oral ingestion in male and female rats.

**Conclusions**

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Toxicological Investigation of: 0.4 Mole Fraction 3-Methylpyridine – lot: QET 195729 (Final Report) with Cover Letter Dated 112691. EPA Document number 88-920000371. Monsanto Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

332

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: Not stated  
Year: 1983  
Species/Strain: Rat/Fischer  
Sex: Male  
No. of animals per sex per dose: 3  
Vehicle: None  
Route of administration: Oral (gavage)  
Remarks: Groups of three male rats were administered a single dose of the test substance at concentrations of 320, 630, 1300, 2000, 3200 and 5000 mg/kg. The test substance was administered as received (undiluted). Following exposure, rats were observed for signs of toxicity and mortality for two weeks post dose. Body weights were recorded.

#### Results

Value: LD<sub>50</sub> = approximately 630 mg/kg  
Number of deaths: 320 mg/kg = 0/3  
630 mg/kg = 1/3  
1300 mg/kg = 3/3  
2000 mg/kg = 3/3  
3200 mg/kg = 3/3  
5000 mg/kg = 3/3  
Remarks: The following signs of toxicity were noted:  
320 mg/kg = lethargy and watery eyes  
630, 1300 and 2000 mg/kg = lethargy, watery eyes, loss of motor coordination, excessive salivation, rapid shallow breathing and unconsciousness  
3200 mg/kg = watery eyes, excessive salivation, rapid shallow breathing and unconsciousness  
5000 mg/kg = rapid shallow breathing and unconsciousness  
Rats in the 320 and 630 mg/kg dose groups recovered, appeared healthy and gained weight during the 2-week observation period.

**Conclusions**

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Carreon, R. E. 1983. 3-Methylpyridine: Acute Toxicological Properties and Industrial Handling Hazards. EPA Document number 878214754. Dow Chemical Company, Midland, MI, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

334

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: 99.5%  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1976  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male  
No. of animals per sex per dose: 10  
Vehicle: Water  
Route of administration: Oral (gavage)  
Remarks: Groups of ten adult male rats were administered the test substance (10% aqueous solution) orally at concentrations of 0, 550, 790 and 950 mg/kg. The controls were dosed with an amount of water equivalent to that given at the highest dose. Food was withheld for 16 to 18 hours prior to treatment but was available *ad libitum* at all other times. Rats were observed daily for 28 days and weighed once per week. A gross pathological examination was performed immediately on animals that died and on all rats at the end of the observation period. Representative organs and tissues were collected, preserved and examined by light microscopy: all gross lesions, kidney, liver, lung, brain and spinal cord.

#### Results

Value: LD<sub>50</sub> for male rats > 950 mg/kg  
Number of deaths: 550 mg/kg = 0/10  
790 mg/kg = 0/10  
950 mg/kg = 4/10  
Remarks: Immediately following dosing, rats in all treatment groups appeared lethargic. This condition lasted for approximately 24 hours in the 550 mg/kg dose group and 24 to 48 hours in the 790 and 950 mg/kg dose groups. Four rats in the 950 mg/kg dose group died within the two days post dose. One surviving rat in the 950 mg/kg dose group showed definite signs of muscular incoordination and loss of

equilibrium, which lasted for four to five days after treatment. All other rats appeared normal throughout the remaining observation period. Decreases in body weight were observed in rats in the 950 mg/kg dose group throughout the study. This was associated with a decreased content of adipose tissue when examined at autopsy. Body weights of rats in the other treatment groups were comparable to the control group. Gross autopsy examinations in rats that died prior to scheduled sacrifice revealed accumulation of exudate around the mouth and eyes, decreased content of fluid ingesta in the gastrointestinal tract, a dark, congested liver, gastric hemorrhage and a moist, edematous appearance of the tissues. Gross autopsy examinations of the six surviving rats in the 950 mg/kg group revealed decreased content of adipose tissue in 4/6 rats and decreased size of the carcass in 1/6 rats; these observations were considered to be treatment-related. There were no other findings in any group considered to be related to treatment. Upon microscopic examination of rats that died prior to scheduled sacrifice, findings considered to be treatment-related included the brain of 1/4 rats that had some lesions possibly suggestive of focal encephalomalacia of the cerebrum and cerebellum and possible renal tubular epithelial sloughing. Another 1/4 rats showed signs of focal gastric hemorrhage. Upon microscopic examination of surviving rats, findings considered to be treatment-related in the 950 mg/kg dose group included encephalomalacia in 2/6 rats. There were no other microscopic findings in any group considered to be related to treatment.

**Conclusions**

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

Remarks:

1B

Reliable without restriction; comparable to guideline study.

**References**

Vaughn, C., Keeler, P. A. and K. J. Olson. 1976. Acute Oral Toxicity of  $\alpha$ -picoline in Rats. EPA Document number 878214755. Dow Chemical Company, Midland, MI, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

396

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1972  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male and female  
No. of animals per sex per dose: 2 or 3  
Vehicle: None  
Route of administration: Oral (gavage)  
Remarks: Groups of five rats (mixed sex) were administered a single dose of the undiluted test substance via stomach tube at concentrations of 631, 794, 1000 and 1260 mg/kg. Males and females were in the weight ranges of 210 – 270 g and 200 – 245 g, respectively. Rats were observed for signs of toxicity and the viscera of the rats were examined macroscopically. Surviving rats were sacrificed seven days after dosing. LD<sub>50</sub> was calculated according to the method of E. J. de Beer.

#### Results

Value: LD<sub>50</sub> = 810 mg/kg  
(lower and upper limits = 730 and 910 mg/kg)  
Number of deaths: 631 mg/kg = 0/5  
794 mg/kg = 1/5  
1000 mg/kg = 2/5  
1260 mg/kg = 5/5  
Remarks: Rats that died prior to scheduled sacrifice did so within one to three days post dose. Toxic signs included reduced appetite and activity (for one to three days in survivors), increasing weakness, ocular discharge containing blood and collapse. Autopsy findings in those rats that died prior to scheduled sacrifice included hemorrhagic lungs, liver discoloration and acute gastrointestinal inflammation. The viscera of rats that survived the observation period appeared normal by macroscopic examination. The compound was classified as

mildly toxic by oral ingestion in male and female rats.

**Conclusions**

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Toxicological Investigation of: 0.4 Mole Fraction 2-Methylpyridine with Cover Letter Dated 081792. EPA Document number 88-920007591. Monsanto Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

401

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: KW 48 (CAS RN 68391-11-7; Pyridine, alkyl derivs)  
Purity: Not stated  
Remarks: KW 48 is a mixture of pyridine; hydrochloric acid; methanol; poly (oxy-1,2-ethanediyl)- $\alpha$ -(dinonylphenyl)- $\omega$ -hydroxy-; amines, tallow alkyl, ethoxylated and water. The percentage of each chemical in the mixture was not stated.

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1979  
Species/Strain: Rat/Sherman-Wistar  
Sex: Male  
No. of animals per sex per dose: 5  
Vehicle: None  
Route of administration: Oral (gavage)  
Remarks: Groups of five young adult male rats weighing 200 – 300 g were administered a single dose of the test substance orally at concentrations of 1, 2, 4, 8 and 16 g/kg. The test substance was administered as received (undiluted). Rats were deprived of food for 24 hours prior to dosing. Following exposure, rats were observed for signs of toxicity and mortality continuously for four hours on the day of exposure and subsequently twice daily for 14 days. Gross pathologic examinations were conducted on all rats. LD<sub>50</sub> was calculated using the Weil modification of the Thompson moving average method.

#### Results

Value: LD<sub>50</sub> = 2.5 g/kg  
(95% Confidence Limits = 1.9 to 3.2 g/kg)  
Number of deaths: 1 g/kg = 0/5  
2 g/kg = 1/5  
4 g/kg = 5/5  
8 g/kg = 5/5  
16 g/kg = 5/5

**Remarks:** Within one hour the rats treated with 1 and 2 g/kg of the test substance were ataxic, lethargic and depressed. At 24 hours post dose hypothermia, decreased respiration, ataxia and depression were observed. A few rats in the 2 g/kg dose group were semi-comatose. One death occurred at 2 g/kg. The surviving rats in these two groups appeared to recover after six to seven days. Rats in the 4, 8 and 16 g/kg dose groups were severely depressed and ataxic within minutes of dosing and died in most cases in less than five to six hours post dose. Gross pathologic examinations revealed nothing remarkable.

**Conclusions**

**Remarks:** The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

**Reliability (Klimisch):** 2A  
**Remarks:** Reliable with restrictions; acceptable, well-documented study report which meets basic scientific principles.

**References**

Petrolite Corp. 1979. Initial submission: Acute Oral Toxicity – Rats (Final Report) with Cover Letter Dated 022192. EPA Doc. No. 88-920001249, Microfiche No. OTS0535838.

**Other**

**Last changed:** December 17, 2003  
**Order number for sorting:** 432  
**Remarks:**

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: Kontol AK-7 (CAS RN 68909-18-2; Pyridinium, 1-(phenylmethyl)-, Et Me derivs., chlorides)  
Purity: Not stated  
Remarks: Kontol AK-7 is a mixture of pyridinium, 1-(phenylmethyl)-ethylmethyl derivatives; isopropanol; poly (oxy-1,2-ethanediyl)- $\alpha$ -(dinonylphenyl)- $\omega$ -hydroxy; poly (oxy-1,2-ethanediyl)- $\alpha$ -(nonylphenyl)- $\omega$ -hydroxy; water and thiourea. The percentage that each chemical was included in the mixture was not stated.

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1980  
Species/Strain: Rat/Sherman-Wistar  
Sex: Male and female  
No. of animals per sex per dose: 5  
Vehicle: Water  
Route of administration: Oral (gavage)  
Remarks: Groups of ten young adult rats (five males and five females) weighing 200 – 300 g were administered a single dose of the test substance orally at concentrations of 10, 20, 40, 80 and 160 mg/kg. The test substance was dosed as a 1.0% w/v suspension in water. Rats were deprived of food but not water overnight prior to dosing. Following dose administration, rats were allowed access to food and water *ad libitum*. Animals were observed continually for four hours after dosing and then twice daily for 14 days for signs of toxicity and mortality. Gross pathologic examinations were conducted on all rats. The LD<sub>50</sub> was calculated using the Thompson Moving Average Method as modified by Weil (Biometrics. 1952. 8(3):249 - 263).

#### Results

Value: Combined LD<sub>50</sub> = 50.1 mg/kg  
(95% Confidence Limits = 29.2 to 86.5 mg/kg)  
Male LD<sub>50</sub> = 56.6 mg/kg  
(95% Confidence Limits = 35.1 to 91.3 mg/kg)

Female LD<sub>50</sub> = 43.6 mg/kg  
(95% Confidence Limits = 23.3 to 81.6 mg/kg)

Number of deaths:  
10 mg/kg = 0/10  
20 mg/kg = 1/10  
40 mg/kg = 4/10  
80 mg/kg = 7/10  
160 mg/kg = 10/10

Remarks:  
Rats treated with 10 mg/kg of the test substance were slightly ruffled after 30 to 60 minutes post dose. They appeared normal within 24 hours. Rats in the 20 mg/kg dose group were depressed and ruffled after 30 minutes post dose. One female rat became comatose and died six hours post dose. The remaining rats appeared essentially normal within 24 hours. Rats in the 40 mg/kg group were severely depressed one hour post dose and gasping and slight convulsions were evident. Two male and two female rats became comatose and died within four to six hours post dose. The remaining rats appeared essentially normal within 24 hours. Rats in the 80 mg/kg dose group were severely depressed, ruffled, gasping and convulsing one hour post dose. Four male and three female rats died after three to five hours post dose. The surviving rats appeared essentially normal within 24 hours. Rats treated with 160 mg/kg of the test substance were severely depressed and/or comatose after 30 minutes. Most deaths occurred in less than two hours. Gross pathologic examinations revealed nothing remarkable.

**Conclusions**

Remarks:  
The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):  
Remarks:  
2A  
Reliable with restrictions; acceptable, well-documented study report which meets basic scientific principles.

**References**

Gabriel, K. L. 1980. Acute Oral Toxicity LD<sub>50</sub> – Rats (Final Report) with Cover Letter dated 022192. EPA Document number 88-920001226. Petrolite Corporation, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

434

Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 3-Cyanopyridine  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1978  
Species/Strain: Rat/Sherman-Wistar  
Sex: Male  
No. of animals per sex per dose: Five male rats per dose group  
Vehicle: Water  
Route of administration: Oral gavage  
Remarks: Groups of five male rats, weighing 200 to 300 g, were administered the test substance orally at concentrations of 250, 500, 1000, 2000 and 4000 mg/kg. The test substance was dosed as a 50% w/v suspension in water. The rats were deprived of food but not water for 24 hours prior to dosing. Food and water were available *ad libitum* post dose. Rats were observed for signs of toxicity and mortality for 14 days post dose. Body weights were taken at dosing and at study termination in surviving rats. A gross necropsy was conducted.

#### Results

Value: LD<sub>50</sub> = 1100 mg/kg (95% Confidence limits = 960 to 1500 mg/kg)  
Number of deaths: 250 mg/kg = 0/5  
500 mg/kg = 0/5  
1000 mg/kg = 2/5  
2000 mg/kg = 5/5  
4000 mg/kg = 5/5  
Remarks: No signs of toxicity were observed at the 250 mg/kg dose level. At 500 mg/kg, the rats were depressed one hour post dose and lethargic. They appeared normal 24 hours post dose. Rats in these two dose groups gained weight during the observation period. Rats in the 1000 mg/kg dose group were extremely depressed 30 minutes post dose and exhibited shallow breathing. Within 24 hours they were

semi-comatose. This condition prevailed for five days during which time two animals died, one at three days post dose and the other four days post dose. The surviving rats appeared normal eight to nine days post dose. A decrease in body weight for the surviving animals was observed at study termination. Rats in the 2000 and 4000 mg/kg dose groups died within one to three hours post dose. Gross pathologic examination revealed nothing remarkable.

### Conclusions

Remarks:

The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2C

Reliable with restrictions; comparable to guideline study with acceptable restrictions.

### References

Karnatz, R. A., R. A. Kattau and P. Mackell. 1973. Biodegradation, Hydrolysis, Toxicity and BOD of 2-, 3- and 4-pyridinecarbonitrile with Cover Letter Dated 072987. EPA Document number 86-870001339. Reilly Tar and Chemical Corporation, Indianapolis, IN, U. S.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

187

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: 3-Cyanopyridine  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: 99.9%  
Remarks:

#### Method

Method/guideline followed: OECD Test Guideline 401  
Type: LD<sub>50</sub>  
GLP: Yes  
Year: Not stated  
Species/Strain: Rat/Crl:CD (Sprague-Dawley)  
Sex: Male and female  
No. of animals per sex per dose: 5  
Vehicle: Water  
Route of administration: Oral  
Remarks: A concurrent control was included in this study. Five male and five female rats were administered the test substance as a single oral dose at doses of 0 (vehicle), 1297, 1388, 1485, 1589 and 1700 mg/kg. Animals were observed for deaths and clinical signs of toxicity for 14 days post dose. At the end of the post dosing observation period all animals were subjected to a necropsy examination.

#### Results

Value: Male LD<sub>50</sub> = 1475 mg/kg  
(95% Confidence Limits = 1382 to 1574 mg/kg)  
Female LD<sub>50</sub> = 1455 mg/kg  
(95% Confidence Limits = 1375 to 1539 mg/kg)  
Number of deaths: 0 mg/kg = 0 males and females  
1297 mg/kg = 1 male, 0 females  
1388 mg/kg = 2 males, 3 females  
1485 mg/kg = 4 males, 3 females  
1589 mg/kg = 2 males, 3 females  
1700 mg/kg = 4 males, 5 females  
Remarks: Hypoactivity, bradypnea, salivation, lacrimation and wheezing were found in both sexes receiving 1297 mg/kg or more on the day of administration. Decreased body weights were noted in both sexes receiving 1297 mg/kg or more on the day after administration. Pathological lesions due to 3-cyanopyridine were observed in the stomach, lung, liver, urinary bladder and testis.

**Conclusions**

Remarks: The acute oral LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1D  
Remarks: Reliable without restriction; guideline study – report written in Japanese, not fully translated.

**References**

Katoku, K., K. Ichimura, E. Murata, T. Saitoh, H. Wada, K. Yuki, T. Ichiki. Single Dose Oral Toxicity Test of 3-Cyanopyridine in Rats. Panapharm Laboratories Co., Ltd., Kumamaoto, Japan.

**Other**

Last changed: June 26, 2001  
Order number for sorting: 202a/202b  
Remarks:

### 5.1.1 ACUTE ORAL TOXICITY

#### Test Substance

Identity: Picolinonitrile (CAS RN 100-70-9)  
Purity: Unknown  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1966  
Species/Strain: Rat  
Sex: Not stated  
No. of animals per sex per dose: 2 or 3 rats per dose  
Vehicle: Corn oil  
Route of administration: Oral  
Remarks: Groups of rats were administered the test substance as a 5% solution in corn oil at concentrations of 0.5 (two rats) and 1.0 g/kg (three rats). Rats were observed for signs of toxicity.

#### Results

Value: LD<sub>50</sub> not calculated  
Number of deaths: 0.5 g/kg = 0/2  
1.0 g/kg = 2/3  
Remarks: Rats administered 0.5 g/kg of the test substance appeared normal during and after test substance administration. One rat in the 1.0 g/kg dose group died overnight; the other rat died three days after dosing.

#### Conclusions

Remarks: The acute oral LD<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of this test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Olson, K. J. 1966. Toxicological Properties and Industrial Handling Hazards of Picolinonitrile. EPA Document number 86-870002151. Dow Chemical Company, Midland, MI, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

217

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute inhalation toxicity  
GLP: No  
Year: 1962  
Species/Strain: Rat  
Sex: Not stated  
No. of animals per sex per dose: 6 rats per dose group  
Vehicle: Not stated  
Route of administration: Inhalation  
Remarks: A group of six rats was exposed to the test substance via inhalation at a concentration of 2000 ppm for four hours. Rats were observed for signs of toxicity 14 days post exposure.

#### Results

Value:  $LC_{50} > 2000$  ppm  
Number of deaths: 0/6  
Remarks:

#### Conclusions

Remarks: The acute inhalation  $LC_{50}$  was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Smyth, H. F., C. P. Carpenter, C. S. Weil, U. C. Pozzani and J. A. Striegel. 1962. Range-Finding Toxicity Data: List VI. Amer. Ind. Hyg. Assoc. J. 23(2):95 - 107.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

27

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LC<sub>50</sub>  
GLP: No  
Year: 1972  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male and female  
No. of animals per sex per dose: 5 rats per dose  
Vehicle: Not stated  
Route of administration: Inhalation  
Remarks: Five rats per group, weighing 200 to 300 g, were exposed to the test substance for a one-hour period. The test was performed using bell jars or large desiccators. The chamber contaminant concentrations were measured by standard techniques or by methods developed in the laboratory and checked to give relative standard deviations of 5% or less.

#### Results

Value: Male LC<sub>50</sub> = 9010 ppm (8220 to 9880 ppm)  
Female LC<sub>50</sub> = 9020 ppm (8160 to 9970 ppm)  
Number of deaths: Not stated  
Remarks: The LC<sub>50</sub> values were determined by the method of Thompson (1947) and Weil (1952) or by the probit method.

#### Conclusions

Remarks: The acute inhalation LC<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Vernot, E. H., J. D. MacEwen, C. C. Haun and E. R. Kinkead. 1977. Acute Toxicity and Skin Corrosion Data for Some Organic and Inorganic Compounds and Aqueous Solutions. *Toxicol. Appl. Pharmacol.* 42:417 - 423.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

84

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Lethal concentration  
GLP: Not stated  
Year: 1984  
Species/Strain: Rat/Crl:CD<sup>®</sup>(SD)BR  
Sex: Male  
No. of animals per sex per dose: 6  
Vehicle: None  
Route of administration: Inhalation (nose-only)  
Remarks: Groups of six male rats, eight weeks old and weighing between 237 and 279 g, were exposed to the test substance via inhalation (nose only exposure) at concentrations of 1600, 4900 and 6000 ppm for a single four-hour period. Rats were weighed prior to exposure and observed during exposure. Surviving rats were weighed and observed daily for 14 days post exposure, weekends excluded except when deemed necessary by the rats' condition. Except during exposure, feed and water were available *ad libitum*. The atmospheric concentration of the test substance was determined by gas chromatography at approximately 30-minutes intervals throughout the exposure period.

#### Results

Value: Lethal concentration = 4900 ppm  
LC<sub>50</sub> > 4900 ppm and < 6000 ppm  
Number of deaths: 1600 ppm = 0/6  
4900 ppm = 2/6  
6000 ppm = 5/6  
Remarks: During exposure, some rats in all groups had red nasal discharge and diminished or no response when the chamber was tapped. Immediately after the four-hour exposure to 1600 ppm, rats had slightly labored breathing, wet perineum, hunched posture, ruffled fur and slight red ocular discharge. Rats exposed to 4900 ppm were limp and prostrate

and had very slow and shallow breathing. Within one hour, these rats began to show signs of movement and had severely labored breathing. At 6000 ppm, five rats died during exposure. During the post-exposure observation period, one rat exposed to 4900 ppm was found dead the morning after exposure; another four days post exposure. Surviving rats in all groups had slight to severe weight loss one day post exposure. At 4900 ppm, some rats continued to lose weight for three more days. No adverse clinical signs were observed in surviving rats exposed to 1600 and 6000 ppm during the recovery period. At 4900 ppm, rats had labored breathing, red nasal, ocular and oral discharge, no righting or grasping reflexes, discolored fur and tremors. All clinical signs were absent six days post exposure.

**Conclusions**

Remarks:

The acute inhalation LC<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

Remarks:

2A

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Kinney, L. A., N. C. Chromey and R. T. Turner. 1984. Lethal Concentration(s) by Inhalation of Pyridine and 3-methylpyridine with Cover Letter. EPA Doc. No. 878214921. E. I. du Pont de Nemours & Co. Inc., Wilmington, DE, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

86

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute inhalation toxicity  
GLP: No  
Year: 1951  
Species/Strain: Rat  
Sex: Not stated  
No. of animals per sex per dose: 6  
Vehicle: Not stated  
Route of administration: Inhalation  
Remarks: Six rats were exposed to the test substance via inhalation at a concentration of 4000 ppm for four hours. Rats were observed for mortality 14 days post exposure.

#### Results

Value:  $LC_{50} < 4000$  ppm  
Number of deaths: 5/6  
Remarks: Rats that died did so within 14 days.

#### Conclusions

Remarks: The acute inhalation  $LC_{50}$  was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Smyth, H. F., Jr., C. P. Carpenter and C. S. Weil.  
1951. Range-Finding Toxicity Data: List IV.  
Arch. Ind. Hyg. Occup. Med. 4:119 - 122.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

155a

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: 0.4 mole fraction  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute inhalation toxicity  
GLP: No  
Year: 1972  
Species/Strain: Rat/Strain not stated  
Sex: Male  
No. of animals per sex per dose: 6  
Vehicle: Room air  
Route of administration: Inhalation (whole-body)  
Remarks: A group of six male rats were exposed to the test substance via inhalation at an average chamber concentration of 9.17 g/m<sup>3</sup> for five hours. Rats were observed for behavior during exposure and the viscera of the rats were examined macroscopically.

#### Results

Value: LC<sub>50</sub> < 9.17 g/m<sup>3</sup>  
Number of deaths: 6/6  
Remarks: All animals died within five hours after start of exposure. Observations during exposure included slight lethargy at one hour, and increasing weakness, labored breathing and collapse between one and five hours. The documentation of autopsy findings was not legible on the available copy of the report. It was concluded that the vapors were highly toxic under the conditions of this test.

#### Conclusions

Remarks: The acute inhalation LC<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Initial submission:  
Toxicological Investigation of: 0.4 Mole Fraction  
4-Methylpyridine – Lot: QET 195729 (Final  
Report) with Cover Letter Dated 081792. EPA  
Document number 88-920007597. Monsanto  
Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

267

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute inhalation toxicity  
GLP: No  
Year: 1972  
Species/Strain: Rat/Strain not stated  
Sex: Male  
No. of animals per sex per dose: 6  
Vehicle: Room air  
Route of administration: Inhalation (whole-body)  
Remarks: A group of six male rats were exposed to the test substance via inhalation at an average chamber concentration of 17.5 g/m<sup>3</sup> for 2.5 hours. Rats were observed for behavior during exposure and the viscera of the rats were examined macroscopically.

#### Results

Value: LC<sub>50</sub> < 17.5 g/m<sup>3</sup>  
Number of deaths: 6/6  
Remarks: All animals died within 2.5 hours after the start of exposure. Observations during exposure included lethargy at one hour and increasing weakness, labored breathing and collapse between one and 2.5 hours. Autopsy findings included hemorrhagic lungs and liver hyperemia. It was concluded that the vapors were highly toxic under the conditions of this test.

#### Conclusions

Remarks: The acute inhalation LC<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Initial submission:  
4-Methylpyridine – Neat – Lot: QET 195729 (Final Report) with Cover Letter Dated 112691. EPA Document number 88-920000385. Monsanto Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

269

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: 4-Picoline (CAS RN 108-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute inhalation toxicity  
GLP: No  
Year: 1954  
Species/Strain: Rat  
Sex: Male  
No. of animals per sex per dose: 6  
Vehicle: Not stated  
Route of administration: Inhalation  
Remarks: A group of six male albino rats was exposed to the test substance via inhalation at a concentration of 1000 ppm for four hours. Rats were observed for signs of toxicity 14 days post exposure.

#### Results

Value:  $LC_{50} > 1000$  ppm  
Number of deaths: 1/6  
Remarks:

#### Conclusions

Remarks: The acute inhalation  $LC_{50}$  was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Smyth, H. F., C. P. Carpenter, C. S. Weil and U. C. Pozzani. 1954. Range-Finding Toxicity Data: List V. Amer. Ind. Hyg. Occup. Med. 10:61 - 68.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

270

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute vapor inhalation  
GLP: No  
Year: 1972  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male  
No. of animals per sex per dose: 6  
Vehicle: Room air  
Route of administration: Inhalation (whole-body)  
Remarks: A group of six male rats was exposed to the test substance via inhalation at an average chamber concentration of 11.82 g/m<sup>3</sup> for five hours. Rats were observed for behavior during exposure and the viscera of the rats were examined macroscopically.

#### Results

Value: LC<sub>50</sub> < 11.82 g/m<sup>3</sup>  
Number of deaths: 6/6  
Remarks: All animals died within five hours after the start of exposure. Observations during exposure included slight lethargy at one hour and increasing weakness, labored breathing and collapse between one and five hours. Autopsy findings included hemorrhagic lungs and areas of slight liver discoloration. It was concluded that the vapors were highly toxic under the conditions of this test.

#### Conclusions

Remarks: The acute inhalation LC<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Toxicological Investigation of:  
0.4 Mole Fraction 3-Methylpyridine – lot: QET  
195729 (Final Report) with Cover Letter Dated  
112691. EPA Document number 88-920000371.  
Monsanto Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

332

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: 98.5%  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Lethal concentration  
GLP: Not stated  
Year: 1984  
Species/Strain: Rat/Crl:CD<sup>®</sup>(SD)BR  
Sex: Male  
No. of animals per sex per dose: 6  
Vehicle: None  
Route of administration: Inhalation (nose-only)  
Remarks: Groups of six male rats, eight weeks old and weighing between 237 and 279 g, were exposed to the test substance via inhalation (nose only exposure) at concentrations of 1300 and 3300 ppm for a single four-hour period. Rats were weighed prior to exposure and observed during exposure. Surviving rats were weighed and observed daily for 14 days post exposure, weekends excluded except when deemed necessary by the rats' condition. Except during exposure, feed and water were available *ad libitum*. The atmospheric concentration of the test substance was determined by gas chromatography at approximately 30-minutes intervals throughout the exposure period.

#### Results

Value: Lethal concentration = 3300 ppm  
LC<sub>50</sub> > 1300 ppm and < 3300 ppm  
Number of deaths: 1300 ppm = 0/6  
3300 ppm = 6/6  
Remarks: During exposure, rats in both groups had no response when the chamber was tapped. At 3300 ppm, rats had clear to red nasal discharge and labored breathing before they died. All rats exposed to 3300 ppm died during exposure. After four hours of exposure, rats in the 1300 ppm group were limp and prostrate, had no righting reflex and one rat had red ocular discharge. During the post-

exposure observation period, surviving rats had severe weight loss for one or two days, followed by normal weight gain. Some rats had dry red nasal, ocular and oral discharges, wet perineum, decreased muscle tone, general paralysis, no righting reflex, hunched posture and were cold to the touch. The majority of clinical signs were observed one day post exposure and all signs were absent four days post exposure.

### Conclusions

Remarks:

The acute inhalation LC<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2A

Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

### References

Kinney, L. A., N. C. Chromey and R. T. Turner. 1984. Lethal Concentration(s) by Inhalation of Pyridine and 3-Methylpyridine with Cover Letter. EPA Document number 878214921. E. I. du Pont de Nemours & Co. Inc., Wilmington, DE, U. S.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

335

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute vapor inhalation  
GLP: No  
Year: 1972  
Species/Strain: Rat/Sprague-Dawley  
Sex: Male  
No. of animals per sex per dose: 6  
Vehicle: Room air  
Route of administration: Inhalation (whole-body)  
Remarks: A group of six male rats were exposed to the test substance via inhalation at an average chamber concentration of 13.2 g/m<sup>3</sup> for four hours. Rats were observed for behavior during exposure and the viscera of the rats were examined macroscopically.

#### Results

Value: LC<sub>50</sub> < 13.2 g/m<sup>3</sup>  
Number of deaths: 6/6  
Remarks: All animals died within four hours after the start of exposure. Observations during exposure included slight lethargy at one hour and increasing weakness, labored breathing and collapse between one and four hours. Autopsy findings included hemorrhagic lungs and slight liver discoloration. It was concluded that the vapors were highly toxic under the conditions of this test.

#### Conclusions

Remarks: The acute inhalation LC<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Birch, M. D. 1972. Toxicological Investigation of:  
0.4 Mole Fraction 2-Methylpyridine with Cover  
Letter Dated 081792. EPA Document number 88-  
920007591. Monsanto Company, St. Louis, MO,  
U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

401

Remarks:

### 5.1.2 ACUTE INHALATION TOXICITY

#### Test Substance

Identity:  $\alpha$ -Picoline (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Acute vapor inhalation  
GLP: No  
Year: 1951  
Species/Strain: Rat  
Sex: Not stated  
No. of animals per sex per dose: 6  
Vehicle: Not stated  
Route of administration: Inhalation  
Remarks: Six rats per group were exposed to the test substance via inhalation at concentrations of 2000 and 4000 ppm for four hours. Rats were observed for mortality 14 days post exposure.

#### Results

Value:  $LC_{50} > 2000$  ppm and  $< 4000$  ppm  
Number of deaths: 2000 ppm = 0/6  
4000 ppm = 6/6  
Remarks: Rats that died did so within 14 days.

#### Conclusions

Remarks: The acute inhalation  $LC_{50}$  has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Smyth, H. F., Jr., C. P. Carpenter and C. S. Weil.  
1951. Range-Finding Toxicity Data: List IV.  
Arch. Ind. Hyg. Occup. Med. 4:119 - 122.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

404

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1962  
Species/Strain: Rabbit/New Zealand White  
Sex: Male  
No. of animals per sex per dose: 4  
Vehicle: Not stated  
Route of administration: Dermal  
Remarks: Groups of four male rabbits, weighing 2.5 to 3.5 kg, were exposed to the test substance dermally. The fur was removed from the entire trunk by clipping and the dose site was covered by an impervious plastic film. After a 24-hour exposure period, the film was removed and rabbits were observed for signs of toxicity for 14 days.

#### Results

Value: LD<sub>50</sub> = 0.32 ml/kg (0.23 – 0.43 ml/kg)  
Number of deaths: Not stated  
Remarks:

#### Conclusions

Remarks: The acute dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Smyth, H. F., C. P. Carpenter, C. S. Weil, U. C. Pozzani and J. A. Striegel. 1962. Range-Finding Toxicity Data: List VI. Amer. Ind. Hyg. Assoc. J. 23(2):95 - 107.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

27

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed:  
Type:  
GLP: No  
Year: 1973  
Species/Strain: Rabbit  
Sex: Not stated  
No. of animals per sex per dose: 2  
Vehicle: Not stated  
Route of administration: Dermal  
Remarks: A group of six albino rabbits was administered the test substance dermally at concentrations of 500, 1000 or 2000 mg/kg. The hair was removed from the entire trunk of each rabbits 24 hours prior to test substance application. The test site was covered with an impervious cuff held together with a bandage. Observations of the rabbits were made during and following the 24-hour exposure period. The rabbits were weighed at intervals up to two weeks post dose or, when practical, until any weight loss had been regained and the animals appeared healthy.

#### Results

Value:  $LD_{50} > 1000 \text{ mg/kg}$  and  $< 2000 \text{ mg/kg}$   
Number of deaths: 500 mg/kg = 0/2  
1000 mg/kg = 0/2  
2000 mg/kg = 2/2  
Remarks: Lethargy and an initial loss of weight were observed in all animals. The weight of the animals slowly increased to the starting weight. The animals in the 2000 mg/kg dose group died by day 1 post exposure. Topical skin effect at all levels was a severe chemical burn. Gross pathological examination of the surviving rabbits revealed no compound-related changes.

**Conclusions**

Remarks:

The acute dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Pullin, T. G., H. N. Edwards and R. L. Schwebel. 1973. Acute Percutaneous Absorption and Inhalation Toxicity of Pyridine with Cover Letter. EPA Document number 87821120. Dow Chemical Company, Midland, MI, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

89

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Minimal lethal dose  
GLP: No  
Year: 1972  
Species/Strain: Rabbit/New Zealand White  
Sex: Male and female  
No. of animals per sex per dose: 1 animal per group  
Vehicle: None  
Route of administration: Dermal  
Remarks: One rabbit (male or female) per group was administered a single dose of the undiluted test substance dermally at concentrations of 79.4 (male), 126.0 (female), 200.0 (male), 316.0 (female), 501.0 (male), 1000.0 (female) and 2000.0 mg/kg (male). Males and females were in the weight range of 2.0 to 2.7 kg. The skin was closely clipped and the test substance was applied undiluted. The treated areas were covered with plastic strips for a period of 24 hours. Rabbits were observed for toxic signs for 14 days and the viscera of the rabbits were examined macroscopically.

#### Results

Value: Minimal lethal dose > 200 mg/kg and < 316 mg/kg  
Number of deaths: 79.4 mg/kg = 0/1  
126.0 mg/kg = 0/1  
200.0 mg/kg = 0/1  
316.0 mg/kg = 1/1  
501.0 mg/kg = 1/1  
1000.0 mg/kg = 1/1  
2000.0 mg/kg = 1/1  
Remarks: Rabbits in the 501.0 mg/kg dose group and above died within 16 hours. The rabbit in the 316.0 mg/kg dose group died within 1 day. Toxic signs included reduced appetite and activity (for one to two days in survivors), rapidly increasing weakness and collapse. Autopsy findings in those rabbits that died prior to scheduled sacrifice included

hemorrhagic lungs and slight liver discoloration. The viscera of rabbits that survived the observation period appeared normal by macroscopic examination. The test substance was classified as moderately toxic by skin absorption in male and female rabbits.

### Conclusions

Remarks:

The acute dermal LD<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of this test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2D

Reliable with restrictions; data are reliable but article lacks details.

### References

Birch, M. D. 1972. Initial submission: Toxicological Investigation of: 0.4 Mole Fraction 4-Methylpyridine – Lot: QET 195729 (Final Report) with Cover Letter Dated 081792. EPA Document number 88-920007597. Monsanto Company, St. Louis, MO, U. S.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

267

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 4-Methylpyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Minimal lethal dose  
GLP: No  
Year: 1972  
Species/Strain: Rabbit/New Zealand White  
Sex: Male and female  
No. of animals per sex per dose: 1 animal per group  
Vehicle: None  
Route of administration: Dermal  
Remarks: One rabbit (male or female) per group was administered a single dose of the undiluted test substance dermally at concentrations of 50.1 (male), 79.4 (female), 126.0 (male), 200.0 (female), 501.0 (male), 1000.0 (female) and 2000.0 mg/kg (male). Males and females were in the weight range of 2.1 to 2.7 kg. The skin was closely clipped and the test substance was applied undiluted. The treated areas were covered with plastic strips for a period of 24 hours. Rabbits were observed for toxic signs for 14 days after dosing and the viscera of the rabbits were examined macroscopically.

#### Results

Value: Minimal lethal dose > 126 mg/kg and < 200 mg/kg  
Number of deaths: 50.1 mg/kg = 0/1  
79.4 mg/kg = 0/1  
126.0 mg/kg = 1/1  
200.0 mg/kg = 1/1  
501.0 mg/kg = 1/1  
1000.0 mg/kg = 1/1  
2000.0 mg/kg = 1/1  
Remarks: Rabbits in the 200, 501 and 2000 mg/kg dose groups died within 16 hours. The rabbit in the 1000 mg/kg dose group died within 1 day. Toxic signs included reduced appetite and activity (for one to three days in survivors), rapidly increasing weakness and collapse. Autopsy findings in those rabbits that died prior to scheduled sacrifice

included hemorrhagic lungs, slight liver discoloration, and gastrointestinal inflammation. The viscera of rabbits that survived the observation period appeared normal by macroscopic examination. The test substance was classified as highly toxic by skin absorption in male and female rabbits.

### Conclusions

Remarks:

The acute dermal LD<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of this test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

### References

Birch, M. D. 1972. Initial submission: 4-Methylpyridine – Neat – Lot: QET 195729 (Final Report) with Cover Letter Dated 112691. EPA Document number 88-920000385. Monsanto Company, St. Louis, MO, U. S.

### Other

Last changed:

December 17, 2003

Order number for sorting:

269

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 4-Picoline (CAS RN 108-89-4)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: One-day cuff method described by Draize  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1954  
Species/Strain: Rabbit/New Zealand White  
Sex: Male  
No. of animals per sex per dose: 4  
Vehicle: Not stated  
Route of administration: Dermal  
Remarks: A group of four male rabbits, weighing 2.5 to 3.5 kg, was exposed to the test substance dermally. The fur was removed from the entire trunk by clipping and the dose site was covered by an impervious plastic film. After a 24-hour exposure period, the film was removed and rabbits were observed for signs of toxicity for 14 days.

#### Results

Value: LD<sub>50</sub> = 0.27 ml/kg  
(± 1.96 standard deviation = 0.19 to 0.38 ml/kg)  
Number of deaths: Not stated  
Remarks: LD<sub>50</sub> calculated by the method of Thompson.

#### Conclusions

Remarks: The acute dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Smyth, H. F., C. P. Carpenter, C. S. Weil and U. C. Pozzani. 1954. Range-Finding Toxicity Data: List V. Amer. Ind. Hyg. Occup. Med. 10:61 - 68.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

270

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: DOT guidelines specified in 52 FR 42961, 49 CFR 173.132, acute dermal toxicity  
Type: LD<sub>50</sub>  
GLP: Not stated  
Year: 1991  
Species/Strain: Rabbit  
Sex: Male and female  
No. of animals per sex per dose: 5  
Vehicle: None  
Route of administration: Dermal  
Remarks: Ten albino rabbits (five males and five females) were administered the test substance dermally at concentrations of 200 and 1000 mg/kg. The skin of each rabbit was clipped free of hair prior to application of the test substance. The test substance was applied directly to the intact skin under gauze patches moistened with USP sterile water and these patches were secured with an impervious bandage. Rabbits were exposed to the test substance for 24 hours. At the end of the exposure period, the test sites were rinsed with water and the rabbits were observed for signs of erythema and edema. They also were observed for signs of toxicity for 14 days post exposure. A gross necropsy was performed on all rabbits at the end of the observation period.

#### Results

Value: LD<sub>50</sub> > 200 mg/kg and < 1000 mg/kg  
Number of deaths: 200 mg/kg = 0/10  
1000 mg/kg = 10/10  
Remarks: All rabbits in the 200 mg/kg dose group showed signs of erythema at the test sites (Grades 3, 4 or necrotic). Eight of the rabbits showed signs of edema (Grade 1 or 2). Discoloration of the skin at the test site was noted in all rabbits. No other clinical signs of toxicity were noted for any of the rabbits and all rabbits gained weight during the course of the study. There were no visible lesions

noted in any of the rabbits upon gross observation at necropsy. All rabbits in the 1000 mg/kg dose group died prior to the completion of the 24-hour exposure period; therefore, the test sites were not scored for erythema and edema. Discoloration of the skin at the site of application was noted for all rabbits. No other clinical signs of toxicity were noted. There were no visible lesions noted in any rabbits upon gross observation at necropsy.

### Conclusions

Remarks:

The acute dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

1C

Remarks:

Reliable without restriction; test procedure according to national standards.

### References

Reilly Industries. 1993. Letter from Reilly Industries Submitting Studies Concerning 3-Methylpyridine. EPA Doc. #86-930000171. Reilly Industries, Indianapolis, IN, U. S.

### Other

Last changed:

December 17, 2003

Order number for sorting:

323

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Minimal lethal dose  
GLP: No  
Year: 1972  
Species/Strain: Rabbit/New Zealand White  
Sex: Male and female  
No. of animals per sex per dose: 1 animal per group  
Vehicle: None  
Route of administration: Dermal  
Remarks: One rat (male or female) per group was administered a single dose of the undiluted test substance dermally at concentrations of 79.4 (male), 126.0 (female), 200.0 (male), 316.0 (female), 501.0 (male), 1000.0 (female) and 2000.0 mg/kg (male). Males and females were in the weight ranges of 2.2 – 2.8 kg. The test substance was administered undiluted. The skin was closely clipped and the test substance was applied. The treated areas were covered with plastic strips for a period of 24 hours. Rabbits were observed for 14 days post dose for toxic signs and the viscera of all rabbits were examined macroscopically.

#### Results

Value: Minimal lethal dose > 126 mg/kg and < 200 mg/kg  
Number of deaths: 79.4 mg/kg = 0/1  
126.0 mg/kg = 0/1  
200.0 mg/kg = 1/1  
316.0 mg/kg = 0/1  
501.0 mg/kg = 1/1  
1000.0 mg/kg = 1/1  
2000.0 mg/kg = 1/1  
Remarks: Rabbits that died prior to scheduled sacrifice in the 200, 501, 1000 and 2000 mg/kg dose groups died within six, three, four and one day(s), respectively. Toxic signs included reduced appetite and activity (for one to three days in survivors), increasing weakness and collapse. Autopsy findings in those

rabbits that died prior to scheduled sacrifice included hemorrhagic lungs, slight liver discoloration and gastrointestinal inflammation. The viscera of rabbits that survived the 14-day observation period appeared normal by macroscopic examination. The test substance was classified as highly toxic by skin absorption in male and female rabbits.

### Conclusions

Remarks:

The acute dermal LD<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of the test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2D

Reliable with restrictions; data are reliable but article lacks details.

### References

Birch, M. D. 1972. Toxicological Investigation of: 0.4 Mole Fraction 3-Methylpyridine – lot: QET 195729 (Final Report) with Cover Letter Dated 112691. EPA Document number 88-920000371. Monsanto Company, St. Louis, MO, U. S.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

332

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: Not stated  
Year: 1983  
Species/Strain: Rabbit/New Zealand White  
Sex: Not stated  
No. of animals per sex per dose: 2 animals per group  
Vehicle: None  
Route of administration: Dermal  
Remarks: Groups of two rabbits were administered the test substance dermally at concentrations of 200, 800 and 2000 mg/kg. The test substance was administered as received (undiluted). Rabbits were observed for signs of toxicity and mortality for two weeks post dose. Body weights were recorded.

#### Results

Value: LD<sub>50</sub> = between 800 and 2000 mg/kg  
Number of deaths: 200 mg/kg = 0/2  
800 mg/kg = 0/2  
2000 mg/kg = 2/2  
Remarks: Moderate redness, slight to moderate swelling and moderate necrosis were observed on the application sites of surviving rabbits 24 hours post exposure. The majority of surviving rabbits gained weight during the two-week observation period. The following signs of toxicity were noted at each dose level:  
200 mg/kg = lethargy  
800 mg/kg = lethargy, apparent loss of appetite and semi-consciousness  
2000 mg/kg = semi-consciousness, watery eyes and rapid shallow breathing

**Conclusions**

Remarks:

The acute dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; data are reliable but article lacks details.

**References**

Carreon, R. E. 1983. 3-Methylpyridine: Acute Toxicological Properties and Industrial Handling Hazards. EPA Document number 878214754. Dow Chemical Company, Midland, MI, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

334

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 2-Picoline (CAS RN 109-06-8)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Cuff technique  
Type: Range-finding  
GLP: No  
Year: 1964  
Species/Strain: Rabbit  
Sex: Not stated  
No. of animals per sex per dose: 2 rabbits per dose  
Vehicle: None  
Route of administration: Dermal  
Remarks: Groups of two rabbits were administered the undiluted test substance dermally at concentrations of 0.252 and 0.5 g/kg. The test site was covered using a cuff for 24 hours. Rabbits were observed for signs of toxicity.

#### Results

Value:  $LD_{50} > 0.252 \text{ g/kg}$  and  $< 0.5 \text{ g/kg}$   
Number of deaths:  $0.252 \text{ g/kg} = 0/2$   
 $0.5 \text{ g/kg} = 2/2$   
Remarks: Rabbits administered 0.252 g/kg of the test substance showed signs of moderate necrosis with slight edema upon removal of the cuff. Animals recovered normally. One animal in the 0.5 g/kg dose group died overnight. The other rabbit had severe necrosis and slight edema upon removal of the cuff and appeared to have lost control over his hindquarters to a certain extent. This rabbit died nine days later.

#### Conclusions

Remarks: The acute dermal  $LD_{50}$  has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D

Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Taylor, M. L. and K. J. Olson. 1964. Results of Range Finding Toxicological Tests on 2-Picoline. EPA Doc. No. 878214756. Dow Chemical Co., Midland, MI, U. S.

**Other**

Last changed: December 17, 2003

Order number for sorting: 400

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Minimal lethal dose  
GLP: No  
Year: 1972  
Species/Strain: Rabbit/New Zealand White  
Sex: Male and female  
No. of animals per sex per dose: 1 animal per group  
Vehicle: None  
Route of administration: Dermal  
Remarks: One rat (male or female) per group was administered a single dose of the undiluted test substance dermally at concentrations of 79.4 (female), 200.0 (male), 316.0 (female), 501.0 (male), 1000.0 (female) and 2000.0 mg/kg (male). Males and females were in the weight range of 2.5 to 2.8 kg. The skin was closely clipped and the test substance was applied undiluted. The treated areas were covered with plastic strips for a period of 24 hours. Rabbits were observed for toxic signs for 14 days after dosing and the viscera of the rabbits were examined macroscopically.

#### Results

Value: Minimal lethal dose > 200 mg/kg and < 316 mg/kg  
Number of deaths: 79.4 mg/kg = 0/1  
200.0 mg/kg = 0/1  
316.0 mg/kg = 1/1  
501.0 mg/kg = 1/1  
1000.0 mg/kg = 1/1  
2000.0 mg/kg = 1/1  
Remarks: Rabbits in the 316 and 501 mg/kg dose groups died within one day post dose. Rabbits in the 1000 and 2000 mg/kg dose groups died within 16 hours. Toxic signs included reduced appetite and activity (for one to three days in survivors), rapidly increasing weakness and collapse. Autopsy findings in those rabbits that died prior to scheduled sacrifice included hemorrhagic lungs, slight liver

discoloration and gastrointestinal inflammation. The viscera of rabbits that survived the observation period appeared normal by macroscopic examination. The test substance was classified as moderately toxic by skin absorption in male and female rabbits.

### Conclusions

Remarks:

The acute dermal LD<sub>50</sub> was not provided. This study is included to provide additional information on the acute oral toxicity of this test substance. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):  
Remarks:

2D  
Reliable with restrictions; data are reliable but article lacks details.

### References

Birch, M. D. 1972. Toxicological Investigation of: 0.4 Mole Fraction 2-Methylpyridine with Cover Letter Dated 081792. EPA Document number 88-920007591. Monsanto Company, St. Louis, MO, U. S.

### Other

Last changed:  
Order number for sorting:  
Remarks:

December 17, 2003  
401

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity:  $\alpha$ -Picoline (CAS RN 109-06-8; Picoline)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: Range-finding LD<sub>50</sub>  
GLP: No  
Year: 1951  
Species/Strain: Rabbit  
Sex: Not stated  
No. of animals per sex per dose: Not stated  
Vehicle: Not stated  
Route of administration: Dermal  
Remarks: Rabbits were administered the test substance dermally and observed for signs of toxicity for 14 days. LD<sub>50</sub> calculated by the method of Thompson.

#### Results

Value: LD<sub>50</sub> = 0.41 ml/kg  
( $\pm$  1.96 standard deviations = 0.27 – 0.63 ml/kg)  
Number of deaths: Not stated  
Remarks: Not stated

#### Conclusions

Remarks: The acute dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2D  
Remarks: Reliable with restrictions; data are reliable but article lacks details.

**References**

Smyth, H. F., Jr., C. P. Carpenter and C. S. Weil.  
1951. Range-Finding Toxicity Data: List IV.  
Arch. Ind. Hyg. Occup. Med. 4:119 - 122.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

404

Remarks:

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: PAP 220 (CAS RN 68391-11-7; Pyridine, alkyl derivs.)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Methods described in the Federal Hazardous Substances Act, September 27, 1973 Federal Register  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1977  
Species/Strain: Rabbit/New Zealand White  
Sex: Male and female  
No. of animals per sex per dose: 2  
Vehicle: None  
Route of administration: Dermal  
Remarks: Groups of rabbits (two males and two females), weighing 2.40 to 2.85 kg, were administered the test substance dermally at concentrations of 0.5, 1.0 and 2.0 ml/kg. The high dose was chosen because of the spreading nature of the compound it was not possible to keep more the 2.0 ml/kg within the limits of the dosing site. The skin of two rabbits per group was abraded while the skin of the remaining two rabbits was left intact. The test substance was applied to the test site under an occlusive wrap of dental dam and remained in contact with the skin for 24 hours. Following exposure, test sites were wiped with a damp cloth. All rabbits were observed for dermal irritation, gross signs of systemic toxicity and mortality once daily for 14 days following dosing. Rabbits were weighed initially and at the end of the 14-day post dosing observation period. A gross necropsy was performed on all rabbits at the end of the observation period.

#### Results

Value: LD<sub>50</sub> > 2.0 ml/kg  
Number of deaths: 0.5 ml/kg = 0/4  
1.0 ml/kg = 0/4  
2.0 ml/kg = 1/4

**Remarks:** One female rabbit in the 2.0 ml/kg dose group died on day 12 of the observation period. No other mortalities or signs of toxicity were observed in any other rabbits. Slight to moderate edema and very slight to severe erythema was observed in all rabbits in all three dose groups, beginning on day 1. Very slight to moderate coriaceous skin also was noted in rabbits and the skin appeared to be dehydrated and detached from the underlying layers. The degree of skin response did not seem to vary according to the dose level. All rabbits had very similar responses that seemed to climax around days 6 through 11. Gross signs observed at the time of necropsy in the rabbit that died included thick yellow discharge from the nose, reddish discoloration of the lungs and enlarged and empty gastrointestinal tract with dilated blood vessels on the serosal surface of the stomach. There were no visible lesions observed at necropsy in any rabbits that survived the observation period.

**Conclusions**

**Remarks:** The dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

**Reliability (Klimisch):** 2C  
**Remarks:** Reliable with restrictions; comparable to guideline study with acceptable restrictions.

**References**

Hodgdon, R. 1977. Acute Dermal Toxicity Study in Rabbits with PAP 220. Project number WIL-1032-77. Welcome Independent Laboratories, Inc., Cincinnati, OH, U. S.

**Other**

**Last changed:** December 17, 2003  
**Order number for sorting:** 433  
**Remarks:**

### 5.1.3 ACUTE DERMAL TOXICITY

#### Test Substance

Identity: 3-Cyanopyridine  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: Not stated  
Remarks:

#### Method

Method/guideline followed: Not stated  
Type: LD<sub>50</sub>  
GLP: No  
Year: 1978  
Species/Strain: Rabbit  
Sex: Male and female  
No. of animals per sex per dose: 2  
Vehicle: None  
Route of administration: Dermal  
Remarks: Groups of four rabbits (two male and two female), weighing 2.0 to 3.0 kg, were administered the test substance dermally at concentrations of 0.5, 1.0, 2.0 and 4.0 g/kg. The test substance was applied undiluted. The back of each rabbit was clipped free of hair 24 hours prior to dosing. Also, all of the rabbits had their backs abraded prior to dosing. The test site was occluded. After exposure (time of exposure not stated), the dressings were removed and the approximate amount of test substance remaining was noted. The rabbits were observed for signs of toxicity and mortality for 14 days post dose. Body weights were taken prior to dosing and at study termination in surviving rabbits. A gross necropsy was conducted on all rabbits that died during the 14-day observation period and on all surviving rabbits.

#### Results

Value: LD<sub>50</sub> > 2 g/kg and < 4 g/kg  
Number of deaths: 0.5 g/kg = 0/4  
1.0 g/kg = 0/4  
2.0 g/kg = 1/4  
4.0 g/kg = 4/4  
Remarks: No signs of toxicity were observed at the 0.5 g/kg dose level. At 1.0 g/kg, the rabbits were depressed after 24 hours but appeared normal by 48 hours. Rabbits in the 2.0 g/kg dose group were severely

depressed, ataxic, cold and demonstrating involuntary muscle tremors by 24 hours. One male died two days post dose. The surviving rabbits appeared normal seven days post dose, although their weight gain at the conclusion of the study was below average. At 4.0 g/kg, the rabbits were severely depressed after eight to 12 hours and comatose within 18 hours. Deaths occurred between 18 and 36 hours. Weight gain was observed in surviving rabbits in all dose groups. Gross pathologic examination revealed nothing remarkable.

**Conclusions**

Remarks:

The acute dermal LD<sub>50</sub> has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2C

Remarks:

Reliable with restrictions; comparable to guideline study with acceptable restrictions.

**References**

Karnatz, R. A., R. A. Kattau and P. Mackell. 1973. Biodegradation, Hydrolysis, Toxicity and BOD of 2-, 3- and 4-pyridinecarbonitrile with Cover Letter Dated 072987. EPA Document number 86-870001339. Reilly Tar and Chemical Corporation, Indianapolis, IN, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

187

Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Inhalation  
GLP: No  
Year: 1973  
Species: Rat and rabbit  
Strain: Not stated  
Route of administration: Inhalation  
Duration of test: 5 months  
Doses/concentration levels:  $0.01 \pm 0.001$  and  $0.002 \pm 0.0003$  mg/l  
Sex: Male  
Exposure period: 4 months  
Frequency of treatment: 4 hours/day; 5 times/week  
Control group and treatment: Yes, treatment not described  
Post exposure observation period: 1 month  
Statistical methods: Not stated  
Remarks: Two groups of 20 rats and 6 rabbits were administered the test substance via inhalation in 700-liter chambers at concentrations of  $0.01 \pm 0.001$  or  $0.002 \pm 0.0003$  mg/l, 4 hours per day, 5 times per week for 4 months. A control group consisting of 20 rats and 6 rabbits was exposed to air. The exposure levels and regimen were selected to mimic workplace exposure conditions. Test substance concentration in the chambers was recorded eight times in the course of each 4-hour exposure (at 30, 60, 90, 120, 150, 180, 210 and 240 minutes). After the 4-month exposure period, there was a recovery period of one month. The effects of prolonged inhalation exposure to the test substance were evaluated using a set of sensitive and adequate indicators reflecting growth; the conditions of nervous, cardiovascular and respiratory systems; and the condition of the liver, kidneys, gonads and peripheral blood. Body weights were measured and morphological changes of internal organs were examined. The function of the nervous system was assessed using the total threshold indicator, while the condition of

the cardiovascular system was evaluated with the help of endurance and permeability of the walls of skin capillaries. Blood parameters evaluated were: hemoglobin, red blood cells, reticulocytes, leukocyte counts. Liver function was evaluated by determining the capacity for hippuric acid synthesis, and its protein, albumin, and globulin content. Kidney function was evaluated. Testicular damage was assessed by weighing, spermatogenesis index, total spermatogonia count, relative number of tubules with cast-off germinal epithelium, and number of tubules with Phase 12 meiosis.

## Results

NOAEL (NOEL)	0.002 mg/l
LOAEL (LOEL)	0.01 mg/l
Actual dose received:	0.01 mg/l and 0.002 mg/l
Toxic response/effects:	Described below
Statistical results:	Not stated
Remarks:	Body weights of the animals in the 0.01 mg/l exposure group were reduced beginning at 14 days of exposure and remained reduced throughout the recovery period. This reduction in body weight compared to the control group was treatment-related. Skin capillary endurance in the animals exposed to 0.01 mg/l was lower than the controls at the start and end of exposures and also at the end of the recovery period. Observation of skin capillary permeability revealed that at the start of the exposure for the two exposure groups, permeability went down; however, prolonged exposure resulted in higher permeability that persisted throughout the recovery period. The biological significance of this experimental variability, if any, is unknown. At the end of the exposure period animals in the 0.01 mg/l group had a reduced amount of hippuric acid in the urine compared to controls. Impaired kidney function in the 0.01 mg/l group was observed at the end of the exposure period based on the lower daily diuresis than controls. Relative lung weights of animals exposed to 0.01 mg/l at the 4 month necropsy were increased compared to the control group. Histopathologic evaluations of animals exposed to 0.01 mg/l at 4 months of exposure: scars in the

myocardium, including random necrotic areas; random thickening of alveolar walls of the lungs; protein dystrophy in the liver; hyaline droplet degeneration in the kidneys; dead germinal epithelium and appearance of gigantic cells in the testicles; and fewer lymphoid elements in the stroma of the spleen. The histopathologic findings seen in the lungs and liver of the animals exposed to 0.01 mg/l at the 4-month necropsy were not observed at the recovery necropsy. All other findings noted above were not reversible. The morphological changes of the internal organs of the animals exposed to 0.002 mg/l of the test substance were much less prominent than those of the higher exposure group and were fully reversible.

Reproductive organs were examined and spermatogenesis evaluated meeting SIDS/HPV requirements for reproductive screening.

### Conclusions

Remarks:

The results showed that prolonged exposure to piperidine at concentrations of 0.01 mg/l caused stable changes in the body weight, the condition of the nervous and cardiovascular systems, kidney function and morphological spermatogenesis indicators. (Author of article)

This endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; translated article used to prepare robust summary.

### References

Bazarova, L.A. 1973. Evaluation of the Piperidine Toxic General and Specific Effect in Prolonged Exposure. The USSR Academy of Medical Science. Toxicology of New Industrial Chemical Substances, 13:100-107.

### Other

Last changed:

December 17, 2003

Order number for sorting:

32

Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Chronic oral  
GLP: Not stated  
Year: 1976  
Species: Rat  
Strain: Sprague-Dawley  
Route of administration: Oral (drinking water)  
Duration of test: 50 weeks  
Doses/concentration levels: 0.09%, with and without 0.2% sodium nitrite  
Sex: Male and female  
Exposure period: 50 weeks  
Frequency of treatment: 5 times weekly  
Control group and treatment: Yes; 0.2% sodium nitrite solution in drinking water for 2 years  
Post exposure observation period: Until death or moribund condition - 130 weeks  
Statistical methods: Not stated  
Remarks: The possible formation of N-nitroso compounds *in vivo* from ingested secondary or tertiary amines and nitrite was tested with piperidine and 12 other amino compounds. Piperidine was administered to rats in the drinking water with or without sodium nitrite. An appropriate amount of the test substance was dissolved in distilled water to provide a concentration of 0.09% piperidine. For the test group with sodium nitrite, sodium nitrite was added to the drinking water at a concentration of 0.2%. Fifteen male and 15 female rats per test group and 26 male and 30 female rats in the control group (approximately 8 to 10 weeks old at study initiation) were provided 60 ml of the appropriate dose solution to drink for five days per week. On the remaining two days of each week, tap water was provided. The treatment period, following the above regimen, lasted for 50 weeks for the treated groups and 2 years for the control group. Animals were maintained on study after the treatment period until spontaneous death or until they became moribund and were killed. A

complete necropsy was performed on all animals and tissues were retained and examined histologically. The rats were housed three per cage throughout the study. The purpose of the study was to evaluate the formation of tumors. The only results provided were tumor incidences.

**Results**

NOAEL (NOEL): 0.09%  
 LOAEL (LOEL): Not applicable  
 Actual dose received: Not calculated  
 Toxic response/effects: Described below  
 Statistical results: Not stated  
 Remarks: All animals in the two test groups survived for 20 weeks following cessation of exposure to the appropriate drinking water solution (i.e. through study week 70). Following is a list of survivors beginning on study week 90.

<b>Test Group</b>	<b>Sex</b>	<b>Week 90</b>	<b>Week 110</b>	<b>Week 130</b>
0.09% Piperidine	Male	10	4	0
	Female	11	7	1
0.09% Piperidine with 0.2% Sodium Nitrite	Male	11	2	0
	Female	10	3	1

Following is the incidence of tumors in the three groups:

Tumor location or type of tumor	Control (0.2% sodium nitrite)		0.09% Piperidine		0.09% Piperidine w/ 0.2% Sodium Nitrite	
	M	F	M	F	M	F
Breast	3	18	1	9	1	8
Pituitary	6	20	0	8	6	9
Adrenal	10	7	3	4	5	3
Uterus	--	9	--	5	--	3
Pancreas	4	1	1	1	0	0
Liver	1	0	0	0	1	1
Thyroid	4	4	1	0	3	0
Duodenum	3	0	0	1	0	0
Zimball gland	1	1	1	1	0	0
Stomach	1	0	0	0	0	0
Brain	1	0	0	0	1	0
Ileum	0	1	0	0	0	0
Thymus	0	1	0	0	0	0
Myeloma	0	1	0	0	0	0
Kidney	0	0	0	1	0	0
Lymphosarcoma	0	0	0	1	1	0
Skin papilloma	0	0	2	0	0	0
Skin sarcinoma	0	0	0	0	1	0
Jejunum	0	0	1	0	0	0
Seminal vesicle	0	--	1	--	0	--
Osteosarcoma	0	0	0	1	0	0
Heart myxoma	0	0	1	0	0	0
Testis mesothelioma	0	--	0	--	1	--
Sarcoma	0	0	0	0	1	0
Lung adenoma	0	0	0	0	0	1

M = Male; F = Female

Reproductive organs were examined, meeting the requirements for SIDS/HPV reproductive screening.

**Conclusions**  
 Remarks:

Incidence of tumors for rats chronically exposed to 0.09% piperidine or 0.09% piperidine with 0.2% sodium nitrite was not significantly increased as compared to control rats receiving

0.2% sodium nitrite in drinking water. The NOAEL was determined to be 0.09% piperidine in drinking water for tumorigenesis. The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; tumor formation was the only endpoint evaluated and only one dose level was evaluated.

**References**

Lijinsky, W. and H.W. Taylor. 1977. Nitrosamines and Their Precursors in Food. in Origins of Human Cancer; Book C, Human Risk Assessment. Cold Spring Harbor Conferences on Cell Proliferation. Volume 4.

Lijinsky, W. and H.W. Taylor. 1977. Feeding Tests in Rats on Mixtures of Nitrite with Secondary and Tertiary Amines of Environmental Importance. *Fd. Cosmet. Toxicol.* 15:269-274.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

45, 45b

Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: 99.9%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Oral  
GLP: Not stated  
Year: 1986  
Species: Rat  
Strain: Sprague-Dawley  
Route of administration: Oral (gavage)  
Duration of test: 13 weeks  
Doses/concentration levels: 0.0, 0.25, 1.0, 10.0, 25.0, 50.0 mg/kg/day  
Sex: Male and female  
Exposure period: 89 days  
Frequency of treatment: 7 days/week  
Control group and treatment: Yes; concurrent vehicle-treated  
Post exposure observation period: None  
Statistical methods: The Number Cruncher Statistical System (NCSS, published by Dr. Jerry L. Hintze, Kaysville, Utah) was used in evaluating hematology, clinical chemistry, food consumption and brain measurements. Body weight and organ weight data were analyzed with the Labcat System from innovative Programming Associates, Princeton, New Jersey). In all cases a one-way analysis of variance was performed followed by a Dunnett's or Duncan's Test when appropriate.  
Remarks: Six groups of 10 male and female rats were administered the test substance by gavage at concentrations of 0, 0.25, 1.0, 10.0, 25.0 and 50.0 mg/kg/day. The male and female rats were approximately 45 days old and weighed 182-221 g and 124-178 g, respectively, at study initiation. Food was available *ad libitum* except on the nights preceding scheduled blood collection or necropsy. Mortality checks were performed twice daily and cage side clinical observations were made each day. Animals were weighed and food consumption was determined weekly throughout the study. Dosing solutions used were 0.2 mg/ml for the 0.25 and 1.0 mg/kg/day dose groups and 10.0 mg/ml for the

10, 25 and 50 mg/kg/day dose groups. Dosing volumes were calculated weekly using the most recent body weight. Ophthalmic examinations were performed by a veterinarian prior to dosing and during the final week of the study. Blood samples were obtained from the orbital sinus of animals fasted overnight. A group of five male and five female rats not assigned to the study had blood samples drawn prior to study initiation to obtain prestudy baseline values. Blood samples were obtained from five animals per sex per group on study days 28 - 30 and before necropsy. Clinical chemistry and hematology parameters were evaluated. Study animals were sacrificed one to four days after the completion of dosing. At terminal sacrifice, one half of the animals were selected for a routine full gross necropsy (5/sex/group). Body weights and weights of the livers, kidneys, spleen, gonads, brain, heart and adrenal glands were obtained. Complete sets of tissues from these animals were prepared for histopathological examination. The remaining one half of the animals was scheduled for systemic perfusion (5/sex/group). Body weights were obtained and a partial necropsy, including observation of thoracic and abdominal cavity was performed. A complete set of nervous system tissues was prepared for histopathological examination from animals in the control and high dose group. Samples of lung, kidneys and liver and all gross lesions from animals in the intermediate groups were also prepared for histopathological examinations.

## Results

NOAEL (NOEL):	1.0 mg/kg/day
LOAEL (LOEL):	10 mg/kg/day
Actual dose received:	0.0, 0.25, 1.0, 10.0, 25.0, 50.0 mg/kg/day
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	No dose-related deaths or clinical observations were noted throughout the study. One control animal died on day 28, probably due to blood draw procedure. The male rats in 50 mg/kg/day group had statistically significant decreases in absolute body weights (days 57, 64, 71, 78 and 85), body

weight gains (days 36, 50, 57 and 71) and total weight gain. Although not statistically significant, the total weight gains of the male rats in the 10.0 and 25.0 mg/kg/day groups were considerably lower than that of the male vehicle control group. The male rats in the 50.0 mg/kg/day group also showed increased food consumption per day per 100 grams of body weight during Weeks 5, 6, 10, 11 and 12 of dosing when compared to the control group. Mild elevation in mean cholesterol levels in the female rats from the 25 and 50 mg/kg/day dose groups, evident at both the 30 day sampling and at termination appear to be compound and dose-related. BUN and uric acid levels of the 50 mg/kg/day male rats were elevated at 30 days; however, this finding was not observed in the terminal blood sample analysis. The absolute liver weights of the female rats in the 10 and 50 mg/kg/day dose group were statistically significantly increased compared to controls. Although not statistically significant, the absolute liver weight of the female rats in the 25 mg/kg/day dose group was also increased. In addition, the relative liver weights for the females in the 10, 25 and 50 mg/kg/day dose groups were statistically significantly different from the control group. There were no treatment related effects on the hematological parameters evaluated, macroscopic or microscopic examination of the tissues from necropsy. The ophthalmologic examination indicated no abnormal findings. There were no statistically significant differences among the treated and control groups in the brain length or width, or the brain weight as a percent of body weight. There were no significant lesions seen histopathologically in the following organs: adrenal gland, thyroid and parathyroid gland, gonads, uterus, urinary bladder, ureter, heart, thymus, skeletal muscle, aorta, trachea, salivary gland, lacrimal gland, mammary gland, eye, brain, Gasserian ganglia, peripheral nerves, spleen, esophagus, stomach, jejunum, pancreas, duodenum, ileum, cecum, colon, rectum, lymph node, bone, bone marrow, lumbar and cervical spinal cord, dorsal root ganglia and dorsal and ventral root fibers. There were no neuropathological lesions

observed. Inflammatory hepatic lesions were present in 70% of the males in the 50 mg/kg/day dose group and 10% of the males in the 0.25, 1.0 mg/kg/day and vehicle control groups. There was no evidence of these lesions in the males from the 10 and 25 mg/kg/day groups. The inflammatory hepatic lesions were less frequently noted in female rats, with 20% of the 50 mg/kg/day group and 10% of the vehicle control animals affected. These lesions appeared to be related to administration of the test substance in male rats, however, a dose response is lacking. (Author of the Report).

### Conclusions

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2A

Reliable with restrictions; acceptable, well-documented study report which meets basic scientific principles.

### References

Anderson, R. C. 1987. 90-Day Subchronic Oral Toxicity in Rats Test Material: Pyridine. Report number 55463-03. Arthur D. Little, Inc., Washington, DC, U. S.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

98

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: 97.5%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Subchronic oral  
GLP: No  
Year: 1979  
Species: Mouse  
Strain: B6C3F1  
Route of administration: Oral (gavage)  
Duration of test: 13 weeks  
Doses/concentration levels: 25, 50, 100, 200 and 400 mg/kg  
Sex: Male and female  
Exposure period: 13 weeks  
Frequency of treatment: 5 times weekly  
Control group and treatment: Yes; deionized water only  
Post exposure observation period: None  
Statistical methods: Not stated  
Remarks: Five groups of 20 mice (ten males and ten females), approximately seven weeks old, were administered the test substance in deionized water via oral gavage at concentrations of 0, 25, 50, 100, 200 and 400 mg/kg/day for 13 weeks. Mice were weighed at the time of the first dose and weekly thereafter. They were observed twice daily for signs of toxicity and mortality. Necropsies were conducted 91 days after the initial administration. At the conclusion of the test, mice were tested for murine virus antibodies. With the exception of one autolyzed male mouse from the 400 mg/kg/day group, all test substance-treated and control mice were examined for gross anatomical changes. Microscopic examination of all the tissues was done on mice in the 400 mg/kg/day and control groups, on the liver of those in the 200 mg/kg/day and 100 mg/kg/day groups and on the tissues with anatomical lesions regardless of the group.

**Results**

NOAEL (NOEL):	Due to reduced body weights in the 25 mg/kg/day group, no NOAEL was established.
LOAEL (LOEL):	25 mg/kg/day
Actual dose received:	0, 25, 50, 100, 200 and 400 mg/kg/day
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	Six males in the 400 mg/kg/day dose group and one male from the 200 mg/kg/day dose group died between weeks 8 and 10 of the treatment period. There was little difference in the weight gain of the females when compared to the control group, with all of the test groups out gaining the controls. Males in all dose levels showed body weight depressions ranging from – 6% at the lowest level to – 40% at the highest level. Males in the 25 mg/kg/day dose group thin, rough coats and diarrhea (weeks 2 – 3). Females had rough coats (weeks 12 – 13). Males in the 50 mg/kg/day group had rough coats (weeks 7, 10, 12 and 13). Males in the 100 and 200 mg/kg/day groups had rough coats (week 7 and weeks 7 – 13, respectively). Females had rough coats (week 13 and weeks 10 – 13, respectively). Males in the 400 mg/kg/day group became lethargic or moribund (week 8) and/or had rough coats (weeks 8 – 13). Females had rough coats and/or appeared thin (weeks 11 – 13, weeks 12 – 13, respectively). The mice did not carry murine virus titers. The only significant findings of necropsy were prominent lobular markings in the livers of two males and four females in the 400 mg/kg/day group. Microscopically, however, the liver of all the 400 mg/kg/day group mice examined (nine males and ten females), as well as that of two 200 mg/kg/day females, had histopathological changes. These hepatic lesions consisted of fatty metamorphosis, hepatocytomegaly and multifocal necrosis and occasionally, parenchymal degeneration, indicated by an increase number of normal mitotic figures. No microscopic hepatic lesions were seen in mice of the 100 mg/kg/day group or in those of the controls.

**Conclusions**

Remarks: The endpoint has been adequately characterized. No NOAEL was determined. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1B  
Remarks: Reliable without restriction; basic data given, comparable to guidelines/standards.

**References**

Pullin, T. G., E. Bernal and R. J. Wheeler. 1979. Analysis of NCI Subchronic Testing & Subchronic Test of Pyridine (C55301) in B6C3F1 Mice & Fischer 344 Rats by Oral Gavage with Cover Letter Dated 111189. EPA Document number 40-8141029. Gulf South Research Institute, New Iberia, LA, U. S.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 101-mice  
Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Oral  
GLP: Yes  
Year: 1989-1990  
Species: Mouse  
Strain: B6C3F<sub>1</sub>  
Route of administration: Oral (drinking water)  
Duration of test: 13 weeks  
Doses/concentration levels: 50, 100, 250, 500 and 1000 ppm  
Sex: Male and female  
Exposure period: 13 weeks  
Frequency of treatment: *ad libitum*  
Control group and treatment: Yes; drinking water  
Post exposure observation period: None  
Statistical methods: Product-limit procedure of Kaplan and Meier (1958); Cox's (1972) method for testing two groups of equality; Tarone's (1975) life table test to identify dose-related trends  
Remarks: Groups of ten male and ten female B6C3F<sub>1</sub> mice, were exposed to the test substance in drinking water at concentrations of 0, 50, 100, 250, 500 or 1000 ppm (equivalent to average daily doses of 10, 20, 50, 85 or 160 mg /kg for males and 10, 20, 60, 100 and 190 mg/kg for females). Mice were approximately seven weeks old at study initiation. Feed and water were available *ad libitum*; fresh control or treated water was provided twice weekly. Animals were observed twice daily and clinical findings were recorded weekly. Water consumption was recorded twice weekly. The animals were weighed initially and weekly thereafter. A necropsy was performed on all animals, in which the heart, right kidney, liver, lung, right testis and thymus were weighed. Complete histopathology was performed on mice from the 0 and 1000 ppm dose groups. The following tissues were examined: adrenal gland, bone (with marrow), brain, clitoral gland, esophagus, gallbladder, heart, large intestine

(cecum, colon, rectum), small intestine (duodenum, jejunum, ileum), kidney, liver, lung, lymph nodes (mandibular and mesenteric), mammary gland (with adjacent skin), nose, ovary, pancreas, parathyroid gland, pituitary gland, preputial gland, prostate gland, salivary gland, spleen, stomach, testis (with epididymis and seminal vesicle), thymus, thyroid gland, trachea, urinary bladder and uterus. Sperm motility and vaginal cytology were examined in animals from the 0, 250, 500 and 1000 ppm dose groups at the end of the study. Determination of the test substance in plasma also was conducted at the end of the study on all animals.

### Results

NOAEL (NOEL):	50 ppm (10 mg/kg/day)
LOAEL (LOEL):	100 ppm (20 mg/kg/day)
Actual dose received:	10, 20, 50, 85 or 160 mg /kg/day for males and 10, 20, 60, 100 and 190 mg/kg/day for females
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	One female mouse exposed to 250 ppm died during week 2. Final mean body weights and body weight gains of female mice exposed to 1000 ppm were significantly less than those of controls. Water consumption by exposed female mice was lower than that by controls at week 1 but generally slightly higher than controls at week 13. There were no treatment-related clinical signs. Sperm motility in exposed male mice was significantly decreased relative to controls. Absolute and relative liver weights were significantly increased relative to controls in males exposed to 100 ppm or greater and in 250 and 500 ppm females. No chemical-related lesions were observed in male or female mice. Reproductive organs were examined and sperm motility and vaginal cytology evaluated meeting SIDS/HPV requirements for reproductive screening.

### Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group). IARC (WHO 2000) determined that evidence for cancer in humans was inadequate and evidence for carcinogenicity in experimental animals was limited. Therefore, pyridine
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was considered *not classifiable as to carcinogenicity to humans* (Group 3).

**Data Quality**

Reliability (Klimisch):

1B

Remarks:

Reliable without restriction; comparable to guideline study.

**References**

National Toxicology Program. 2000. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 00-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

World Health Organization (WHO). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Some Industrial Chemicals. (Volume 77) 15–22 February 2000.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

102 – mouse, 13 wk.

Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Oral  
GLP: Yes  
Year: 1991-1993  
Species: Mouse  
Strain: B6C3F<sub>1</sub>  
Route of administration: Oral (drinking water)  
Duration of test: 2 years  
Doses/concentration levels: 250, 500 and 1000 ppm (males) and 125, 250 and 500 ppm (females)  
Sex: Male and female  
Exposure period: 2 years  
Frequency of treatment: *ad libitum*  
Control group and treatment: Yes; drinking water  
Post exposure observation period: None  
Statistical methods: Product-limit procedure of Kaplan and Meier (1958); Cox's (1972) method for testing two groups of equality; Tarone's (1975) life table test to identify dose-related trends  
Remarks: Groups of 50 male B6C3F<sub>1</sub> mice were exposed to the test substance in drinking water at concentrations of 0, 250, 500 or 1000 ppm (equivalent to average daily doses of 35, 65 or 110 mg/kg) for 104 weeks and groups of 50 female B6C3F<sub>1</sub> mice were exposed to the test substance in drinking water at concentrations of 0, 125, 250 or 500 ppm (equivalent to average daily doses of 15, 35 or 70 mg/kg) for 105 weeks. Mice were approximately seven weeks old at study initiation. Animals were housed individually and feed and water were available *ad libitum*. Animals were observed twice daily and clinical findings were recorded at four-week intervals. Water consumption was recorded weekly for the first 13 weeks and every four weeks thereafter. The animals were weighed initially, weekly for the first 13 weeks, every four weeks until week 96 and then once every two weeks. A necropsy was performed

on all animals, in which organs and tissues were examined for grossly visible lesions and all major tissues were observed microscopically: The following tissues were examined: adrenal gland, bone (with marrow), brain, clitoral gland, esophagus, gallbladder (mice), heart, large intestine (cecum, colon, rectum), small intestine (duodenum, jejunum, ileum), kidney, liver, lung, lymph nodes (mandibular and mesenteric), mammary gland (with adjacent skin), nose, ovary, pancreas, parathyroid gland, pituitary gland, preputial gland, prostate gland, salivary gland, spleen, stomach, testis (with epididymis and seminal vesicle), thymus, thyroid gland, trachea, urinary bladder, uterus and gross lesions and tissue masses.

## Results

NOAEL (NOEL):	No NOAEL was established for male mice based on the incidences of hepatocellular carcinoma and hepatoblastoma.
LOAEL (LOEL):	125 ppm (15 mg/kg/day) for female mice 250 ppm (35 mg/kg/day) for males and females
Actual dose received:	35, 65 or 110 mg/kg/day for male mice and 15, 35 or 70 mg/kg/day for female mice
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	Survival of exposed males and females was similar to that of the controls. Mean body weights of 500 and 1000 ppm females were less than controls from weeks 89 and 73, respectively. Water consumption by males exposed to 250 or 500 ppm was generally greater than that by controls; male mice exposed to 1000 ppm consumed less water than controls throughout the study. Water consumption by exposed females was generally lower than that by controls during the first year of the study, but greater than controls during the second year. There were no treatment-related clinical findings. Hepatocellular neoplasms, including hepatoblastomas, in exposed male and female mice were clearly related to test substance-exposure. Incidences of hepatocellular adenoma were significantly increased relative to controls in 250 ppm males and females and 1000 ppm males. Incidences of hepatocellular carcinoma and hepatoblastoma were significantly increased relative to controls in all exposed groups of males and

females except for the incidence of hepatoblastoma in 125 ppm females. Incidences of hepatocellular adenoma, hepatocellular carcinoma or hepatoblastoma were significantly increased in all exposed male groups and in 250 and 500 ppm females relative to controls. The incidences of hepatocellular neoplasms in exposed males and females generally exceeded the historical control ranges. Incidences of hepatoblastoma in control and exposed males and females exceeded the historical control range. Neoplasms from control mice, 500 ppm females and 1000 males were negative when stained for p53 protein.

### Conclusions

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group). IARC (WHO 2000) determined that evidence for cancer in humans was inadequate and evidence for carcinogenicity in experimental animals was limited. Therefore, pyridine was considered *not classifiable as to carcinogenicity to humans* (Group 3).

### Data Quality

Reliability (Klimisch):

Remarks:

1B

Reliable without restriction; comparable to guideline study.

### References

National Toxicology Program. 2000. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 00-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

World Health Organization (WHO). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Some Industrial Chemicals. (Volume 77) 15–22 February 2000.

### Other

Last changed:

Order number for sorting:

Remarks:

July 6, 2001

102 – mouse, 2 yr.

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: 97.5%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Subchronic oral  
GLP: No  
Year: 1979  
Species: Rat  
Strain: Fischer F344  
Route of administration: Oral (gavage)  
Duration of test: 13 weeks  
Doses/concentration levels: 12.5, 25, 50, 100 and 200 mg/kg  
Sex: Male and female  
Exposure period: 13 weeks  
Frequency of treatment: 5 times weekly  
Control group and treatment: Yes; deionized water only  
Post exposure observation period: None  
Statistical methods: Not stated  
Remarks: Five groups of 20 rats (ten males and ten females), approximately nine weeks old, were administered the test substance in deionized water via oral gavage at concentrations of 0, 12.5, 25, 50, 100 and 200 mg/kg/day for 13 weeks. Rats were weighed at the time of the first dose and weekly thereafter. They were observed twice daily for signs of toxicity and mortality. Necropsies were conducted 91 days after the initial administration. At the conclusion of the test, rats were tested for murine virus antibodies. Histopathologic examination of all the tissues was done on rats in the 200 mg/kg/day and control groups, on the liver of those in the 100 mg/kg/day and 50 mg/kg/day groups and on the tissues with anatomical lesions regardless of the group.

### Results

NOAEL (NOEL): Due to reduced body weights in the 12.5 mg/kg/day group, no NOAEL was established.  
LOAEL (LOEL): 12.5 mg/kg/day  
Actual dose received: 0, 12.5, 25, 50, 100 and 200 mg/kg/day

Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	<p>One male from each of the 100 and 200 mg/kg/day dose groups and two females from the 200 mg/kg/day dose group died between weeks 8 and 13 of the treatment period. All females gained less than their controls, from – 11% for the lowest level (12.5 mg/kg/day) to – 14% for the two highest levels (100 and 200 mg/kg/day). Male body weights were more dramatic with the three highest levels (50, 100 and 200 mg/kg/day), lower than controls (– 13%, – 21% and – 41%, respectively). Males in the 25 mg/kg/day dose group were thin and anemic (week 8). Males in the 50 mg/kg/day group were thin with rough coats (weeks 8 – 10, 12 – 13). Males in the 100 mg/kg/day group were thin (weeks 8 – 10) and/or had rough coats (weeks 8 – 10, 12 – 13). Females had rough coats (week 9 and/or weeks 12 – 13) and/or were thin (week 9). Males in the 200 mg/kg/day group had rough coats and were thin (weeks 6 – 13), were sluggish (weeks 6, 10, 12 and/or 13), were bleeding from the penis (week 3) and/or had dark urine (week 7). Females had bloody urine (week 3), had rough coats (weeks 6 – 13), were sluggish (weeks 6, 10), had dark urine (weeks 3, 7, 10) and/or were thin (weeks 7 – 10). The rats did not carry murine virus titers. Toxicity effects observed by gross pathology included granularity of the visceral surface of the liver with depressed areas of brownish tan or yellowish-brown discoloration. Some of the minor hepatic lobes were reduced in size while the other lobes were swollen. Microscopically the liver damage consisted of multiple foci or diffuse necrosis, hepatocytomegaly, bile duct hyperplasia and fatty metamorphosis. There was a proliferation of connective tissue that sometime formed collagenous bands that irregularly subdivided the parenchyma giving it a nodular appearance. These microscopic alterations were found in the two highest dose levels. The livers of control rats were normal. Focal interstitial myocarditis was observed in the hearts of four males and three females of the highest dose level.</p>

**Conclusions**

Remarks: The endpoint has been adequately characterized. No NOAEL was determined. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1B  
Remarks: Reliable without restriction; basic data given, comparable to guidelines/standards.

**References**

Pullin, T. G., E. Bernal and R. J. Wheeler. 1979. Analysis of NCI Subchronic Testing & Subchronic Test of Pyridine (C55301) in B6C3F1 Mice & Fischer 344 Rats by Oral Gavage with Cover Letter Dated 111189. EPA Document number 40-8141029. Gulf South Research Institute, New Iberia, LA, U. S.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 101 - rat  
Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Oral  
GLP: Yes  
Year: 1990  
Species: Rat  
Strain: F344/N  
Route of administration: Oral (drinking water)  
Duration of test: 13 weeks  
Doses/concentration levels: 50, 100, 250, 500 and 1000 ppm  
Sex: Male and female  
Exposure period: 13 weeks (19 days for special study rats)  
Frequency of treatment: *ad libitum*  
Control group and treatment: Yes; drinking water  
Post exposure observation period: None  
Statistical methods: Product-limit procedure of Kaplan and Meier (1958); Cox's (1972) method for testing two groups of equality; Tarone's (1975) life table test to identify dose-related trends  
Remarks: Groups of ten male and ten female F344/N rats were exposed to the test substance in drinking water at concentrations of 0, 50, 100, 250, 500 or 1000 ppm (equivalent to average daily doses of 5, 10, 25, 55 or 90 mg/kg). Rats were approximately seven to eight weeks old at study initiation. Groups of ten male and ten female F344/N rats exposed to the same concentrations were designated as special study animals for hematology and clinical chemistry analyses, which were conducted on these animals on days 5 and 20. Feed and water were available *ad libitum*; fresh control or treated water was provided twice weekly. Animals were observed twice daily and clinical findings were recorded weekly. Water consumption was recorded twice weekly. The animals were weighed initially and weekly thereafter. A necropsy was performed on all animals, in which the heart, right kidney, liver, lung, right testis and thymus were weighed. Complete histopathology was performed on rats

from the 0 and 1000 ppm dose groups. The following tissues were examined: adrenal gland, bone (with marrow), brain, clitoral gland, esophagus, heart, large intestine (cecum, colon, rectum), small intestine (duodenum, jejunum, ileum), kidney, liver, lung, lymph nodes (mandibular and mesenteric), mammary gland (with adjacent skin), nose, ovary, pancreas, parathyroid gland, pituitary gland, preputial gland, prostate gland, salivary gland, spleen, stomach, testis (with epididymis and seminal vesicle), thymus, thyroid gland, trachea, urinary bladder and uterus. The kidney of male rats and the liver of all rats also were examined in all other exposure groups. Clinical pathology was performed on all core study rats at the end of the study. Sperm motility and vaginal cytology were examined in animals from the 0, 250, 500 and 1000 ppm dose groups at the end of the study. Determination of the test substance in plasma also was conducted at the end of the study on all animals.

## Results

NOAEL (NOEL):	100 ppm (10 mg/kg/day)
LOAEL (LOEL):	250 ppm (25 mg/kg/day)
Actual dose received:	5, 10, 25, 55 and 90 mg/kg/day
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	Two female rats exposed to 1000 ppm died during week 1; all other rats survived until the end of the study. Final mean body weights of 1000 ppm males and 500 and 1000 ppm females and mean body weight gains of males and females exposed to 500 or 1000 ppm were significantly less than those of the controls. Water consumption by female rats exposed to 1000 ppm was less than that by the controls. At study termination, evidence of hepatocellular injury and/or altered hepatic function demonstrated by increases of serum alanine aminotransferase and sorbitol dehydrogenase activity and bile acid concentrations in 500 and 1000 ppm rats. The estrous cycle length of 1000 ppm females was significantly longer than that of the controls. Absolute and relative liver weights of males and females exposed to 250, 500 or 1000 ppm were significantly greater than controls. In the liver, the incidences of centrilobular

degeneration, hypertrophy, chronic inflammation and pigmentation were generally increased in 500 and 1000 ppm males and females relative to controls. Many of the kidney lesions observed in exposed males were components of spontaneous nephropathy common in male rats including protein casts, chronic inflammation and mineralization. The severities of renal tubule regeneration increased in male rats exposed to 500 or 1000 ppm compared to controls. The incidences of granular casts in the kidney and renal tubule hyaline degeneration were increased relative to controls in males exposed to 1000 ppm. Reproduction organs were examined and sperm motility and vaginal cytology evaluated, meeting requirements for SIDS/HPV reproduction screening.

### Conclusions

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group). IARC (WHO 2000) determined that evidence for cancer in humans was inadequate and evidence for carcinogenicity in experimental animals was limited. Therefore, pyridine was considered *not classifiable as to carcinogenicity to humans* (Group 3).

### Data Quality

Reliability (Klimisch):  
Remarks:

1B  
Reliable without restriction; comparable to guideline study.

### References

National Toxicology Program. 2000. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (drinking water studies). NIH publication No. 00-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

World Health Organization (WHO). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Some Industrial Chemicals. (Volume 77) 15–22 February 2000.

### Other

Last changed:  
Order number for sorting:  
Remarks:

December 17, 2003  
102 – rat, F344, 13 wk

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Oral  
GLP: Yes  
Year: 1991-1993  
Species: Rat  
Strain: F344/N  
Route of administration: Oral (drinking water)  
Duration of test: 2 years  
Doses/concentration levels: 100, 200 and 400 ppm  
Sex: Male and female  
Exposure period: 2 years  
Frequency of treatment: *ad libitum*  
Control group and treatment: Yes; drinking water  
Post exposure observation period: None  
Statistical methods: Product-limit procedure of Kaplan and Meier (1958); Cox's (1972) method for testing two groups of equality; Tarone's (1975) life table test to identify dose-related trends  
Remarks: Groups of 50 male and 50 female F344/N rats were exposed to the test substance in drinking water at concentrations of 0, 100, 200 or 400 ppm (equivalent to average daily doses of 7, 14 or 33 mg/kg) for 103 (males) or 104 (females) weeks. Rats were approximately seven weeks old at study initiation. Rats were housed five per cage and feed and water were available *ad libitum*. Animals were observed twice daily and clinical findings were recorded at four-week intervals. Water consumption was recorded weekly for the first 13 weeks and every four weeks thereafter. The animals were weighed initially, weekly for the first 13 weeks, every four weeks until week 92 and then once every two weeks. A necropsy was performed on all animals, in which organs and tissues were examined for grossly visible lesions and all major tissues were observed microscopically. The following tissues were examined: adrenal gland, bone (with marrow), brain, clitoral gland,

esophagus, heart, large intestine (cecum, colon, rectum), small intestine (duodenum, jejunum, ileum), kidney, liver, lung, lymph nodes (mandibular and mesenteric), mammary gland (with adjacent skin), nose, ovary, pancreas, parathyroid gland, pituitary gland, preputial gland, prostate gland, salivary gland, spleen, stomach, testis (with epididymis and seminal vesicle), thymus, thyroid gland, trachea, urinary bladder, uterus and gross lesions and tissue masses.

## Results

NOAEL:	100 ppm (7 mg/kg/day)
LOAEL:	200 ppm (14 mg/kg/day)
Actual dose received:	7, 14 or 33 mg/kg/day
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	Survival of male and female rats was not significantly different from controls. Mean body weights of 400 ppm males and females generally were less than those of controls throughout the study and those of 200 ppm males and females were less than those of controls during the second year of the study. Water consumption by males and females exposed to 200 or 400 ppm generally was greater than that by controls. Incidences of renal tubule adenoma and renal tubule adenoma or carcinoma (combined) in male rats exposed to 400 ppm were significantly increased compared to controls and exceeded the historical control ranges. The findings from an extended evaluation (step section) of the kidneys did not reveal additional carcinomas, but additional adenomas were observed in each group of males. In the standard evaluation, an increased incidence of renal tubule hyperplasia was observed in 400 ppm males compared to controls. The severity of nephropathy in males increased slightly with exposure concentration. Incidences of mononuclear cell leukemia in female rats were significantly increased in the 200 and 400 ppm groups compared to controls and the incidence in the 400 ppm group exceeded the historical control range. Exposure concentration-related nonneoplastic liver lesions were observed in males and females and the incidences were generally increased in groups exposed to 400 ppm.

These included centrilobular cytomegaly, cytoplasmic vacuolization, periportal fibrosis, fibrosis, centrilobular degeneration and necrosis and pigmentation. Bile duct hyperplasia occurred more often in exposed females than in controls. Reproductive organs were examined, meeting the requirements for SIDS/HPV reproductive screening.

### Conclusions

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group). IARC (WHO 2000) determined that evidence for cancer in humans was inadequate and evidence for carcinogenicity in experimental animals was limited. Therefore, pyridine was considered *not classifiable as to carcinogenicity to humans* (Group 3).

### Data Quality

Reliability (Klimisch):  
Remarks:

1B  
Reliable without restriction; comparable to guideline study.

### References

National Toxicology Program. 2000. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 00-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

World Health Organization (WHO). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Some Industrial Chemicals. (Volume 77) 15–22 February 2000.

### Other

Last changed:  
Order number for sorting:  
Remarks:

December 17, 2003  
102 – rat, F344, 2 yr.

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Oral  
GLP: Yes  
Year: 1990  
Species: Rat  
Strain: Wistar  
Route of administration: Oral (drinking water)  
Duration of test: 13 weeks  
Doses/concentration levels: 50, 100, 250, 500 and 1000 ppm  
Sex: Male  
Exposure period: 13 weeks (20 days for special study rats)  
Frequency of treatment: *ad libitum*  
Control group and treatment: Yes; drinking water  
Post exposure observation period: None  
Statistical methods: Product-limit procedure of Kaplan and Meier (1958); Cox's (1972) method for testing two groups of equality; Tarone's (1975) life table test to identify dose-related trends  
Remarks: Male Wistar rats were utilized to evaluate the effects of pyridine in a rat model with a low spontaneous incidence of mononuclear cell leukemia. Groups of ten male Wistar rats were exposed to the test substance in drinking water at concentrations of 0, 50, 100, 250, 500 or 1000 ppm (equivalent to average daily doses of 5, 10, 30, 60 or 100 mg/kg). Rats approximately seven weeks old at study initiation. Groups of ten male Wistar rats exposed to the same concentrations were designated as special study animals for hematology and clinical chemistry analyses, which were conducted on these animals on days 5 and 20. Feed and water were available *ad libitum*; fresh control or treated water was provided twice weekly. Animals were observed twice daily and clinical findings were recorded weekly. Water consumption was recorded twice weekly. The animals were weighed initially and weekly thereafter. A necropsy was performed on all animals, in which the heart, right

kidney, liver, lung, right testis and thymus were weighed. Complete histopathology was performed on rats from the 0 and 1000 ppm dose groups. The following tissues were examined: adrenal gland, bone (with marrow), brain, clitoral gland, esophagus, heart, large intestine (cecum, colon, rectum), small intestine (duodenum, jejunum, ileum), kidney, liver, lung, lymph nodes (mandibular and mesenteric), mammary gland (with adjacent skin), nose, ovary, pancreas, parathyroid gland, pituitary gland, preputial gland, prostate gland, salivary gland, spleen, stomach, testis (with epididymis and seminal vesicle), thymus, thyroid gland, trachea, urinary bladder and uterus. The kidney and the liver of all rats also were examined in all other exposure groups. Clinical pathology, including measurements of hematology and clinical chemistry, was examined on all animals on days 5 and 20. Clinical pathology was performed on all core study rats at the end of the study. Determination of the test substance in plasma also was conducted at the end of the study on all animals.

## Results

NOAEL (NOEL):	100 ppm (10 mg/kg/day)
LOAEL (LOEL):	250 ppm (30 mg/kg/day)
Actual dose received:	5, 10, 30, 60 or 100 mg/kg/day
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	One male rat exposed to 500 ppm died during week 1. Final mean body weights and body weight gains of rats exposed to 250, 500 or 1000 ppm were significantly less than those of the controls. Water consumption by rats exposed to 1000 ppm was lower than that by controls. There was evidence of hepatocellular injury and/or altered function demonstrated by increases of serum alanine aminotransferase and sorbitol dehydrogenase activity and bile acid concentrations in rats from the 500 and 1000 ppm groups. Incidences of centrilobular degeneration, hypertrophy, chronic inflammation and pigmentation in the liver of rats exposed to 500 or 1000 ppm were significantly increased relative to controls. Reproductive organs

were evaluated, meeting the requirements of SIDS/HPV reproductive screening.

### Conclusions

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group). IARC (WHO 2000) determined that evidence for cancer in humans was inadequate and evidence for carcinogenicity in experimental animals was limited. Therefore, pyridine was considered *not classifiable as to carcinogenicity to humans* (Group 3).

### Data Quality

Reliability (Klimisch):

1B

Remarks:

Reliable without restriction; comparable to guideline study.

### References

National Toxicology Program. 2000. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 00-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

World Health Organization (WHO). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Some Industrial Chemicals. (Volume 77) 15–22 February 2000.

### Other

Last changed:

December 17, 2003

Order number for sorting:

102 – rat, Wistar, 13 wk.

Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Oral  
GLP: Yes  
Year: 1991-1993  
Species: Rat  
Strain: Wistar  
Route of administration: Oral (drinking water)  
Duration of test: 2 years  
Doses/concentration levels: 100, 200 and 400 ppm  
Sex: Male  
Exposure period: 2 years  
Frequency of treatment: *ad libitum*  
Control group and treatment: Yes; drinking water  
Post exposure observation period: None  
Statistical methods: Product-limit procedure of Kaplan and Meier (1958); Cox's (1972) method for testing two groups of equality; Tarone's (1975) life table test to identify dose-related trends  
Remarks: Male Wistar rats were utilized to evaluate the effects of pyridine in a rat model with a low spontaneous incidence of mononuclear cell leukemia. Groups of 50 male Wistar rats were exposed to the test substance in drinking water at concentrations of 0, 100, 200 or 400 ppm (equivalent to average daily doses of 8, 17 or 36 mg/kg) for 103 weeks. Rats were approximately seven weeks old at study initiation. Rats were housed three per cage and feed and water were available *ad libitum*. Animals were observed twice daily and clinical findings were recorded at four-week intervals. Water consumption was recorded weekly for the first 13 weeks and every four weeks thereafter. The animals were weighed initially, weekly for the first 13 weeks, every four weeks until week 88 and then once every two weeks. A necropsy was performed on all animals, in which organs and tissues were examined for grossly visible lesions and all major tissues were observed

microscopically: The following tissues were examined: adrenal gland, bone (with marrow), brain, clitoral gland, esophagus, heart, large intestine (cecum, colon, rectum), small intestine (duodenum, jejunum, ileum), kidney, liver, lung, lymph nodes (mandibular and mesenteric), mammary gland (with adjacent skin), nose, ovary, pancreas, parathyroid gland, pituitary gland, preputial gland, prostate gland, salivary gland, spleen, stomach, testis (with epididymis and seminal vesicle), thymus, thyroid gland, trachea, urinary bladder, uterus and gross lesions and tissue masses.

## Results

NOAEL (NOEL):	Due to reduced body weights in the 100 ppm group, no NOAEL was established.
LOAEL (LOEL):	100 ppm (8 mg/kg/day)
Actual dose received:	8, 17 or 36 mg/kg/day
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	Survival of rats exposed to 200 and 400 ppm was significantly less than that of the controls. Mean body weights of rats exposed to 100, 200 and 400 ppm were significantly less than controls beginning in weeks 69, 49 and 6, respectively. Water consumption of exposed rats was similar to that of controls. The incidence of testicular adenoma in rats exposed to 400 ppm was significantly increased compared to controls. Incidences of interstitial cell hyperplasia were observed in control and exposed groups and were slightly, but not significantly, increased in rats exposed to 200 or 400 ppm. Severity of nephropathy was marked in all groups and additional evidence of kidney disease, including mineralization in the glandular stomach, parathyroid gland hyperplasia and fibrous osteodystrophy, was observed in 100 and 200 ppm rats. Relative to the controls, the incidences of hepatic centrilobular degeneration and necrosis, fibrosis, periportal fibrosis and/or pigmentation were increased in exposed groups. Reproductive organs were examined, meeting the requirements for SIDS/HPV reproductive screening.

### Conclusions

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group). IARC (WHO 2000) determined that evidence for cancer in humans was inadequate and evidence for carcinogenicity in experimental animals was limited. Therefore, pyridine was considered *not classifiable as to carcinogenicity to humans* (Group 3).

### Data Quality

Reliability (Klimisch):

1B

Remarks:

Reliable without restriction; comparable to guideline study.

### References

National Toxicology Program. 2000. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 00-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

World Health Organization (WHO). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Some Industrial Chemicals. (Volume 77) 15–22 February 2000.

### Other

Last changed:

December 17, 2003

Order number for sorting:

102 – rat, Wistar, 2 yr.

Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Inhalation  
GLP: Not stated  
Year: 1994  
Species: Rat  
Strain: Fischer 344  
Route of administration: Inhalation (nose-only)  
Duration of test: 4 days  
Doses/concentration levels: 5 and 444 ppm  
Sex: Male  
Exposure period: 4 days  
Frequency of treatment: 6 hours/day  
Control group and treatment: Yes, filtered air  
Post exposure observation period: None  
Statistical methods: Not stated  
Remarks: The purpose of this test was to examine the effect of inhaled pyridine on the morphology of nasal tissue. Two groups consisting of five male rats were administered the test substance via inhalation at concentrations of  $5.1 \pm 0.4$  or  $444.0 \pm 16$  ppm for six hours/day for four days. A control group consisting of ten rats was exposed to filtered air. Rats were 13 to 15 weeks old and weighing 210 to 285 g. Rats were acclimated to the laboratory conditions for three days prior to test substance exposure. Eighteen to 20 hours after the final exposure to air or test substance, the rats were sacrificed and the nasal cavity and skull, including the brain and nasal tissues, were prepared for microscopic examination.

### Results

NOAEL (NOEL) < 5 ppm  
LOAEL (LOEL) 5 ppm  
Actual dose received: 4.7 to 5.5 ppm or 428 to 460 ppm  
Toxic response/effects: Described below  
Statistical results: Not stated  
Remarks: Olfactory epithelial lesions in rats exposed to both concentrations of the test substance included

vacuolar degeneration of sustentacular cells; focal, marked attenuation of the epithelium; loss of neurons; and the presence of intraepithelial luminal structures. The lesions were only slightly more severe in the rats exposed to 444 ppm compared to those rats exposed to 5 ppm of the test substance.

### Conclusions

Remarks:

The results showed that inhalation of the test substance at concentrations of 5 or 444 ppm caused lesions in the olfactory epithelium of rats. (Author of article)

This endpoint has not been adequately characterized; however, additional data was provided on the toxicity of repeated inhalation of this test substance at concentrations of 5 and 444 ppm (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2D

Reliable with restrictions; involved only the histopathology exam of nasal tissue after inhalation exposure, which is not according to guidelines.

### References

Nikula, K. J. and J. L. Lewis. 1994. Olfactory Mucosal Lesions in F344 Rats Following Inhalation Exposure to Pyridine at Threshold Limit Value Concentrations. *Fundam. Appl. Toxicol.* 23:510 - 517.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

99

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: 3-Methylpyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: 98.5%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Subchronic inhalation  
GLP: Not stated  
Year: 1984  
Species: Rat  
Strain: CrI:CD<sup>®</sup>(SD)BR  
Route of administration: Inhalation (vapor)  
Duration of test: 4 weeks  
Doses/concentration levels: 290 ppm  
Sex: Male  
Exposure period: 2 weeks  
Frequency of treatment: 6 hours/day, 5 days/week  
Control group and treatment: Yes; air only  
Post exposure observation period: 13 days  
Statistical methods: Least Significant Difference test and Dunnett's test  
Remarks: Two groups of ten male rats, eight weeks old and weighing between 211 to 240 g, were exposed to the test substance via inhalation. One group was exposed nose-only, six hours/day, five days/week for two weeks at a concentration of 290 ppm. One group was exposed simultaneously to air only. At the end of the exposure period, blood and urine samples were collected for clinical analysis. Five rats per group were sacrificed after the tenth exposure for pathologic examination and five rats per group were allowed to recover for 13 days post exposure. At the end of the post exposure period the clinical and pathologic examinations were conducted on the surviving rats. Rats were weighed and observed daily throughout the exposure and recovery periods, weekends excluded. Urine samples were collected overnight from ten rats per group prior to the first exposure and after the ninth exposure and from five rats per group on the twelfth day of recovery. Samples were analyzed for volume, osmolality, pH, blood, sugar, protein, bilirubin, urobilinogen and ketone. Each specimen was noted for color and transparency and the

sediment from each sample was examined microscopically. Tail blood samples were collected from ten rats per group prior to the first exposure and after the tenth exposure and from five rats per group on the thirteenth day of recovery. Samples were analyzed for erythrocyte count, hemoglobin concentration, mean corpuscular volume, platelet count, leukocyte count and relative numbers of neutrophils, band neutrophils, lymphocytes, atypical lymphocytes, eosinophils, monocytes and basophils. Hematocrit, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration were calculated from the erythrocyte data. In addition, serum activities of alkaline phosphatase, alanine aminotransferase and aspartate aminotransferase and serum concentrations of urea nitrogen, creatinine, total protein and cholesterol were measured. Organs and tissues examined were the heart, lungs, nasal cavities, trachea, liver, pancreas, esophagus, stomach, duodenum, jejunum, ileum, cecum, colon, kidneys, urinary bladder, bone marrow (sternal), spleen, thymus, mesenteric lymph nodes, thyroid, testes, epididymides, adrenal glands, brain and eyes. Mean organ weights and organ-to-body ratios were calculated for the heart, lungs, liver, spleen, kidneys, testes and thymus.

## Results

NOAEL (NOEL):	No NOEL determined
LOAEL (LOEL):	290 ppm
Actual dose received:	Not applicable
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	Mean body weights for rats exposed to 290 ppm of the test substance were indistinguishable from controls throughout the test. No significant clinical signs were observed in rats from either group throughout the test. After ten exposures, rats exposed to 290 ppm of the test substance had elevated mean liver weights and liver-to-body weight ratios compared to controls. This change was absent after 13 days of recovery. No other significant organ weight changes were observed at either sacrifice. No significant hematological or clinical chemical effects were observed in rats exposed to 290 ppm of the test substance. No

treatment-related gross or microscopic effects were observed in rats exposed to 290 ppm of the test substance at either sacrifice.

### Conclusions

Remarks:

Repeated exposure to 290 ppm of 3-methylpyridine caused elevated liver weights after 10 exposures. This change was reversible after 13 days recovery. No other significant body weight, clinical or pathological effects were observed during the test.

(Author of article)

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2A

Reliable with restrictions; acceptable, well-documented study report which meets basic scientific principles.

### References

Chen, H. C. and W. C. Krauss. 1984. Subchronic Inhalation Toxicity of 3-Methyl Pyridine. EPA Document number 878214922. E. I. du Pont de Nemours & Co., Inc., Newark, DE, U. S.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

341

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity:  $\alpha$ -Picoline (CAS RN 109-06-8; 2-Picoline)  
Purity: 99.45%  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Subchronic inhalation  
GLP: No  
Year: 1979  
Species: Rat  
Strain: Sprague-Dawley  
Route of administration: Inhalation (vapor)  
Duration of test: 6 months  
Doses/concentration levels: 5, 35 and 100 ppm  
Sex: Male and female  
Exposure period: 6 months  
Frequency of treatment: 6 hours/day, 5 days/week  
Control group and treatment: Yes; air only  
Post exposure observation period: None  
Statistical methods: Analysis of variance, Dunnett's test, Fisher's exact probability test  
Remarks: Four groups of 20 rats (ten males and ten females), eight weeks old, were exposed to the test substance via inhalation at concentrations of 0, 5, 35 and 100 ppm. Males received 124 exposures in 182 days and females received 125 exposures in 183 days. All rats were observed during the exposure period for signs of toxicity. Particular attention was paid to the development of sensory or motor deficits indicative of neurological changes produced by the test substance exposure. Five rats per sex per group were subjected to a simple battery of tests to evaluate sensory and motor responses prior to exposure and at monthly intervals thereafter. Body weights were recorded twice weekly for the first four weeks of exposure and weekly thereafter. At the termination of the exposure basic hematology (including red blood cell counts, white blood cell counts and white blood cell differential counts, hemoglobin concentration and packed cell volume), urinalysis (including pH, sugar, ketones, bilirubin, occult blood,

urobilinogen, protein and specific gravity) and clinical chemistry (including blood urea nitrogen, serum glutamic pyruvic transaminase, serum alkaline phosphatase and serum glucose levels) studies were conducted. Gross necropsies were conducted on all rats. Rats were fasted from food overnight prior to sacrifice. The lungs and trachea were removed as a unit and expanded. Fasting body weights and organ weights for liver, kidneys, brain, heart and testes were obtained from all rats at necropsy and organ/body weight ratios were calculated. Histopathologic examination of all gross lesions, liver, kidney, lung, brain and spinal cord were conducted on all rats of the control and 100 ppm exposure groups.

## Results

NOAEL (NOEL):	≥ 100 ppm
LOAEL (LOEL):	> 100 ppm
Actual dose received:	5.1 ± 0.5 ppm, 35.4 ± 1.6 ppm and 99.8 ± 6.4 ppm
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	No signs of toxicity were observed at any treatment level at any time. There were no statistically significant differences noted that indicated any deficit in motor function performance due to treatment. There were no statistically significant differences in the body weights of those rats in any treatment group when compared to the control. There were no statistically significant differences between organs of treatment and control groups that were considered to be treatment-related. Histopathologic examination did not reveal any treatment-related effects in ether males or females exposed to 100 ppm of the test substance. There were no statistically significant differences between hematological parameters of treatment and control groups that were considered to be treatment-related. No grossly visible lesions could be attributed to test substance exposure.

**Conclusions**

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

1B

Remarks:

Reliable without restriction; basic data given, comparable to guidelines/standards.

**References**

Watanabe, P. G., H. O. Yakel, R. J. Kociba, D. G. Keyes and R. M. Carreon. 1979. Six Month Inhalation Study of  $\alpha$ -Picoline in Rats. EPA Document number 40-8341086. Dow Chemical Company, Midland, MI, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

407

Remarks:

## 5.4 REPEATED DOSE TOXICITY

### Test Substance

Identity: 3-Cyanopyridine  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: 99.9%  
Remarks:

### Method

Method/guideline followed: Guidelines for 28-day Repeated Dose Toxicity Testing of Chemicals (Japan)  
Test type: Oral  
GLP: Yes  
Year: Not stated  
Species: Rat  
Strain: Crl:CD (Sprague-Dawley)  
Route of administration: Oral (gavage)  
Duration of test: 43 days  
Doses/concentration levels: 0, 5, 30 and 180 mg/kg/day  
Sex: Male and female  
Exposure period: 28 days  
Frequency of treatment: Once daily  
Control group and treatment: Yes; concurrent vehicle-treated  
Post exposure observation period: 14 days  
Statistical methods: The Bartlett method was used to determine the homogeneity of variances. When homogeneous, the Dunnett multiple comparison calibration was employed, and when not homogeneous Steel multiple comparison calibration was employed for comparison with the control group. Mann-Whitney U calibration was employed for evaluation of the histopathological examinations. A level of significance of 5% was employed in all cases.  
Remarks: Six animals per sex per group were assigned in the main study. Six additional animals per sex were assigned to the control and 180 mg/kg/day groups to determine the recovery of the animals 14 days after treatment was terminated. Body weights and food consumption were measured twice weekly during the dosing and recovery periods. Urinalysis was performed during the fourth day week of administration and the second week of recovery. Hematology and blood chemistry parameters were evaluated at the end of the administration period and at the end of the recovery period after fasting

the animals for 18 hours. Animals in the main study were sacrificed on day 29 and recovery animals were sacrificed on day 43. Organ weights were obtained and organ weights relative to body weight were evaluated. The following tissues from the control and high dose groups were examined histologically at the end of the administration period: salivary glands, heart, liver, kidneys, spleen, adrenals, testes, ovaries, bladder and any gross lesions. Further, since changes were observed in the liver, spleen, kidneys, bladder, testes and adrenals, the middle dose group was also examined at the end of the dosing period. In addition, the liver and kidneys from the low dose group were examined. These tissues were also examined in the control and high dose group at the end of the recovery period. No ophthalmological examination was performed.

## Results

NOAEL (NOEL):	5 mg/kg/day
LOAEL (LOEL):	30 mg/kg/day
Actual dose received:	0, 5, 30 and 180 mg/kg/day
Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	Salivation was observed in males and females in the 180 mg/kg/day group just after administration beginning on day 11 of the dosing period. Lacrimation was observed in one female of the 180 mg/kg/day group about 6 hours after administration on day 22 of dosing. Body weight gain of males in the 180 mg/kg/day group was suppressed throughout the dosing period. During the recovery period, the body weight of the males in the 180 mg/kg/day group remained significantly lower than the control group; however, the body weight gain over the recover period was almost the same as that of the control group. A reduction or a tendency toward a reduction in food consumption was observed in males and females of the 180 mg/kg/day dose group during the beginning of the administration period, but a recovery exhibiting roughly the same transition as the control group was exhibited over the remainder of the administration period and throughout the recovery period. Urinalysis showed increase in urine

volume, decreases in osmotic pressure, specific gravity and pH, and pale coloration in males and females of the 180 mg/kg/day group. During the recovery period recovery from these changes had occurred. Hematological examination showed increases in leukocyte counts, the reticulocyte ratio, MCV, MCH and decreased erythrocyte counts in males and females in the 180 mg/kg/day group; increased segmented neutrophil ratio and decreased lymphocyte ratio in males of the 180 mg/kg/day group; and increased prothrombin time in females of the 180 mg/kg/day group. Histologically, hemosiderin deposits in the red pulp of the spleen were seen as a sign of the destruction of erythrocytes and extramedullary hematopoiesis in the spleen was seen as a change corresponding to the decrease in erythrocytes in males and females of the 180 mg/kg/day group. Thus, the reduction in erythrocyte count was thought to be due to advanced destruction of erythrocytes. Further, in a two-week repeated dose toxicity preliminary test, an increase in leukocyte count was seen in both males and females of the 200 mg/kg/day group and above and was thought to be due to administration of the test substance. However, all of these changes were within the range of physiologically fluctuating values and none of the changes were toxicologically significant. Increases in MCV and MCH were seen in males and females of the 180 mg/kg/day group and a reduction in the erythrocyte count was seen in males of the same group at the end of the recovery period; however, the degree was slight as compared to the end of the administration period and a tendency to recover was thought to exist. Blood chemical examination showed increases in total protein, albumin, A/G ratio, GPT, total cholesterol and phospholipids in males and females of the 180 mg/kg/day group, and decreased triglyceride in males and decreased cholinesterase and acetylcholinesterase in females of the 180 mg/kg/day group. These blood chemistry values were not similarly affected during the recovery period. An increase, or a tendency to increase in the absolute and relative (to body weight) liver and kidney weights were observed in

the males and females in the 180 mg/kg/day group, and the absolute and relative adrenal weights were increased in the males of this same group.

Additionally, an increase in the absolute and relative weights of the liver and an increase in the relative weight of the kidneys were observed in females of the 30 mg/kg/day group. At the end of the recovery period, an increase in the relative weight of the kidneys and adrenals was observed in males of the 180 mg/kg/day group.

Histopathologically, centrilobular hypertrophy of hepatocytes was observed in males and females of the 30 mg/kg/day and higher dosage groups. The incidence of hyaline droplets in proximal tubules was increased in males of the 30 mg/kg/day and high dose groups. Furthermore, hypertrophy of zona fasciculate of the adrenal, and extramedullary hematopoiesis and hemosiderin deposits in spleen were observed in males and females of the 180 mg/kg/day group. Necrosis of spermatocytes and spermatids, and vacuolation of Sertoli cells were noted in males of the 180 mg/kg/day group. In addition, cystitis and neutrophil infiltration in renal pelvis were observed in one female of the 180 mg/kg/day group. In animals dissected at the end of the recovery period, centrilobular hepatocytic hypertrophy was seen in the livers of three males and four females in the 180 mg/kg/day group. However, the rate of incidence and the degree of change were slight compared to what was observed at the end of the administration period. Although an increase in the relative weights of the kidneys and adrenals was seen in males of the 180 mg/kg/day group at the end of the recovery period, no histological changes was seen. Further, in the liver, spleen and bladder in which changes were observed at the end of the dosing period, the changes were eliminated or attenuated. Nor was necrosis of spermatocytes and spermatids seen in the testes confirming the capacity for recovery.

**Conclusions**

Remarks:

As noted above, the toxicity of the test substance disappeared or abated 14 days after cessation of administration and was a reversible change (author of the report).

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

1D

Remarks:

Reliable without restriction; guideline study – report written in Japanese, fully translated.

**References**

Ichiki, T., H. Ogata, H. Furukawa, K. Yuki, T. Saito, K. Kamiya, M. Hamamura. Twenty-eight-day Repeat Dose Oral Toxicity Test of 3-Cyanopyridine in Rats. Panapharm Laboratories Co., Ltd., Kumamoto, Japan.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

202e

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1971) for the direct bacterial assay  
Malling (1971) and Frantz and Malling (1975) for  
the microsomal mutagenesis assay  
Legator and Malling (1971) for the host-mediated  
assay  
Type: Direct bacterial assay, microsomal mutagenesis  
assay and host-mediated assay  
System of testing: Bacterial  
GLP: No  
Year: 1977  
Species/strain: *Salmonella typhimurium*/TA1530, TA1531,  
TA1532 and TA1964, for the direct bacterial and  
microsomal mutagenesis assays  
*Salmonella typhimurium* strains, TA1951, TA1952,  
TA1534 and TA1950 for the host-mediated assay  
Metabolic activation: Livers obtained from male mice (C3H/HeJ), 10 to  
14 weeks old  
Concentrations tested: Direct bacterial assay = 0.5 M  
Microsomal mutagenesis assay = 0.15 M  
Host-mediated assay = 300 mg/kg  
Statistical methods: *t*-test  
Remarks: The direct bacterial assay was conducted as  
described by Ames *et al* (1971). In this assay, a  
small sample (1 to 5 mg) of the test substance was  
place in the center of a petri plate. The plates were  
inverted and incubated at 37°C for two days, after  
which time the number of revertant colonies  
appearing was counted. A control group also was  
tested. This test was conducted without metabolic  
activation. The microsomal mutagenesis assay was  
conducted as described by Malling (1971) and  
Frantz and Malling (1975). This assay consisted of  
mouse-liver post-mitochondrial fraction for  
activation of the test substance and the *Salmonella*  
strains for mutagen detection. After the test  
material was incubated with the liver fraction,  
NADPH + H<sup>+</sup> solution, MgCl<sub>2</sub> · 6H<sub>2</sub>O solution and  
a bacterial suspension of 2 x 10<sup>9</sup> bacteria/ml of

saline, the suspension was diluted and incorporated into an overlay media and poured on agar plates of defined composition. After the two-day incubation period the number of revertant/10<sup>6</sup> survivors was determined. The host-mediated assay was conducted as described by Legator and Malling (1971). In this assay, male mice, 10 to 14 weeks old, were injected intraperitoneally with 2 ml of an overnight growth of one of the *Salmonella typhimurium* strains, TA1951, TA1952, TA1534 and TA1950. Each mouse was given a 0.1 ml intramuscular injection of the test substance. Three hours post injection the mice were sacrificed. Each mouse then received a 1 ml intraperitoneal injection of isotonic saline and as much fluid as possible was aseptically removed from the peritoneum. Plating media and concentrations were as described by Legator and Malling (1971). After two days incubation at 37°C, mutant frequency was determined and compounds were considered mutagenic if there was a 10-fold increase in mutant frequency.

## Results

Result:	Results from the direct bacterial, microsomal mutagenesis and host-mediated assays indicated that the test substance was not mutagenic.
Cytotoxic concentration:	0.5 M in the microsomal mutagenesis assay only.
Genotoxic effects:	Negative
Statistical results:	None significantly different from the negative controls.
Remarks:	The microsomal assay was run at only 0.15 M since the test substance was cytotoxic in this assay at 0.5 M (percent survival was only 45% compared to 100% in the controls).

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	2C
Remarks:	Reliable with restrictions; comparable to guideline study with acceptable restrictions.

**References**

Green, N. R. and J. R. Savage. 1978. Screening of Safrole, Eugenol, Their Ninhydrin Positives Metabolites and Selected Secondary Amines for Potential Mutagenicity. Mutation Research 57:115 - 121.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

37

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Rosenkranz *et al* (1980)  
Type: *Escherichia coli polA<sup>+</sup>/polA<sup>-</sup>* assay  
System of testing: Bacterial  
GLP: No  
Year: 1981  
Species/strain: *Escherichia coli* 343/113 *polA<sup>+</sup>* and *Escherichia coli* KMBL1787 *polA<sup>-</sup>*  
Metabolic activation: None  
Concentrations tested: 10 µg and 40 mM  
Statistical methods: Not stated  
Remarks: The diameters of the growth-inhibition zones on both *E. coli* strains, caused by the test substance, were determined, each from three plates. In the liquid assay the survival rates of both *E. coli* strains in the presence of different concentrations of substance were determined. Each test was conducted twice. 9-Aminoacridine was used as a positive reference mutagen.

### Results

Result: The diameter of the growth-inhibition zoned caused by the test substance was diffuse; therefore no clear conclusion could be drawn. Due to the inconclusive result, the test substance was retested at a concentration of 40 mM in the liquid assay. The test substance was estimated as negative in this retest.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative without metabolic activation  
Statistical results: Not stated  
Remarks: The reference substance gave inhibition zones of 14.5 mm in the *polA<sup>+</sup>* strain and 21 mm in the *polA<sup>-</sup>* strain.

### Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Riebe, M., K. Westphal and P. Fortnagel. 1982. Mutagenicity Testing, in Bacterial Test Systems, of Some Constituents of Tobacco. Mutation Research 101:39 - 43.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

39

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: No  
Year: 1980  
Species/strain: *Salmonella typhimurium*/TA98, TA100, TA1535 and TA1537  
Metabolic activation: Liver fraction (S9) from Aroclor 1254-induced Sprague-Dawley, male rats; the amount used in the test was the dose found optimal for metabolic activation of the test substance  
Concentrations tested: 3 µmol/plate  
Statistical methods: Not stated  
Remarks: The test procedures were the same as described by Ames *et al* (1975). The test substance was tested in spot tests both with and without metabolic activation. The test substance was tested at 3 µmol/plate. The test substance was dissolved in ethanol. The following controls were made for each experiment: the viable count was determined; the number of spontaneous revertants was measured; the presence of the rfa-mutation was checked by crystal violet inhibition; the presence of the plasmid pKM 101 in strains TA98 and TA100 was checked by resistance to ampicillin; and the response to the positive controls N-methyl-N'-nitro-N-nitrosoguanidin (not requiring metabolic activation) and 2 aminoanthracene (requiring activation) was checked.

### Results

Result: No mutagenic activity was observed with this test substance under any of the assay conditions used.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative with and without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2C  
Remarks: Reliable with restrictions; comparable to guideline study with acceptable restrictions.

**References**

Florin, I., L. Rutberg, M. Curvall and C. R. Enzell. 1980. Screening of Tobacco Smoke Constituents for Mutagenicity Using the Ames' Test. Toxicology 18:219 - 232.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 43a  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Clive *et al* (1979)  
Type: Mammalian cell forward mutation assay  
System of testing: Nonbacterial  
GLP: Not stated  
Year: 1988  
Cell type: Heterozygous L5178Y<sup>+/−</sup> 3.7.2.C mouse lymphoma cells  
Metabolic activation: S9 homogenate derived from livers of Aroclor 1254-induced male Sprague-Dawley rats  
Concentrations tested: 0, 3.03 x 10<sup>−3</sup>, 4.04 x 10<sup>−3</sup>, 5.05 x 10<sup>−3</sup>, 6.06 x 10<sup>−3</sup> and 7.07 x 10<sup>−3</sup> mol/l without metabolic activation  
0, 3.03 x 10<sup>−3</sup>, 4.04 x 10<sup>−3</sup>, 5.05 x 10<sup>−3</sup>, 6.06 x 10<sup>−3</sup>, 7.07 x 10<sup>−3</sup> and 8.08 x 10<sup>−3</sup> mol/l with metabolic activation  
Statistical methods: Normal distribution as described by Shapiro and Wilkes (1965); analysis of variance; pairwise two-tailed Student's *t*-test; regression analysis using SAS computer programming package (1985).  
Remarks: The assay was performed according to Clive *et al* (1979) with the following modifications in the culture conditions: addition of Hepes and decreased cell density. These modifications improved the plating efficiency of the cells, which was erratic and low in some experiments prior to the introduction of these changes. Treated and control cultures were plated in triplicate. No mention that positive controls were run as an integral part of the test.

### Results

Result: The test substance produced increases in the mutation frequency in the treated cultures relative to the control cultures at total growths of 10% or higher that were dose-related and statistically significant at the 1% level or greater. The test substance produced increases in mutation frequency between three- and four-fold at a concentration of 6.06 x 10<sup>−3</sup> mol/l without metabolic activation. The total growth at this concentration was 24%.

Cytotoxic concentration:	7.07 x 10 <sup>-3</sup> mol/l without metabolic activation
Genotoxic effects:	Positive without metabolic activation only
Statistical results:	Described above
Remarks:	

### Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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### Data Quality

Reliability (Klimisch):	2A
Remarks:	Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

### References

Wangenheim, J. and G. Bolcsfoldi. 1988. Mouse Lymphoma L5178Y Thymidine Kinase Locus Assay of 50 Compounds. *Mutagenesis* 3(3):193 - 205.

### Other

Last changed:	December 17, 2003
Order number for sorting:	34
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: DNA alkaline unwinding assay  
System of testing: Nonbacterial  
GLP: Not stated  
Year: 1988  
Cell type: Mouse lymphoma L5178Y/TK<sup>+/+</sup> (-3.7.2 C) cells  
Metabolic activation: Liver homogenate (S9) from male Sprague-Dawley rats pretreated with Aroclor 1254  
Concentrations tested: 0, 2.00 x 10<sup>-3</sup>, 4.01 x 10<sup>-3</sup> and 6.01 x 10<sup>-3</sup> mole/l (without S9)  
0, 2.00 x 10<sup>-3</sup>, 4.01 x 10<sup>-3</sup>, 6.01 x 10<sup>-3</sup> and 8.02 x 10<sup>-3</sup> mole/l (with S9)  
Statistical methods: One-tailed normal distribution curve  
Remarks: A rapid genotoxicity test based on the measurement of the proportion of single- to double-stranded DNA by alkaline unwinding and hydroxyapatite elution in mouse lymphoma cells treated *in vitro* with the test substance, was evaluated. The aim of this test was to evaluate the utility of the alkaline unwinding assay applied to a mammalian cell line, for predicting the genotoxic potential of chemical agents and to establish criteria for positive and negative results. Culture media and conditions were according to the procedures for the mouse lymphoma mutagenicity assay. Cultures were treated with and without S9 mix. The test substance was dissolved in Fischer's medium without serum, water, ethanol or dimethylsulfoxide and appropriate dilutions made. Strand breaks in DNA were detected by alkaline unwinding and hydroxyapatite elution, according to Ahnström and Erixon (1981) with modifications. Viability of the cell samples was determined. Control cells were evaluated concurrently with and without S9. Concentrations resulting in a 6.5% or greater increase in the fraction of ssDNA were assigned a plus or minus depending on whether the corresponding increase in relative toxicity was smaller or greater, respectively.

The criteria used for classification were the following:

- An increase in the relative fraction of ssDNA of 6.5% at a relative toxicity of less than 5% was considered positive.
- An increase in the relative fraction of ssDNA that is greater than the increase in the relative toxicity at the corresponding concentrations of the test compound at relative toxicities of 5% to 50% was considered positive if this occurred at two or more concentrations. If such an increase was seen at one concentration the result was classified as equivocal.
- The classifications under the first and second criteria were true if the increase in relative fraction of ssDNA was dose-related.
- A result was considered negative if a toxic response was obtained and no increase in the fraction of ssDNA was seen or if the increase was smaller than the corresponding increase in relative toxicity. If toxicity is not evident the result cannot be adequately evaluated.

## Results

Result:

In the DNA alkaline unwinding assay, the test substance gave a negative response without S9 activation and an equivocal response with S9 activation at toxic concentrations with some dose-response. In the mouse lymphoma assay the test substance was found to produce a positive result without S9 activation and a negative result with S9 activation.

Cytotoxic concentration:

$6.01 \times 10^{-3}$  mole/l without S9 activation

$8.02 \times 10^{-3}$  mole/l with S9 activation

Genotoxic effects:

Positive without S9 activation in the mouse lymphoma assay

Negative with S9 activation in the mouse lymphoma assay

Statistical results:

See above

Remarks:

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

**References**

Garberg, P., E-L. Åkerblom and G. Bolcsfoldi. 1988. Evaluation of a Genotoxicity Test Measuring DNA-Strand Breaks in Mouse Lymphoma Cells by Alkaline Unwinding and Hydroxyapatite Elution. Mutation Research 203:155 - 176.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 33  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: OECD Guideline No. 471  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Yes  
Year: 1991-1993  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA98 and TA100  
Metabolic activation: Liver fraction (S9) from Aroclor 1254-induced Sprague-Dawley rats  
Concentrations tested: 50, 160, 500, 1600 and 5000 nl/plate  
Statistical methods: Not stated  
Remarks: The mutagenicity assay included negative and positive controls and five doses of the test substance tested in the presence and absence of S9 mix. Triplicate plates were poured for each dose level. Two independent experiments were performed. The following compounds were used as positive controls without metabolic activation: sodium azide (0.5 and 1.0 µg/plate for TA1535 and TA100, respectively), 2-nitrofluorene (2 µg/plate for TA98) and 9-amino-acridine (50 µg/plate for TA1537). 2-Amino-anthracene (1 µg/plate) was used as a positive control with metabolic activation for all bacterial strains. The solvent (water) was used for the negative control. For the test substance to be scored as positive, one or both of the following criteria must be reproducibly met: 1) the test substance must induce a dose-related increase in the number of revertant colonies; and 2) the test substance must induce a doubling (or greater) in the number of revertants, at least at one dose level.

### Results

Result: Cytotoxicity and mutagenic activity was not observed with this test substance in the presence and absence of S9.  
Cytotoxic concentration: None with and without metabolic activation  
Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The test substance was devoid of mutagenic activity under the conditions of the test. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1A  
Remarks: Reliable without restriction; guideline study.

**References**

Vleminckx, C., M. Ottogali, L. Schriewer, G. Rigaux and T. Lakhansky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. A. *Salmonella*/microsome test. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 103  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: No  
Year: 1978  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA1538, TA98 and TA100  
*Saccharomyces cerevisiae*/D4  
Metabolic activation: S9 fraction derived from livers of Aroclor 1254-induced male adult Sprague-Dawley rats  
Concentrations tested: From 0.1 µl to 50 µl per plate  
Statistical methods: Not stated  
Remarks: Nonactivation tests and activation tests were conducted with at least four dose levels each, from 0.1 µl to 20 µl per plate. A repeat test was conducted with all the strains at 25 and 50 µl/plate because no toxicity was observed in the initial test. Positive and solvent (DMSO) controls using both directly active positive chemicals and those that require metabolic activation were run with each assay. The test substance was tested over a series of concentrations such that there was either quantitative or qualitative evidence of some chemically-induced physiological effects at the high dose level. The low dose in all cases was below a concentration that demonstrated any toxic effects. The numbers of colonies on each plate were counted and recorded. The following criteria were used to evaluate the results.

- Strains TA1535, TA1537 and TA1538: If the solvent control value is within the normal range, a chemical that produced a positive dose response over three concentrations with the lowest increase equal to twice the solvent control value is considered to be mutagenic.
- Strains TA98, TA100 and D4: If the solvent control value is within the normal range, a

chemical that produces a positive dose response over three concentrations with the highest increase equal to twice the solvent control value for TA100 and two to three times the solvent control value for strains TA98 and D4 is considered to be mutagenic. For these strains the dose-response increase should start at approximately the solvent control value.

- Because TA1535 and TA100 are both derived from the same parental strain and because TA1538 and TA98 are both derived from the same parental strain, there is a built-in redundancy in the microbial assay. In general, the two strains of a set respond to the same mutagen and such a pattern is sought. It also is anticipated that if a given strain responds to a mutagen in nonactivation tests, it will generally do so in activation tests (the converse of this relationship is not expected). While similar response patterns are not required for all mutagens, they can be used to enhance the reliability of an evaluation decision.
- If a chemical produces a response in a single test that cannot be reproduced in one or more additional runs, the initial positive test data lose significance.

## Results

Result:

The results of the tests conducted on the test substance in the absence of a metabolic activation system were all negative. The results of the tests conducted on the test substance in the presence of a rat liver activation system were all negative. The test substance was not considered mutagenic under the conditions of this test.

Cytotoxic concentration:

Described below

Genotoxic effects:

Negative with and without metabolic activation

Statistical results:

Not stated

Remarks:

A repeat test was conducted with all the *Salmonella* strains at 25 and 50 µl per plate because no toxicity was observed in the initial test. The test substance was toxic to all the strains except TA100 and TA1535 at 50 µl per plate. Toxicity was observed with TA1535 at 50 µl per plate with metabolic

activation. The test with yeast strain D4 was repeated in the presence of S9 because of the increased number of revertants observed in the initial test. The repeat test was negative and the number of revertants observed with various doses of test substance was similar to the solvent control values.

### Conclusions

Remarks:

The test substance, pyridine, did not demonstrate mutagenic activity in any of the assays conducted in this evaluation and was considered not mutagenic under these test conditions. (Author of report)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2B

Reliable with restrictions; basic data given, comparable to guidelines/standards.

### References

Jagannath, D. R. 1978. Mutagenicity Evaluation of Pyridine in the Ames *Salmonella*/Microsome Plate Test (Final Reports) with Cover Letter Dated 110879. EPA Document number 40-7941026. Litton Bionetics Inc., Kensington, MD, U. S.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

107

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: No  
Year: 1980  
Species/strain: *Salmonella typhimurium*/TA98, TA100, TA1535 and TA1537  
Metabolic activation: S-9 supernatant prepared from livers of Aroclor 1254-induced male Sprague-Dawley rats and Aroclor 1254-induced male CD-1 mice  
Concentrations tested: Initial test: 0.01, 0.04, 0.2, 1.0, 3.0 and 10.0 µl  
Retest: 0.01, 0.04, 0.2, 0.5, 1.0, 1.3, 1.5, 3.0, 3.9 and 10 µl  
Statistical methods: Bartlett's test, T-test, lack of fit test, Grubb's analysis for outliers  
Remarks: An initial toxicity test was performed to determine the toxicity of the test substance to tester strain TA100. A spot test also was conducted with tester strains TA98, TA100, TA1535 and TA1537 at 25µl per spot (using no solvent) with and without rat and mouse microsomal activation. The plate incorporation assay was conducted with and without rat microsomal activation using *Salmonella typhimurium* strains, TA98, TA100, TA1535 and TA1537. The test substance was prepared with water in sterile vials and equal volumes of dilutions (20 µl) were added per plate to give required concentrations. Five positive controls and one negative control (distilled water) also were tested. The plate incorporation assay was conducted at concentrations of 0.01, 0.04, 0.2, 1.0, 3.0 and 10.0 µl using bacterial strains TA98, TA100, TA1535 and TA1537 with and without microsomal activation. Because solvent control values were not acceptable with strains TA98, TA100 and/or TA1535 in the presence or absence of microsomal activation, additional retests were conducted. Samples for retests were prepared in the same

manner and volumes of dilutions were added per plate to give the final concentrations of 0.01, 0.04, 0.2, 0.5, 1.0, 1.3, 1.5, 3.0, 3.9 and 10 µl of sample per plate.

## Results

Result: All initial plate incorporation assay and retest results confirmed the test sample was not mutagenic under the conditions tested.

Cytotoxic concentration: 25 µl/plate without metabolic activation in the spot test

Genotoxic effects: Negative with and without metabolic activation

Statistical results: Described below

Remarks: Results from the toxicity test demonstrated no apparent toxicity of the test sample at a concentration of  $\leq 10.0$  µl of sample per plate either with or without rat microsomal activation using tester strain TA100. Results from the spot tests indicated no mutagenic response of the test strains TA98, TA100, TA1535 and TA1537 to the test substance at a concentration of 25 µl of sample per plate either with or without mammalian microsomal activation. Significant toxicity was demonstrated to all tester strains in the absence of microsomal activation. At retest of the initial assay, a significant difference was demonstrated between the test sample and solvent control response ( $p \leq 0.01$ ) using strains TA100 without microsomal activation and TA98 with microsomal activation; however, dose response was not significant. Further retesting demonstrated no significant difference between test sample and solvent control response and no significant dose response using strains TA100 with and without microsomal activation and TA98 both with microsomal activation.

## Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Gridley, J and W. D. Ross. 1980. *Salmonella* Mutagenicity Assay of Pyridine, CP4653, DA-80-029. EPA Document number 878211746. Monsanto Company, St. Louis, MO, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

112

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Modified preincubation Ames test (Yahagi *et al.* 1977)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1989  
Species/Strain: *Salmonella typhimurium*/TA98, TA100 and TA102  
Metabolic activation: Liver fraction (S-9) from Aroclor 1254-induced rats  
Concentrations tested: 12.0 nmol – 1.2 mmol  
Statistical methods: Not stated  
Remarks: A preassay using TA100 was carried out to determine the highest nonbactericidal dose level. The test substance then was tested in *Salmonella typhimurium* strains TA98, TA100 and TA102 with and without metabolic activation at six dose levels ranging from 12.0 nmol – 1.2 mmol. Water, the solvent, was used as a negative control. The metabolic activity specific mutagenic compounds, 2-nitrofluorene, sodium azide, mitomycin C, 2-aminofluorene, were employed as the positive controls. Four plates were used per dose and solvent control metabolic activation (30% S-9) was used when appropriate. The plated were incubated for three days and the colonies counted. Mutation factors (induced/spontaneous revertants) were calculated at the dose levels that gave the greatest effect.

### Results

Result: Mutagenic activity was not observed with this test substance in the presence and absence of S-9. However, a slight non-significant increase in mutagenic activity (mutation factor = 1.2-1.3) was noted in TA102 with S-9 metabolic activation.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative with and without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

**References**

Aeschbacher, H. U., U. Wolleb, J. Löliger, J. C. Spadone and R. Liardon. 1989. Contribution of Coffee Aroma Constituents to the Mutagenicity of Coffee. *Fd. Chem. Toxic.* 24(4):227 - 232.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 118  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not determined  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1983  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA98 and TA100  
Metabolic activation: S-9 supernatant prepared from livers of Aroclor 1254-induced male Sprague-Dawley rats and Aroclor 1254-induced male Syrian hamsters  
Concentrations tested: Not stated  
Statistical methods: Methods based on Margolin *et al* (1981)  
Remarks: Prior to the mutation assay, the test substance was checked for toxicity to TA100 up to a concentration of 10 mg/plate, or the limit of solubility in the presence and absence of S-9. If toxicity was not apparent, the highest dose tested was 10 mg/plate; otherwise the upper limit of solubility was used. At least five doses of test substance, in addition to the concurrent solvent and positive controls, were tested on each strain in the presence of S-9 mix or buffer. The preincubation procedure was performed. Three plates were used and the experiment was repeated no less than one week after completion of the initial test. Only the strains and activation systems that gave a positive result were repeated. The positive control chemicals included 2-aminoanthracene, which was tested at concentrations of 1.0 or 2.5 µg/plate on all strains in the presence of rat and hamster S-9 and 4-nitro-o-phenylenediamine, which was tested at a concentration of 5.0 µg/plate on TA98 without S-9. Also without S-9, sodium azide was tested at a concentration of 1.0 µg/plate on TA100 and TA1535 and 9-aminoacridine was tested at a concentration of 50.0 µg/plate on TA1537. A positive response was indicated by a reproducible, dose-related increase, whether it was two-fold over

background or not. The preferred solvent was distilled water; dimethylsulfoxide (DMSO) was used if the test substance was insoluble or not sufficiently soluble in water. Ethanol (95%) or acetone was used if the test substance was not soluble or stable in DMSO.

### Results

Result: Pyridine did not induce mutagenicity under the conditions of this test.

Cytotoxic concentration: Not stated

Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated

Remarks: The results of the preliminary toxicity test were not stated.

### Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2A

Remarks: Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

### References

Haworth, S., T. Lawlor, D. Mortelmans, W. Speck and E. Zeiger. 1983. *Salmonella* Mutagenicity Test Results for 250 Chemicals. Environmental Mutagenesis Supplement 1:3 - 142.

### Other

Last changed: December 17, 2003

Order number for sorting: 125

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Rosenkranz *et al* (1980)  
Type: *Escherichia coli polA<sup>+</sup>/polA<sup>-</sup>* assay  
System of testing: Bacterial  
GLP: No  
Year: 1981  
Species/strain: *Escherichia coli* 343/113 *polA<sup>+</sup>* and *Escherichia coli* KMBL1787 *polA<sup>-</sup>*  
Metabolic activation: None  
Concentrations tested: 10 µg  
Statistical methods: Not stated  
Remarks: The diameters of the growth-inhibition zones on both *E. coli* strains, caused by the test substance, were determined, each from three plates. In the liquid assay the survival rates of both *E. coli* strains in the presence of different concentrations of substance were determined. Each test was conducted twice. 9-Aminoacridine was used as a positive reference mutagen.

### Results

Result: The test substance was estimated as negative in this test.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative without metabolic activation  
Statistical results: Not stated  
Remarks: The reference substance gave inhibition zones of 14.5 mm in the *polA<sup>+</sup>* strain and 21 mm in the *polA<sup>-</sup>* strain.

### Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2B

Remarks:

Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Riebe, M., K. Westphal and P. Fortnagel. 1982. Mutagenicity Testing, in Bacterial Test Systems, of Some Constituents of Tobacco. Mutation Research 101:39 - 43.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

137

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: No  
Year: 1980  
Species/strain: *Salmonella typhimurium*/TA98, TA100, TA1535 and TA1537  
Metabolic activation: Liver fraction (S9) from Aroclor 1254-induced Sprague-Dawley, male rats; the amount used in the test was the dose found optimal for metabolic activation of the test substance  
Concentrations tested: 3 µmol/plate  
Statistical methods: Not stated  
Remarks: The test procedures were the same as described by Ames *et al* (1975). The test substance was tested in spot tests both with and without metabolic activation. The test substance was tested at 3 µmol/plate. The test substance was dissolved in ethanol. The following controls were made for each experiment: the viable count was determined; the number of spontaneous revertants was measured; the presence of the rfa-mutation was checked by crystal violet inhibition; the presence of the plasmid pKM 101 in strains TA98 and TA100 was checked by resistance to ampicillin; and the response to the positive controls N-methyl-N'-nitro-N-nitrosoguanidin (not requiring metabolic activation) and 2 aminoanthracene (requiring activation) was checked.

### Results

Result: No mutagenic activity was observed with this test substance under any of the assay conditions used.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative with and without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2C  
Remarks: Reliable with restrictions; comparable to guideline study with acceptable restrictions.

**References**

Florin, I., L. Rutberg, M. Curvall and C. R. Enzell. 1980. Screening of Tobacco Smoke Constituents for Mutagenicity Using the Ames' Test. Toxicology 18:219 - 232.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 140  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1973)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: No  
Year: 1976  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA1538 and TA100  
Metabolic activation: Microsome (S9) preparations from the following seven different sodium phenobarbital-induced tissues from male Wistar rats: Liver, kidney, brain, spleen, lung, stomach and blood; 0.5 ml of the S-9 mixture was added to the mutagenesis plates  
Concentrations tested: 1, 10 and 100 µg  
Statistical methods: Not stated  
Remarks: The main purpose of this test was to determine the reliability with which test results can be used to distinguish between a presumptive carcinogen and a noncarcinogen. The general procedures were those reported originally by Ames *et al* (1973). Three concentrations of the test substance, 1, 10 and 100 µg, were tested, in the absence of any microsome preparation and in the presence of microsomal preparations from the seven tissue preparations. Two plates per dose level were tested. The test substance was dissolved in dimethylsulfoxide (DMSO). Three types of controls were run concurrently with each experimental test: 1) control runs on bacterial strains with standard carcinogens, 2) control runs on tissue homogenate and 3) control runs on bacterial strains and tissue homogenates.

### Results

Result: The test substance was not mutagenic under the conditions of this assay.  
Cytotoxic concentration: None with and without metabolic activation  
Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):  
Remarks:

2A  
Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

**References**

Commoner, B. 1976. Reliability of Bacterial Mutagenesis Techniques to Distinguish Carcinogenic and Noncarcinogenic Chemicals. NTIS PB Report EPA-600/1-76-022. U. S. Environmental Protection Agency, Washington, D. C., U. S.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 142  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Skopek *et al* (1978)  
Type: Mutation assay  
System of testing: Bacterial  
GLP: No  
Year: 1977 - 1978  
Species/strain: *Salmonella typhimurium*/TM677  
Metabolic activation: Postmitochondrial supernatant (PMS) derived from livers of Phenobarbital- and/or Aroclor-pretreated male Sprague-Dawley rats  
  
Concentrations tested: 6 mM  
Statistical methods: Not stated  
Remarks: The mutagenic activity of pyridine was measured in *Salmonella typhimurium*, using resistance to the purine analog 8-azaguanine as a genetic marker. The experiment used one of two frozen batches of the bacterial strain TM677. Exponentially growing cultures of bacteria were exposed to several concentrations of the test agent for two hours in the presence of PMS. Glucose 6-phosphate, NADP<sup>+</sup> and glucose-6-phosphate dehydrogenase were included as cofactors for the drug-metabolizing system. Following the two-hour incubation at 37 °C, bacteria were centrifuged, resuspended in phosphate-buffered saline and KH<sub>2</sub>PO<sub>4</sub> and plated under selective conditions and nonselective conditions. Colonies were counted after growth for two days at 37 °C. The mean background mutant fraction for experiments performed from the first and second frozen batches were  $7.1 \times 10^{-5}$  and  $5.6 \times 10^{-5}$ , respectively. The 99% confidence limit on the mean background fraction (mean + 3 standard deviations) was the criterion of minimum significance.

## Results

Result:	At a concentration of 6 mM with metabolic activation, the test substance was found to cause a significant induced mutation. The mutagenic activity relative to that of the 80 µm benzo( <i>a</i> )pyrene-positive control performed simultaneously with the test substance was < 0.01.
Cytotoxic concentration:	Not stated
Genotoxic effects:	Positive with metabolic activation
Statistical results:	See above
Remarks:	6 mM was the lowest concentration where a positive response was noted.

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	2D
Remarks:	Reliable with restrictions; not a standard Ames test (only one tester strain TM677 utilized).

## References

Kaden, D. A., R. A. Hites and W. G. Thilly. 1979. Mutagenicity of Soot and Associated Polycyclic Aromatic Hydrocarbons to *Salmonella typhimurium*. *Cancer Res.* 39:4152 - 4159.

## Other

Last changed:	December 17, 2003
Order number for sorting:	113
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Mammalian cell forward mutation assay (HGPRT gene mutation)  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells (V79) from male mature Chinese hamster  
Metabolic activation: None  
Concentrations tested: 0, 8.00, 8.25, 8.50, 8.75, 9.00 and 9.25 µl/ml  
Statistical methods: Analysis of variance, when necessary  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (distilled water) and positive [ethylmethanesulfonate (EMS)] controls and at least three doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.25 µl/ml. Determination of the numbers of mutants and plating efficiency was performed.

### Results

Result: Dose-related cytotoxicity was observed, but no increase of the mutation frequency was detected.  
Cytotoxic concentration: 8.75 µl/ml without metabolic activation  
Genotoxic effects: Negative without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The test substance was not mutagenic under the test conditions. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1B  
Remarks: Reliable without restriction; comparable to guideline study.

**References**

Vleminckx, C., G. Rigaux, L. Schriever, M. Ottogali and Th. Lakhansky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. B. HGPRT Gene Mutation Assay in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 104  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Forward mutation assay, His<sup>+</sup> reversion assay and N-oxide syntheses  
System of testing: Bacterial  
GLP: No  
Year: 1982  
Species/strain: *Salmonella typhimurium*/TA1537, TM677  
Metabolic activation: Aroclor 1254-induced and Phenobarbital-induced post mitochondrial supernatant (PMS) prepared from rat liver homogenates; test substance tested at concentrations of 0, 2.5, 5.0, 7.5 and 10% PMS  
Concentrations tested: Highest concentration tested was 25 mM.  
Statistical methods: Not stated  
Remarks: Cultures were tested with and without metabolic activation in both assays. Duplicate treatments, each plated in triplicate, were tested. In the forward mutation assay, each experiment included a negative control (solvent as test compound) and positive control for checking the activation system (benzo[*a*]pyrene and 2-aminochrysene). For the His<sup>+</sup> reversion assay, the procedure outlined by Ames *et al* was modified to allow quantitative interpretation of the results under conditions of reduced survival of treated cells. For the N-oxide syntheses, the procedure, with some modifications, was that of Ochiai (1967). A mean induced mutant fraction from duplicate treatments of  $2.1 \times 10^{-4}$  or greater was considered a positive result.

### Results

Result: The test substance did not induce statistically significant mutation under any conditions tested.  
Cytotoxic concentration: 80% survival at highest concentration tested (25 mM)  
Genotoxic effects: Negative with and without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication/study report which meets basic scientific principles.

**References**

Seixas, G. M., B. M. Andon, P. G. Hollingshead and W. G. Thilly. 1982. The Azaarenes As Mutagens for *Salmonella typhimurium*. Mutation Research 102:201 - 212.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 136  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Cytogenetic assay (chromosome aberrations)  
System of testing: Nonbacterial  
GLP: No  
Year: 1977  
Species/strain: Chinese hamster fibroblast cell line (CHL)  
Metabolic activation: None  
Concentrations tested: Not stated  
Statistical methods: Not stated  
Remarks: Estimation of the 50% growth inhibition dose for the sample was conducted prior to the chromosome test. For the chromosome test, three different doses, including the 50% inhibition dose of the test substance, were prepared and separately added to three-day-old cultures. The solvent used was physiological saline. Chromosome preparations were made and the number of cells with chromosomal aberrations was recorded on 100 well-spread metaphases at the magnification of 700. Types of aberration were classified into five groups: chromatid gaps, chromatid breaks, chromatid or chromosomal translocation, ring formation and fragmentation or pulverization. Breaks less than the width of a sister chromatid were designated as gaps. The incidence of polyploid cells also was calculated. Untreated cells and cells treated only with solvent served as controls. CHL cells commonly have less than 3.0% cells with chromosomal aberrations. Therefore, the final judgment given to all experimental groups was as follows: Negative if less than 4.9% of the aberrations was detected even when doses of the agent were elevated to sub-lethal amounts, where almost no mitosis was observed; suspicious if between 5.0 and 9.9%; and positive if greater than or equal to 10.0%. When no reasonable dose response was obtained, additional experiments with

different doses were carried out to confirm reproducibility.

### Results

Result: At a maximum effective dose of 505.7 mg/ml ( $4 \times 10^{-4}$  M), the test substance did not cause significant increases of chromosomal aberration.

Cytotoxic concentration: Not stated

Genotoxic effects: Negative without metabolic activation

Statistical results: Not stated

Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2A

Remarks: Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

### References

Ishidate, M., Jr. and S. Odashima. 1977. Chromosome Tests with 134 Compounds on Chinese Hamster Cells *In Vitro* – A Screening for Chemical Carcinogens. *Mutation Research* 48:337 - 354.

### Other

Last changed: December 17, 2003

Order number for sorting: 126

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: > 99%  
Remarks:

### Method

Method/guideline followed: Galloway *et al* (1987)  
Type: Cytogenetic assay (chromosomal aberrations)  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1997  
Cell type: Chinese hamster ovary cell  
Metabolic activation: S9 (from Aroclor 1254-induced male Sprague-Dawley rat liver)  
Concentrations tested: 503, 1081 and 2325 µg/ml without S9  
1081, 2325 and 5000 µg/ml with S9  
Statistical methods: Analyses conducted on the slopes of the dose-response curves and the individual dose points (Galloway *et al*, 1987)  
Remarks: The high dose was limited by toxicity or, in the absence of toxicity 5000 µg/ml. Without S9, Chinese hamster ovary (CHO) cells were incubated for 11.5 hours with the test substance in supplemented McCoy's 5A medium; Colcemid was added and incubation continued for two hours. The cells were then harvested by mitotic shake-off, fixed and stained with Giemsa. With S9, cells were treated with the test substance and S9 for two hours, after which the treatment medium was removed and the cells were incubated for 11.5 hours in fresh medium, with Colcemid present for the final two hours. Distilled water was the solvent control. Mitomycin-C (without S9), at a concentration of 0.4 µg/ml and cyclophosphamide (with S9), at a concentration of 20 µg/ml, were the positive controls. Two hundred first-division metaphase cells were scored at each dose level. Classes of aberrations included simple (breaks and terminal deletions), complex (rearrangements and translocations) and other (pulverized cells, despiralized chromosomes and cells containing ten or more aberrations). For a single trial, a statistically significant ( $P \leq 0.05$ ) difference for one dose point and a significant trend ( $P \leq 0.015$ ) were

considered weak evidence for a positive response; significant differences for two or more doses indicated the trial was positive. A positive trend test in the absence of a statistically significant increase at any one dose resulted in an equivocal call. Ultimately, the trial calls were based on a consideration of the statistical analyses as well as the biological information available to the reviewers.

## Results

Result: The test substance did not induce aberrations, with or without S9.

Cytotoxic concentration: >5000 µg/ml with metabolic activation;  
>2325 µg/ml without metabolic activation

Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated

Remarks:

## Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1B

Remarks: Reliable without restriction; comparable to guideline study.

## References

National Toxicology Program. 1997. NTP Technical Report on the Toxicology and Carcinogenesis studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 98-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

## Other

Last changed: December 17, 2003

Order number for sorting: 102

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Cytogenetic assays (chromosome aberrations and sister chromatid)  
System of testing: Nonbacterial  
GLP: No  
Year: 1977  
Species/strain: Chinese hamster cells  
Metabolic activation: None  
Concentrations tested:  $1 \times 10^{-3}$ ,  $2 \times 10^{-3}$  and  $5 \times 10^{-3}$  M  
Statistical methods: *t*-test for SCE  
Remarks: The test substance was dissolved/suspended in HBSS (Hanks' balanced salt solution) to make final concentrations of  $1 \times 10^{-3}$ ,  $2 \times 10^{-3}$  and  $5 \times 10^{-3}$  M. When necessary, higher or intermediate doses also were tested. The final doses of the solvents per ml medium did not exceed 0.1 ml for saline. For a given dose of the test substance, at least one culture was made; however, the experiments may have been repeated for some critical concentrations. One control culture containing 5-bromodeoxyuridine and solvent was routinely prepared for each series of experiments. All cultures were kept in complete darkness at 37 °C for 26 hours (this covered two rounds of cell cycle) and 0.25 µg colchicine/ml was added for the final two hours. Air-dried slides of cells were prepared and examined. The frequencies of sister chromatid exchange (SCE) and chromosome aberrations were scored. Chromosome aberrations were examined on 100 metaphase plates for each dose and the frequency of aberrations, excluding gaps, was indicated by the number of breaks per cell. A ring, a dicentric and a chromatid exchange were each scored as two breaks, a tricentric as four breaks and an acentric fragment or an isochromatid break as one break. The number of SCE per cell was determined on the basis of 20 – 50 intact metaphases in which all chromosomes had a "harlequinized" appearance

without gross chromosome aberrations. SCE in the centromeric region were not scored because they were indistinguishable from the twisting of the sister chromatids.

### Results

Result:	The test substance did not induce SCE or aberrations.
Cytotoxic concentration:	Not stated
Genotoxic effects:	Negative without metabolic activation
Statistical results:	<i>t</i> -test for SCE
Remarks:	The mitotic index was not appreciably decreased. The <i>t</i> -test for SCE was not significant.

### Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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### Data Quality

Reliability (Klimisch):	2A
Remarks:	Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

### References

Abe, S. and M. Sasaki. 1977. Chromosome Aberrations and Sister Chromatid Exchanges in Chinese Hamster Cells Exposed to Various Chemicals. *J. Natl. Cancer Inst.* 58(6):1635 – 1641.

### Other

Last changed:	December 17, 2003
Order number for sorting:	116
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: > 99%  
Remarks:

### Method

Method/guideline followed: Galloway *et al* (1987)  
Type: Cytogenetic assay (sister chromatid exchange)  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1997  
Cell type: Chinese hamster ovary cell  
Metabolic activation: S9 (from Aroclor 1254-induced male Sprague-Dawley rat liver)  
Concentrations tested: 167, 502, 1673 and 5020 µg/ml without S9  
502, 1673 and 5020 µg/ml with S9  
Statistical methods: Analyses conducted on the slopes of the dose-response curves and the individual dose points (Galloway *et al*, 1987)  
Remarks: In the sister chromatid exchange (SCE) test without S9, Chinese hamster ovary (CHO) cells were incubated for 26 hours with the test substance in supplemented McCoy's 5A medium. Bromodeoxyuridine (BrdU) was added two hours after culture initiation. After 26 hours, the medium containing the test substance was removed and replaced with fresh medium plus BrdU and Colcemid and incubation was continued for two hours. Cells were then harvested by mitotic shake-off, fixed and stained with Hoechst 33258 and Giemsa. In the SCE test with S9, cells were incubated with the test substance, serum-free medium and S9 for two hours. The medium was then removed and replaced with medium containing serum and BrdU and no test substance. Incubation proceeded for an additional 26 hours, with Colcemid present for the final two hours. Harvesting and staining were the same as for cells treated without S9. Distilled water was the solvent control. Mitomycin-C (without S9), at concentrations of 0.001 and 0.004 µg/ml and cyclophosphamide (with S9), at concentrations of 0.125 and 0.5 µg/ml, were the positive controls. Fifty second-division metaphase cells were scored

for frequency of SCEs/cell from each dose level. Because significant chemical-induced cell cycle delay was seen, incubation time was lengthened to ensure a sufficient number of scorable (second-division metaphase) cells. An SCE frequency of 20% above the concurrent solvent control value was chosen as a statistically conservative positive response. An increase of 20% or greater at any single dose was considered weak evidence of activity; increase at two or more doses resulted in a determination that the trial was positive. A statistically significant trend ( $P < 0.005$ ) in the absence of any responses reaching 20% above background led to a call of equivocal.

### Results

Result: The test substance did not induce SCEs, with or without S9.  
Cytotoxic concentration: 5020 µg/ml without S9  
Genotoxic effects: Negative with and without metabolic activation  
Statistical results: Not stated  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 1B  
Remarks: Reliable without restriction; comparable to guideline study.

### References

National Toxicology Program. 1997. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 98-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S

### Other

Last changed: December 17, 2003  
Order number for sorting: 102  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: DNA single-strand breaks measurements in V79 cells alkaline filter elution test  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells from male mature Chinese hamster (V79)  
Metabolic activation: None  
Concentrations tested: 2.0, 5.0, 6.5, 8.0, 8.5, 9.0 and 10.0 µl/ml  
Statistical methods: Not stated  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (water) and positive [ethylmethanesulfonate (EMS)] controls and at least four doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.0 µl/ml. Twenty-four hours after seeding, the growth medium is replaced by the treatment medium and cultures are treated with the test or control solutions for four hours. The treatment medium is then aspirated (sheltered from light) and the cell monolayer is washed twice with cold phosphate buffered saline. The alkaline elution procedure, fractions collection and the fluorimetric DNA assay were conducted. A three-fold increase in SSB or elution rate compared with the concurrent control in two consecutive doses is indicative of a biologically significant increase in DNA SSBs, i.e. a positive result.

## Results

Result:	In the mammalian cells (V79), dose-related cytotoxicity was observed, but formation of DNA single strand breaks in the alkaline elution assay was not detected in the absence of metabolic activation.
Cytotoxic concentration:	9.0 µl/ml without metabolic activation
Genotoxic effects:	Negative without metabolic activation
Statistical results:	Not stated
Remarks:	

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

## References

Schriewer, L., C. Vleminckx, G. Rigaux, M. Ottogali and T. Lakhansky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. C. DNA Single-Strand Breaks Measurement in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

## Other

Last changed:	December 17, 2003
Order number for sorting:	105
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 4-Methyl-pyridine (CAS RN 108-89-4; 4-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1981  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA1538, TA98 and TA100  
Metabolic activation: Liver fraction (S9) from Aroclor-induced rats  
Concentrations tested: 0.01, 0.05, 0.10, 0.50 and 1.0 mg/plate  
Statistical methods: Described below  
Remarks: The plate incorporation assay was employed. The bacterial cultures (approximately  $2 \times 10^8$  cells/plate) were treated with the test substance in the presence of S9 mix. The experiments were repeated independently at least two times in the nontoxic and effect dose range using three plates per dose. The specific mutagenic activities were determined from the slope values of linear dose-response curves and were given as revertants per mg of the test substance. Dimethylsulfoxide was used as the solvent and negative control. The following positive controls were used in the assay: 8-Aminoquinoline for tester strain TA1537, benzo[*a*]pyrene and 2-acetylaminofluorene for tester strains TA98 and TA100.

### Results

Result: Mutagenic activity was not observed with this test substance in the presence of S9 mix.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative with metabolic activation  
Statistical results: Not stated  
Remarks: Although all the tester strains were used, TA98 was the most sensitive strain and was the strain for which most data were reported in this article.

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2B  
Remarks: Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Ho, C-H., B. R. Clark, M. R. Guerin, B. D. Barkenbus, T. K. Rao and J. L. Epler. 1981. Analytical and Biological Analyses of Test Materials from the Synthetic Fuel Technologies. IV. Studies of Chemical Structure-Mutagenic Activity Relationships of Aromatic Nitrogen Compounds Relevant to Synfuels. *Mutat. Res.* 85:335 - 345.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 244  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 4-Picoline (CAS RN 108-89-4)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: OECD Guideline No. 471  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Yes  
Year: 1991 - 1993  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA98 and TA100  
Metabolic activation: Liver fraction (S9) from Aroclor 1254-induced Sprague-Dawley rats  
Concentrations tested: 50, 160, 500, 1600 and 5000 nl/plate  
Statistical methods: Not stated  
Remarks: The mutagenicity assay included negative and positive controls and five doses of the test substance tested in the presence and absence of S9 mix. Triplicate plates were poured for each dose level. Two independent experiments were performed. The following compounds were used as positive controls without metabolic activation: sodium azide (0.5 and 1.0 µg/plate for TA1535 and TA100, respectively), 2-nitrofluorene (2 µg/plate for TA98) and 9-amino-acridine (50 µg/plate for TA1537). 2-Amino-anthracene (1 µg/plate) was used as a positive control with metabolic activation for all bacterial strains. The solvent (water) was used for the negative control. For the test substance to be scored as positive, one or both of the following criteria must be reproducibly met: 1) the test substance must induce a dose-related increase in the number of revertant colonies; and 2) the test substance must induce a doubling (or greater) in the number of revertants, at least at one dose level.

### Results

Result: Cytotoxicity and mutagenic activity was not observed with this test substance in the presence and absence of S9.  
Cytotoxic concentration: None with and without metabolic activation  
Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The test substance was devoid of mutagenic activity under the conditions of the test. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1A  
Remarks: Reliable without restriction; guideline study.

**References**

Vleminckx, C., M. Ottogali, L. Schriewer, G. Rigaux and T. Lakhansky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. A. *Salmonella*/Microsome Test. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 271  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 4-Picoline (CAS RN 108-89-4)  
Purity: 98.6%  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1987  
Species/strain: *Salmonella typhimurium*/TA97, TA98, TA100 and TA102  
Metabolic activation: 9000 g (S9) liver homogenate from Aroclor 1254-induced, Sprague-Dawley male rats  
Concentrations tested: 10, 50, 100, 500, 1000 and 5000 µg/plate  
Statistical methods: Stead *et al* (1981) and Bernstein *et al* (1982)  
Remarks: The test procedures were the same as described by Ames *et al* (1975). All tests were conducted in the standard plate-incorporation assay on at least two separate days both with and without exogenous activation. The test substance was tested at six doses using duplicate plates. Appropriate negative (solvent) and positive controls were run in parallel with the assay. The test substance and solvent control were dissolved in dimethylsulfoxide (DMSO). The test substance was not designated positive or negative unless reproducible results were obtained. A positive response was defined as a reproducible, dose-related increase in histidine independent revertants over the solvent control level in at least one strain/activation combination; it was not necessary for this increase to be equal or greater than two-fold the background. A definite positive or negative result was assigned to a test result when the statistical methods and visual examination of the data agreed. An equivocal response occurred when 1) test results were not reproducible, 2) a low-level, but not dose-related increase, in *his*<sup>+</sup> colonies was obtained, or 3) when an increase was observed at only one dose level.

## Results

Result:	No mutagenic activity was observed with this test substance under any of the assay conditions used. No toxicity was observed with this test substance.
Cytotoxic concentration:	None with and without metabolic activation
Genotoxic effects:	Negative with and without metabolic activation
Statistical results:	Not stated
Remarks:	

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

## References

Claxton, L. D., K. L. Dearfield, R. J. Spanggord, E. S. Riccio and K. Mortelmans. 1987. Comparative Mutagenicity of Halogenated Pyridines in the *Salmonella typhimurium*/Mammalian Microsome Test. *Mutation Research* 176:185 - 198.

## Other

Last changed:	December 17, 2003
Order number for sorting:	275
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 4-Picoline (CAS RN 108-89-4)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Mammalian cell forward mutation assay (HGPRT gene mutation)  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells from male mature Chinese hamster (V79)  
Metabolic activation: None  
Concentrations tested: 0, 3.75, 4.00, 4.25 and 4.50 µl/ml  
Statistical methods: Analysis of variance, when necessary  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (distilled water) and positive [ethylmethanesulfonate (EMS)] controls and at least three doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.25 µl/ml. Determination of the numbers of mutants and plating efficiency was performed.

### Results

Result: Dose-related cytotoxicity was observed, but no increase of the mutation frequency was detected.  
Cytotoxic concentration: 4.5 µl/ml without metabolic activation  
Genotoxic effects: Negative without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The test substance was not mutagenic under the test conditions. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1B  
Remarks: Reliable without restriction; comparable to guideline study.

**References**

Vleminckx, C., G. Rigaux, L. Schriewer, M. Ottogali and T. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. B. HGPRT Gene Mutation Assay in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 272  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 4-Picoline (CAS RN 108-89-4)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: DNA single-strand breaks measurements in V79 cells alkaline filter elution test  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells (V79) from male mature Chinese hamster  
Metabolic activation: None  
Concentrations tested: 1.0, 2.0, 3.0, 3.5, 4.0 and 4.5 µl/ml  
Statistical methods: Not stated  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (water) and positive [ethylmethanesulfonate (EMS)] controls and at least four doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.0 µl/ml. Twenty four hours after seeding, the growth medium is replaced by the treatment medium and cultures are treated with the test or control solutions for four hours. The treatment medium is then aspirated (sheltered from light) and the cell monolayer is washed twice with cold phosphate buffered saline. The alkaline elution procedure, fractions collection and the fluorimetric DNA assay were conducted. A three-fold increase in SSB or elution rate compared with the concurrent control in two consecutive doses is indicative of a biologically significant increase in DNA SSBs, i.e. a positive result.

## Results

Result:	In the mammalian cells (V79), dose-related cytotoxicity was observed, but formation of DNA single strand breaks in the alkaline elution assay was not detected in the absence of metabolic activation.
Cytotoxic concentration:	4.5 µl/ml (19% survival index) without metabolic activation
Genotoxic effects:	Negative without metabolic activation
Statistical results:	Not stated
Remarks:	

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

## References

Schriewer, L., C. Vleminckx, G. Rigaux, M. Ottogali and T. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. C. DNA Single-Strand Breaks Measurement in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

## Other

Last changed:	December 17, 2003
Order number for sorting:	274
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 3-Methyl-pyridine (CAS RN 108-99-6; 3-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1981  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA1538, TA98 and TA100  
Metabolic activation: Liver fraction (S9) from Aroclor-induced rats  
Concentrations tested: 0.01, 0.05, 0.10, 0.50 and 1.0 mg/plate  
Statistical methods: Described below  
Remarks: The plate incorporation assay was employed. The bacterial cultures (approximately  $2 \times 10^8$  cells/plate) were treated with the test substance in the presence of S9 mix. The experiments were repeated independently at least two times in the nontoxic and effect dose range using three plates per dose. The specific mutagenic activities were determined from the slope values of linear dose-response curves and were given as revertants per mg of the test substance. Dimethylsulfoxide was used as the solvent and negative control. The following positive controls were used in the assay: 8-Aminoquinoline for tester strain TA1537, benzo[*a*]pyrene and 2-acetylaminofluorene for tester strains TA98 and TA100.

### Results

Result: Mutagenic activity was not observed with this test substance in the presence of S9 mix.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative with metabolic activation  
Statistical results: Not stated  
Remarks: Although all the tester strains were used, TA98 was the most sensitive strain and was the strain for which most data were reported in this article.

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2B  
Remarks: Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Ho, C-H., B. R. Clark, M. R. Guerin, B. D. Barkenbus, T. K. Rao and J. L. Epler. 1981. Analytical and Biological Analyses of Test Materials from the Synthetic Fuel Technologies. IV. Studies of Chemical Structure-Mutagenic Activity Relationships of Aromatic Nitrogen Compounds Relevant to Synfuels. *Mutat. Res.* 85:335 - 345.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 286  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity:  $\beta$ -Picoline (CAS RN 108-99-6; 3-Picoline)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1983  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA98 and TA100  
Metabolic activation: S-9 supernatant prepared from livers of Aroclor 1254-induced male Sprague-Dawley rats and Aroclor 1254-induced male Syrian hamsters  
Concentrations tested: Not stated  
Statistical methods: Methods based on Margolin *et al* (1981)  
Remarks: Prior to the mutation assay the test substance was checked for toxicity to TA100 up to a concentration of 10 mg/plate, or the limit of solubility in the presence and absence of S-9. If toxicity was not apparent, the highest dose tested was 10 mg/plate; otherwise the upper limit of solubility was used. At least five doses of test substance, in addition to the concurrent solvent and positive controls, were tested on each strain in the presence of S-9 mix or buffer. Three plates were used and the experiment was repeated no less than one week after completion of the initial test. Only the strains and activation systems that gave a positive result were repeated. The positive control chemical used on all strains in the presence of rat and hamster S-9 was 2-aminoanthracene, at concentrations of 1.5 or 0.75  $\mu\text{g}/\text{plate}$ , respectively. The positive control chemicals used without S-9 activation were: 4-nitro-o-phenylenediamine, for TA98 at a concentration of 12.0  $\mu\text{g}/\text{plate}$ ; sodium azide at a concentration of 2.5  $\mu\text{g}/\text{plate}$  for TA100 and TA1535; and 9-aminoacridine at a concentration of 80.0  $\mu\text{g}/\text{plate}$  on TA1537. A positive response was indicated by a reproducible, dose-related increase, whether it was two-fold over background or not. The preferred solvent was distilled water;

dimethylsulfoxide (DMSO) was used if the test substance was insoluble or not sufficiently soluble in water. Ethanol (95%) or acetone was used if the test substance was not soluble or stable in DMSO.

## Results

Result:  $\beta$ -Picoline did not induce mutagenicity under the conditions of this test.

Cytotoxic concentration: Not stated

Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated

Remarks: The results of the preliminary toxicity test were not stated.

## Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 2A

Remarks: Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

## References

Haworth, S., T. Lawlor, D. Mortelmans, W. Speck and E. Zeiger. 1983. *Salmonella* Mutagenicity Test Results for 250 Chemicals. Environmental Mutagenesis Supplement 1:3 - 142.

## Other

Last changed: December 17, 2003

Order number for sorting: 346

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 3-Picoline (CAS RN 108-99-6)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: OECD Guideline No. 471  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Yes  
Year: 1991-1993  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA98 and TA100  
Metabolic activation: Liver fraction (S9) from Aroclor 1254-induced Sprague-Dawley rats  
Concentrations tested: 50, 160, 500, 1600 and 5000 nl/plate  
Statistical methods: Not stated  
Remarks: The mutagenicity assay included negative and positive controls and five doses of the test substance tested in the presence and absence of S9 mix. Triplicate plates were poured for each dose level. Two independent experiments were performed. The following compounds were used as positive controls without metabolic activation: sodium azide (0.5 and 1.0 µg/plate for TA1535 and TA100, respectively), 2-nitrofluorene (2 µg/plate for TA98) and 9-amino-acridine (50 µg/plate for TA1537). 2-Amino-anthracene (1 µg/plate) was used as a positive control with metabolic activation for all bacterial strains. The solvent (water) was used for the negative control. For the test substance to be scored as positive, one or both of the following criteria must be reproducibly met: 1) the test substance must induce a dose-related increase in the number of revertant colonies; and 2) the test substance must induce a doubling (or greater) in the number of revertants, at least at one dose level.

## Results

Result: Cytotoxicity and mutagenic activity was not observed with this test substance in the presence and absence of S9.

Cytotoxic concentration: None with and without metabolic activation

Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated

Remarks:

## Conclusions

Remarks: The test substance was devoid of mutagenic activity under the conditions of the test. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1A

Remarks: Reliable without restriction; guideline study.

## References

Vleminckx, C., M. Ottogali, L. Schriever, G. Rigaux and T. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. A. *Salmonella*/Microsome Test. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

## Other

Last changed: December 17, 2003

Order number for sorting: 349

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 3-Picoline (CAS RN 108-99-6)  
Purity: 99.0%  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1987  
Species/strain: *Salmonella typhimurium*/TA97, TA98, TA100 and TA102  
Metabolic activation: 9000 g (S9) liver homogenate from Aroclor 1254-induced, Sprague-Dawley male rats  
Concentrations tested: 10, 50, 100, 500, 1000 and 5000 µg/plate  
Statistical methods: Stead *et al* (1981) and Bernstein *et al* (1982)  
Remarks: The test procedures were the same as described by Ames *et al* (1975). All test were conducted in the standard plate-incorporation assay on at least two separate days both with and without exogenous activation. The test substance was tested at six doses using duplicate plates. Appropriate negative (solvent) and positive controls were run in parallel with the assay. The test substance and solvent control were dissolved in dimethylsulfoxide (DMSO). The test substance was not designated positive or negative unless reproducible results were obtained. A positive response was defined as a reproducible, dose-related increase in histidine independent revertants over the solvent control level in at least one strain/activation combination; it was not necessary for this increase to be equal or greater than two-fold the background. A definite positive or negative result was assigned to a test result when the statistical methods and visual examination of the data agreed. An equivocal response occurred when 1) test results were not reproducible, 2) a low-level, but not dose-related increase, in *his*<sup>+</sup> colonies was obtained, or 3) when an increase was observed at only one dose level.

## Results

Result: No mutagenic activity was observed with this test substance under any of the assay conditions used. No toxicity was observed with this test substance.

Cytotoxic concentration: None with and without metabolic activation

Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated

Remarks:

## Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1B

Remarks: Reliable without restriction; comparable to guideline study.

## References

Claxton, L. D., K. L. Dearfield, R. J. Spanggord, E. S. Riccio and K. Mortelmans. 1987. Comparative Mutagenicity of Halogenated Pyridines in the *Salmonella typhimurium*/Mammalian Microsome Test. *Mutation Research* 176:185 - 198.

## Other

Last changed: December 17, 2003

Order number for sorting: 344

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 3-Picoline (CAS RN 108-99-6)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Mammalian cell forward mutation assay (HGPRT gene mutation)  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells from male mature Chinese hamster (V79)  
Metabolic activation: None  
Concentrations tested: 0, 3.00, 3.25, 3.50, 3.75 and 4.00 µl/ml  
Statistical methods: Analysis of variance, when necessary  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (distilled water) and positive [ethylmethanesulfonate (EMS)] controls and at least three doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.25 µl/ml. Determination of the numbers of mutants and plating efficiency was performed.

### Results

Result: Dose-related cytotoxicity was observed, but no increase of the mutation frequency was detected.  
Cytotoxic concentration: 4.0 µl/ml without metabolic activation  
Genotoxic effects: Negative without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The test substance was not mutagenic under the test conditions. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1B  
Remarks: Reliable without restriction; comparable to guideline study.

**References**

Vleminckx, C., G. Rigaux, L. Schriewer, M. Ottogali and T. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. B. HGPRT Gene Mutation Assay in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 350  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 3-Picoline (CAS RN 108-99-6)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: DNA single-strand breaks measurements in V79 cells alkaline filter elution test  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells (V79) from male mature Chinese hamster  
Metabolic activation: None  
Concentrations tested: 2.0, 3.0, 4.0 and 5.0 µl/ml  
Statistical methods: Not stated  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (water) and positive [ethylmethanesulfonate (EMS)] controls and at least four doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.0 µl/ml. Twenty four hours after seeding, the growth medium is replaced by the treatment medium and cultures are treated with the test or control solutions for four hours. The treatment medium is then aspirated (sheltered from light) and the cell monolayer is washed twice with cold phosphate buffered saline. The alkaline elution procedure, fractions collection and the fluorimetric DNA assay were conducted. A three-fold increase in SSB or elution rate compared with the concurrent control in two consecutive doses is indicative of a biologically significant increase in DNA SSBs, i.e. a positive result.

## Results

Result:	In the mammalian cells (V79), dose-related cytotoxicity was observed, but formation of DNA single strand breaks in the alkaline elution assay was not detected in the absence of metabolic activation.
Cytotoxic concentration:	5.0 µl/ml without metabolic activation
Genotoxic effects:	Negative without metabolic activation
Statistical results:	Not stated
Remarks:	

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

## References

Schriewer, L., C. Vleminckx, G. Rigaux, M. Ottogali and T. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. C. DNA Single-Strand Breaks Measurement in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

## Other

Last changed:	December 17, 2003
Order number for sorting:	351
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 2-Methyl-pyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)

Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1981  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA1538, TA98 and TA100

Metabolic activation: Liver fraction (S9) from Aroclor-induced rats  
Concentrations tested: 0.01, 0.05, 0.10, 0.50 and 1.0 mg/plate  
Statistical methods: Described below  
Remarks: The plate incorporation assay was employed. The bacterial cultures (approximately  $2 \times 10^8$  cells/plate) were treated with the test substance in the presence of S9 mix. The experiments were repeated independently at least two times in the nontoxic and effect dose range using three plates per dose. The specific mutagenic activities were determined from the slope values of linear dose-response curves and were given as revertants per mg of the test substance. Dimethylsulfoxide was used as the solvent and negative control. The following positive controls were used in the assay: 8-Aminoquinoline for tester strain TA1537, benzo[*a*]pyrene and 2-acetylaminofluorene for tester strains TA98 and TA100.

### Results

Result: Mutagenic activity was not observed with this test substance in the presence of S9 mix.

Cytotoxic concentration: Not stated  
Genotoxic effects: Negative with metabolic activation  
Statistical results: Not stated  
Remarks: Although all the tester strains were used, TA98 was the most sensitive strain and was the strain for which most data were reported in this article.

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2B  
Remarks: Reliable with restrictions; basic data given, comparable to guidelines/standards.

**References**

Ho, C-H., B. R. Clark, M. R. Guerin, B. D. Barkenbus, T. K. Rao and J. L. Epler. 1981. Analytical and Biological Analyses of Test Materials from the Synthetic Fuel Technologies. IV. Studies of Chemical Structure-Mutagenic Activity Relationships of Aromatic Nitrogen Compounds Relevant to Synfuels. *Mutat. Res.* 85:335 - 345.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 371  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 2-Picoline (CAS RN 109-06-8)  
Purity: 98.6%  
Remarks:

### Method

Method/guideline followed: Ames *et al* (1975)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1987  
Species/strain: *Salmonella typhimurium*/TA97, TA98, TA100 and TA102  
Metabolic activation: 9000 g (S9) liver homogenate from Aroclor 1254-induced, Sprague-Dawley male rats  
Concentrations tested: 10, 50, 100, 500, 1000 and 5000 µg/plate  
Statistical methods: Stead *et al* (1981) and Bernstein *et al* (1982)  
Remarks: The test procedures were the same as described by Ames *et al* (1975). All test were conducted in the standard plate-incorporation assay on at least two separate days both with and without exogenous activation. The test substance was tested at six doses using duplicate plates. Appropriate negative (solvent) and positive controls were run in parallel with the assay. The test substance and solvent control were dissolved in dimethylsulfoxide (DMSO). The test substance was not designated positive or negative unless reproducible results were obtained. A positive response was defined as a reproducible, dose-related increase in histidine independent revertants over the solvent control level in at least one strain/activation combination; it was not necessary for this increase to be equal or greater than two-fold the background. A definite positive or negative result was assigned to a test result when the statistical methods and visual examination of the data agreed. An equivocal response occurred when 1) test results were not reproducible, 2) a low-level, but not dose-related increase, in *his*<sup>+</sup> colonies was obtained, or 3) when an increase was observed at only one dose level.

## Results

Result:	No mutagenic activity was observed with this test substance under any of the assay conditions used. No toxicity was observed with this test substance.
Cytotoxic concentration:	None with and without metabolic activation
Genotoxic effects:	Negative with and without metabolic activation
Statistical results:	Not stated
Remarks:	

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

## References

Claxton, L. D., K. L. Dearfield, R. J. Spanggord, E. S. Riccio and K. Mortelmans. 1987. Comparative Mutagenicity of Halogenated Pyridines in the *Salmonella typhimurium*/Mammalian Microsome Test. *Mutation Research* 176:185 - 198.

## Other

Last changed:	December 17, 2003
Order number for sorting:	416
Remarks:	

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 2-Picoline (CAS RN 109-06-8)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: OECD Guideline No. 471  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Yes  
Year: 1991 - 1993  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA98 and TA100  
Metabolic activation: Liver fraction (S9) from Aroclor 1254-induced Sprague-Dawley rats  
Concentrations tested: 50, 160, 500, 1600 and 5000 nl/plate  
Statistical methods: Not stated  
Remarks: The mutagenicity assay included negative and positive controls and five doses of the test substance tested in the presence and absence of S9 mix. Triplicate plates were poured for each dose level. Two independent experiments were performed. The following compounds were used as positive controls without metabolic activation: sodium azide (0.5 and 1.0 µg/plate for TA1535 and TA100, respectively), 2-nitrofluorene (2 µg/plate for TA98) and 9-amino-acridine (50 µg/plate for TA1537). 2-Amino-anthracene (1 µg/plate) was used as a positive control with metabolic activation for all bacterial strains. The solvent (water) was used for the negative control. For the test substance to be scored as positive, one or both of the following criteria must be reproducibly met: 1) the test substance must induce a dose-related increase in the number of revertant colonies; and 2) the test substance must induce a doubling (or greater) in the number of revertants, at least at one dose level.

## Results

Result: Cytotoxicity and mutagenic activity was not observed with this test substance in the presence and absence of S9.

Cytotoxic concentration: None with and without metabolic activation

Genotoxic effects: Negative with and without metabolic activation

Statistical results: Not stated

Remarks:

## Conclusions

Remarks: The test substance was devoid of mutagenic activity under the conditions of the test. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1A

Remarks: Reliable without restriction; guideline study.

## References

Vleminckx, C., M. Ottogali, L. Schriewer, G. Rigaux and T. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. A. *Salmonella*/Microsome Test. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

## Other

Last changed: December 17, 2003

Order number for sorting: 417

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 2-Methylpyridine (CAS RN 109-06-8; 2-Picoline)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Modified preincubation Ames test (Yahagi *et al.* 1977)  
Type: Reverse mutation assay  
System of testing: Bacterial  
GLP: Not stated  
Year: 1989  
Species/Strain: *Salmonella typhimurium*/TA98, TA100 and TA102  
Metabolic activation: Liver fraction (S-9) from Aroclor 1254-induced rats  
Concentrations tested: 10.0 nmol – 1.0 mmol  
Statistical methods: Not stated  
Remarks: A preassay using TA100 was carried out to determine the highest nonbactericidal dose level. The test substance then was tested in *Salmonella typhimurium* strains TA98, TA100 and TA102 with and with out metabolic activation at six dose levels ranging from 10.0 nmol – 1.0 mmol. Water, the solvent, was used as a negative control. The metabolic activity specific mutagenic compounds, 2-nitrofluorene, sodium azide, mitomycin C, 2-aminofluorene, were employed as the positive controls. Four plates were used per dose and solvent control metabolic activation (30% S-9) was used when appropriate. The plated were incubated for three days and the colonies counted. Mutation factors (induced/spontaneous revertants) were calculated at the dose levels that gave the greatest effect.

### Results

Result: Mutagenic activity was not observed with this test substance in the presence or absence of S-9.  
Cytotoxic concentration: Not stated  
Genotoxic effects: Negative with and without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

**References**

Aeschbacher, H. U., U. Wolleb, J. Löliger, J. C. Spadone and R. Liardon. 1989. Contribution of Coffee Aroma Constituents to the Mutagenicity of Coffee. *Fd. Chem. Toxic.* 24(4):227 - 232.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 420  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 2-Picoline (CAS RN 109-06-8)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: Mammalian cell forward mutation assay (HGPRT gene mutation)  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells from male mature Chinese hamster (V79)  
Metabolic activation: None  
Concentrations tested: 0, 4.50, 4.75, 5.00, 5.25 and 5.50 µl/ml  
Statistical methods: Analysis of variance, when necessary  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (distilled water) and positive [ethylmethanesulfonate (EMS)] controls and at least three doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.25 µl/ml. Determination of the numbers of mutants and plating efficiency was performed.

### Results

Result: Dose-related cytotoxicity was observed, but no increase of the mutation frequency was detected.  
Cytotoxic concentration: 5.25 µl/ml without metabolic activation  
Genotoxic effects: Negative without metabolic activation  
Statistical results: Not stated  
Remarks:

**Conclusions**

Remarks: The test substance was not mutagenic under the test conditions. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch): 1B  
Remarks: Reliable without restriction; comparable to guideline study.

**References**

Vleminckx, C., G. Rigaux, L. Schriewer, M. Ottogali and T. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. B. HGPRT Gene Mutation Assay in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

**Other**

Last changed: December 17, 2003  
Order number for sorting: 418  
Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 2-Picoline (CAS RN 109-06-8)  
Purity: 98%  
Remarks:

### Method

Method/guideline followed: Not stated  
Type: DNA single-strand breaks measurements in V79 cells alkaline filter elution test  
System of testing: Nonbacterial  
GLP: Yes  
Year: 1991 - 1992  
Cell type: Lung cells (V79) from male mature Chinese hamster  
Metabolic activation: None  
Concentrations tested: 2.0, 3.0, 4.0, 5.0 and 6.0 µl/ml  
Statistical methods: Not stated  
Remarks: A preliminary cytotoxicity test was conducted in order to determine the appropriate dose levels for the main assay. Each experiment in the main assay included negative (water) and positive [ethylmethanesulfonate (EMS)] controls and at least four doses of the test substance tested in the absence of S9 mix. This test was performed only in the absence of an S9 metabolizing system because of negative results obtained in the Ames test. Two independent experiments were conducted. The negative control was treated with the maximum amount of solvent vehicle used in any test substance treatment. EMS was used at a concentration of 1.0 µl/ml. Twenty four hours after seeding, the growth medium is replaced by the treatment medium and cultures are treated with the test or control solutions for four hours. The treatment medium is then aspirated (sheltered from light) and the cell monolayer is washed twice with cold phosphate buffered saline. The alkaline elution procedure, fractions collection and the fluorimetric DNA assay were conducted. A three-fold increase in SSB or elution rate compared with the concurrent control in two consecutive doses is indicative of a biologically significant increase in DNA SSBs, i.e. a positive result.

## Results

Result: In the mammalian cells (V79), dose-related cytotoxicity was observed, but formation of DNA single strand breaks in the alkaline elution assay was not detected in the absence of metabolic activation.

Cytotoxic concentration: 6.0 µl/ml without metabolic activation

Genotoxic effects: Negative without metabolic activation

Statistical results: Not stated

Remarks:

## Conclusions

Remarks: The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 1B

Remarks: Reliable without restriction; comparable to guideline study.

## References

Schriewer, L., C. Vleminckx, G. Rigaux, M. Ottogali and Th. Lakhanisky. 1993. Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. C. DNA Single-Strand Breaks Measurement in V79 Cells. Study number IHE-TOX-1003. Institute of Hygiene and Epidemiology, Brussels, Belgium.

## Other

Last changed: December 17, 2003

Order number for sorting: 419

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 3-Cyanopyridine  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: 99.9%  
Remarks:

### Method

Method/guideline followed: OECD Guideline No. 471, 472 and Guidelines for Screening Mutagenicity Testing of Chemicals (Japan)  
Type: Reverse mutation assay (Ames test)  
System of testing: Bacterial  
GLP: Yes  
Year: Not stated  
Species/strain: *Salmonella typhimurium*/TA1535, TA1537, TA98 and TA100; *Escherichia coli*/WP2 uvrA  
Metabolic activation: Liver fraction (S9) from Phenobarbital- and 5,6-benzoflavone-induced Sprague-Dawley rats  
Concentrations tested: 313, 625, 1250, 2560 and 5000 µg/plate  
Statistical methods: None  
Remarks: A preliminary dose range-finding test was conducted at concentrations of 1.22 to 5000 µg/plate. The preincubation method was employed for the mutagenicity assays. The mutagenicity assay included negative and positive controls, and five doses of the test substance tested in the presence and absence of S9 mix. Triplicate plates were used for each dose level. Two independent experiments were performed. The solvent was distilled water and was also used for the negative control. The following compounds were used as positive controls without metabolic activation: 2-(2-furyl)-3-(5-nitro-2-furyl)acrylamide (0.1 µl/plate for TA98 and 0.01 µl/plate for TA100), sodium azide (0.5 µg/plate for TA1535), N-ethyl-N'-nitro-N-nitrosoguanidine (2.0 µg/plate for WP2 uvrA) and 9-aminoacridine (80 µg/plate for TA1537). 2-Aminoanthracene (1.0, 2.0, 10.0, 0.5 and 2.0 µg/plate for TA100, TA1535, WP2 uvrA, TA98 and TA 1537, respectively) was used as a positive control with metabolic activation for all bacterial strains. Sodium azide was dissolved in deionized water and the other positive control compounds were dissolved in dimethyl sulfoxide. Criteria for

judging test results: when the number of reverse mutation colonies (average value) accompanying an increase in test substance concentration increased to twice or more than that of the negative control value, and that increase was found to be reproducible, the test substance was judged to be positive. All other cases were judged to be negative.

## Results

Result:

No increase in the number of reverse mutation colonies exhibiting a level of twice or more than that of the negative control level was observed for any of the bacteria, with or without metabolic activation. The test substance did not induce mutations in any of the bacterial strains tested. No toxicity was observed up to a concentration of 5000 µg/plate, with or without metabolic activation.

Cytotoxic concentration:

None with and without metabolic activation

Genotoxic effects:

Negative with and without metabolic activation

Statistical results:

Not applicable

Remarks:

## Conclusions

Remarks:

The test substance was devoid of mutagenic activity under the conditions of the test (author of the article).

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch):

1D

Remarks:

Reliable without restriction; guideline study – report written in Japanese, fully translated.

## References

Mizuno, F., Y. Enomoto, Y. Ishige. Reverse Mutation Test of 3-Cyanopyridineon Bacteria. Mitsubishi Chemical Safety Institute Ltd., Kashima Laboratory, Ibaraki, Japan.

## Other

Last changed:

December 17, 2003

Order number for sorting:

202c

Remarks:

## 5.5 GENETIC TOXICITY *IN VITRO*

### Test Substance

Identity: 3-Cyanopyridine  
(CAS RN 100-54-9; Nicotinonitrile)  
Purity: 99.9%  
Remarks:

### Method

Method/guideline followed: OECD Guideline No. 473 and Guidelines for Screening Mutagenicity Testing of Chemicals (Japan)  
Type: Cytogenetic assay (chromosomal aberration)  
System of testing: Nonbacterial  
GLP: Yes  
Year: Not stated  
Species/strain: Chinese hamster CHL/IU cells  
Metabolic activation: Liver fraction (S9) from Phenobarbital- and 5,6-benzoflavone-induced Sprague-Dawley rats  
Concentrations tested: Without activation (24-hour continuous treatment) 0, 375, 750, 1500 and 3000 µg/ml  
Without activation (48-hour continuous treatment) 0, 375, 750, 1500 and 3000 µg/ml  
Without activation (6-hour short-term treatment) 0, 625, 1250, 2500 and 5000 µg/ml  
With activation (6-hour short-term treatment) 0, 1250, 2500 and 5000 µg/ml  
Statistical methods: Judgment was done on the basis of the criteria of Ishidate *et al*, 1987.  
Remarks: The dose levels selected for the chromosome aberration assay were based on the results of a cell proliferation inhibition test. The positive controls used were mitomycin C for assays without metabolic activation and benzo[a]pyrene for assays with metabolic activation. The negative solvent control was physiological saline. Two plates per test. Chromosomal patterns; the presence or absence of gaps, breaks, exchanges and other structural aberrations in chromosomal patterns; and the presence or absence of polyploid cells were observed and a group of 200 mitosis metaphase cells.

## Results

Result:	<p>Cell proliferation results: The concentrations of 3-cyanopyridine yielding about 50% proliferation inhibition for the 24- and 48-hour treatment was calculated from two values above and below 50%. The results of continuous treatment for 24- and 48-hours were 1,836 and 1,917 µg/ml, respectively. Further, the concentration exhibiting about 50% proliferation inhibition in the short-term treatment without the presence of S9 mix was 1,749 µg/ml. In the short-term treatment with the presence of S9 mix, there was not 50% or greater inhibition of cell proliferation even at 5,000 µg/ml.</p> <p>Chromosomal aberration assay results: The results of 24-hour and 48-hour continuous treatment of CHL/IU cells revealed occurrence frequencies of 5% or less for chromosomal structural aberrations and polyploid cells. Further, treatment groups subjected to short-term treatment (6 hours) with and without metabolic activation all exhibited occurrence frequencies of 5% or less for chromosomal structural aberrations and polyploid cells.</p>
Cytotoxic concentration:	None; with and without metabolic activation in the short-term treatment group and without metabolic activation in the 24- and 48-hour treatment groups
Genotoxic effects:	Negative; with and without metabolic activation in the short-term treatment group and without metabolic activation in the 24- and 48-hour treatment groups
Statistical results:	Not stated
Remarks:	

## Conclusions

Remarks:	<p>The test substance did not induce structural chromosomal aberrations or polyploidy under the conditions of this experiment (author of the article). The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).</p>
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## Data Quality

Reliability (Klimisch):	1D
Remarks:	Reliable without restriction; guideline study – report written in Japanese, fully translated.

**References**

Nishitomi, T., F. Mizuno, E. Ohta, M. Nakagawa, Y. Anazawa. *In Vitro* Chromosomal Aberration Test of 3-Cyanopyridine on Cultured Chinese Hamster Cells. Mitsubishi Chemical Safety Institute Ltd., Kashima Laboratory, Ibaraki, Japan.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

202d

Remarks:

## 5.6 GENETIC TOXICITY *IN VIVO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/Guideline followed: Not stated  
Type: Chromosomal aberrations test  
GLP: Yes  
Year: 1997  
Species: Mouse  
Strain: B6C3F<sub>1</sub>  
Sex: Male  
Route of administration: I.p. injection  
Doses/concentration levels: 400, 500 and 600 mg/kg  
Exposure period: 17 or 36 hours  
Statistical methods: Trend test (Margolin *et al*, 1986)  
Remarks: A dose range-finding study was performed and the highest dose was limited by toxicity. Ten mice per dose group were injected intraperitoneally with the test substance dissolved in phosphate-buffered saline (PBS) (injection volume = 0.4 ml). Solvent control mice received equivalent injections of PBS alone. The positive control was Mitomycin C. The mice were subcutaneously implanted with a Bromodeoxyuridine (BrdU) tablet 18 hours before the scheduled harvest. The use of BrdU allowed selection of the appropriate cell population for scoring. Two hours before sacrifice, the mice received an intraperitoneal injection of colchicine in saline. The animals were sacrificed 17 or 36 hours after injection of the test substance. One or both femurs were removed and the marrow was flushed out with PBS. Cells were treated with a hypotonic salt solution, fixed and dropped onto chilled slides. After a 24-hour drying period, the slides were stained and scored. Fifty first-division metaphase cells were scored from each of eight animals per group. Responses were evaluated as the percentage of aberrant metaphase cells, excluding gaps.

**Results**

PCE/NCE ratio:	Not stated
Genotoxic effects:	Negative
NOAEL (NOEL):	600 mg/kg
Statistical results:	No dose-related statistical significance noted.
Remarks:	No induction of aberrations was noted in bone marrow cells at either of the two sampling times at doses as high as 600 mg/kg.

**Conclusions**

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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**Data Quality**

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

**References**

National Toxicology Program. 1997. NTP Technical Report on the Toxicology and Carcinogenesis studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (Drinking Water Studies). NIH publication No. 98-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

**Other**

Last changed:	December 17, 2003
Order number for sorting:	102
Remarks:	

## 5.6 GENETIC TOXICITY *IN VIVO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Approximately 99%  
Remarks:

### Method

Method/Guideline followed: Not stated  
Type: Micronucleus test  
GLP: Yes  
Year: 1997  
Species: Mouse  
Strain: B6C3F<sub>1</sub>  
Sex: Male  
Route of administration: I.p. injection  
Doses/concentration levels: 31.25, 62.50, 125, 250 and 500 mg/kg  
Exposure period: 72 hours  
Statistical methods: One-tailed Cochran-Armitage trend test (Margolin *et al*, 1990)  
Remarks: Preliminary range-finding studies were performed. Factors affecting dose selection included chemical solubility and toxicity and the extent of cell cycle delay induced by pyridine exposure. Five mice per dose group were injected intraperitoneally three times at 24-hour intervals with the test substance dissolved in phosphate-buffered saline (PBS) (injection volume = 0.4 ml). Solvent control mice received equivalent injections of PBS alone. The positive control was cyclophosphamide. The animals were killed 24 hours after the third injection and blood smears were prepared from bone marrow cells obtained from the femurs. Air-dried smears were fixed and stained; 2000 polychromatic erythrocytes (PCEs) were scored for the frequency of micronucleated cells in each of five animals per dose group. In addition, the percentage of PCEs among the total erythrocyte population in the bone marrow was scored for each dose group as a measure of toxicity. An individual trial was considered positive if the trend test P value was less than or equal to 0.025 or if the P value for any single dose group was less than or equal to 0.025 divided by the number of dose groups. A final call of positive for micronucleus induction was preferable based on reproducibly positive trials.

Ultimately, the final call was determined by the scientific staff after considering the results of statistical analyses, the reproducibility of any effects observed and the magnitude of those effects.

## Results

PCE/NCE ratio:	Not stated
Genotoxic effects:	Negative
NOAEL (NOEL):	500 mg/kg
Statistical results:	No dose-related statistical significance noted.
Remarks:	No increase in the frequency of micronucleated PCEs was noted in bone marrow after intraperitoneal injection of the test substance when administered up to 500 mg/kg three times at 24-hour intervals. The micronucleated PCEs per 1000 PCE and the percent PCEs in the treated groups were essentially identical to the control values.

## Conclusions

Remarks:	The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

## References

National Toxicology Program. 1997. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN. 110-86-1) in F344/N Rats, Wistar Rats and B6C3F<sub>1</sub> Mice (drinking water studies). NIH publication No. 98-3960. U. S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Washington D. C., U. S.

## Other

Last changed:	December 17, 2003
Order number for sorting:	102
Remarks:	

## 5.6 GENETIC TOXICITY *IN VIVO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: 99.86%  
Remarks:

### Method

Method/Guideline followed: Not stated  
Type: *In vivo-in vitro* mouse Unscheduled DNA Synthesis (UDS) assay  
GLP: Yes  
Year: Not stated, but must be at least 1999, since references from 1999 are included  
Species: Mouse  
Strain: B6C3F1  
Sex: Male  
Route of administration: Oral (gavage)  
Doses/concentration levels: 175, 350 and 700 mg/kg  
Exposure period: 2 or 16 hours prior to sacrifice  
Statistical methods: Not stated  
Remarks: Test substance solutions in water (USP sterile water) were administered to mice (8 weeks of age) two or 16 hours prior to the scheduled sacrifice. The vehicle control group received water 16 hours prior to sacrifice and the positive control group received 10 mg/kg dimethylnitrosamine (DMN) in water two hours prior to sacrifice. Dose groups consisted of four mice; the first three successful perfusions were analyzed for UDS. Body weights were recorded on the day of randomization and on the day of dose administration. Mice were observed for morbidity or mortality once daily and examined for clinical signs at one hour  $\pm$  0.5 hour post dose and prior to sacrifice for mice in the 16 hour dose groups and for some mice in the two hour dose groups, as clinical signs warranted. After sacrifice, hepatocytes were isolated, cultured and counted. A minimum of 105 cells was scored per mouse. A positive result is indicated if the mean net grain count for any dose group is greater than zero net grains per nucleus (NG, the nuclear count minus the cytoplasmic count) and the percent of cells in repair for that group is greater than 20%.

## Results

PCE/NCE ratio:	Not stated
Genotoxic effects:	Negative
NOAEL (NOEL):	Not stated
Statistical results:	Described below
Remarks:	Mice given 700 mg/kg of the test substance two hours prior to sacrifice were slightly to markedly hypoactive immediately post dose, but recovered by approximately ten to 15 minutes post dose and appeared normal from then until the scheduled sacrifice. Two mice in the two hour 700 mg/kg dose group showed slightly hunched posture approximately one hour post dose. Mice given 350 and 175 mg/kg appeared normal immediately after dosing and until the scheduled sacrifice. The test substance did not significantly increase the UDS response in hepatocytes isolated from the treated mice. The vehicle control group and the low, mid and high dose groups $\leq$ - 8.3 NG, $\leq$ 1% cells in repair (percentage of cells with at least five net grains in repair) and $\leq$ 8.6 mean net grains of cells in repair. These results indicated that the test substance was unequivocally negative in the hepatocyte UDS test with <i>in vivo</i> treatment of male B6C3F1 mice.

## Conclusions

Remarks:	The test substance was nongenotoxic in B6C3F1 mouse liver using the UDS endpoint. (Author of article) The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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## Data Quality

Reliability (Klimisch):	1B
Remarks:	Reliable without restriction; comparable to guideline study.

**References**

MacGregor, J. A., C. A. Hamilton, J. E. Kubicek and J. C. Mirsalis. Pyridine Does Not Induce Unscheduled DNA Synthesis (UDS) in Hepatocytes of Male B6C3F1 Mice Treated *In Vivo*. *Journal of Applied Toxicology*, 20(5): 389-393. Reilly Industries, Inc. Indianapolis, IN, U. S.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

147

Remarks:

## 5.6 GENETIC TOXICITY *IN VIVO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: > 99%  
Remarks:

### Method

Method/Guideline followed: Not stated  
Type: Sex-linked recessive lethal (SLRL) mutation  
GLP: Not stated  
Year: 1993  
Species: *Drosophila melanogaster*  
Strain: Canton-S and *Basc*  
Sex: Male and female  
Route of administration: Feeding and injection  
Doses/concentration levels: 500 and 730 ppm  
Exposure period: minimum of 72 hours  
Statistical methods: Poisson analysis; binomial distribution, as suggested by Margolin *et al* (1983); comparison to historical control, as described by Mason *et al* (1992)  
Remarks: Two or three glass fiber filter discs were saturated with the test substance in water at a concentration of 730 ppm at the bottom of a standard glass vial. Male *Drosophila* were treated in the vial. Concurrent control males were treated with water only. Solutions were renewed at 24 and 48 hours. After 72 hours of exposure, surviving males were mated. Because the feeding exposure was found to be nonmutagenic, 2 to 3 day-old males were injected with 0.7% NaCl solution containing the test substance at a concentration of 500 ppm. At 24 hours post injection, toxicity was noted and survivors were mated. F<sub>2</sub> cultures were scored as presumptive lethals if the number of wild-type males recovered was 0, 1 or fewer than 5% of the number of *Basc* males (or heterozygous *Basc/+* females). For the test substance to be considered mutagenic, the mutant frequency in the treated series (treated frequency) must exceed 0.15% with a *P* value of < 0.05, or the treated frequency must exceed 0.10% with a *P* value of < 0.01. If the treated frequency is between 0.10% and 0.15% and the *P* value is between 0.1 and 0.01, or if the treated frequency is higher than 0.15% and the *P* value is

between 0.1 and 0.05, the result is considered equivocal. All other results are considered negative.

### Results

PCE/NCE ratio:	Not stated
Genotoxic effects:	Negative
NOAEL (NOEL):	Not stated
Statistical results:	Described below
Remarks:	Mortality was found to be 22 and 4% in the 730 and 500 ppm dose groups, respectively. Percent sterility was 0 in both groups. Percent lethals (total number of lethals per total tests performed x 100) were 0.04, 0.12, 0.12 and 0.05% in the 730, 0, 500 and 0 ppm dose groups, respectively.

### Conclusions

Remarks:	The test substance was considered to be nonmutagenic under the conditions of this test. (Author of article) The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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### Data Quality

Reliability (Klimisch):	2A
Remarks:	Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

### References

Fouremant, P., J. M. Mason, R. Valencia and S. Zimmering. 1994. Chemical Mutagenesis Testing in *Drosophila*. X. Results of 70 Coded Chemicals Tested for the National Toxicology Program. Environ. Mol. Mutagen. 23:208 - 227.

### Other

Last changed:	December 17, 2003
Order number for sorting:	115
Remarks:	

## 5.6 GENETIC TOXICITY *IN VIVO*

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Technical, not analyzed for purity  
Remarks:

### Method

Method/Guideline followed: Not stated  
Type: Sex-linked recessive lethal (SLRL) mutation  
GLP: Not stated  
Year: 1984  
Species: *Drosophila melanogaster*  
Strain: Canton-S and *Basc*  
Sex: Male and female  
Route of administration: Feeding and injection  
Doses/concentration levels: 600, 700 and 7000 ppm  
Exposure period: Minimum of 72 hours  
Statistical methods: Poisson analysis and methods suggested by Margolin *et al* (1983)  
Remarks: Glass fiber filter material was saturated with the test solution at concentrations of 600 and 700 ppm at the bottom of a standard glass vial. Male *Drosophila* were treated in the vials. Concurrent control males were treated with water only. Solutions were renewed at 24 and 48 hours. After 72 hours of exposure, surviving males were mated. Because the feeding exposure was found to be nonmutagenic, males were injected with 0.7% NaCl solution containing the test substance at a concentration of 7000 ppm. Males to be injected were held on regular food for one to three days. After the injection, males were held for 24 hours to recover and then were mated. F<sub>2</sub> cultures were scored as presumptive lethals if the number of wild-type males recovered was 0, 1 or fewer than 5% of the number of *Basc* males (or heterozygous *Basc/+* females). Lethal-bearing cultures were defined as containing 5% or fewer of the expected number of wild-type males. A SLRL was considered negative if  $p \leq 0.06$ , equivocal if  $p = 0.04$  to  $0.06$ , either questionable or positive if  $p = 0.01$  to  $0.04$  (depending on the control frequency) and positive if  $P \geq 0.01$ . Generally, a test was considered positive if the frequency of lethals in the treated series exceeded 0.2% over the control frequency.

## Results

PCE/NCE ratio: Not stated  
Genotoxic effects: Negative  
NOAEL (NOEL): Not stated  
Statistical results: Described below  
Remarks: The results of the feeding study were equivocal and the results of the injection study were negative. Mortality was found to be 5, 20 and 5% in the 600, 700 and 7000 ppm dose groups, respectively. Percent sterility was 0 in the 600 and 7000 ppm dose groups and 2 in the 700 ppm dose group. The percent lethals (total number of lethals per total tests performed x 100) were as follows:

600 ppm = 0.06%  
0 ppm = 0.03%  
700 ppm = 0.16%  
0 ppm = 0.03%  
7000 ppm = 0.08%  
0 ppm = 0.05%

## Conclusions

Remarks: The test substance was considered to be nonmutagenic under the conditions of this test. (Author of article)  
The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

## Data Quality

Reliability (Klimisch): 2A  
Remarks: Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

## References

Valencia, R., J. M. Mason, R. C. Woodruff and S. Zimmering. 1985. Chemical Mutagenesis Testing in *Drosophila*. III. Results of 48 Coded Compounds Tested for the National Toxicology Program. Environ. Mutagen. 7:325 - 348.

## Other

Last changed: December 17, 2003  
Order number for sorting: 128  
Remarks:

## 5.9 DEVELOPMENTAL TOXICITY/TERATOGENICITY

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Inhalation  
GLP: No  
Year: 1975  
Species: Rat  
Strain: Not stated  
Route of administration: Inhalation  
Duration of test: Until gestation day 21  
Doses/concentration levels: 3, 15 and 100 mg/m<sup>3</sup>  
Sex: Female  
Exposure period: Exposure scenario 1: Throughout the entire pregnancy;  
Exposure scenario 2: On day 4 of pregnancy (implantation period) at 100 and 3 mg/m<sup>3</sup> only; or  
Exposure scenario 3: On day 9 of pregnancy (placental period)  
Frequency of treatment: Not stated  
Control group and treatment: Yes, treatment not described  
Post exposure observation period: See remarks below  
Statistical methods: Not stated  
Remarks: The embryotropic effect was assessed in the course of the necropsy performed on the 21<sup>st</sup> day of pregnancy. At necropsy, fetuses were counted, weighed and measured; corpora lutea, implantation sites, and early and late resorptions were counted; and placentas were measured and weighed.

### Results

Maternal toxicity NOEL: 3 mg/m<sup>3</sup>  
Developmental toxicity NOEL: 3 mg/m<sup>3</sup>  
Actual dose received: 3 ± 2.6 mg/m<sup>3</sup>  
15 ± 1.5 mg/m<sup>3</sup>  
100 ± 7.0 mg/m<sup>3</sup>  
Maternal and fetal data: Maternal data: Behavior of the animals in the exposure groups did not differ from the control groups. Detailed physical examination on day 17 of pregnancy did not reveal any statistically significant differences with regard to indicators of

neuromuscular excitement, morphological composition of the peripheral blood or respiration rate in any of the treated animals compared to the control group. Animals exposed to 15 and 100 mg/m<sup>3</sup> gained significantly less weight than the control group.

Fetal data: The number of implantation sites and the number of fetuses per female was reduced (statistically significant) at 100 mg/m<sup>3</sup> in the group of females exposed on day 4 of pregnancy (exposure scenario 2). Fetal body weight was statistically significantly reduced in all exposure groups compared to control when exposed during the entire pregnancy (exposure scenario 1). Dams exposed to 15 or 100 mg/m<sup>3</sup> gained significantly less weight than the control group, which could result in reduced fetal body weight. However, the data for maternal body weights were not provided and, therefore, it could not be determined if maternal body weights also were reduced at 3 mg/m<sup>3</sup> compared to the control group.

Statistically significant decreases in fetal body weights and length also were noted in the 3 mg/m<sup>3</sup> groups but not at higher exposure concentrations when the females were exposed on day 4 or 9 of pregnancy. Since these effects were not dose-related, they are not considered to be biologically significant.

Statistical results:

Remarks:

See comments above

Pregnancy status (# pregnant/# inseminated)

Exposure scenario 1: 10/10 females per group

Exposure scenario 2: 8/9 and 6/6 females in the 100 and 3 mg/m<sup>3</sup> groups, respectively;

Exposure scenario 3: 8/8, 5/8 and 7/8 females in the 100, 15 and 3 mg/m<sup>3</sup> groups, respectively.

## Conclusions

Remarks:

In studying the embryotropic effect of piperidine the most significant changes occurred when the animals were exposed to 100 mg/m<sup>3</sup> during the entire course of pregnancy and on the fourth day of pregnancy. Piperidine has no specific embryotropic effect. (Author of article)  
Piperidine is not a selective developmental toxicant. This endpoint has been adequately characterized (American Chemistry Council,

Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability (Klimisch):

2D

Remarks:

Reliable with restrictions; translation of Russian article; minimum information provided on the methodology (i.e. length of daily exposures not stated, treatment of controls not stated); and fetal evaluations limited to external examination.

**References**

Timofievskaya, L.A. and I.V. Silantyeva. 1975. Study of Piperidine Effect on Embryogenesis. The USSR Academy of Medical Science. Toxicology of New Industrial Chemical Substances, 14:40-46.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

51

Remarks:

## 5.10 ADDITIONAL REMARKS

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: I.P.; hepatotoxicity  
GLP: Not stated  
Year: 1996  
Species: Rat  
Strain: Sprague-Dawley  
Route of administration: I.P.  
Duration of test: 6 days  
Doses/concentration levels: 1.25 mmol  
Sex: Male  
Exposure period: 5 days  
Frequency of treatment: Daily for 5 days  
Control group and treatment: Yes, saline  
Post exposure observation period: None  
Statistical methods: Means  $\pm$  standard errors; ANOVA; Student-Newman-Keuls' test  
Remarks: This study was conducted to examine the hepatotoxicity and nephrotoxicity of repeated i.p. dosing with pyridine and its metabolites in rats. The effect of pyridine on hepatic xenobiotic metabolizing ability was also measured. In a preliminary study group, five adult male rats were administered 2.5 mmol of the test substance per kg body weight i.p. in saline 18 hours prior to sacrifice. To examine repeated dosing, the test substance was administered to five adult male rats i.p. daily for five days. Because of the concern for possible excessive cumulative toxicity, the dose was lowered to 1.25 mmol/kg. The animals were killed 18 hours after the last i.p. dose. Serum sorbitol dehydrogenase (SDH), blood urea nitrogen (BUN), serum creatinine and *p*-nitrophenol hydroxylase, were measured.

### Results

NOAEL (NOEL): Not determined  
LOAEL (LOEL): Not determined  
Actual dose received: 1.25 mmol/kg I.p.

Toxic response/effects:	Described below
Statistical results:	Described below
Remarks:	At the 2.5 mmol/kg dose level (single dose), the test substance did not cause increases in SDH, BUN or creatine. It did, however, increase <i>p</i> -nitrophenol hydroxylation activity. At the 1.25 mmol/kg dose level (5 days of dosing), the test substance was hepatotoxic as indicated by increased serum SDH. It also slightly increased BUN. An increase in <i>p</i> -nitrophenol hydroxylase indicated that repeated i.p. dosing of pyridine also induced the metabolism of <i>p</i> -nitrophenol.

### Conclusions

Remarks:	This study is included to provide additional information. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
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### Data Quality

Reliability (Klimisch):	2D
Remarks:	Reliable with restrictions; only examined liver and kidney toxicity.

### References

Carlson, G. P. 1996. Comparison of the Effects of Pyridine and Its Metabolites on Rat Liver and Kidney. *Toxicol. Lett.* 85:173 - 178.

### Other

Last changed:	December 17, 2003
Order number for sorting:	93
Remarks:	

## 5.10 ADDITIONAL REMARKS

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Inhalation  
GLP: Not stated  
Year: 1994  
Species: Rat  
Strain: Fischer 344  
Route of administration: Inhalation (nose-only)  
Duration of test: 4 days  
Doses/concentration levels: 5 and 444 ppm  
Sex: Male  
Exposure period: 4 days  
Frequency of treatment: 6 hours/day  
Control group and treatment: Yes, filtered air  
Post exposure observation period: None  
Statistical methods: Not stated  
Remarks: The purpose of this test was to examine the effect of inhaled pyridine on the morphology of nasal tissue. Two groups consisting of five male rats were administered the test substance via inhalation at concentrations of  $5.1 \pm 0.4$  or  $444.0 \pm 16$  ppm for six hours/day for four days. A control group consisting of ten rats was exposed to filtered air. Rats were 13 to 15 weeks old and weighing 210 to 285 g. Rats were acclimated to the laboratory conditions for three days prior to test substance exposure. Eighteen to 20 hours after the final exposure to air or test substance, the rats were sacrificed and the nasal cavity and skull, including the brain and nasal tissues, were prepared for microscopic examination.

### Results

NOAEL (NOEL) < 5 ppm  
LOAEL (LOEL) 5 ppm  
Actual dose received: 4.7 to 5.5 ppm or 428 to 460 ppm  
Toxic response/effects: Described below  
Statistical results: Not stated  
Remarks: Olfactory epithelial lesions in rats exposed to both concentrations of the test substance included

vacuolar degeneration of sustentacular cells; focal, marked attenuation of the epithelium; loss of neurons; and the presence of intraepithelial luminal structures. The lesions were only slightly more severe in the rats exposed to 444 ppm compared to those rats exposed to 5 ppm of the test substance.

### Conclusions

Remarks:

The results showed that inhalation of the test substance at concentrations of 5 or 444 ppm caused lesions in the olfactory epithelium of rats. (Author of article)

This study is included to provide additional information. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch):

Remarks:

2D

Reliable with restrictions; involved only the histopathology exam of nasal tissue after inhalation exposure, which is not according to guidelines.

### References

Nikula, K. J. and J. L. Lewis. 1994. Olfactory Mucosal Lesions in F344 Rats Following Inhalation Exposure to Pyridine at Threshold Limit Value Concentrations. *Fundam. Appl. Toxicol.* 23:510 - 517.

### Other

Last changed:

Order number for sorting:

Remarks:

December 17, 2003

99

## 5.10 ADDITIONAL REMARKS

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: Not stated  
Remarks:

### Method

Method/guideline followed: Not stated  
Test type: Subcutaneous injection  
GLP: No  
Year: 1971  
Species: Rat  
Strain: Fischer 344  
Route of administration: Subcutaneous injection  
Duration of test: 18 months  
Doses/concentration levels: 3, 10, 30 and 100 mg/kg  
Sex: Male and female  
Exposure period: 52 weeks  
Frequency of treatment: Twice weekly  
Control group and treatment: Yes; described below  
Post exposure observation period: 6 months  
Statistical methods: Not stated  
Remarks: A range-finding study was conducted to determine the repeated injection maximum tolerated dose (MTD) of the test substance and therefore choose dose levels for the definitive study. Groups of 20, 40, 60 and 80 rats (equal numbers of males and females), four weeks old and weighing approximately 60 g on arrival, were administered the test substance at concentrations of 3, 10, 30 and 100 mg/kg, respectively. Treatment consisted of twice-weekly injections for 52 weeks, with the dose level maintained on the mg/kg basis by adjusting the injection volumes to the body weights. Three types of control groups were used: 1) vehicle controls (60 males and 60 females) received twice weekly injections of saline at 0.25 ml per injection; 2) negative controls (60 males and 60 females) received no treatment; and 3) positive controls (80 males and 80 females) received predetermined fixed doses of nickel sulfide. Rats were examined daily for abnormalities and were weighed weekly throughout the study. After the 52-week treatment period, the experimental rats were kept for observation for an additional six months. All

experimental rats were necropsied after they died or were sacrificed. Organ weights were obtained and select tissues preserved for histopathological examinations. Each rat was autopsied either 12 or 18 months after study initiation. All spontaneous deaths, moribund rats and those showing gross pathology or abnormal organ weights were examined histologically in addition to those chosen for routine examination. Only three major criteria were considered for assaying toxicity: survival time, weight gains and drug-related organ pathology.

## Results

NOAEL (NOEL):	Not stated
LOAEL (LOEL):	Not stated
Actual dose received:	Not stated
Toxic response/effects:	Described below
Statistical results:	Not stated
Remarks:	The mortality rate of the treated groups was similar to the vehicle and negative control groups. Of the 200 rats treated with the test substance, three (1.5%) rats died within 12 months and eight (4.0%) rats died within 18 months. Of the 120 rats in the negative control group, four (2.0%) and seven (5.8%) rats died within 12 and 18 months, respectively. Of the 120 rats in the vehicle control group, four (2.0%) and ten (8.3%) rats died within 12 and 18 months, respectively. Of the 160 rats in the positive control group, 120 (75.0%) and 144 (90.0%) rats died within 12 and 18 months, respectively. For the 12-month period, the test substance had an average retardation of weight gained of 11% for the highest dose level. At lower dose levels, the retardation of weight gains was less significant. For the 18-month period, there was a good recovery almost to normal. No remarkable test substance related organ pathology was observed.

## Conclusions

Remarks:	There was no indication that this test substance was carcinogenic in this study. (Author of article) The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).
----------	--

**Data Quality**

Reliability (Klimisch):

2A

Remarks:

Reliable with restrictions; acceptable, well-documented publication which meets basic scientific principles.

**References**

Mason, M. M., C. C. Cate and J. Baker. 1971. Toxicology and Carcinogenesis of Various Chemicals Used in the Preparation of Vaccines. Clin. Toxicol. 4(2):185 - 204.

**Other**

Last changed:

December 17, 2003

Order number for sorting:

144

Remarks:

201-14925B2

Robust Summaries of QSAR Model Data for  
Pyridine and Pyridine Derivatives HPV Category

Appendix B

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**3.5 BIODEGRADABILITY**

Piperidine (CAS RN 110-89-4).  
U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10;  
Biodegradation Probability Program (BIOWIN), Version 4.00; PC-  
Computer software developed by EPA's Office of Pollution Prevention  
Toxics and Syracuse Research Corporation (SRC). ..... 62

**4.1 ACUTE/PROLONGED TOXICITY TO FISH**

Piperidine (CAS RN 110-89-4).  
U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10;  
ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR  
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Pyridine (CAS RN 110-86-1).  
U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10;  
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Program, Risk Assessment Division (7403), Washington, D.C. .... 64

4-Picoline (CAS RN 108-89-4).  
U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10;  
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Program, Risk Assessment Division (7403), Washington, D.C. .... 65

3-Picoline (CAS RN 108-99-6).  
U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10;  
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Program, Risk Assessment Division (7403), Washington, D.C. .... 66

2-Picoline (CAS RN 109-06-8).  
U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10;  
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Picolinonitrile (CAS RN 100-70-9).  
U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10;  
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## 2.1 MELTING POINT

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) – Estimated value was obtained using the Joback Group Contribution Method and Gold and Ogle Method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

### Results

Melting Point: Estimated (mean of both methods) = -24.69 °C  
Experimental database match = -11.03 °C  
Decomposition: N/A  
Sublimation: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; MPBPWIN Program, Version 1.40; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) – Estimated value was obtained using the Joback Group Contribution Method and Gold and Ogle Method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

### Results

Melting Point: Estimated (mean of both methods) = -44.54 °C  
Experimental database match = -41.6 °C  
Decomposition: N/A  
Sublimation: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; MPBPWIN Program, Version 1.40; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the Joback  
Group Contribution Method and Gold and Ogle  
Method.

GLP: N/A

Year: 2003

Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: vapor  
pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling  
point of 145.0°C and melting point of 3.66°C.

### Results

Melting Point: Estimated (mean of both methods) = -25.92 °C  
Experimental database match = 3.66 °C

Decomposition: N/A

Sublimation: N/A

Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2

Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003

Order Number for Sorting:

Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) – Estimated value was obtained using the Joback Group Contribution Method and Gold and Ogle Method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C and melting point of -18.30°C.

### Results

Melting Point: Estimated (mean of both methods) = -25.92 °C  
Experimental database match = -18.1 °C  
Decomposition: N/A  
Sublimation: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; MPBPWIN Program, Version 1.40; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) – Estimated value was obtained using the Joback Group Contribution Method and Gold and Ogle Method.

GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

### Results

Melting Point: Estimated (mean of both methods) = -25.92 °C  
Experimental database match = -66.7 °C

Decomposition: N/A  
Sublimation: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; MPBPWIN Program, Version 1.40; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

## **Other Available Reports**

### **Other**

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the Joback  
Group Contribution Method and Gold and Ogle  
Method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 240°C and melting point of 50°C.

### Results

Melting Point: Estimated (mean of both methods) = 25.39 °C  
Experimental database match = 51 °C  
Decomposition: N/A  
Sublimation: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.1 MELTING POINT

### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the Joback  
Group Contribution Method and Gold and Ogle  
Method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 222°C and melting point of 29°C.

### Results

Melting Point: Estimated (mean of both methods) = 25.39 °C  
Experimental database match = 29 °C  
Decomposition: N/A  
Sublimation: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) – Estimated value was obtained using the adapted Stein and Brown method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

### Results

Boiling Point: Estimated = 127.91 °C  
Experimental database match = 106.2 °C  
Pressure: N/A  
Pressure Unit: N/A  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; MPBPWIN Program, Version 1.40; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) – Estimated value was obtained using the adapted Stein and Brown method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

### Results

Boiling Point: Estimated = 113.36 °C  
Experimental database match = 115.2 °C  
Pressure: N/A  
Pressure Unit: N/A  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; MPBPWIN Program, Version 1.40; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the adapted  
Stein and Brown method.

GLP: N/A

Year: 2003

Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: vapor  
pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling  
point of 145.0°C and melting point of 3.66°C.

### Results

Boiling Point: Estimated = 136.41 °C  
Experimental database match = 145.3 °C

Pressure: N/A

Pressure Unit: N/A

Decomposition: N/A

Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2

Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003

Order Number for Sorting:

Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the adapted  
Stein and Brown method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 143.9°C and melting point of –18.30°C.

### Results

Boiling Point: Estimated = 136.41 °C  
Experimental database match = 144.1 °C  
Pressure: N/A  
Pressure Unit: N/A  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the adapted  
Stein and Brown method.

GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following four  
permutations of physico-chemical property input  
values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -66.8°C.

### Results

Boiling Point: Estimated = 136.41 °C  
Experimental database match = 129.3 °C

Pressure: N/A  
Pressure Unit: N/A  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

## **Other Available Reports**

### **Other**

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the adapted  
Stein and Brown method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 240°C and melting point of 50°C.

### Results

Boiling Point: Estimated = 200.84 °C  
Experimental database match = 206.9 °C  
Pressure: N/A  
Pressure Unit: N/A  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.2 BOILING POINT

### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the adapted  
Stein and Brown method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 222°C and melting point of 29°C.

### Results

Boiling Point: Estimated = 200.84 °C  
Experimental database match = 224.5 °C  
Pressure: N/A  
Pressure Unit: N/A  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value is the mean of values obtained  
using the Antoine and Modified Grain methods.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: water  
solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm  
Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

### Results

Vapor Pressure: Estimated (mean of both methods) = 28.5 mm Hg  
Experimental database match = 32.1 mm Hg  
Temperature: 25°C  
Decomposition: N/A  
Remarks: Experiment match reference: Yaws, C. L. (1994)

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value is the mean of values obtained  
using the Antoine and Modified Grain methods.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: vapor  
pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling  
point of 115.2°C and melting point of -41.6°C.

### Results

Vapor Pressure: Estimated (mean of both methods) = 19.3 mm Hg  
Experimental database match = 20.8 mm Hg  
Temperature: 25°C  
Decomposition: N/A  
Remarks: Experiment match reference: Daubert, T. E. and R.  
P. Danner (1989)

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value is the mean of values obtained  
using the Antoine and Modified Grain methods.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: vapor  
pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling  
point of 145.0°C and melting point of 3.66°C.

### Results

Vapor Pressure: Estimated (mean of both methods) = 5.05 mm Hg  
Experimental database match = 5.77 mm Hg  
Temperature: 25°C  
Decomposition: N/A  
Remarks: Experiment match reference: Chao, J. et al. (1983)

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value is the mean of values obtained  
using the Antoine and Modified Grain methods.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 143.9°C and melting point of –18.30°C.

### Results

Vapor Pressure: Estimated (mean of both methods) = 5.32 mm Hg  
Experimental database match = 6.05 mm Hg  
Temperature: 25°C  
Decomposition: N/A  
Remarks: Experiment match reference: Chao, J. et al. (1983)

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value is the mean of values obtained  
using the Antoine and Modified Grain methods.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following four  
permutations of physico-chemical property input  
values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11,  
boiling point of 128.8°C and melting point of -66.8°C.

### Results

Vapor Pressure: Estimated (mean of both methods) = 10.6 mm Hg  
Experimental database match = 11.2 mm Hg  
Temperature: 25°C  
Decomposition: N/A  
Remarks: Experiment match reference: Chao, J. et al. (1983)

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

**Other**

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the Modified  
Grain Method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 240°C and melting point of 50°C.

### Results

Vapor Pressure: 0.0262 mm Hg  
Temperature: 25°C  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.4 VAPOR PRESSURE

### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) MPBPWIN Program (v 1.40) –  
Estimated value was obtained using the Modified  
Grain Method.  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 222°C and melting point of 29°C.

### Results

Vapor Pressure: 0.102 mm Hg  
Temperature: 25°C  
Decomposition: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; MPBPWIN Program,  
Version 1.40; PC-Computer software developed by  
EPA's Office of Pollution Prevention Toxics and  
Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

### Method

Method: EPIWIN (v 3.10), KOWWIN Program (v 1.66)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

### Results

Log  $K_{ow}$ : 1.19  
Temperature °C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; KOWWIN Program, Version 1.66; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

#### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

### Method

Method: EPIWIN (v 3.10), KOWWIN Program (v 1.66)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

### Results

Log  $K_{ow}$ : 0.80  
Temperature °C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; KOWWIN Program, Version 1.66; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

#### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

### Method

Method: EPIWIN (v 3.10), KOWWIN Program (v 1.66)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling point of 145.0°C and melting point of 3.66°C.

### Results

Log  $K_{ow}$ : 1.35  
Temperature °C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; KOWWIN Program, Version 1.66; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

#### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

### Method

Method: EPIWIN (v 3.10), KOWWIN Program (v 1.66)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C and melting point of -18.30°C.

### Results

Log K<sub>ow</sub>: 1.35  
Temperature °C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; KOWWIN Program, Version 1.66; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

### Method

Method: EPIWIN (v 3.10), KOWWIN Program (v 1.66)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

### Results

Log  $K_{ow}$ : 1.35  
Temperature °C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; KOWWIN Program, Version 1.66; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

### Method

Method: EPIWIN (v 3.10), KOWWIN Program (v 1.66)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 240°C and melting point of 50°C.

### Results

Log  $K_{ow}$ : 0.35  
Temperature °C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; KOWWIN Program, Version  
1.66; PC-Computer software developed by EPA's  
Office of Pollution Prevention Toxics and Syracuse  
Research Corporation (SRC).

### Other Available Reports

#### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.5 PARTITION COEFFICIENT

### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

### Method

Method: EPIWIN (v 3.10), KOWWIN Program (v 1.66)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 222°C and melting point of 29°C.

### Results

Log  $K_{ow}$ : 0.35  
Temperature °C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized.  
(American Chemistry Council, Pyridine and  
Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI  
Suite™, Version 3.10; KOWWIN Program, Version  
1.66; PC-Computer software developed by EPA's  
Office of Pollution Prevention Toxics and Syracuse  
Research Corporation (SRC).

### Other Available Reports

#### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10), WSKOW Program (v 1.40)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84, boiling point of 106.3°C and MW of 85.15.

### Results

Solubility: Estimated (mean of both methods) = 249,400mg/L  
Experimental database match = 1,000,000 mg/L  
Temperature: 25°C  
pH value and concentration: N/A  
pKa value at 25°C: N/A  
Remarks: Experiment match reference: Yalkowsky, S. H. and R. M. Dannenfelser (1992)

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; WSKOW Program, Version 1.36; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10), WSKOW Program (v 1.40)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C, melting point of -41.6°C and MW of 79.10.

### Results

Solubility: Estimated (mean of both methods) = 936,300 mg/L  
Experimental database match = 1,000,000 mg/L  
Temperature: 25°C  
pH value and concentration: N/A  
pKa value at 25°C: N/A  
Remarks: Experiment match reference: Goe, G. L. (1978)

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; WSKOW Program, Version 1.36; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10), WSKOW Program (v 1.40)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling point of 145.0°C, melting point of 3.66°C and MW of 93.13.

### Results

Solubility: Estimated (mean of both methods) = 276,400 mg/L  
Experimental database match = 1,000,000 mg/L  
Temperature: 25°C  
pH value and concentration: N/A  
pKa value at 25°C: N/A  
Remarks: Experiment match reference: Goe, G. L. (1978)

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; WSKOW Program, Version 1.36; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10), WSKOW Program (v 1.40)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C, melting point of -18.30°C and MW of 93.13.

### Results

Solubility: Estimated (mean of both methods) = 288,800 mg/L  
Experimental database match = 1,000,000 mg/L  
Temperature: 25°C  
pH value and concentration: N/A  
pKa value at 25°C: N/A  
Remarks: Experiment match reference: Goe, G. L. (1978)

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; WSKOW Program, Version 1.36; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10), WSKOW Program (v 1.40)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values: MW of 93.13 and  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
or  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

### Results

Solubility: Estimated (mean of both methods) = 352,400 mg/L  
Experimental database match = 1,000,000 mg/L  
Temperature: 25°C  
pH value and concentration: N/A  
pKa value at 25°C: N/A  
Remarks: Experiment match reference: Riddick, J. A. et al. (1986)

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; WSKOW Program, Version 1.36; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last Changed: October 9, 2003

Order Number for Sorting:

Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10), WSKOW Program (v 1.40)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 240°C, melting point of 50°C and MW of 104.11.

### Results

Solubility: 27,920 mg/L  
Temperature: 25°C  
pH value and concentration: N/A  
pKa value at 25°C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; WSKOW Program, Version 1.36; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

## 2.6 WATER SOLUBILITY

### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10), WSKOW Program (v 1.40)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 222°C, melting point of 29°C and MW of 104.11.

### Results

Solubility: 35,710 mg/L  
Temperature: 25°C  
pH value and concentration: N/A  
pKa value at 25°C: N/A  
Remarks:

### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability: 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; WSKOW Program, Version 1.36; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

### Other Available Reports

### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

### 3.1.1 PHOTODEGRADATION

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10), AOPWIN Program (v 1.90)  
Type: N/A  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

#### Results

Concentration of substance: N/A  
Temperature °C: N/A  
Direct photolysis: N/A  
Indirect photolysis: N/A  
Breakdown products: N/A  
Remarks: Overall OH Rate Constant ( $k_{phot}$ ) =  $8.86 \text{ E-}11 \text{ cm}^3/\text{molecule-sec}$   
 $t_{1/2} = 0.121 \text{ days (12-hour day; } 1.5 \text{ E6 OH/cm}^3\text{)}$

#### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; AOPWIN Program, Version 1.90; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 3.1.1 PHOTODEGRADATION

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10), AOPWIN Program (v 1.90)  
Type: N/A  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

#### Results

Concentration of substance: N/A  
Temperature °C: N/A  
Direct photolysis: N/A  
Indirect photolysis: N/A  
Breakdown products: N/A  
Remarks: Overall OH Rate Constant ( $k_{phot}$ ) = 3.70 E-11  $cm^3/molecule\text{-sec}$   
 $t_{1/2}$  = 28.9 days (12-hour day; 1.5 E6 OH/ $cm^3$ )

#### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; AOPWIN Program, Version 1.90; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 3.1.1 PHOTODEGRADATION

#### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10), AOPWIN Program (v 1.90)  
Type: N/A  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling point of 145.0°C and melting point of 3.66°C.

#### Results

Concentration of substance: N/A  
Temperature °C: N/A  
Direct photolysis: N/A  
Indirect photolysis: N/A  
Breakdown products: N/A  
Remarks: Overall OH Rate Constant ( $k_{phot}$ ) = 1.102 E-12  $cm^3/molecule\text{-}sec$   
 $t_{1/2}$  = 9.707 days (12-hour day; 1.5 E6 OH/ $cm^3$ )

#### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; AOPWIN Program, Version 1.90; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 3.1.1 PHOTODEGRADATION

#### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10), AOPWIN Program (v 1.90)  
Type: N/A  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C and melting point of -18.30°C.

#### Results

Concentration of substance: N/A  
Temperature °C: N/A  
Direct photolysis: N/A  
Indirect photolysis: N/A  
Breakdown products: N/A  
Remarks: Overall OH Rate Constant ( $k_{\text{phot}}$ ) = 1.102 E-12 cm<sup>3</sup>/molecule-sec  
 $t_{1/2}$  = 9.707 days (12-hour day; 1.5 E6 OH/cm<sup>3</sup>)

#### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; AOPWIN Program, Version 1.90; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 3.1.1 PHOTODEGRADATION

#### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10), AOPWIN Program (v 1.90)  
Type: N/A  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

#### Results

Concentration of substance: N/A  
Temperature °C: N/A  
Direct photolysis: N/A  
Indirect photolysis: N/A  
Breakdown products: N/A  
Remarks: Overall OH Rate Constant ( $k_{phot}$ ) = 1.102 E-12  $cm^3/molecule\text{-}sec$   
 $t_{1/2}$  = 9.707 days (12-hour day; 1.5 E6 OH/ $cm^3$ )

#### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; AOPWIN Program, Version 1.90; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.1.1 PHOTODEGRADATION

#### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10), AOPWIN Program (v 1.90)  
Type: N/A  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 240°C and melting point of 50°C.

#### Results

Concentration of substance: N/A  
Temperature °C: N/A  
Direct photolysis: N/A  
Indirect photolysis: N/A  
Breakdown products: N/A  
Remarks: Overall OH Rate Constant ( $k_{\text{phot}}$ ) = 6.53 E-14 cm<sup>3</sup>/molecule-sec  
 $t_{1/2}$  = 163.72 days (12-hour day; 1.5 E6 OH/cm<sup>3</sup>)

#### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; AOPWIN Program, Version 1.90; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 3.1.1 PHOTODEGRADATION

#### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10), AOPWIN Program (v 1.90)  
Type: N/A  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 222°C and melting point of 29°C.

#### Results

Concentration of substance: N/A  
Temperature °C: N/A  
Direct photolysis: N/A  
Indirect photolysis: N/A  
Breakdown products: N/A  
Remarks: Overall OH Rate Constant ( $k_{\text{phot}}$ ) = 6.53 E-14 cm<sup>3</sup>/molecule-sec  
 $t_{1/2}$  = 163.72 days (12-hour day; 1.5 E6 OH/cm<sup>3</sup>)

#### Conclusions

The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; AOPWIN Program, Version 1.90; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 3.3.2 TRANSPORTATION BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY MODEL)

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A  
Remarks:

#### Method

Method/Guideline followed: EPIWIN (v 3.10) LEVEL3NT (v 1.01); Mackay's EQC Level III Fugacity Model  
Media: Water, air, soil and sediment (model run with 1000 kg/hr emissions to air)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

#### Results

Remarks: Following are the results from the model:

Level III Fugacity Model (Full-Output):

=====

Chem Name : Piperidine  
Molecular Wt: 85.15  
Henry's LC : 4.45e-006 atm-m3/mole (Henry database)  
Vapor Press : 32.1 mm Hg (user-entered)  
Log Kow : 0.84 (user-entered)  
Soil Koc : 2.84 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	69.9	2.9	1000
Water	16.1	360	0
Soil	14.1	360	0
Sediment	0.0284	1.44e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	1.15e-011	956	40	95.6	4
Water	2.4e-013	1.77	0.918	0.177	0.0918
Soil	6.34e-012	1.55	0	0.155	0
Sediment	1.98e-013	0.00078	3.24e-005	7.8e-005	3.24e-006

Persistence Time: 5.72 hr  
Reaction Time: 5.96 hr  
Advection Time: 140 hr  
Percent Reacted: 95.9  
Percent Advected: 4.09

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):

Air: 2.897  
Water: 360  
Soil: 360  
Sediment: 1440  
Biowin estimate: 3.035 (weeks )

Advection Times (hr):

Air: 100  
Water: 1000  
Sediment: 5e+004

**Conclusions:**

**Mass Amounts:**

Air = 70 %  
Water = 16 %  
Soil = 14 %  
Sediment < 0.1%

**Remarks:**

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2

Remarks:

Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Mackay's Equilibrium Concentration Model (EQC) Fugacity Model, LEVEL3NT (v 1.01); PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.3.2 TRANSPORTATION BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY MODEL)

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A  
Remarks:

#### Method

Method/Guideline followed: EPIWIN (v 3.10) LEVEL3NT (v 1.01); Mackay's EQC Level III Fugacity Model  
Media: Water, air, soil and sediment (model run with 1000 kg/hr emissions to air)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

#### Results

Remarks: Following are the results from the model:

Level III Fugacity Model (Full-Output):

=====

Chem Name : Pyridine  
Molecular Wt: 79.1  
Henry's LC : 1.1e-005 atm-m3/mole (Henry database)  
Vapor Press : 20 mm Hg (user-entered)  
Log Kow : 0.64 (user-entered)  
Soil Koc : 1.79 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	79	694	1000
Water	14.6	360	0
Soil	6.41	360	0
Sediment	0.0252	1.44e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	2.64e-010	85.4	855	8.54	85.5
Water	1.1e-011	30.4	15.8	3.04	1.58
Soil	1.56e-010	13.4	0	1.34	0
Sediment	9.1e-012	0.0131	0.000546	0.00131	5.46e-005

Persistence Time: 108 hr  
Reaction Time: 838 hr  
Advection Time: 124 hr  
Percent Reacted: 12.9  
Percent Advected: 87.1

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):

Air: 693.8  
Water: 360  
Soil: 360  
Sediment: 1440  
Biowin estimate: 2.810 (weeks )

Advection Times (hr):

Air: 100  
Water: 1000  
Sediment: 5e+004

**Conclusions:**

Mass Amounts:

Air = 79 %  
Water = 15 %  
Soil = 6 %  
Sediment < 0.1 %

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2

Remarks:

Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Mackay's Equilibrium Concentration Model (EQC) Fugacity Model, LEVEL3NT (v 1.01); PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.3.2 TRANSPORTATION BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY MODEL)

#### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A  
Remarks:

#### Method

Method/Guideline followed: EPIWIN (v 3.10) LEVEL3NT (v 1.01); Mackay's EQC Level III Fugacity Model  
Media: Water, air, soil and sediment (model run with 1000 kg/hr emissions to air)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling point of 145.0°C and melting point of 3.66°C.

#### Results

Remarks: Following are the results from the model:

Level III Fugacity Model (Full-Output):

=====

Chem Name : Pyridine, 4-methyl-  
Molecular Wt: 93.13  
Henry's LC : 6e-006 atm-m3/mole (Henry database)  
Vapor Press : 7.99 mm Hg (user-entered)  
Log Kow : 1.22 (user-entered)  
Soil Koc : 6.8 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	60.2	233	1000
Water	22.5	900	0
Soil	17.2	900	0
Sediment	0.048	3.6e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	1.89e-010	215	722	21.5	72.2
Water	8.68e-012	20.7	26.9	2.07	2.69
Soil	1.6e-010	15.9	0	1.59	0
Sediment	7.97e-012	0.0111	0.00115	0.00111	0.000115

Persistence Time: 120 hr  
Reaction Time: 477 hr  
Advection Time: 160 hr  
Percent Reacted: 25.1  
Percent Advected: 74.9

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):

Air: 233

Water: 900

Soil: 900

Sediment: 3600

Biowin estimate: 2.704 (weeks-months)

Advection Times (hr):

Air: 100

Water: 1000

Sediment: 5e+004

**Conclusions:**

Mass Amounts:

Air = 60 %

Water = 23 %

Soil = 17 %

Sediment < 0.1 %

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2

Remarks:

Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Mackay's Equilibrium Concentration Model (EQC) Fugacity Model, LEVEL3NT (v 1.01); PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.3.2 TRANSPORTATION BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY MODEL)

#### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A  
Remarks:

#### Method

Method/Guideline followed: EPIWIN (v 3.10) LEVEL3NT (v 1.01); Mackay's EQC Level III Fugacity Model  
Media: Water, air, soil and sediment (model run with 1000 kg/hr emissions to air)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C and melting point of -18.30°C.

#### Results

Remarks: Following are the results from the model:

Level III Fugacity Model (Full-Output):

=====

Chem Name : Pyridine, 3-methyl-  
Molecular Wt: 93.13  
Henry's LC : 7.73e-006 atm-m3/mole (Henry database)  
Vapor Press : 5.32 mm Hg (Mppbpwin program)  
Log Kow : 1.2 (Kowwin program)  
Soil Koc : 6.5 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	63.8	233	1000
Water	22	900	0
Soil	14.1	900	0
Sediment	0.0468	3.6e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	1.91e-010	216	727	21.6	72.7
Water	1.04e-011	19.3	25.1	1.93	2.51
Soil	1.62e-010	12.4	0	1.24	0
Sediment	9.56e-012	0.0103	0.00107	0.00103	0.000107

Persistence Time: 114 hr  
Reaction Time: 459 hr  
Advection Time: 151 hr  
Percent Reacted: 24.8  
Percent Advected: 75.2

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):

Air: 233

Water: 900

Soil: 900

Sediment: 3600

Biowin estimate: 2.704 (weeks-months)

Advection Times (hr):

Air: 100

Water: 1000

Sediment: 5e+004

**Conclusions:**

Mass Amounts:

Air = 64 %

Water = 22 %

Soil = 14 %

Sediment < 0.1 %

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2

Remarks:

Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Mackay's Equilibrium Concentration Model (EQC) Fugacity Model, LEVEL3NT (v 1.01); PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.3.2 TRANSPORTATION BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY MODEL)

#### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A  
Remarks:

#### Method

Method/Guideline followed: EPIWIN (v 3.10) LEVEL3NT (v 1.01); Mackay's EQC Level III Fugacity Model  
Media: Water, air, soil and sediment (model run with 1000 kg/hr emissions to air)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

#### Results

Remarks: Following are the results from the model:

##### Level III Fugacity Model (Full-Output):

=====  
Chem Name : Pyridine, 2-methyl-  
Molecular Wt: 93.13  
Henry's LC : 9.96e-006 atm-m3/mole (Henry database)  
Vapor Press : 10 mm Hg (user-entered)  
Log Kow : 1.11 (user-entered)  
Soil Koc : 5.28 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	67.1	233	1000
Water	21.6	900	0
Soil	11.2	900	0
Sediment	0.0448	3.6e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	1.92e-010	218	731	21.8	73.1
Water	1.26e-011	18.2	23.6	1.82	2.36
Soil	1.69e-010	9.36	0	0.936	0
Sediment	1.16e-011	0.0094	0.000977	0.00094	9.77e-005

Persistence Time: 109 hr  
Reaction Time: 444 hr  
Advection Time: 144 hr  
Percent Reacted: 24.5  
Percent Advected: 75.5

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):

Air: 233  
Water: 900  
Soil: 900  
Sediment: 3600  
Biowin estimate: 2.704 (weeks-months)

Advection Times (hr):

Air: 100  
Water: 1000  
Sediment: 5e+004

**Conclusions:**

**Mass Amounts:**

Air = 67 %  
Water = 22 %  
Soil = 11 %  
Sediment < 0.1 %

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2

Remarks:

Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Mackay's Equilibrium Concentration Model (EQC) Fugacity Model, LEVEL3NT (v 1.01); PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.3.2 TRANSPORTATION BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY MODEL)

#### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A  
Remarks:

#### Method

Method/Guideline followed: EPIWIN (v 3.10) LEVEL3NT (v 1.01); Mackay's  
EQC Level III Fugacity Model  
Media: Water, air, soil and sediment (model run with  
1000 kg/hr emissions to air)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 240°C and melting point of 50°C.

#### Results

Remarks: Following are the results from the model:

Level III Fugacity Model (Full-Output):

=====

Chem Name : 3-Pyridinecarbonitrile  
Molecular Wt: 104.11  
Henry's LC : 2.74e-007 atm-m3/mole (Henry database)  
Vapor Press : 0.0262 mm Hg (Mpbpwin program)  
Liquid VP : 0.0463 mm Hg (super-cooled)  
Melting Pt : 50 deg C (user-entered)  
Log Kow : 0.36 (Kowwin program)  
Soil Koc : 0.939 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	10.8	3.93e+003	1000
Water	33	900	0
Soil	56.1	900	0
Sediment	0.0622	3.6e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	1.2e-010	9.01	511	0.901	51.1
Water	2.05e-012	120	156	12	15.6
Soil	1.2e-010	204	0	20.4	0
Sediment	1.89e-012	0.0566	0.00588	0.00566	0.000588

Persistence Time: 473 hr  
Reaction Time: 1.42e+003 hr  
Advection Time: 709 hr  
Percent Reacted: 33.3  
Percent Advected: 66.7

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):

Air: 3929

Water: 900

Soil: 900

Sediment: 3600

Biowin estimate: 2.673 (weeks-months)

Advection Times (hr):

Air: 100

Water: 1000

Sediment: 5e+004

**Conclusions:**

Mass Amounts:

Air = 11 %

Water = 33 %

Soil = 56 %

Sediment < 0.1 %

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2

Remarks:

Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Mackay's Equilibrium Concentration Model (EQC) Fugacity Model, LEVEL3NT (v 1.01); PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.3.2 TRANSPORTATION BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY MODEL)

#### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A  
Remarks:

#### Method

Method/Guideline followed: EPIWIN (v 3.10) LEVEL3NT (v 1.01); Mackay's  
EQC Level III Fugacity Model  
Media: Water, air, soil and sediment (model run with  
1000 kg/hr emissions to air)  
GLP: N/A  
Year: 2003  
Remarks: The EPIWIN model was run with the following  
physico-chemical property input values: boiling  
point of 222°C and melting point of 29°C.

#### Results

Remarks: Following are the results from the model:

Level III Fugacity Model (Full-Output):

=====

Chem Name : 2-Pyridinecarbonitrile  
Molecular Wt: 104.11  
Henry's LC : 6.81e-008 atm-m3/mole (Henrywin program)  
Vapor Press : 0.102 mm Hg (Mpbpwin program)  
Liquid VP : 0.112 mm Hg (super-cooled)  
Melting Pt : 29 deg C (user-entered)  
Log Kow : 0.45 (Kowwin program)  
Soil Koc : 1.16 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	2.99	3.93e+003	1000
Water	34	900	0
Soil	62.9	900	0
Sediment	0.0644	3.6e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	5.04e-011	3.79	215	0.379	21.5
Water	8e-013	188	245	18.8	24.5
Soil	5.02e-011	349	0	34.9	0
Sediment	7.37e-013	0.0891	0.00926	0.00891	0.000926

Persistence Time: 719 hr  
Reaction Time: 1.33e+003 hr  
Advection Time: 1.57e+003 hr  
Percent Reacted: 54.1  
Percent Advected: 45.9

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):

Air: 3929

Water: 900

Soil: 900

Sediment: 3600

Biowin estimate: 2.673 (weeks-months)

Advection Times (hr):

Air: 100

Water: 1000

Sediment: 5e+004

**Conclusions:**

Mass Amounts:

Air = 3 %

Water = 34 %

Soil = 63 %

Sediment < 0.1 %

Remarks:

The endpoint has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

**Data Quality**

Reliability:

2

Remarks:

Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Mackay's Equilibrium Concentration Model (EQC) Fugacity Model, LEVEL3NT (v 1.01); PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

**Other Available Reports**

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 3.5 BIODEGRADATION

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

#### Method

Method/guideline followed: EPIWIN (v 3.10) BIOWIN Program (v 4.00)  
Type: N/A  
GLP: N/A  
Year: 2003  
Contact Time: N/A  
Inoculum: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

#### Results

Degradation: Fast; readily degradable  
Results:  $t_{1/2}$  (water) = 15 d  
 $t_{1/2}$  (soil) = 15 d  
 $t_{1/2}$  (sediment) = 15 d  
Kinetic: N/A  
Breakdown Products: N/A  
Remarks:

#### Conclusions

The biodegradability of the test substance has been adequately characterized (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; Biodegradation Probability Program (BIOWIN), Version 4.00; PC-Computer software developed by EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

#### Other Available Reports

##### Other

Last Changed: October 9, 2003  
Order Number for Sorting:  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

##### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

##### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $LC_{50} = 129.594$  mg/l  
Statistical results: N/A  
Remarks:

##### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

##### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

##### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

##### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

##### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

##### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $LC_{50}$  = 1113.24 mg/l  
Statistical results: N/A  
Remarks:

##### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

##### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

##### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

##### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

##### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling point of 145.0°C and melting point of 3.66°C.

##### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $LC_{50} = 373.496$  mg/l  
Statistical results: N/A  
Remarks:

##### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

##### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

##### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

##### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

##### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C and melting point of -18.30°C.

##### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour LC<sub>50</sub> = 281.894 mg/l  
Statistical results: N/A  
Remarks:

##### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

##### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

##### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

##### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

##### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

##### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $LC_{50}$  = 473.90 mg/l  
Statistical results: N/A  
Remarks:

##### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

##### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

##### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 240°C and melting point of 50°C.

##### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour LC<sub>50</sub> = 2744.737 mg/l  
Statistical results: N/A  
Remarks:

##### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

##### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

##### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

##### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

#### 4.1 ACUTE/PROLONGED TOXICITY TO FISH

##### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

##### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Fathead minnow (*Pimephales promelas*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 222°C and melting point of 29°C.

##### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour LC<sub>50</sub> = 2744.737 mg/l  
Statistical results: N/A  
Remarks:

##### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

##### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

##### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

##### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Daphnid (*Daphnia magna*)  
Analytical monitoring: N/A  
Exposure period: 48-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 48-hour  $LC_{50} = 8.234$  mg/l  
Statistical results: N/A  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Daphnid (*Daphnia magna*)  
Analytical monitoring: N/A  
Exposure period: 48-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 48-hour  $LC_{50}$  = 1085.897 mg/l  
Statistical results: N/A  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Daphnid (*Daphnia magna*)  
Analytical monitoring: N/A  
Exposure period: 48-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling point of 145.0°C and melting point of 3.66°C.

### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 48-hour  $LC_{50} = 379.216$  mg/l  
Statistical results: N/A  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Daphnid (*Daphnia magna*)  
Analytical monitoring: N/A  
Exposure period: 48-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C and melting point of -18.30°C.

### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 48-hour LC<sub>50</sub> = 288.793 mg/l  
Statistical results: N/A  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Daphnid (*Daphnia magna*)  
Analytical monitoring: N/A  
Exposure period: 48-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 48-hour  $LC_{50}$  = 477.514 mg/l  
Statistical results: N/A  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Daphnid (*Daphnia magna*)  
Analytical monitoring: N/A  
Exposure period: 48-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 240°C and melting point of 50°C.

### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 48-hour LC<sub>50</sub> = 2624.223 mg/l  
Statistical results: N/A  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

## 4.2 TOXICITY TO AQUATIC INVERTEBRATES

### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Daphnid (*Daphnia magna*)  
Analytical monitoring: N/A  
Exposure period: 48-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 222°C and melting point of 29°C.

### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 48-hour LC<sub>50</sub> = 2624.223 mg/l  
Statistical results: N/A  
Remarks:

### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: Piperidine (CAS RN 110-89-4)  
Purity: N/A

#### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Green Algae (*Selenastrum capricornutum*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: water solubility of  $1 \times 10^6$  mg/l, vapor pressure of 32.1 mm Hg, log  $K_{ow}$  of 0.84 and boiling point of 106.3°C.

#### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $EC_{50} = 10.414$  mg/l  
Statistical results: N/A  
Remarks:

#### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: Pyridine (CAS RN 110-86-1)  
Purity: N/A

#### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Green Algae (*Selenastrum capricornutum*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 20 mm Hg, log  $K_{ow}$  of 0.64, boiling point of 115.2°C and melting point of -41.6°C.

#### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $EC_{50}$  = 627.753 mg/l  
Statistical results: N/A  
Remarks:

#### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: Pyridine, 4-methyl- (CAS RN 108-89-4; 4-Picoline)  
Purity: N/A

#### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Green Algae (*Selenastrum capricornutum*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: vapor pressure of 7.99 mm Hg, log  $K_{ow}$  of 1.22, boiling point of 145.0°C and melting point of 3.66°C.

#### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $EC_{50}$  = 226.666 mg/l  
Statistical results: N/A  
Remarks:

#### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: Pyridine, 3-methyl- (CAS RN 108-99-6; 3-Picoline)  
Purity: N/A

#### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Green Algae (*Selenastrum capricornutum*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 143.9°C and melting point of -18.30°C.

#### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour EC<sub>50</sub> = 173.915 mg/l  
Statistical results: N/A  
Remarks:

#### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: Pyridine, 2-methyl- (CAS RN 109-06-8; 2-Picoline)  
Purity: N/A

#### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Green Algae (*Selenastrum capricornutum*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following four permutations of physico-chemical property input values:  
(A) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(B) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -70°C;  
(C) Vapor pressure of 10 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C;  
(D) Vapor pressure of 12.6 mm Hg, log  $K_{ow}$  of 1.11, boiling point of 128.8°C and melting point of -66.8°C.

#### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour  $EC_{50}$  = 283.620 mg/l  
Statistical results: N/A  
Remarks:

#### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

**References**

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

**Other**

Last changed:

October 9, 2003

Order number for sorting:

Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: 3-Pyridinecarbonitrile (CAS RN 100-54-9;  
Nicotinonitrile)  
Purity: N/A

#### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Green Algae (*Selenastrum capricornutum*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 240°C and melting point of 50°C.

#### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour EC<sub>50</sub> = 1491.938 mg/l  
Statistical results: N/A  
Remarks:

#### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

#### References

U.S. Environmental Protection Agency. 2000. EPI Suite™, Version 3.10; ECOSAR Version 0.99g; PC-Computer software developed by ECOSAR Program, Risk Assessment Division (7403), Washington, D.C.

#### Other

Last changed: October 9, 2003  
Order number for sorting:  
Remarks:

### 4.3 TOXICITY TO AQUATIC PLANTS (ALGAE)

#### Test Substance

Identity: 2-Pyridinecarbonitrile (CAS RN 100-70-9;  
Picolinonitrile)  
Purity: N/A

#### Method

Method/Guideline followed: EPIWIN (v 3.10) ECOSAR Program (v 0.99g)  
Type: N/A  
GLP: N/A  
Year: 2003  
Species/Strain/Supplier: Green Algae (*Selenastrum capricornutum*)  
Analytical monitoring: N/A  
Exposure period: 96-hour  
Statistical methods: N/A  
Remarks: The EPIWIN model was run with the following physico-chemical property input values: boiling point of 222°C and melting point of 29°C.

#### Results

Nominal concentrations (mg/l): N/A  
Measured concentrations (mg/l): N/A  
Unit: mg/l  
Element value: 96-hour EC<sub>50</sub> = 1491.938 mg/l  
Statistical results: N/A  
Remarks:

#### Conclusions

Remarks: The endpoint has been adequately characterized. (American Chemistry Council, Pyridine and Pyridine Derivatives HPV Work Group).

#### Data Quality

Reliability (Klimisch): 2  
Remarks: Reliable with restrictions; model data.

#### References

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#### Other

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