

October 15, 2002

Lorraine E. Twerdok, Ph.D., DABT
Manager, Health Sciences
American Petroleum Institute
1220 L Street, N.W.
Washington, DC 20005

Dear Dr. Twerdok:

The Office of Pollution and Toxics is transmitting EPA's comments on the robust summaries and test plan for the Gasoline Blending Streams Category posted on the ChemRTK HPV Challenge Program Web site on January 25, 2002. I commend The American Petroleum Institute for its commitment to the HPV Challenge Program.

EPA reviews test plans and robust summaries to determine whether the reported data and test plans will provide the data necessary to adequately characterize each SIDS endpoint. On its Challenge Web site, EPA has provided guidance for determining the adequacy of data and preparing test plans used to prioritize chemicals for further work.

EPA will post this letter and the enclosed comments on the HPV Challenge Web site within the next few days. As noted in the comments, we ask that The American Petroleum Institute advise the Agency, within 90 days of this posting on the Web site, of any modifications to its submission.

If you have any questions about this response, please contact Richard Hefter, Chief of the HPV Chemicals Branch, at 202-564-7649. Submit questions about the HPV Challenge Program through the HPV Challenge Program Web site "Submit Technical Questions" button or through the TSCA Assistance Information Service (TSCA Hotline) at (202) 554-1404. The TSCA Hotline can also be reached by e-mail at tsca-hotline@epa.gov.

I thank you for your submission and look forward to your continued participation in the HPV Challenge Program.

Sincerely,

-S-

Oscar Hernandez, Director
Risk Assessment Division

Enclosure

cc: C. Auer
A. Abramson
W. Penberthy
M. E. Weber

EPA Comments on Chemical RTK HPV Challenge Submission: Gasoline Blending Streams Category

SUMMARY OF EPA COMMENTS

The sponsor, the Petroleum HPV Testing Group of the American Petroleum Institute, submitted a test plan and robust summaries to EPA for the Gasoline Blending Streams Category dated December 20, 2001. EPA posted the submission on the ChemRTK HPV Challenge Web site on January 25, 2002. The category consists of 87 petroleum streams used in blending gasoline.

EPA has reviewed this submission and has reached the following conclusions:

1. Category Definition. The submitter adequately defined the category of 87 streams according to the paraffinic (P), olefinic (O), naphthenic (N), or aromatic (A) content, or PONA, classification system.
2. Category Justification. The submitter's support for grouping the chemicals under this category is adequate.
3. Physicochemical Properties and Environmental Fate. EPA agrees with the submitter's plan to conduct a biodegradation test on the representative naphthenic blend with some modifications identified below. In addition, the submitter needs to supply vapor pressure ranges for the olefinic, naphthenic, and aromatic streams. Finally, EPA recommends that Level III fugacity calculations be presented rather than Level I.
4. Health Effects. Adequate data are available for all endpoints except for reproductive toxicity for the aromatic class of category members. Given that the aromatic class representative is supposed to have an aromatic content of at least 60% (according to the submitter's own criteria), the existing reproductive toxicity study on a substance with less than 10% aromatic content is not applicable. In addition, the submitter needs to address deficiencies in some robust summaries.
5. Ecological Effects. In order to address the upper end of the carbon range in the 87 category members - which is not covered by the PONA approach - the submitter needs to consider conducting an acute and/or chronic test(s) on one category member with $C \geq 10$ as a major component because the log Kow is ≥ 4.2 and EPA expects this chemical will show acute and/or chronic aquatic toxicity.

EPA requests that the submitter advise the Agency within 90 days of any modifications to its submission.

EPA COMMENTS ON THE GASOLINE BLENDING STREAMS CATEGORY CHALLENGE SUBMISSION

General

The submitter presented a generally thorough and well-written test plan. However, the clarity was impaired by some inconsistencies in describing the composition of streams (e.g., percentages not always defined as on a weight, volume or molecular basis). In many cases it was difficult to link test substances in the robust summaries to the corresponding discussion in the test plan. In addition, the submitter did not always provide robust summaries for studies discussed in the test plan - especially important if they are considered critical in the overall assessment of the category. Examples of studies mentioned in the Test Plan but for which no summaries were provided include: olefinic (two repeated dose studies and one genotoxicity study); naphthenic naphtha (acute fish, invertebrate, and algae); and aromatic naphthenes (two repeated dose studies, four genotoxicity studies, and acute fish and daphnid studies). In the case of the ecotoxicity studies, not even citations were provided.

Category Definition

The submitter proposed a category of 87 petroleum refinery streams used in blending gasoline. The sponsored substances (process streams) are listed in the submission. The streams are composed of mixtures of the following classes of hydrocarbons in varying percentages: normal and branched paraffins (P), olefins (O), naphthenes (N), and aromatics (A). The chemical characteristics of the blending streams are described according to their PONA classification, which is based both on the relative composition of the four hydrocarbon classes and the variation in carbon number (C_4 to C_{12}) of the individual hydrocarbon components within the blending streams. These blending streams are also defined by boiling point ranges that fall within the range of -20 to 230°C.

Table 1 was helpful in identifying refinery stream and PONA content. The submitter needs to clarify how the light hydrocracked naphtha and sweetened naphtha relate to the naphthenic content representatives identified as the heavy (or light) straight run naphtha on page 8 and elsewhere in the test plan.

Category Justification

The submitter proposes that the physicochemical, environmental, and toxicological properties of the streams will be defined by the percentage of P, O, N, and A hydrocarbons in each stream. Thus, the submitter suggests that the properties of the streams in this category will be bounded by those streams that contain a high proportion of each of the PONA hydrocarbons: a) light alkylate naphtha (high "P" - 100% paraffinic); b) light catalytically cracked naphtha (high "O" - ~ 40% olefinic); c) heavy straight-run naphtha (high "N" - ~ 30% naphthenics); and d) catalytically reformed naphtha (high "A" - ~ 60% aromatic). This approach is acceptable, although a number of details need to be added to the plan (see next paragraph).

Physicochemical properties. The submitter proposes to use the PONA hydrocarbon groupings and/or information on both the composition of the stream and the physicochemical properties of the individual compounds to define these endpoints. However, the basis for determining the range of values for a particular process stream is not clear, especially for defining the boiling point and vapor pressure ranges. The submitter intends to use the "product's component composition" as one determinant in defining the lower and upper ranges of these values, but has not fully explained the selection criteria. Therefore, the submitter needs to provide this additional information.

Test Plan

Physicochemical Properties (melting point, boiling point, vapor pressure, partition coefficient and water solubility).

Adequate data are available for all endpoints (except vapor pressure) for the purposes of the HPV Challenge Program.

Vapor Pressure. The submitter did not provide data on the vapor pressure ranges for the olefinic, naphthenic, and aromatic streams. The submitter needs to provide these data.

Environmental Fate (photodegradation, stability in water, biodegradation, fugacity).

Adequate data are available for photodegradation and stability in water for the purposes of the HPV Challenge Program.

Biodegradation. EPA agrees with the submitter's plan to conduct a biodegradation test on the representative naphthene blend (CAS # 64741-41-9). However, EPA believes that in order for the test to be meaningful, it would be important to analyze for the individual components during the course of the study.

Transport and Distribution (Fugacity). EPA recommends that Level III fugacity calculations be performed on each of the representative streams (PONA) rather than the Level I calculations provided.

Health Effects (acute toxicity, repeated-dose toxicity, genetic toxicity, and reproductive/developmental toxicity).

Acute toxicity and Genetic (gene effects) toxicity. Adequate data are available for the purposes of the HPV Challenge Program.

Repeated-dose toxicity. EPA considers the submitted data for gasoline, paraffinic naphtha, olefinic naphtha, and aromatic naphtha adequate and agrees with the submitter's plan to conduct a combined repeated-dose/reproductive/developmental toxicity screening test (OECD Guideline 422) to address the repeated-dose toxicity endpoint for the naphthenic naphtha group.

Genetic toxicity (chromosome effects). EPA considers the in vivo chromosomal aberration test on olefinic compounds inadequate; however, other adequate chromosomal aberration studies address this endpoint for the purposes of the HPV Challenge Program.

Reproductive toxicity. EPA agrees with the submitter's plan to conduct a combined repeated-dose/reproductive/developmental toxicity screening test (OECD Guideline 422) to address the reproductive toxicity endpoint for the naphthenic naphtha group. However, EPA is concerned that the percentage of aromatics in the distillate of light catalytically reformed naphtha (LCRN-D) is too low (< 10%) to represent the high-aromatics naphtha group as stipulated in the test plan (page 8 - representative aromatic substance should be ~ 60% aromatic). Therefore, EPA recommends the submitter use a test substance that is truly representative of this stream.

Developmental toxicity. EPA agrees with the submitter's plan to conduct a combined repeated-dose/reproductive/developmental toxicity screening test (OECD Guideline 422) to address the developmental toxicity endpoint for the naphthenic naphtha group. However, the submitter needs to address the developmental toxicity endpoint for the paraffinic naphthene by providing the appropriate data in a separate developmental toxicity robust summary. The Bui et al. (1998) paper does not provide the specific results for the developmental toxicity endpoint (see page 130 in the publication).

Ecotoxicity (fish, invertebrates, and algae).

Fish, Invertebrates, and Algae. Although adequate data exist for these endpoints for the purposes of the HPV Challenge Program in the C6 - C8 carbon ranges of the PONA system, EPA believes that the upper carbon range ($C_{\geq 10}$) has not been adequately represented. The range of carbons listed for the category is C4 - C12. EPA believes the acute aquatic toxicity behavior is well understood for the lower end of this range and that the PONA data adequately cover the middle portion of this range. Data are needed for the upper carbon range ($\geq C_{10}$). For chemicals with a log Kow of ≥ 4.2 the submitter needs to consider conducting a daphnia chronic test and/or acute toxicity tests because aquatic toxicity can occur for both of these endpoints.

Specific Comments on the Robust Summaries

Generic comment

All summaries should clearly identify the test substance, especially in relation to its PONA classification.

Health Effects

The clarity of the presentation was impaired by the fact that composition data tables did not always report the units of measure or indicate whether percentages were on a volume, weight or molecular basis; apparent percentages did not always add up to 100%. Although some compositional information was included in section 1.1 of each dossier, these data could be applied with certainty to individual studies only for labeled samples (e.g. the paraffinic naphtha API-83-19); unless specified in the summary, this association could not be made for test materials identified only by acronyms (e.g. the olefinic LCCN-D), although in some cases descriptions in the test plan included the PONA-class composition. The submitter needs to provide the specific PONA-class compositional information in each robust summary (especially of test atmospheres in inhalation studies) or refer to dossier section 1.1 as appropriate. The submitter also needs to ensure that units are consistent between the robust summaries and test plan (for example, the naphthene content of sweetened naphtha (sample API 81-08) was reported as 20.9% by volume in the test plan (page 9 of 38) but as 16.5% (by an undefined measure) in dossier section 1.1 (page 2/28). Finally, the submitter needs to use consistent terminology throughout the submission. For example, in section 1.1 of the paraffinics dossier, the composition list for sample API 83-19 is blank next to the 'paraffins' line, but there were apparent percentages next to the 'saturates', 'Mon (clear)', and 'RON (clear)' lines that may refer to paraffins, but were not defined.

The submitter needs to verify, present and make consistent the paraffinic, olefinic, and aromatic content of the test substances listed in the robust summaries by referring to Section 1.1 of the IUCLID file or using the appropriate compositional data provided in the test plan.

In addition to the compositional comment in the previous paragraph, the submitter needs to address the deficiencies identified below:

Repeat Dose Toxicity.

1. Gasoline (subchronic inhalation test with rats and monkeys). Provide the method for generating the test atmosphere and did not report the magnitude of the observed organ weight changes.
2. Olefinic (subchronic inhalation EPA guideline bioassay on light catalytically cracked naphtha distillate: LCCN-D - olefinic content not specified). Provide the method for generating the test atmosphere, and some details such as size of the observed body weight reductions and the incidence of histopathology in nasal turbinates and kidney. Provide the olefinic concentration or specify that the information in dossier section 1.1 pertained to this study.
3. Aromatic (4-week dermal toxicity study of full range catalytically reformed naphtha [FRCRN, sample API 83-05; 62.5% aromatic]). Provide the incidence of increased bone marrow granulopoiesis by dose and sex.
4. Aromatic (13-week rat inhalation study on partially vaporized FRCRN (aromatic content not specified)). Provide the method of generating the test atmosphere, units in the table for the atmosphere components, and the percentage of aromatic naphtha in the test atmosphere. Note that Section 1.1 of the dossier indicated that the aromatics content of distilled or partially vaporized catalytic reformed naphtha may be reduced significantly (to <10% in the distilled fraction); thus, it appears that the aromatic naphtha content did not meet the criterion for a high-naphthenic stream.

Genetic Toxicity.

1. (Six robust summaries): Gasoline (Ames test); Gasoline, Olefinic [light cracked catalytic naphtha [LCCN]], Paraffinic [light alkylate naphtha (LAN)], Naphthenic [sweetened naphtha], and Aromatic [full-range catalytic reformed naphtha [FR-CRN]] (forward mutation assay). The source of the S9 activation system is missing and the acronyms TFT and VC were not defined in the LAN and FR-CRN forward mutation assay summaries.

2. Naphthenic [sweetened naphtha] (inhalation in vivo chromosome aberration test). Provide the method for generating the test atmosphere.

3. Aromatic [full-range catalytic reformed naphtha [FR-CRN]] (in vivo chromosome aberration study). Provide the units in results table, and verify the data because the positive and vehicle control data for the females appear to be reversed.

Reproductive Toxicity.

1 Olefinic (distillate of light catalytically cracked naphtha - LCCN-D) (OECD 421 - combined reproductive/developmental toxicity screening test). Specify the method for generating the test atmosphere or characteristics of the test atmosphere.

2. Aromatic (distillate of light catalytically reformed naphtha - LCRN -D) (OECD 421). Information provided in dossier section 1.1 suggests that the aromatic content is 9.09%, considerably less than the proposed ~60% content to represent the high end for this subgroup of the category. In addition, the summary reported the actual high dose concentration as 2490 ppm, which may be a typographical error.

Developmental Toxicity. Olefinic (light catalytically cracked naphtha - LCCN). The summary did not define the numbers in parentheses in the last table and did not report whether food consumption was monitored.

Ecological Effects

The submitter needs to provide the missing robust summaries for the data discussed on page 21 of the Test Plan. These are: the high naphthenic, light straight run naphtha (Concawe sample W94/809) - three summaries; aromatic, light catalytic reformed naphtha CAS #647741-63-5, Concawe sample W94/812) - two summaries. (NOTE: All these appear to come from a single report identified as Concawe, Acute Aquatic Toxicity of Gasolines, Report No. 96/57).

In addition, the three naphthenic ecotoxicity robust summaries in which lethality was estimated by the hydrocarbon block method should be more explicit about the input values (i.e., the percent aromatic content and the toxicity factors used for each contributing component).

Followup Activity

EPA requests that the submitter advise the Agency within 90 days of any modifications to its submission.