federal register

40 CFR Part 799

[OPTS-42053; FRL 2482-8]

Toxic Substances; Alkyl Epoxides; Response to the Interagency Testing Committee

AGENCY: Environmental Protection Agency (EPA).

ACTION: Advance notice of proposed rulemaking.

SUMMARY: This Advance Notice of Proposed Rulemaking (ANPR) is the Agency's response to the Interagency Testing Committee's (ITC) designation of the chemical category "alkyl epoxides" and its recommendation that the alkyl epoxides be considered for health effects and chemical fate testing. This notice addresses those alkyl epoxides on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory other than ethylene oxide, propylene oxide, and 1,2-butylene oxide, which are addressed in other Federal Register notices. EPA is publishing this notice to inform the public of the rationale to be used in selecting the chemicals for testing, to define the regulatory approaches that are being considered, and to seek public comments on EPA's approach in proposing a test rule.

DATE: Interested persons are invited to comment on this ANPR. All comments should be submitted on or before March 5, 1984.

ADDRESS: Submit written comments identified by the document control number (OPTS 42053) in triplicate to: TSCA Public Information Office (TS-793), Office of Pesticides and Toxic Substances, Environmental Protection Agency, Rm. E-108, 401 M St. SW., Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT: Jack P. McCarthy, Director, TSCA Assistance Office (TS-799), Office of Toxic Substances, Environmental Protection Agency, Room E-543, 401 M St. SW., Washington, D.C. 20460, Toll Free: (800-424-9065), In Washington, D.C. (554-1404), Outside the USA: (Operator-202-554-1404.

SUPPLEMENTARY INFORMATION:

I. Background

A. ITC Report

Section 4(a) of TSCA (Pub. L. 94-469, 90 Stat. 2003 *et seq.*; 15 U.S.C. 2601 *et seq.*) authorizes the Administrator of

EPA to promulgate regulations requiring testing of chemical substances and mixtures in order to develop data relevant to determining the risks that such chemicals may present to health and the environment.

Section 4(e) of TSCA established the ITC to recommend to the Administrator of EPA those chemicals that should receive priority consideration for the development of test rules under section 4(a).

The ITC transmitted its First Report to the Administrator of EPA, as published in the Federal Register of October 12, 1977 (42 FR 55026), and designated the category "alkyl epoxides" for priority testing consideration for mutagenicity, carcinogenicity, teratogenicity, other chronic effects (with emphasis on organ effects and behavioral changes), and environmental fate. Epidemiological studies were also recommended for priority consideration for two or three of the highest exposure compounds, if suitable cohorts could be identified.

In order to make a section 4(a)(1)(A) finding, EPA must determine that the manufacture, distribution in commerce, processing, use or disposal of a chemical substance or mixture, or any combination of such activities, may present an unreasonable risk of injury to health or the environment, that insufficient data exist to characterize the potential effects of that chemical to human health and the environment, and that testing is necessary to develop such data. In order to make a section 4(a)(1)(B) finding, EPA must determine that a substance is produced in substantial quantities and that there is or may be significant or substantial human exposure or substantial environmental release of that substance, that there are insufficient data to characterize the potential effects of that chemical to human health and the environment, and that testing is necessary to develop such data.

B. Category Members

The ICC defined the alkyl epoxides category as noncyclic aliphatic hydrocarbons bearing one or more epoxide functional groups.

EPA has identified from the non-confidential (public) TSCA Chemical Substances Inventory six short-chain up to four carbon atoms) alkyl epoxides and eight longer chain (greater than nine carbon atoms) alkyl epoxides and eight longer-chain (greater than nine carbon atoms) alkyl epoxides that fit the alkyl epoxides chemical category definition. No additional alkyl epoxides are listed in the confidential portion of the Inventory. Of the short-chain compounds, three are addressed in separate Federal Register documents: ethylene oxide (Ref. 1), propylene oxide (Ref. 2), and 1,2-butylene oxide (Ref. 3). This notice addresses the remaining three short-chain compounds and eight long-chain substances:

Chemical	CAS No.
SHORT-CHAIN	
2,3-Epoxybutane	(CAS No. 3266-23-7)
Isobutylene oxide	(CAS No. 558-30-5)
1,2:3,4-Diepoxybutane	(CAS No. 1464-53-5)
LONG-CHAIN	
1,2-Epoxydecane	(CAS No. 2404-44-6)
1,2-Epoxydodecane	(CAS No. 2855-19-8)
1,2-Epoxytetradecane	(CAS No. 3234-28-4)
1,2-Epoxypentadecane	(CAS No. 18833-25-5)
1,2-Epoxyhexadecane	(CAS No: 7320-37-8)
1,2-Epoxyheptadecane	(CAS No. 22092-38-2)
1,2-Epoxyoctadecane	(CAS No. 7390-81-0)
1,2-Epoxynonadecane	(CAS No. 67860-04-2)

II. Response to ITC Report

EPA has reviewed the ITC report, the data on which their recommendations were based, the information obtained on alkyl epoxides under the TSCA section 8(a) Preliminary Assessment Information Rule (40 CFR Part 712), unpublished health and safety studies submitted by manufacturers of alkyl epoxides under the TSCA section 8(d) Health and Safety Data Reporting Rule (40 CFR part 716), and other published and unpublished data available to the Agency. EPA is publishing in this Federal Register notice its tentative conclusions as to appropriate action the Agency may take on the alkyl epoxides not addressed in other Federal Register notices.

EPA previously indicated that, although it would generally initiate testing action through publication of a proposed rule, it would initiate action on some chemical categories and certain complex chemicals through publication of an ANPR, as it is doing in this case. There are several reasons, both general to categories and specific to the long-chain alkyl epoxides, why the Agency has chosen to apply this approach in this situation. EPA believes that there are definite advantages to using an ANPR to initiate the process of section 4 rulemaking for certain categories of chemicals.

The Agency has found that in attempting to develop testing rules for a category of chemical substances, the issues that require attention are more complex and numerous than in rulemakings for a single chemical. For example, the Agency is attempting to determine whether it is scientifically valid to obtain data for one or more representative chemicals within the category rather than to test each chemical, in order to avoid unnecessary

or duplicative testing while assuring that adequate data are developed.

One method of achieving this goal is through the use of structure-activity relationships (SAR). The agency believes that there is a logical basis for subcategorization of the long-chain alkyl epoxides based on SAR analysis, see unit IV.C., and for the adoption of a representative testing sample, see unit IV.D.

Publication of an ANPR provides an opportunity for public comment on the difficult issues associated with the alkyl epoxides structural category before the Agency proposes a testing approach for the chemicals in this category. Proceeding with the development of proposed rules prior to receiving such input could result in needless expenditure of the Agency's limited resources and considerable delay in promulgating a final rule, especially if public comments necessitate modification of the proposed sampling approaches or reconsideration of the bases for requiring testing.

Moreover, available data are inadequate for a complete characterization of the extent and types of exposures presented by the alkyl epoxides identified in this notice. The Agency is soliciting public comment through this ANPR in order to obtain additional information on production volumes, exposure, off-site processing and use of these chemicals.

III. General Information

A. Chemical Description

The commercial short-chain alkyl epoxides, Unit I.B., are gases or volatile liquids at ambient temperature, except for the diepoxide, 1,2:3,4-diepoxybutane which is a moderately volatile liquid. The long-chain members of the alkyl epoxide category, Unit I.B., are liquids or lowmelting, waxy solids at ambient temperature. Because all of the long-chain substances are 1,2-monoepoxides, physicochemical properties such as water solubility and partition coefficients are expected to change in a consistent fashion with increasing chain length.

Alkyl epoxides are alkylating agents, because of the presence of the epoxide functional group. These alkylating groups react with nucleophiles such as alcohols, amines or mercaptans, a property that makes them useful as chemical intermediates.

B. Manufacturing Process and Exposure Potential for Alkyl Epoxides

EPA has no information on the specific processes that are being used to manufacture the alkyl epoxides under consideration in this ANPR. However, in general alkyl epoxides can be prepared from the corresponding olefins by oxidation with organic peracids, by catalytic oxidation with air or oxygen, or by treatment of the corresponding halohydrin with base (Refs. 4 and 5).

The three short-chain epoxides—isobutylene oxide, 2,3-epoxybutane, and 1,2:3,4-diepoxybutane—are reported to be available only in small quantities for very minor captive use or for research purposes (Ref. 6). According to information available to EPA, isobutylene oxide is produced on a custom basis and is sold entirely to research laboratories (Ref. 6); 2,3-epoxybutane is produced in amounts less than 100 pounds per year and is used captively as an intermediate (Ref. 6); 1,2:3,4-diepoxybutane is not currently produced in this country but is imported for use as a laboratory research intermediate, with sales of 3 to 4 kilograms per year. On the basis of the low production/import volumes and the known uses of these chemicals, EPA believes that a small number of individuals are likely to be exposed to these chemicals, and that exposure levels are likely to be low. However, given the lack of specific information on exposures (levels and durations), EPA is soliciting comment on its tentative conclusion that such exposures are minimal as well as obtaining any specific exposure information that may be available.

Viking Chemical Company produces the eight long-chain epoxides reported in the TSCA Chemical Substances Inventory. Viking's total annual production of the eight chemicals is estimated at less than 100,000 pounds (Ref. 6). In addition to Viking Chemical Company, Union Carbide Corporation also produces 1,2-epoxyhexadecane; the actual production levels have been claimed as TSCA Confidential Business Information (CBI). The long-chain alkyl epoxides are thought to be used primarily as acid scavengers and in the synthesis of specialty chemicals, possibly including surfactants, lubricants, alkyl resins and coatings (Ref. 6).

Recent patterns indicate a relatively stable demand for the long-chain alkyl epoxides (Ref. 6). Because they may be sold to a variety of users, and because possible intermittent high-level exposures to these chemicals are a concern owing to their alkylating properties, human exposure to some of these long-chain alkyl epoxides could be sufficient to support a finding of potential unreasonable risk. Furthermore, intermittent releases to the environment could be significant near manufacturing, processing, use and disposal sites. However, a lack of detailed knowledge about the uses of the long-chain alkyl epoxides makes a meaningful exposure assessment for these substances difficult, and it is further complicated, as discussed in more detail in unit IV, by the differences in properties between short-chain and long-chain alkyl epoxides.

C. Existing Data and Potential for Adverse Health and Environmental Effects

The alkylating properties that make alkyl epoxides useful as synthetic intermediates also confer the potential to react with and alter biomolecules such as proteins, enzymes, and nucleic acids, with possible adverse consequences such as carcinogenicity, mutagenicity and other effects.

Discussions of the toxicity data for high-production short-chain alkyl epoxides appear in separate Federal Register notices on ethylene oxide (Ref. 1), propylene oxide (Ref. 2), and 1,2-butylene oxide (Ref. 3). The following health effects have been reported for one or more of these three compounds: carcinogenicity, mutagenicity, neurotoxicity, and reproductive toxicity.

EPA has not located any toxicity data for two of the three short-chain alkyl epoxides discussed in this document: 2,3-epoxybutane and isobutylene oxide. Information on 1,2:3,4-diepoxybutane shows acute toxicity with an inhalation LC_{50} (rats) of 90 ppm for a 4-hour exposure, an oral LD_{50} (rats) of 78 mg/kg and a dermal LD_{50} of 89 mg/kg (rabbits) (Ref. 7). Also, the substance elicited a carcinogenic response in a number of studies using a dermal or subcutaneous route of administration (Ref. 8, 9, 10, 11, and 12). In addition, teratogenic effects have been reported in studies using rats and chickens (Ref. 13), and a mutagenic response was reported for a number of test systems (Refs. 14, 15, 16, and 17).

Some acute toxicity data are available on the long-chain alkyl epoxides (specific gravity and animal weight not provided) (Ref. 18). For several mixed long-chain 1,2-epoxides, rat i.p. LD_{50} values were in the range of 4.9 to 7.5 "ml/kg", while rabbit dermal LD_{50}'s were in the range of 5.0 to 14.1 "ml/kg". For 1,2-epoxyhexadecane the corresponding values were 4.9 "ml/kg" (rat) and 10.0 "ml/kg" (rabbit). Skin irritation (rabbit) was "moderate" or "minor"; eye injury (rabbit) was graded as "none" or "trace" (Ref. 18). Additional information on the toxicity of long-chain alkyl epoxides is available from a subchronic study on 1,2-epoxyhexadecane applied dermally to

rats and mice, completed in 1980 for the National Toxicology Program (NTP). Dosages given to both species were 62.5, 125, 250, 500 and 1,000 mg/kg. The material (1,2-epoxyhexadecane in acetone) was applied 5 times weekly to a one-inch square, shaved portion of the dorsal area for 13 weeks. Some mortiality was observed in the mouse at doses of 250 mg/kg and above; none was observed in the rat. Cutaneous reactions, manifested by exfoliation of the stratum corneum, alopecia, hyperemia and/or blanching were seen at the application sites in male mice and rats receiving dose levels of 250, 500 and 1,000 mg/kg, in female mice receiving 1,000 mg/kg and in female rats receiving 500 and 1,000 mg/kg. Reduced body weights were observed in male mice and rats dosed at 250 mg/kg and above and female rats dosed at 500 and 1,000 mg/kg. No other toxic effects were observed (Ref. 19).

Although a recently completed Ames test on 1,2-epoxyhexadecane, with and without metabolic activation, was negative (Ref. 20), the work of Van Duuren *et al.* (Ref. 21) suggests that some long-chain alkyl epoxides may be oncogenic. Van Duuren *et al.* (Ref. 21) tested 1,2-epoxydodecane and 1,2-epoxyhexadecane separately in mouse skin painting studies to assess their oncogenic activity. No tumors were observed in a group of 30 ICR/Ha Swiss mice treated for 540 days (18 months) with approximately 100 mg of a 2 percent solution of 1,2-epoxydodecane in acetone (applied to the clipped back of each mouse three times per week from the age of 8 weeks). However, in an experimental group of 41 mice similarly treated with a 10 percent solution of 1.2-epoxyhexadecane in acetone, two mice developed papillomas and one developed a squamous carcinoma. The test duration was 598 days, with a median survival time of 427 days. The first papilloma appeared on day 308 and the carcinoma appeared on day 372. No tumors were reported for the control group.

To confirm the results of Van Duuren *et al.*, the NTP selected 1,2-epoxyhexadecane as a representative long-chain terminal monoepoxide "having potential for significant exposure" to undergo a 2-year bioassay in B6C3F1 mice and Fisher 344 rats by dermal application (Ref. 22). The exposure phase of the test was completed in June, 1982. Doses of 62.5 and 125 mg/kg were applied to a one-inch square shaved portion of the dorsal area of the mice and rats five times per week. The results from this study are not yet available.

The Agency has no data on the environmental effects of alkyl epoxides addressed in this notice nor does it have information relating to the release or the environmental fate of these chemicals. The ITC's concerns for the environmental effects of alkyl epoxides were for the characterization of biodegradation products and the environmental fate of these chemicals.

IV. Tentative EPA Decisions and Issues

A. Preliminary Findings

EPA does not believe that testing of the three short-chain alkyl epoxides 2,3-epoxybutane, isobutylene oxide and 1,2:3,4-diepoxybutane is warranted at this time because of their extremely low current production and import volume. These chemicals do not appear to meet the criteria for a finding under section 4(a)(1)(A)(i), that they may present an unreasonable risk, or for a finding under section 4(a)(1)(B)(i), that they are produced in substantial quantities and may enter the environment in substantial quantities or have significant or substantial human exposure. However, the Agency is soliciting comment on its tentative conclusion that such exposures are minimal and is interested in obtaining specific exposure and environmental release information that may be available. In addition, EPA is considering options for follow-up activities on these chemical substances such as rulemaking to require reporting of production and importation levels under a TSCA section 8(a) rule or reporting of significant new uses under a TSCA section 5(a)(2) rule.

EPA believes that the long-chain alkyl epoxides may meet the criteria for a section 4(a)(1)(A)(i) finding of potential unreasonable risk to human health on the basis of the information presented in units III.C and IV.C. Although it seems unlikely that the long-chain alkyl epoxides would meet the criteria for a finding under section 4(a)(1)(B)(i), the Agency is interested in acquiring information to better define exposure to these chemicals.

B. Testing Alternatives

On the basis of information available to the Agency and in order to address the ITC's concerns for the long-chain alkyl epoxides the Agency is considering a number of testing options.

1. *Full-scale testing.* This approach could include testing for carcinogenicity, mutagenicity, teratogenicity, other chronic effects and environmental fate as well as conducting epidemiological studies. This assumes that the Agency could make the requisite findings under section 4(a)(1)(A). The Agency acknowledges that in light of the available information on the production and economics of these chemicals this approach may cause curtailment of production and use of some or all of these alkyl expoxides (Ref. 6) and thus may be less desirable than other alternatives.

2. *Battery of tests for all long-chain alkyl epoxides.* EPA believes that as another alternative, the uncertainties about the health effects and environmental fate of these epoxides could be addressed by performing a limited series of tests (Tables 1).

TABLE 1.—EXAMPLE OF LIMITED TESTING FOR SELECTED LONG-CHAIN ALKYL EPOXIDES

	1,2-epoxydecane	1,2-epoxyhexadecane	1,2-epoxynonadecane
Health effects:			
Ames (Salmonella) assay	X	(1)	X
Cell transformation	X	X	X
90-Day subchronic	X	(1)	X
Chemical fate:			
Melting point	(2)	(1)	X
Boiling point	(1)	(1)	X
Vapor pressure, 20°	X	X	X
Water solubility	X	X	X
Partition coeff. (oct.-H_2O)	X	X	X
Partition coeff. (soil-H_2O)	X	X	X
Hydrolysis rate	X	X	X
Biodegradation	X	X	X

X=Testing proposed.
1=Testing completed or in progress.
2=Liquid at ambient temperature.

These tests might include: health effects—Ames test, with an without metabolic activation; *in vitro* cell transformation (possible substitute: *in vitro* cytogenetics and sister chromatid exchange); 90-day subchronic study (which would include parameters for assessing behavioral effects) in rats. Environmental fate—water solubililty; vapor pressure at 20° C; octanol-water partition coefficient; soil-water partition coefficient; hydrolysis rate; boiling point; melting point; and biodegradation rate. Certain results from these tests could trigger additional testing. In general, the intent of these tests is to verify that the long-chain alkyl epoxides behave differently than the short-chain alkyl epoxides while addressing as many of the ITC concerns as is possible. Additional testing may be required if this group of chemicals exhibits activity in these tests.

3. *Battery of tests for representative long-chain alkyl epoxides.* Tests such as those mentioned in alternative 2 could be applied to the three alkyl epoxides that EPA believes could provide data representative of the group. These are: 1,2-epoxydecane, 1,2-epoxyhexadecane and 1,2-epoxynonadecane. Certain results from these tests would trigger additional testing. A discussion of the

rationale for selecting these three epoxides can be found in unit IV.D. This approach would provide information on a range of long-chain alkyl epoxides (C–10, C–16 and C–19) and should provide an indication of the environmental fate and general toxicity of the eight long-chain alkyl epoxides.

4. *Battery of tests for one representative long-chain alkyl epoxides.* The tests (described in alternative 2) might be applied to only one long-chain alkyl epoxide such as 1,2-epoxyhexadecane. Again, certain results from these tests would trigger additional testing. It may be determined that this approach would adequately characterize the group of alkyl epoxides with chain lengths of C–10 to C–19. This testing approach would have the least economic impact. However, the Agency questions the adequacy of such limited testing to characterize all eight of the substances in question.

5. *No testing.* The Agency may decide on the basis of information received as a result of this ANPR that testing is unwarranted at this time. It may become apparent that another approach such as better control of exposures in the workplace or follow-up activities requiring the reporting of production and importation levels under a TSCA section 8(a) rule or the reporting of significant new uses under a TSCA section 5(a)(2) rule might be appropriate.

C. Structure-Activity Analysis

The Agency believes that it is reasonable to expect that a consistent structure-activity relationship will exi among the eight long-chain alkyl epoxides identified in this notice with respect to physicochemical and toxicologic properties. These compounds are members of a homologous series of organic compounds: i.e. they are long-chain 1,2-monoepoxides that differ only in their numbers of methylene groups. Effects of such changes are increasingly subtle at longer chain lengths and would not be expected to result in substantial differencs among longchain epoxides differing by only one or two carbon atoms. Some physical properties of the long-chain alkyl epoxides are available and are listed in Table 2.

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TABLE 2

PHYSICAL PROPERTIES OF LONG-CHAIN ALKYL EPOXIDES

	C_{10}	C_{12}	C_{14}	C_{16}	C_{18}	C_{15-18}
Formula wt.	156.26	184.81	212.36	240.42	268.47	
Boiling point	112-113°C, 35mm	106-109°C, 6mm	95-96°C, .4mm	104-106°C, .2mm	137°C, .5mm	
Melting point	Low	Low	Below room temperature	22°C	26°C	
Specific gravity	.837	.844	.847	.849	.830	.844
N_D	1.4286	1.4358	1.4412	1.4441	-	1.4447
Appearance	Colorless, mobile liquid	Colorless, mobile liquid	Colorless, mobile liquid	Clear, colorless liquid or white, waxy solid	White waxy solid	Pale yellow liquid
Odor	Ether like, penetrating	Ether like, pleasant	Ether like, pleasant	Faint, pleasant	Very faint	Characteristic, pleasant
Vapor pressure				< .01 mm 4.6×10^{-4}mm*		
Solubility in water				< 100 ppm 6×10^{-4} ppm*		

* EPA estimates based on physical data.

(Ref. 24)

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Considerable data on physicochemical properties and on health effects are available or are being generated for several of the short-chain alkyl epoxides, particularly the three substances, ethylene, propylene and 1,2-butylene oxides that the Agency is addressing in the separate **Federal Register** notices (Refs. 1, 2 and 3). Where sufficient data are available for comparison of effects, ethylene oxide appears to be more toxic than propylene oxide, which in turn appears more toxic than 1,2-butylene oxide. Because no corresponding data are available on the 1,2-epoxides having five to nine carbon atoms, it is difficult to determine whether the trend continues beyond 1,2-butylene oxide. Fewer data are available on the longer chain alkyl epoxides than for their two-, three-, and four-carbon homologs. This is unfortunate because some of the physicochemical properties that are extremely important contributors to health effects and chemical fate differ markedly between the short-chain and long-chain members of the series.

The long-chain alkyl epoxides, for example, have much lower water solubilities and vapor pressures and higher estimated soil-water and octanol-water partition coefficients than do the short-chain alkyl expoxides. In addition, the aqueous hydrolysis rates of the long-chain alkyl epoxides may be considerably slower than those of the short-chain alkyl epoxides, owing to their hydrophobic nature and/or their less reactive molecular conformations. Such lowered reactivity can be a consequence of the molecular folding that occurs with large flexible molecules such as straight-chain alkyl derivatives; the folding can result in blocking (steric hindrance) of reactive sites in a molecule. Thus, persistence and bioaccumulation, which depend on factors such as high fat solubility and low reactivity, could be significant for these substances, whereas for the short-chain homologs they are not, according to the available data. In addition, dermal exposures would be expected to be the primary route of human exposures for the long-chain alkyl epoxides, whereas inhalational exposures are likely to predominate for the volatile or gaseous short-chain alkyl epoxides.

For these reasons, the Agency believes that, on the basis of its structure activity analysis, the long-chain alkyl epoxides comprise a subcategory of alkyl epoxides that are more similar to each other than they are to their short-chain homologs, and will most likely exhibit different physicochemical properties and toxicities than their short-chain homologs. However, the Agency believes that the available data on the long-chain alkyl epoxides are insufficient to confirm this conclusion and that they do not provide adequate information to characterize their toxicity. The Agency believes that the presence of the epoxide functional group, a known alkylator, and the well documented toxicity of the short-chain alkyl epoxides, ethylene oxide and propylene oxide, are sufficient to generate concern for the potential toxic effects of these compounds.

D. Justification for Testing Representative Chemicals

EPA believes that the close relationshop of the long-chain alkyl epoxides to one another affords an opportunity to obtain adequate information about the group without testing all members of the category. Although the differences in physicochemical properties described in unit IV.C. and the lack of data on epoxides having an intermediate number (five to nine) of carbon atoms reduces the accuracy of extrapolating test data from short-chain to Long-chain alkyl epoxides, the near-continuity of the series from C–10 to C–19 suggests that relatively little difference in physicochemical properties can be expected between nearest neighbors in the latter series. This is true largely because all the chemicals are 1,2-monoepoxides and, therefore, no discontinuities are introduced as a result of positional isomerism. Thus, the Agency is considering as an alternative requiring the testing of a representative sample rather than all eight of the long-chain alkyl epoxides. In that case, EPA believes that the following group members would be appropriate: 1,2-epoxydecane, 1,2-epoxyhexadecane, and 1,2-epoxynonadecane. The Agency is considering this approach because by testing three members of the group, the entire group of long-chain alkyl epoxides (i.e., C–10 to C–19) might be adequately characterized on the basis of test results from one substance having a low number of carbon atoms (i.e., C–10), one having a high number (i.e., C–19) and one an intermedate number (i.e., C–18). The Agency believes such an approach is appropriate because, as discussed above, chemical activity for this group of epoxides, seems to correlate well with chain length. Although the C–14 or C–15 compound is closer to the midpoint of the series, the Agency believes that the available data and ongoing testing of the C–16 epoxide justifies the choice of this substance for testing. This may result in a more complete data base on one of the chemicals tested. The Agency believes that testing only one of the long-chain alkyl epoxides is a less desirable alternative in that extrapolations based on data for one representative member of the group will result in greater uncertainties than would be the case if data were obtained on three representative epoxides.

E. Economic Impact

Although EPA is still assessing the economic impact of different options to testing the long-chain alkyl epoxides, it appears that conducting the full range of ITC-recommended tests on all eight epoxides would impose a substantial financial burden on the industry. While adverse economic effects are not a barrier to requiring testing under section 4(a), these economic assessments have encouraged the Agency to examine testing needs carefully with respect to this category and to seek public comment on the best way to obtain needed data while not depriving society of the benefits of the chemicals. Estimated comparative costs for the testing alternatives 2, 3 and 4, described in unit IV.B., are indicated in Table 3.

TABLE 3. Estimated Cost of Tests Listed in Table 1.

	Estimated Cost for Limited Testing[1]		
	C-10,C-12,C-14 to C-19 ($)	C-10, C-16, C-19 ($)	C-16 ($)
Testing Cost range[2]	402,200—1,350,400	102,200—360,400	20,700—80,100
Annualized testing cost range[2,3]	104,217—349,910	26,482—93,385	5,364—20,755

[1] Cost estimated for limited testing only, additional testing not considered in estimates.

[2] Cost range reflects variations in protocols and costs among testing laboratories.

[3] Annual Cost derived using a 15 year period and a 25% cost of capital.

(Ref. 23)

The potential for adverse economic effects resulting from even relatively limited testing requirements for alkyl epoxides is high for the following reasons:

1. Of the five companies producing these long-chain alkyl epoxides, one produces approximately 100,000 pounds per year of all eight chemicals combined (Ref. 6) and the other produces only 1,2-epoxyhexadecane (quantity is Confidential Business Information);

2. No major demand changes are expected in the next 3 to 5 years.

Testing costs would be expected to create a noticeable impact on the pricing structure of these compounds with resulting effects on the marketability of products. These effects could range from a minor curtailment of production to a complete cessation of production of one or more of the compounds. A manufacturer might elect to stop production rather than embark on testing (Ref. 6).

V. Issues and Alternatives

1. EPA is soliciting exposure-related data and additional production data to refine its analysis of the alkyl epoxides. EPA requests the submission of more detailed exposure information and current production figures for the short-chain and long-chain alkyl epoxides addressed in this notice. The Agency is particularly interested in receiving information on the number of workers at manufacturing, processing, and use sites actually involved with alkyl epoxides, their use patterns, and the potential for exposure of workers, consumers and the general public. The Agency is likewise soliciting information on the release, potential release, disposal, transformation products, persistence and bioaccumulation of the alkyl epoxides addressed in this notice. The Agency will reconsider which alkyl epoxides should be tested if new production and other exposure related data on the compounds warrant this approach.

2. The Agency is interested in obtaining data on ecotoxicity and any additional health effects information not previously submitted under the section 8(d) Health and Safety Reporting Rule.

3. The Agency is interested in obtaining information on the industrial uses and consumer uses of the alkyl epoxides addressed in this notice and their possible substitutes.

4. The Agency is interested in receiving comments on the proposed testing options, other testing alternatives not considered in this notice, the choice of tests which would comprise the optimum testing battery, the rational for selecting representative chemicals for testing and the conclusions drawn by EPA from its structure-activity analysis.

5. The Agency invites suggestions for other testing approaches such as combinations of the testing options, see unit IV.B., or other approaches which could be employed. An example of a combination is the application of the tests to all eight of the compounds and the application of futher tests to one or several of the compounds. The Agency is interested in receiving comments on this and other approaches for testing.

6. If epidemiological studies were to be conducted, could suitable cohorts be identified?

VI. References

(1) USEPA. 1983. Draft Federal Register Notice for Ethylene Oxide. Federal register Office. No. 83T-3747; OPTS No. 42027.

(2) USEPA. 1983. Draft Federal Register Notice for Propylene Oxide. Federal Register Office. No. 83T-3741; OPTS No. 42028A.

(3) USEPA. 1983. Draft Federal register Notice for 1,2-Butylene Oxide. Federal Register Office. No. 83T-3742; OPTS No. 42049.

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VII. Development of Rulemaking

After an analysis of the public comments on the ITC report and review of the available data, EPA tentantively believes that there is reason to proceed with development of a proposed rule for testing of the long-chain alkyl epoxides but not of the short-chain alkyl epoxides addressed in this notice.

By publishing this ANPR, EPA hopes to receive early comment on its tentative bases for proceeding with rulemaking, on the testing alternatives proposed, on the use of structure-activity analysis for the long-chain alkyl epoxides, on its proposed sampling approach to test substances, and on the kinds of tests the Agency believes necessary to characteristize the effects of these chemicals. Also, comment is requested on the bases for the choice of test chemicals, for the suggested findings, and for the screening tests under consideration. The Agency will analyze all comments, production, use patterns, available data, and other relevant issues raised in comments on this ANPR. The Agency will also consider any negotiated testing plans proposed for its review and comment. Testing plans submitted for the Agency's consideration in the ANPR comments need not be in final form, but they should include formal protocoals for proper review.

VIII. Public Record

The EPA has established a public record for this ANPR, (Docket Number OPTS–42053). This record includes:

(1) Federal Register notice containing the designations of alkyl epoxides to the priority list and all comments on alkyl epoxides received in response to that notice.

(2) Communications with industry.

(3) Letters.

(4) Contact reports of telephone conversations.

(5) Published and unpublished data.

(6) Federal Register notice requesting information and comments on alternatives being considered by the Agency and all comments received in response to that notice.

This record, containing the basic information considered by the Agency in developing the decision, is available for inspection in the OPTS Reading Room 8:00 a.m. to 4:00 p.m., Monday through Friday (except legal holidays) in Room E–107, 401 M Street, SW., Washington, D.C. 20460. The Agency will supplement this record periodically with additional relevant information received.

(Sec. 4, 90 Stat. 2003 (15 U.S.C. 2601))

Dated: December 23, 1983.

Alvin L. Alm,

Acting Administrator.

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