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Part V

Environmental Protection Agency

Twenty-sixth Report of the Interagency Testing Committee to the Administrator; Receipt of Report and Request for Comments Regarding Priority List of Chemicals; Notice

ENVIRONMENTAL PROTECTION AGENCY

[OPTS-41033; FRL 3765-4]

Twenty-Sixth Report of the Interagency Testing Committee to the Administrator; Receipt of Report and Request for Comments Regarding Priority List of Chemicals

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Interagency Testing Committee (ITC), established under section 4(e) of the Toxic Substances Control Act (TSCA), transmitted its Twenty-sixth Report to the Administrator of EPA on May 8, 1990. This report, which revises and updates the Committee's priority list of chemicals, adds one chemical and three chemical groups to the list. One chemical and one chemical group are recommended with intent-to-designate. The Twenty-sixth Report is included with this notice.

The ITC has removed one chemical and one chemical group from the priority list. Crotonaldehyde (CAS No. 4170-30-3) was removed from the priority list because the EPA published a consent order on November 9, 1989 (54 FR 47062). Disperse blue dyes were removed from the priority list because the EPA published a consent order on November 21,1989 (54 FR 48102), that requires testing of CAS No. 3618-72-2.

EPA invites interested persons to submit written comments on the report, and to attend Focus Meetings to help narrow and focus the issues raised by the ITC's intent to designate recommendations. Additionally, EPA is soliciting interest in public participation in the consent agreement process for sodium cyanide and isocyanates.

DATES: Written comments should be submitted by July 5, 1990.Written notice of interest in being designated an "interested party" to the development of consent agreements for sodium cyanide or isocyanates should be submitted by July 5, 1990. The procedures for negotiations are described in 40 CFR 790.22. All written submissions should bear the identifying docker number (OPTS-41033; FRL 3765-4).

A Focus Meeting will be held on June 20, 1990.

ADDRESSES: Send written submissions to: TSCA Public Docket Office (TS-793), Office of Toxic Substances, Environmental Protection Agency, Rm. NE G-004, 401 M St., SW., Washington, DC 20460. Submissions should bear the document control number (OPTS-41033; FRL 3765-4).

The public record supporting this action, including comments, is available for public inspection in Rm. NE G-004 at the address noted above from 8 a.m. to 4 p.m., Monday through Friday, except legal holidays.

The Focus Meeting will be held at EPA Headquarters, Rm. 103 NE Mall, 401 M St., SW., Washington, DC. Persons planning to attend the Focus Meeting, and/or seeking to be informed of subsequent public meetings on these chemicals, should notify the Environmental Assistance Division at the address listed below. To ensure seating accommodations at the Focus Meetings, persons interested in attending are asked to notify EPA at least one week ahead of the scheduled date.

FOR FURTHER INFORMATION CONTACT: Michael M. Stahl, Director, Environmental Assistance Division (TS-799), Office of Toxic Substances, Environmental Protection Agency, 401 M St., SW., Rm. E-543B, Washington, DC 20460, (202) 554-1404, TDD (202) 554-0551.

SUPPLEMENTARY INFORMATION: EPA has received the TSCA Interagency Testing Committee's Report to the Administrator.

I. Background

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 under section 4(a) requiring testing of chemical substances and mixtures in order to develop data relevant to determining the risks that such chemical substances and mixtures may present to health and the environment. Section 4(e) of TSCA established an Interagency Testing Committee to make recommendations to the Administrator of EPA on chemical substances and mixtures to be given priority consideration in proposing test rules under section 4(a). Section 4(e) directs the ITC to revise its list of recommendations at least every 6 months as necessary. The ITC may "designate" up to 50 substances and mixtures at any one time for priority consideration by the Agency. The ITC's Twenty-sixth Report was received by the Administrator on May 8, 1990, and follows this Notice. The Report adds one chemical and three groups of chemicals to the TSCA section 4(e) priority list.

II. Written and Oral Comments and Public Meetings

EPA invites interested persons to submit detailed comments on the ITC's new recommendations. The Agency is interested in receiving information concerning additional or ongoing health and safety studies on the subject chemicals as well as information relating to the human and environmental exposure to these chemicals.

A notice will be published later in the **Federal Register** adding the substances recommended in the ITC's Twenty-sixth Report to the TSCA section 8(d) Health and Safety Data Reporting Rule (40 CFR part 716), which requires the reporting of unpublished health and safety studies on the listed chemicals. The delay in publishing this notice is necessitated because of the requirement to complete the economic analysis on three groups of chemicals. That notice will also add chemicals to the TSCA section 8(a) Preliminary Assessment Information Rule (40 CFR part 712). The section 8(a) rule requires the reporting of production volume, use, exposure, and release information on the listed chemicals.

Focus Meetings will be held to discuss relevant issues pertaining to the intent to designate chemicals and to narrow the range of issues/effects which will be the focus of the Agency's subsequent activities in responding to the ITC recommendations. The Focus Meetings will be held on June 20, 1990, as follows:

10:00-11:30 a.m.: Sodium Cyanide.
1:00-2:30 p.m.: Isocyanates.

They will be held at EPA Headquarters, Rm. 103 NE Mall, 401 M St., SW., Washington, DC. These meetings are intended to supplement and expand upon written comments submitted in response to this notice.

Persons wishing to attend these meetings, or subsequent meetings on these chemicals, should call Michael Stahl, Environmental Assistance Division, at the telephone number listed above at least one week in advance.

This notice also serves to invite persons interested in participating in or monitoring negotiations for a consent agreement for sodium cyanide or isocyanates to notify EPA no later than [insert date 30 days after date of publication in the **Federal Register**]. The procedures for negotiations are described in 40 CFR 790.22. All written submissions should bear the identifying docket number (OPTS-41033; FRL 3765-4).

III. Status of List

In addition to adding one chemical and three chemical group recommendations to the priority list, the ITC's Twenty-sixth Report notes the removal of crotonaldehyde and disperse blue dyes from the list.

Authority: 15 U.S.C. 2603.

Dated: May 30, 1990.

Charles M. Auer,

Acting Director, Existing Chemical Assessment Division.

Twenty-Sixth Report of the Interagency Testing Committee to the Administrator, Environmental Protection Agency

Summary

Section 4 of the Toxic Substances Control Act of 1976 (TSCA, Pub. L. 94–469) provides for the testing of chemicals in commerce that may present an unreasonable risk of injury to health or the environment, that may reasonably be anticipated to enter the environment in substantial quantities or that may involve significant or substantial human exposure. It also provides for the establishment of a Committee (the Interagency Testing Committee), composed of representatives from eight designated Federal agencies, to recommend chemical substances and mixtures (chemicals) to which the Administrator of the U.S. Environmental Protection Agency (EPA) should give priority testing consideration.

Section 4(e)(1)(A) of TSCA directs the Committee to recommend to the EPA Administrator chemicals to which the Administrator should give priority testing consideration pursuant to section 4(a). The Committee is required to designate those chemicals, from among its recommendations, to which the Administrator should respond within 12 months by either initiating a rulemaking proceeding under section 4(a) or publishing the Administrator's reason for not initiating such a proceeding. At least every 6 months, the Committee makes those revisions in the TSCA section 4(e) Priority List that it determines to be necessary and transmits them to the EPA Administrator.

As a result of its deliberations, the Committee is revising the TSCA section 4(e) Priority List by the addition of one chemical and three chemical groups.

The Priority List is divided into three parts: Part A contains those recommended chemicals and groups designated for priority consideration and response by the EPA Administrator within 12 months. Part B contains chemicals and groups recommended with intent-to-designate. This category was established by the Committee in its seventeenth report (50 FR 47603; November 19, 1985) to take advantage of rules promulgating automatic reporting requirements for non-designated ITC recommendations under the section 8(a) Preliminary Assessment Information Rule and the TSCA section 8(d) Health and Safety Data Reporting Rule. Information received following recommendation with intent-to-designate may influence the Committee to either designate or not designate the chemicals or groups in a subsequent report to the Administrator. Part C contains chemicals and groups that have been recommended for priority consideration by EPA without being designated for response within 12 months. The changes to the Priority List are presented, together with the types of testing recommended in the following Table 1. The notes following Table 1 acknowledge the Committee's efforts to comprehensively examine ongoing testing-related activities and available information previously submitted under TSCA.

TABLE 1—ADDITIONS TO THE SECTION 4(E) PRIORITY LIST MAY 1990

Chemical/group	Recommended studies
A. Designated:	
None.	
B. Recommended with Intent-to-Designate:	
Sodium cyanide (CAS No. 143-33-9)	Chemical Fate: None. Health Effects: Under review, as cyanide. Ecological Effects: Toxicity to migratory birds.
Isocyanates	Chemical Fate: Physical/chemical properties and persistence. Health Effects: Under review. Ecological Effects: None.
C. Recommended:	
Brominated flame retardants	Chemical Fate: Physical/chemical properties and persistence. Health Effects: Under review. Ecological Effects: None.
Alkyl phosphates	Chemical Fate: Physical/chemical properties and persistence. Health Effects: None. Ecological Effects: None, except tri-*n*-butyl phosphate.

The individual chemicals for the chemical groups in Table 1 are listed below to identify SARA section 110 and EPCRA section 313 chemicals and to minimize ambiguities related to TSCA sections 8(a) and 8(d) reporting requirements. Chemical nos. 1 through 43 are isocyanates, chemical nos. 44 through 59 are brominated flame retardants, and chemical nos. 60 through 79 are alkyl phosphates.

Chemical name	CAS No.	Notes
1. 2,6-Toluene diisocyanate	91-08-7	b,d,e,f
2. 4,4'-Diisocyanato-3,3'-dimethylbiphenyl	91-97-4	e,f
3. *p*-Nitrophenyl isocyanate	100-28-7	
4. 4,4'-Diphenylmethane diisocyanate	101-68-8	b,e,f
5. 3,4-Dichlorophenyl isocyanate	102-36-3	
6. Phenyl isocyanate	103-71-9	c
7. *p*-Chlorophenyl isocyanate	104-12-1	
8. *p*-Phenylene diisocyanate	104-49-4	e,f
9. Ethyl isocyanate	109-90-0	
10. *n*-Propyl isocyanate	110-78-1	
11. *n*-Butyl isocyanate	111-36-4	
12. Octadecyl isocyanate	112-96-9	

Chemical name	CAS No.	Notes
13. 1,3-Diisocyanatobenzene	123-61-5	e,f
14. (α,α,α-Trifluoro-*m*-tolyl)-isocyanate	329-01-1	
15. 2,4-Toluene diisocyanate	584-84-9	b,d,e,f
16. 1-Isocyanato-2-methylbenzene	614-68-6	
17. 1-Isocyanato-4-methylbenzene	622-58-2	
18. Methyl isocyanate	624-83-9	b
19. 3-Isocyanato-1-propene	1476-23-9	
20. 1,1',1''-Methylidynetris(4-isocyanato-benzene)	2422-91-5	
21. 1-Bromo-4-isocyanatobenzene	2493-02-9	
22. 1-Chloro-3-isocyanatobenzene	2909-38-8	
23. Ethyl isocyanatoacetate	2949-22-6	
24. Cyclohexyl isocyanate	3173-53-3	
25. Tris(isocyanatohexyl)biuret	4035-89-6	
26. Isophorone diisocyanate	4098-71-9	e,f
27. Tris(4-isocyanatophenyl) thiophosphate	4151-51-3	
28. 1,1'-Methylenebis(4-isocyanato-cyclohexane)	5124-30-1	e,f
29. 1-Isocyanato-2-((4-isocyanato-phenyl)methyl)benzene	5873-54-1	e,f
30. Diphenylmethylene diisocyanate	10031-75-1	
31. 1,6-Diisocyanato-2,4,4-trimethylhexane	15646-96-5	e,f
32. 1,6-Diisocyanato-2,2,4-trimethylhexane	16938-22-0	e,f
33. Bis(isocyanatomethyl)benzene	25854-16-4	
34. 1,1'-Methylenebis(isocyanatobenzene)	26447-40-5	e
35. Toluene diisocyanate	26471-62-5	a,b,d,e,f
36. 1,3,5-Tris(3-isocyanatomethylphenyl)-1,3,5-triazine-2,4,6(1*H*,3*H*,5*H*)-trione	26603-40-7	
37. Toluene diisocyanate dimer	26747-90-0	
38. 2,6-Diisopropylphenyl isocyanate	28178-42-9	
39. 2-Isocyanato-1,3-dimethylbenzene	28556-81-2	
40. 2-Isocyanatoethyl methacrylate	30674-80-7	
41. 3,5-Dichlorophenyl isocyanate	34893-92-0	
42. 2-Heptyl-3,4-bis(9-isocyanatononyl)-1-pentylcyclohexane	68239-06-5	
43. Isophorone diisocyanate, hydroxyethyl methacrylate adduct	73597-26-9	
44. Bromochloromethane	74-97-5	a,e
45. 3,4',5-Tribromosalicylanilide	87-10-5	
46. 2,3,4,5,6-Pentabromotoluene	87-83-2	
47. 1,2,3,4,5-Pentabromo-6-chlorocyclohexane	87-84-3	
48. 2,3-Dibromopropanol	96-13-9	
49. Vinyl bromide	593-60-2	c
50. 2,4-Dibromophenol	615-58-7	
51. Ethoxylated tetrabromobisphenol A	4162-45-2	
52. Tetrabromobisphenol A, bis(allyl ether)	25327-89-3	
53. Tetrabromodichlorocyclohexane	30554-72-4	
54. Tribromotrichlorocyclohexane	30554-73-5	
55. Tribromoneopentyl alcohol	36483-57-5	
56. Tetrabromobisphenol A diacrylate	55205-38-7	
57. Alkanes, C_{10-16}, bromochloro	68955-41-9	
58. 2,4-(or 2,6)-Dibromophenol, homopolymer	69882-11-7	
59. Benzene, ethenyl-, homopolymer, brominated	88497-56-7	
60. Triethyl phosphate	78-40-0	f
61. Tris(2-ethylhexyl) phosphate	78-42-2	f
62. Tris(2-butoxyethyl) phosphate	78-51-3	f
63. Di-*n*-butyl phosphate	107-66-4	
64. Triisobutyl phosphate	126-71-6	f
65. Tri-*n*-butyl phosphate[1]	126-73-8	c,e,f
66. Di(2-ethylhexyl) phosphate	298-07-7	
67. Monomethyl phosphate	812-00-0	
68. Mono(2-ethylhexyl) phosphate	1070-03-7	
69. Ethyl dichlorophosphate	1498-51-7	
70. *n*-butyl phosphate	1623-15-0	
71. Mono(isopropyl) phosphate	1623-24-1	
72. Monooctadecyl phosphate	2958-09-0	
73. Monohexyl phosphate	3900-04-7	
74. Monooctyl phosphate	3991-73-9	
75. Di-*n*-dodecyl phosphate	7057-92-3	
76. 2-(2-Butoxyethoxy)ethanol phosphate (3:1)	7332-46-9	f
77. 2-Ethylhexyl phosphate	12645-31-7	
78. Dodecyl phosphate	12751-23-4	
79. Diisooctyl phosphate	27215-10-7	

[1]Recommended in 18th Report, but plant toxicity testing needed.

Notes:

a. Superfund Amendments and Reauthorization Act (SARA) section 110.

b. Emergency Planning and Community Right-to-Know Act (EPCRA) section 313.

c. Toxic Substances Control Act (TSCA) section 8(a) Preliminary Assessment Information Rule (PAIR).

d. TSCA section 8(a) Comprehensive Assessment Information Rule (CAIR).

e. TSCA section 8(d) Health and Safety Data Reporting Rule.

f. TSCA section 8(c) notices requiring manufacturers, importers, processors and distributors to submit records and reports of allegations that chemical substances or mixtures caused significant adverse reaction to health or the environment.

TSCA Interagency Testing Committee

Statutory Member Agencies and Their Representatives:

Council on Environmental Quality

Nomination pending

Department of Commerce
Raimundo Prat, Alternate
Environmental Protection Agency
Letitia Tahan, Member
Vincent Nabholz, Alternate
National Cancer Institute
Thomas P. Cameron, Alternate
National Institute of Environmental Health Sciences
James K. Selkirk, Member and Chairperson
National Institute for Occupational Safety and Health
Robert W. Mason, Member (See Note 1)
Rodger L. Tatken, Alternate
National Science Foundation
Carter Kimsey, Member
Jarvis L. Moyers, Alternate
Occupational Safety and Health Administration
Loretta Schuman, Member and Vice-Chairperson
Stephen Mallinger, Alternate
Liaison Agencies and Their Representatives:
Agency for Toxic Substances and Disease Registry
Deborah Barsotti
Consumer Product Safety Commission
Lakshmi C. Mishra
Department of Agriculture
Richard M. Parry, Jr.
Elise A. B. Brown
Department of Defense
Harry Salem
Melvin E. Anderson
Department of the Interior
Clifford P. Rice
Barnett A. Rattner
Department of Transportation
James O'Steen (See Note 2)
Food and Drug Administration
Charles J. Kokoski (See Note 3)
Raju Kammula (See Note 4)
National Library of Medicine
Vera Hudson
National Toxicology Program
Ex-officio
U.S. International Trade Commission
Edward Matusik (See Note 5)
James Raftery (See Note 6)
Committee Staff:
John D. Walker, Executive Secretary
Norma Williams, ITC Program Specialist
Support Staff:
Alan Carpien — Office of the General Counsel, EPA

Notes:
(1) Appointed on April 4, 1990.
(2) Appointed on February 9, 1990.
(3) Appointed on February 1, 1990.
(4) Appointed on February 5, 1990.
(5) Appointed on March 19, 1990.
(6) Appointed on April 18, 1990.

The Committee acknowledges and is grateful for the assistance and support given the ITC by the staff of Syracuse Research Corp. (technical support contractor) and personnel of the EPA Office of Toxic Substances.

Chapter 1—Introduction

1.1 *Background.* The Interagency Testing Committee (Committee) was established under section 4(e) of the Toxic Substances Control Act of 1976 (TSCA, Pub. L 94–469). The specific mandate of the Committee is to recommend to the Administrator of the U.S. Environmental Protection Agency (EPA) chemical substances and mixtures in commerce that should be given priority testing consideration. TSCA specifies that the Committee's recommendations shall be in the form of a Priority List, which is to be published in the **Federal Register**. The Committee is directed by section 4(e)(1)(A) of TSCA to designate those chemicals on the Priority List to which the EPA Administrator should respond within 12 months by either initiating a rulemaking proceeding under section 4(a) or publishing the Administrator's reason for not initiating such a proceeding. There is no statutory time limit for EPA response regarding chemicals that ITC has recommended with intent-to-designate or recommended.

At least every 6 months, the Committee makes those revisions in the section 4(e) Priority List that it determines to be necessary and transmits them to the EPA Administrator.

The Committee is composed of representatives from 8 statutory member agencies and 10 liaison agencies. The specific representatives and their affiliations are named in the front of this report. The Committee's chemical review procedures and priority recommendations are described in previous reports (Refs. 1 through 9).

1.2 *Committee's previous reports.* Twenty-five previous reports to the EPA Administrator have been issued by the Committee and published in the **Federal Register**. Seventy-eight chemicals and 21 chemical groups were recommended for priority consideration by the EPA Administrator and designated for response within 12 months. In addition, 12 chemicals and 6 chemical groups were recommended without being so designated. Overall, in the 25 reports to the EPA Administrator, the Committee has recommended testing for 90 chemicals and 26 chemical groups. The groups of designated and recommended chemicals do not total 27, because 1 group (brominated flame retardants) was split between designated and recommended parts of the priority list. A complete list of recommended chemicals may be obtained by contacting: Dr. John D. Walker, Executive Secretary, Interagency Testing Committee, U.S. Environmental Protection Agency (TS–792), 401 M St., SW., Washington, DC 20460, U.S.A., (202) 382–3820.

1.3 *Committee's activities during this reporting period.* Between October 26, 1989 and April 26, 1990, the Committee reviewed chemicals that were nominated by Member Agencies, evaluated chemicals by using the Committee's computerized, substructure-based, chemical selection processes (Ref. 11) and examined lists of ongoing activities related to reducing testing information deficiencies .

Member-Agency nominations sustains one of the Committee's major functions, viz, to serve in an advisory capacity to assist in the exchange of information, collaboration, and elimination of problems caused by jurisdictional overlap and to assist in the coordination of testing being sponsored or required by U.S. Government organizations. The chemical, 4-Vinylcyclohexene and the brominated flame retardants, that were recommended for testing in the Committee's 25th Report, were nominated by the National Institute for Occupational Safety and Health and the U.S. Environmental Protection Agency, respectively. New member-agency nominations for this report include sodium cyanide (the U.S. Department of the Interior) and isocyanates (the U.S. Environmental Protection Agency).

Alkyl phosphates were selected by using the Committee's computerized, substructure-based, chemical selection processes. The Committee continues to recommend groups of structurally- or use-related chemicals for screening tests. The Committee believes this is a cost-effective approach to satisfying chemical testing information deficiencies because it promotes a comprehensive analysis of chemicals that may produce similar effects or that may involve similar exposures.

During this reporting period, the Committee reviewed several TSCA section 8(a) and 8(c) reports containing Confidential Business Information (CBI). The Committee is requesting that EPA not add 2,4-, 2,6-, and mixed isomers of toluene diisocyanate to PAIR at this time. For these chemicals, the Committee wants Member Agencies to have an opportunity to examine information submitted in response to CAIR, especially information that might be redundant with information required by PAIR.

During this reporting period, the Committee also reviewed several For Your Information (FYI), TSCA section

8(d) and 8(e) documents that are stored on microfiche in the TSCA Public Docket Office, Office of Toxic Substances, Environmental Protection Agency, Room G-004 NE Mall, 401 M St., SW., Washington, D.C. 20460. These microfiched documents are also available from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161 (1-800-336-4700), and from Chemical Information Systems, Inc., 7215 York Road, Baltimore, Maryland 21212 (1-800-CIS-USER). The Committee referenced several of these documents in Chapter 2 of this report and readers are referred to the above addresses to obtain further information. Interested parties can also obtain, from the EPA address, copies of publicly-available reports, letters and published references supporting recommendations of chemicals in this report.

The Committee continues to comprehensively search available domestic and international lists of ongoing activities related to reducing testing information deficiencies on chemicals under review. Efforts to conduct these searches identified chemicals listed in other statutes and chemicals for which TSCA information-gathering activities are ongoing (see Table 1 notes). The Committee makes the results of these searches publicly available by referencing TSCA submissions in Reports to the EPA Administrator or making tables and references of these submissions available in the public dockets supporting a Report to the EPA Administrator.

As related to ongoing international activities, the Committee compared the list of CAS Registry numbers of chemicals that it is recommending for testing with a March 9, 1990 list of CAS Registry numbers for 45 high production volume chemicals allocated for cooperative work by the Organization for Economic Cooperation and Development. There were no common CAS Registry numbers on both lists.

During this reporting period, the Committee reviewed available information on 92 chemicals and 14 chemical groups. One chemical and three chemical groups were selected for addition to the section 4(e) Priority List; one chemical and two chemical groups were deferred. Review of the remaining chemicals is continuing.

1.4 *The TSCA section 4(e) Priority List.* Section 4(e)(1)(B) of TSCA directs the Committee to: "*** make such revisions in the [priority] list as it determines to be necessary and *** transmit them to the Administrator together with the Committee's reasons for the revisions." Under this authority, the Committee is revising the List by adding one chemical, sodium cyanide (CAS No. 143-33-9) and three chemical groups, isocyanates, brominated flame retardants (BFRs), and alkyl phosphates. Crotonaldehyde (CAS No. 4170-30-3) was removed from the Priority List because the EPA published a Consent Order on November 9, 1989 (54 FR 47062). Disperse Blue Dyes were removed from the Priority List because the EPA published a Consent Order on November 21, 1989 (54 FR 46162) that required testing of CAS No. 3618-72-2; but no testing for CAS Nos. 3618-73-3, 3956-55-6 and 21429-43-6.

The Priority List (Table 2) is divided into the following three parts; namely, A. Designated Chemicals and Groups, B. Chemicals and Groups Recommended with Intent-to-Designate, and C. Recommended Chemicals and Groups. Individual chemicals in Priority List chemical groups are included in the list of chemicals following Table 1 of this Report and the body of Table 1 in previous Reports to minimize ambiguities related to TSCA section 8(a) and 8(d) reporting requirements. Table 2 reads as follows:

TABLE 2—THE TSCA SECTION 4(E) PRIORITY LIST MAY 1990

Entry	Date of designation
A. Designated Chemicals and Groups:.	
Brominated flame retardants..	November 1989
B. Chemicals and Groups Recommended with Intent-to-Designate:.	
Chloroalkyl phosphates.....	November 1988
4-Vinylcyclohexene.....	November 1989
Sodium cyanide.....	May 1990
Isocyanates.....	May 1990
C. Recommended Chemicals and Groups:.	
Imidazolium quaternary ammonium compounds.	May 1988
Ethoxylated quaternary ammonium compounds.	May 1988
Butyraldehyde.....	November 1988
Brominated flame retardants..	November 1989
	May 1990
Alkyl phosphates.....	May 1990

References

(1) Sixteenth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, May 21, 1985, 50 FR 20930-20939. Includes references to Reports 1 through 15 and an annotated list of removals.

(2) Seventeenth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, November 19, 1985, 50 FR 47603-47612.

(3) Eighteenth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, May 19, 1986, 51 FR 18368-18375.

(4) Nineteenth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, November 14, 1986, 51 FR 41417-41432.

(5) Twentieth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, May 20, 1987, 52 FR 19020-19026.

(6) Twenty-first Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, November 20, 1987, 52 FR 44830-44837.

(7) Twenty-second Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, May 20, 1988, 53 FR 18196-18210.

(8) Twenty-third Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, November 16, 1988, 53 FR 46262-46278.

(9) Twenty-fourth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, July 27, 1989, 54 FR 31248-31249.

(10) Twenty-fifth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, December 12, 1989, 54 FR 51114-51130.

(11) Walker, J.D. and Brink, R.H. "New Cost-Effective, Computerized Approaches to Selecting Chemicals for Priority Testing Consideration." Aquatic Toxicology and Environmental Fate. G.W. Suter II and M.A. Lewis, Eds. American Society for Testing and Materials, Philadelphia, PA. ASTM STP 1007. 11:507-536 (1989).

Chapter 2—Recommendations of the Committee

2.1 *Chemicals recommended for priority consideration by the EPA Administrator.* As provided by section 4(e)(1)(B) of TSCA, the Committee is adding to the section 4(e) Priority List one chemical and three chemical groups (see Table 1). The recommendation of these chemicals is made after considering the factors identified in section 4(e)(1)(A) and other relevant information, such as the chemical testing information deficiencies of Member Agencies.

2.2 *Designated chemicals.* None.

2.3 *Chemicals recommended with intent-to-designate—2.3.a— Sodium cyanide—Summary of recommended*

studies. It is recommended that sodium cyanide be tested for:

1. *Chemical fate.* None.
2. *Health effects.* Under review, as cyanide.
3. *Ecological effects.* Toxicity to migratory birds.

Physical and Chemical Information

CAS Number: 143-33-9
Synonyms: Sodium Cyanide
Acronym: NaCN
Structural Formula: Na^+CN^-
Empirical Formula: NaCN
Molecular Weight: 49.02
Physical State at 25° C: Solid
Description of Chemical: White granules or fused pieces (Ref. 21, Windholtz et al., 1983)
Melting Point: 563° C
Vapor Pressure: $< 10^{-9}$ mm Hg (extrapolated to 25° C)
Specific Gravity: Not Applicable
Log Octanol/Water Partition Coefficient: Not Applicable
Water Solubility at 20° C: 480,000 mg/L
Log K_{oc}: Not Applicable
Henry's Constant: Not Applicable

Rationale for Recommendations

A. *Exposure information — Production/use/disposal/exposure/release.* In 1986, U.S. demand for NaCN was approximately 71 million lbs. (Ref. 6, CMR, 1987).

Sodium cyanide is used in the leaching of gold and silver from ores (Ref. 21 Windholtz et al., 1983) and mine tailings (Ref. 9 Fiksel et al., 1981), electroplating baths, and fumigating warehouses and shipping containers (e.g., ships, railcars) (Ref. 21, Windholtz et al., 1983).

B. *Evidence for exposure—Environmental exposure.* During its use to extract gold and silver from mine tailings, cyanide-containing waters are discharged to impoundments (Ref. 9, Fiksel et al., 1981). The letter from the U.S. Department of the Interior nominating sodium cyanide to the Committee contained the following information (Ref. 5, Buffington, 1990):

The number of the mines employing this method is estimated to be in the hundreds and every indication is that the use of this method is expanding. Gold mining operations have been shown to yield CN [cyanide] concentrations of 25–300 ppm in water of mill tailings impoundments and even higher concentrations, 500–2000 ppm, occur where the leach process is used. The fresh water impoundments vary from shallow depressions of about 50 feet across to more than 100 acres and depths of 15 feet; the median pond is 3–4 acres. In the interest of recycling the CN, the operators intentionally try to maintain high levels of CN in the ponds.

Sodium cyanide is included in "cyanide compounds" that are defined in 40 CFR 372.65. These cyanide compounds are on the Toxics Release Inventory established under section 313 of the Emergency Planning and Community Right-to-Know Act (Pub. L. 99-499, "EPCRA"). Section 313 of EPCRA requires certain facilities that manufacture, process, or otherwise use toxic chemicals to report annually their environmental releases of such chemicals. Mining operations, however, are not required to report discharges to impoundments under section 313 of EPCRA. Releases of "cyanide compounds" as reported under section 313 of EPCRA for the years 1987 and 1988 are summarized below:

Medium	Pounds Released	
	1987	1988
Air	1,119,119	631,926
Water	142,413	190,906
Land	14,580	134,559
Underground (Injection)	4,047,763	5,761,349
POTWs[1]	1,206,796	1,143,282

[1]Publicly Owned Treatment Works.

In addition, a number of monitoring studies of water and wastewater, including a number of studies submitted under TSCA are available (Ref. 1, Allied Chem Corp., 1985a; Ref. 2, Allied Chem Corp., 1985b; Ref. 3, Allied Signal Inc., 1989); Ref. 7, E. I. du Pont de Nemours & Co., Inc., 1989; Ref. 8, E. I. du Pont de Nemours & Co., Inc., 1989; Ref. 10, FMC Corp, 1979; Ref. 12, Monsanto Co., 1987; Ref. 13, PPG Industries, Inc., 1987a; Ref. 14, PPG Industries, Inc, 1987b; Ref. 15, Rohm & Haas Co., 1982; Ref. 16, Rohm & Haas Co., 1986; Ref. 17, Shell Oil Co, 1989; Ref. 18, Sybron Corp, 1982; Ref. 19, Union Carbide Corp., 1988.

I. Chemical Fate Information

Chemical fate testing is not recommended at this time.

II. Health Effects Information

Health effects information on cyanide is being reviewed by the Agency for Toxic Substances and Disease Registry (ATSDR) (Ref. 4, ATSDR, 1989). Available information suggests that some health effects testing may be necessary, but before testing is recommended, the Committee wants ATSDR and other Member Agencies to have an opportunity to examine any additional information that is submitted in response to this report.

III. Ecological Effects Information

A. *Acute and subchronic (short-term) effects.* Cyanides are Priority Pollutants under the Clean Water Act. Numerous tests are available that demonstrate the acute toxicity of free cyanide to aquatic organisms. Free cyanide is present in water from the dissolution of such cyanide compounds as sodium cyanide, potassium cyanide, and hydrogen cyanide. The LC_{50} values for 9 freshwater fish species range from 52 to 350 μg/L; the most sensitive species is *Salvelinus fontinalis*. The LC_{50} values for 6 invertebrate species range from 83 to 2,490 μg/L, with the most sensitive species being *Daphnia pulex*. The LC_{50} values for 3 marine fish species (*Menidia menidia, Cyprinodon variegatus*, and *Pseudopieronectes americanus*) are 59, 300, and 372 μg/L, respectively. Amphipods are the least sensitive of the marine invertebrates tested (LC_{50} = 1,220 μg/L), and mysids and copepods the most sensitive (LC_{50} values = 30 and 113 μg/L, respectively). In addition, the 96-hour LC_{50} values for the green alga *Scenedesmus quadricauda* is 160 μg/L (Ref. 20, US EPA, 1985).

B. *Chronic (long-term) effects.* Tests with free cyanide produced chronic toxicity values of: 34 μg/L for *Asellus communis*; 18 μg/L for *Gammarus psuedolimnaeus*; 8 μg/L for *Salvelinus fontinalis*; 16 μg/L for *Pimephales promelas*; and 70 μg/L for *Mysidopsis bahia* (Ref. 20, US EPA, 1985).

C. *Other ecological effects (biological, behavioral, or ecosystem process).* The letter from the U.S. Department of the Interior nominating sodium cyanide to the Committee contained the following information (Ref. 5, Buffington 1990):

Cyanide in water of heap leach and mill tailings ponds associated with precious metal

mining has been implicated in substantial wildlife mortality in the western U.S. during the 1980s. As a result of voluntary reporting by 47 mining operations in the State of Nevada, more than 6,000 carcasses of at least 80 species of birds, 17 species of mammals, and a variety of reptiles and amphibians have been retrieved from these impoundments. Birds, especially aquatic migrants, represented over 90 percent of the total mortalities. Although these mine ponds are not usually associated with prime wildlife habitat, they are frequently located along critical avian migration routes and provide resting sites for opportunistic migrants.

D. *Bioconcentration and food-chain transport.* No data were found.

E. *Rationale for ecological effects testing recommendation.* The U.S. Department of the Interior is concerned about the toxicity of cyanide to migratory birds that alight on ponds containing cyanide-contaminated water. Ecological effects testing is recommended because data are insufficient to reasonably determine or predict the toxicity of cyanide to migratory birds and other wildlife.

References

(1) Allied Chemical Corp. TSCA Sec. 8(d) submission 878216017, microfiche number OTS0206784. "Hydrogeologic investigation and implementation of remedial measures at Bendix Industrial Tools Green Field, Massachusetts with cover letters." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1985a).

(2) Allied Chemical Corp. TSCA Sec. 8(d) submission 878216189, microfiche number OTS0206865. "Final report preliminary site assessment Broadview, Illinois plant Amphenol Products Division industrial and sector with cover letter attached." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1985b).

(3) Allied Signal, Inc. TSCA Sec. 8(d) submission 88-890000266, microfiche number OTS0520421. "Final draft phase 1 site assessment: Body of report, figures, attachments and hydraulic properties with attached appendices and cover letter dated 05/15/89." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1989).

(4) ATSDR. Agency for Toxic Substances and Disease Registry. "Toxicological Profile for Cyanide." TP-88/12. Department of Health and Human Services, U.S. Public Health Service, Centers for Disease Control, Atlanta, GA (1989).

(5) Buffington, J.D. Letter from John D. Buffington, Regional Director for Research and Development, Fish and Wildlife Servide, U.S. Department of the Interior to John D. Walker, Acting Executive Secretary, Interagency Testing Committee (ITC), nominating NaCN for consideration by the ITC, Dated April 17, 1990.

(6) CMR. Chemical Marketing Reporter. "Chemical Profile: Hydrogen Cyanide." June 22. New York, NY: Schnell Publishing Co. (1987).

(7) E.I. du Pont de Nemours & Co., Inc. TSCA Sec. 8(d) submission 86-890000135, microfiche number OTS0517735. "Endangerment assessment, on-site conditions on seven chemicals with cover letter dated 02/24/89." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1989a).

(8) E.I. du Pont de Nemours & Co., Inc. TSCA Sec. 8(d) submission 86-890000134, microfiche number OTS0517734. "Endangerment assessment, off-site conditions on 1,1,1-trichloroethane, 1,1-dichloroethane, 1,2-dichloroethane, xylenes and 1,3-dichloropropane with cover letter dated 02/24/89." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1989b).

(9) Fiksel, J., Cooper, C., Eschenroeder, A., Goyer, M., and Perwak, J., "Exposure and risk assessment for cyanide." EPA/440/4-85/008. (NTIS PB85-220572). Cambridge, MA: Arthur D. Little, Inc. (1981).

(10) FMC Corp. TSCA Sec. 4 submission 40-7942485, microfiche number OTS0519270. "Health effect studies on various aryl phosphates." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1979).

(11) Janks, W.R. "Cyanides." In: *Kirk-Othmer Encyclopedia of Chemical Technology*, New York, NY: John Wiley & Sons (1979).

(12) Monsanto Co. TSCA Sec. 8(d) submission 86-870000940, microfiche number OTS0515378. "Acute oral, eye, skin, and inhalation toxicity, preliminary ground water assessment, and characterization of effluents of phenol with cover letter dated 07/27/87." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1987).

(13) PPG Industries, Inc. TSCA Sec. 8(d) submission 86-870002003, microfiche number OTS0517092. "Waste disposal sites assessment." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1987a).

(14) PPG Industries, Inc. TSCA Sec. 8(d) submission 86-870002033, microfiche number OTS0517122. "Preliminary investigation at the Hranica waste disposal site - Sarver, Penn." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1987b).

(15) Rohm & Haas Co. TSCA Sec. 8(d) submission 878212294, microfiche number OTS0205979. "Characterization & fate of the discharge of priority pollutants from the Rohm & Haas Philadelphia plant into Delaware low level collector of the Philadelphia sewer." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1982).

(16) Rohm & Haas Co. TSCA Sec. 8(d) submission 868600048, microfiche number OTS0510197. "Memorandum: treatment of cyanide in the Houston plant with cover letter dated 05/07/86." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1986).

(17) Shell Oil Co. TSCA Sec. 8(d) submission 88-890000228, microfiche number OTS0516763. "Analysis of waste water samples and inhalation reproduction range-finding study in mated rats with C9 aromatic hydrocarbons with cover letter dated 05/10/89." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1989).

(18) Sybron Corp. TSCA Sec. 8(d) submission 878210423, microfiche number OTS0206251. "Surface water quality and hydrogeologic investigation of abandoned settling basins." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1982).

(19) Union Carbide Corp. TSCA Sec. 8(d) submission 86-880000319, microfiche number OTS0514200. "Hydrogeological investigation at the Union Carbide Solvents and Materials Coating Plant with cover letter dated 07/06/88." Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1988).

(20) U.S. EPA. Environmental Protection Agency. Ambient Water Quality Criteria for Cyanide. Washington, DC: Office of Water Regulation and Standards, U.S. Environmental Protection Agency. (1985).

(21) Windholtz, M., Budavari, S., Blumetti, R.F., and Otterbein, E.S., eds., The Merck Index. 10th edition. Rahway, New Jersey: Merck & Co., Inc., p. 8440 (1983).

2.3.b *Isocyanates—Summary of recommended studies.* It is recommended that the isocyanates included in the list of chemicals following Table 1 (except for those with specific testing noted in the Physical and Chemical Information section and section II of this chapter) be tested for:

1. *Chemical fate.* Physical/chemical properties and persistence.

2. *Health effects.* Under review.

3. *Ecological effects.* None.

Physical and Chemical Information

Except for vapor pressure of phenyl isocyanate (2.57 mm Hg at 25° C; Ref. 6, Daubert and Danner, 1989), 2,4-toluene diisocyanate (0.008 mm Hg at 20° C; Ref. 3, Boublick et al., 1984), *n*-butyl isocyanate (17.6 mm Hg at 25° C; Ref. 6, Daubert and Danner, 1989) and cyclohexyl isocyanate (1.02 mm Hg at 25° C; Ref. 6, Daubert and Danner, 1989), melting point of cyclohexyl isocyanate (48° C; Ref. 2, Aldrich, 1988), methyl isocyanate (-17° C; Ref. 7, Dean, 1985), *p*-chlorophenyl isocyanate (31° C; Ref. 7, Dean, 1985) and *n*-butyl isocyanate (26° C; Ref. 2, Aldrich, 1988) and boiling point of *p*-chlorophenyl isocyanate (204° C; Ref. 7, Dean, 1985), cyclohexyl isocyanate (168-170° C; Ref. 7, Dean, 1985), *n*-butyl isocyanate (115° C; Ref. 7, Dean, 1985) and methyl isocyanate (39.1° C; Ref. 16, Weast, et al., 1985), the Committee has no information on measured physical/chemical properties of the isocyanates included in the list of chemicals following Table 1.

Rationale for Recommendations

A. *Exposure information—Production/use/disposol/exposure/*

release. The Committee believes that the isocyanates included in the list of chemicals following Table 1 are commercially available and that many are produced in substantial volumes; actual volumes are CBI. Isocyanates are used in a large number of applications including polyurethanes, flexible urethane foams (for furniture, transportation, carpet underlay, bedding, and other foam uses), rigid foams, coatings, elastomers, thermoplastic elastomers, preparation of polyurethane resin and spandex fibers, bonding rubber to rayon and nylon, and in the manufacture of carbamates ureas for pharmaceuticals, herbicides, and pesticides. A search of studies submitted under TSCA revealed monitoring studies for 4,4'-diphenylmethane diisocyanate and 2,4-toluene diisocyanate (Ref. 8, Hazelton Labs, 1977; Ref. 14, Potlatch Corp., 1987).

B. *Evidence for exposure—Human exposure*. The isocyanates recommended in this report are used in a variety of applications, many of which can lead to worker exposure. This is exemplified by the case reports or industrial hygiene studies submitted to the EPA as FYI (for your information) or under TSCA sections 8(d) (health and safety studies) or 8(e) (notice of substantial risk) as well as the reports of significant adverse reactions submitted under TSCA section 8(c) as CBI. A table of isocyanates for which FYI, TSCA 8(d) or 8(e) case reports and industrial hygiene studies, and a list of references for those reports or studies are contained in the public docket for the 26th ITC Report.

Environmental exposure. The following releases are reported from the Toxics Release Inventory:

Chemical name/medium	Pounds released	
	1987	1988
2,6-Toluene diisocyanate:		
Air	424,400	131,421
Water	102,510	0
Land	1,000	510
4,4'-Diphenylmethane diisocyanate:		
Air	868,740	285,181
Water	770	1,022
Land	66,975	87,165
2,4-Toluene diisocyanate:		
Air	821,295	226,672
Water	250	0
Land	1,000	1,040
Methyl isocyanate:		
Air	286,544	10,175
Water	0	0
Land	0	64

I. Chemical Fate Information

A search of chemical fate studies submitted under TSCA revealed three biodegradation studies for 4,4'-diphenylmethane diisocyanate (Ref. 10, International Isocyanate Institute (III), 1987a.; Ref. 11, III, 1987b; Ref. 12, III, 1987c). These studies, since they were conducted in the presence of liquid water, may be biodegradation tests on isocyanate hydrolysis products. An EPA report provided reliable hydrolysis data for phenyl isocyanate and *n*-butyl isocyanate (Ref. 13, Mill et al., 1984) as did the results of Castro et al. (Ref. 5, 1985) for methyl isocyanate. Other hydrolysis data for methyl isocyanate and phenyl isocyanate appear to be less reliable because it is unknown whether buffers were used to control pH and because some experiments used a considerable amount of dioxane (Ref. 15, Tiger et al., 1971); data for toluene diisocyanate appear to be less reliable because experiments were conducted in the heterogeneous phase, temperature was not controlled, it is unknown whether buffers were used to control pH and because some experiments used dioxane-water mixtures (Ref. 1, Aleksandrova et al., 1972; Ref. 4, Brochhagen and Grieveson, 1984). The Committee acknowledges that simple isocyanates hydrolyze rapidly in the presence of liquid water. However, the Committee recognizes that in the absence of sufficient quantities of liquid water, that physical/chemical properties such as vapor pressure will influence the fate of isocyanates, especially partitioning to air. With respect to partitioning to air and in response to the Committee's recommendation of health effects testing for hexamethylene diisocyanate in the 22nd Report, the EPA proposed gas-phase hydrolysis testing to estimate the persistence of hexamethylene diisocyanate in workplace air. A previous study on gas-phase hydrolysis of toluene diisocyanate indicated that loss of toluene diisocyanate resulted from adsorption to test chamber walls, not hydrolysis (Ref. 9, Holdren et al., 1984). At this time the Committee is not recommending gas-phase hydrolysis testing of isocyanates, because it wants to review the gas-phase hydrolysis test data for hexamethylene diisocyanate. However, chemical fate testing is recommended because data were insufficient to reasonably determine or predict physical/chemical properties and persistence.

II. Health Effects Information

Health effects testing information is being reviewed by the Environmental Protection Agency (EPA), National Institute of Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA). Member Agencies are concerned about the potential adverse health effects that may result from exposure to isocyanates. Available information suggests that some health effects testing may be necessary, but before testing is recommended, the Committee wants EPA, NIOSH, OSHA and other Member Agencies to have an opportunity to examine any additional information that is submitted in response to this Report. A table of isocyanates for which FYI, TSCA 8(d) or 8(e) health effects studies were submitted to the EPA and a list of references for those studies are contained in the public docket for the 26th ITC Report.

III. Ecological Effects Information

No ecological effects testing is recommended at this time. A table of isocyanates for which FYI, TSCA 8(d) or 8(e) ecological effects, bioconcentration and tissue concentration studies were submitted to the EPA and a list of references for those studies are contained in the public docket for the 26th ITC report. Many of these studies, since they were performed in liquid water, may be toxicity tests on isocyanate hydrolysis products.

References

(1) Aleksandrova, Yu V., Kryuchkov, F.A., and Tarakanov, O.G. "Some kinetic relationships of the water-isocyanate reaction." *Vysokomolekulyarnye soedineniya*. Vol. A14(1):23–29 (1972).

(2) Aldrich. *Catalogue Handbook of Fine Chemicals*. Aldrich Chemical Company, Milwaukee, Wisconsin, pp. 279 and 429 (1988–1989).

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(4) Brochhagen, F.K., and Grieveson, B.M. "Environmental aspects of isocyanates in water and soil." *Cellular Polymers*. 3:11–17 (1984).

(5) Castro, A.E., Moodie, R.B., and Sansom, P.J. "The kinetics of hydrolysis of methyl and phenyl isocyanates." *Journal of the Chemical Society*. Perkin Transactions II, pp. 737–742 (1985).

(6) Daubert, T.E. and Danner, R.P. "Physical and thermodynamic properties of pure chemicals: data compilation." Design Institute for Physical Property Data, American Institute of Chemical Engineers. New York, N.Y.: Hemisphere Publishing Corp. Vol. 4 (1989).

(7) Dean, J.A. *Lange's Handbook of Chemistry*. 13th ed. New York, N.Y.: McGraw Hill Book Company, pp. 7–169, 232, 252, 516 (1985).

(8) Hazelton Laboratories. TSCA Sec. 8(d) submission 86–870000690, microfiche number OTS0514800. Foam plant stack emission data report. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1977).

(9) Holdren, M.W., Spicer, C.W., Riggen, R.M. "Gas phase reaction of toluene diisocyanate with water vapor." *American Industrial Hygiene Association Journal*. 45:626–633 (1984).

(10) International Isocyanate Institute. TSCA Sec. 8(d) submission 86–870000652, microfiche number OTS0515179. Biodegradability and toxicity bioassays of isocyanates and amines. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1987a).

(11) International Isocyanate Institute. TSCA Sec. 8(d) submission 86–870000646, microfiche number OTS0515172. Biodegradation of toluene diisocyanate and diphenyl methane diisocyanate. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1987b).

(12) International Isocyanate Institute. TSCA Sec. 8(d) submission 86–870000649, microfiche number OTS0515176. Ecotoxicity of toluene diisocyanate, diphenyl methane diisocyanate, toluene diamine, and diphenyl methane. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1987c).

(13) Mill, T., Mabey, W.R., Podall, R.T., Dulin, D., Drossman, H., Liu, A., Barich, V., Jaber, H., Irwin, K. "Data Generation for Process and Property Constants Used in Fate Assessments." Final Report. *Hydrolysis of Isocyanates*. EPA Contract No. 68–03–2981, Project Officer: L.A. Mulkey, Environmental Protection Agency, Environmental Research Laboratory, Athens, GA, pp. 18–24 (1984).

(14) Potlatch Corp. TSCA Sec. 8(d) submission 88–70001300, microfiche number OTS0515459. Water sample analysis for priority pollutants with cover letter dated 07/29/87. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency. (1987).

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2.4 *Recommended chemicals*—2.4.a *Brominated flame retardants (BFRs)—Summary of recommended studies.* It is recommended that the BFRs included in the list of chemicals following Table 1 (except for those with specific testing noted in the Physical and Chemical Information section and section II of this chapter) be tested for:

1. *Chemical fate.* Physical/chemical properties and persistence.

2. *Health effects.* Under review.

3. *Ecological effects.* None.

Physical and Chemical Information

Except for information on physical/chemical properties of a few commercial mixtures containing the BFRs included in the list of chemicals following Table 1 and water solubility of bromochloromethane (9,000 mg/L; Ref. 9, Kirk-Othmer, 1978) and 2,4- (or 2,6-) dibromophenol, homopolymer (1.6 mg/L; Ref. 14, Velsicol, 1990a), melting point of bromochloromethane (-86.5° C; Ref. 18, Weast, 1987) and 1,2,3,4,5-pentabromo-6-cyclohexane (202° C; Ref. 4, Hutzinger et al., 1976) vapor pressure of bromochloromethane (141 mm Hg at 24° C; Ref. 10, Kudchadker et al., 1979) and ethoxylated tetrabromobisphenol A (10.1 mm Hg at 24° C; Ref. 13, U.S. Testing, 1985), octanol-water partition coefficient of bromochloromethane (25.1; Ref. 5, ISHOW, 1988) and 2,4- (or 2,6-) dibromophenol, homopolymer (143; Ref. 15, Velsicol, 1990b), the Committee has no information on measured physical/chemical properties of the BFRs included in the list of chemicals following Table 1.

Rationale for Recommendation

*A. *Exposure information—Production/use/disposal/exposure/release.* The Committee believes that the BFRs included in the list of chemicals following Table 1 may be commercially available and that several are produced in substantial volumes; actual volumes are CBI. In a January 8, 1990 letter to the Brominated Flame Retardants Industry Panel, the Committee solicited voluntary submissions of production, use, exposure, and release information, as well as any unpublished health effects, chemical fate, and environmental effects data for the first 15 BFRs included in the list of chemicals following Table 1 (Ref. 6, ITC, 1990). In response to that letter, Great Lakes Chemical Corporation (GLCC) indicated that 2,3,4,5,6-pentabromotoluene and 2,3-dibromopropanol were inactive products not manufactured by GLCC, and that 2,4-dibromophenol may be manufactured by GLCC in Europe, but that it is not imported into the U.S. (Ref. 2, Great Lakes, 1990). The Committee appreciates receiving this voluntary information from GLCC. The Committee wants to review any production, importation or exposure information that may be submitted by others in response to this report, before making any subsequent decisions on these chemicals. The 16th BFR included in the list of chemicals following Table 1 was identified by the Ferro Corporation as the analytically correct chemical description of tribrominated polystryene which was recommended for testing in the Committee's 25th Report (Ref. 1, Ferro Corp., 1990). They suspected "that no person manufactures or imports tribrominated polystyrene in the United States for commercial purposes". The Committee is examining the information submitted in response to the 25th Report on tribrominated polystyrene.

The BFRs included in the list of chemicals following Table 1 (for which use data was available) may be used as flame retardants in fire extinguishers (bromochloromethane), polyester resins (2,3,4,5,6-pentabromotoluene, ethoxylated tetrabromobisphenol A), polystyrene foam (1,2,3,4,5-pentabromo-6-cyclohexane), synthetic fibers (vinyl bromide), and plastics (tetrabromobisphenol A allyl ether).

B. *Evidence for exposure—Environmental exposure.* Bromochloromethane was measured at concentrations greater than 10 ng/L in Lake Ontario, at concentrations ranging from 5–150 ng/L in Welland River water, and at 5 ng/L in Niagara Falls, Ontario chlorinated tap water (Ref. 7, Kaiser and Camba, 1983; Ref. 8, Kaiser et al., 1983). Bromochloromethane was also measured (8 μg/L) in a 10 g tissue sample of rainbow trout taken from the Colorado River (Ref. 3, Hiatt, 1983). Vinyl bromide is listed on the Toxics Release Inventory. In 1987, 53,700 pounds were released to air; in 1988, 4,950 pounds were released to air and 400 pounds were discharged to water.

I. Chemical Fate Information

Except for biodegradation data on bromochloromethane (Ref. 12, Tabak et al., 1981), a hexahalocyclohexane mixture containing 1,2,3,4,5-pentabromo-6-cyclohexane (Ref. 11, Lickly et al., 1984) and 2,4- (or 2,6-) dibromophenol, homopolymer (Ref. 16, Velsicol, 1990c), the Committee has no chemical fate information on the BFRs included in the list of chemicals following Table 1. Chemical fate testing is recommended because there are insufficient data to reasonably determine or predict physical/chemical properties and persistence.

II. Health Effects Information

Health effects testing for bromochloromethane is being reviewed by the Agency for Toxic Substances and Disease Registry (ATSDR) and the U.S. Environmental Protection Agency (EPA). Available information suggests that some health effects testing may be necessary, but before testing is recommended, the Committee wants ATSDR, EPA and other Member Agencies to have an opportunity to

examine any additional information that is submitted in response to this Report. A table of BFRs for which FYI, TSCA section 8(d) or 8(e) health effects studies were submitted to the EPA and a list of references for those studies are contained in the public docket for the 26th ITC Report.

III. Ecological Effects Information

No ecological effects testing is recommended at this time. A table of BFRs for which FYI, TSCA section 8(d) or 8(e) ecological effects studies were submitted to the EPA and a list of references for those studies are contained in the public docket for the 26th ITC Report. The Committee examined data for 2,3,4,5,6-pentabromotoluene, including the study of Zitko and Carson (Ref. 19, 1977) which demonstrated slow depuration from Atlantic salmon and the study of Walsh et al. (Ref. 17, 1987) that reported a marine algal $EC_{50} > 1$ mg/L. Available information suggests that some environmental effects testing may be necessary, but before testing is recommended, the Committee wants to examine any additional information that is submitted in response to this Report.

The Committee received permission from GLCC to send to the EPA as a FYI submission, the unpublished chemical fate, health effects, and ecological effects studies that GLCC voluntarily submitted (Ref. 2, Great Lakes, 1990). The studies were assigned FYI-OTS-0490-0756 and the EPA document number 84-900000087. Under 40 CFR 716.20(a)(2), health and safety studies submitted to EPA as FYI are exempt from both the copy and list submission requirements under 40 CFR 716.30 and 716.35; GLCC has no obligation to resubmit these studies to EPA.

References

(1) Ferro Corporation. Letter from David A. Wilson, Ferro Corporation, to TSCA Public Docket No. OPTS 41032, U.S. Environmental Protection Agency (February 9, 1990).

(2) Great Lakes Chemical Corporation. Letter from Dennis L. McFadden to John Walker, Interagency Testing Committee (March 30, 1990).

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(5) ISHOW. "Information System for Hazardous Organics in Water [data base]." Baltimore, MD: Chemical Information Systems, Inc., National Institute of Health/U.S. Environmental Protection Agency (1988).

(6) ITC. Letter from John D. Walker, Interagency Testing Committee, to David L. McAllister, Brominated Flame Retardants Industry Panel (January 8, 1990).

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2.4.b *Alkyl phosphates—Summary of recommended studies.* It is recommended that the alkyl phosphates included in the list of chemicals following Table 1 be tested for:

1. *Chemical fate.* Physical/chemical properties and persistence.

2. *Health effects.* None.

3. *Ecological effects.* None, except tri-*n*-butyl phosphate. Tri-*n*-butyl phosphate was recommended for plant toxicity testing in the 19th report. The EPA published a final rule on August 14, 1989 (54 FR 33400), and reported that proposing the early seedling growth test to determine the toxicity of tri-*n*-butyl phosphate to plants was being considered. The Committee is only rerecommending plant toxicity testing for tri-*n*-butyl phosphate.

Physical and Chemical Information

Except for information on physical/chemical properties of a few commercial mixtures containing the alkyl phosphates included in the list of chemicals following Table 1 and melting point of triethyl phosphate (-56.4° C), tris(2-butoxyethyl) phosphate (-70° C) and tris(2-ethylhexyl) phosphate (-90° C) (Ref 35, Sax and Lewis, 1987), octanol-water partition coefficient of triethyl phosphate (6.3; Ref. 14, Hansch and Leo, 1985) and Henry's Law Constant of triethyl phosphate (6.6×10^{-7} atm m^3/mol; Ref. 38, Wolfenden and Williams, 1983), the Committee has no information on measured physical/chemical properties of the alkyl phosphates included in the list of chemicals following Table 1.

Rationale for Recommendation

A. *Exposure information—Production/use/disposal/exposure/release.* The Committee believes that the alkyl phosphates included in the list of chemicals following Table 1 are commercially available and that many are produced in substantial quantities; actual volumes are CBI. The Committee recognizes that some of these commercially-available mono- and di-alkyl phosphates may be potential degradation products of di- and trialkyl phosphates included in the list of chemicals following Table 1. In 1977, many of the chemicals were produced in 1 to 10 million lbs/year quantities (Ref. 41, TSCAPP, 1990).

Many of the trialkyl phosphates are used as plasticizers, flame retardants, lubricant additives, and solvents, and are found in floor polishes (Ref. 29, Neal et al., 1986). The Committee is concerned that these uses may result in exposure. The other alkyl phosphates are used as extracting agents for actinide elements (di-*n*-butyl phosphate, bis-2-ethylhexyl phosphoric acid, di-*n*-dodecyl phosphate, and dodecyl phosphate), textile and paper processing compounds (methyl phosphate, *n*-butyl phosphate, and diisooctyl phosphate),

polymerizing agent (methyl phosphate, diisooctyl phosphate), chemical intermediates (methyl phosphate and phosphorodichloridic acid, ethyl ester), lubricating oil additives (2-ethylhexyl dihydrogen phosphate and 2-ethylhexyl phosphate), and rust remover and inhibitor (methyl phosphate and diisooctyl phosphate).

B. *Evidence for exposure—Human exposure.* Triethyl phosphate has been detected in drinking water samples in Canada that were drawn from the Great Lakes during a period from 1978 to 1983, in concentrations ranging from 0.3 to 27.1 ppt (Ref. 22, LeBel et al., 1981; Ref. 46, Williams and LeBel, 1981; Ref. 47, Williams et al., 1982; Ref. 23, LeBel et al., 1987) and in concentrations of 1000 ppt in Rhine River water treated by bank infiltration (Ref. 33, Piet and Morra, 1983). Tris(2-butoxyethyl) phosphate has been detected in drinking water samples in Canada that were drawn from the Great Lakes during a period from 1978 to 1983, in concentrations ranging from 0.4 to 5400 ppt (Ref. 22, LeBel et al., 1981; Ref. 46, Williams and LeBel, 1981; Ref. 47, Williams et al., 1982; Ref. 23, LeBel et al., 1987), and in concentrations equal to and less than 58.5 ppt in drinking water in Japan (Ref. 1, Adachi et al., 1984). Tris(2-ethylhexyl) phosphate has been detected in one of six drinking water samples in Ontario, Canada and in the raw water source during 1978–79 in a concentration of 0.3 ppt (same concentration in both samples) (Ref. 22, LeBel et al., 1981). None of the alkyl phosphates that have been detected in drinking water are approved as drinking water additives in the U.S. (Ref. 36, Saxena, 1990).

Triethyl phosphate has been detected (no quantitative data available) in food, predominantly in nut samples taken during a total diet intake study in the U.K. (Ref. 11, Gilbert et al., 1986). The food daily intake estimate for tris(2-butoxyethyl) phosphate from a 1982–84 market basket survey varied from 2.9 to 10.8 ng/kg body weight per day depending upon the age group (Ref. 13, Gunderson, 1988). The food daily intake estimate for tris(2-ethylhexyl) phosphate from a 1982–84 market basket survey varied from 23.2 to 71.0 ng/kg body weight per day depending upon the age group (Ref. 13, Gunderson, 1988).

Tris(2-butoxyethyl) phosphate has also been detected in concentrations of 4 to 25 ng/m^3 in the aerosol particle fraction of indoor air in 1981–82 (Ref. 44, Weschler, 1984; Ref. 45, Weschler and Shields, 1986), which was thought to have arisen from floor finishes (Ref. 10, Gasking 1988). Tris(2-ethylhexyl) phosphate has been detected in concentrations of 6 ng/m^3 in the aerosol particle fraction of indoor air in 1981–82 at 7 different offices, but not in outdoor air taken at two of the sites (Ref. 44, Weschler, 1984; Ref. 45, Weschler and Shields, 1986).

Tris(2-butoxyethyl) phosphate was also detected in 64 out of 160 human adipose tissue samples taken in Canada (concentrations of 0.7 to 142.2 ng/g) (Ref. 21, LeBel and Williams, 1986; Ref. 24, LeBel et al., 1989). It has also been qualitatively detected in cigarette smoke (Ref. 38, Schumacher et al., 1977).

The National Occupational Exposure Survey (NOES) conducted during 1981–83 by NIOSH estimated that 5,855 workers were potentially exposed to triethyl phosphate; 225,008 workers were potentially exposed to tris(2-butoxyethyl) phosphate; 1,209 workers were potentially exposed to tris(2-ethylhexyl) phosphate; 7 workers were potentially exposed to di-*n*-butyl phosphate; and 7 workers were potentially exposed to *n*-butyl phosphate (Ref 30, NIOSH, 1989).

Environmental exposure. Triethyl phosphate has been detected (0.1 to 11.8 ppt, 1982–83) in raw water drawn from the Great Lakes (Ref. 23, LeBel et al., 1987), in 2 out of 5 samples from North Carolina rivers (no quantitative data given) (Ref. 3, Dietrich et al., 1988), and in 11 out of 23 sediment samples (0.85 to 8.5 ppb in 1982–83) taken from a fjord in Denmark (Ref. 20, Kjolholt, 1985). It has also been found in a number of groundwater samples (1 to 10 ppm in 1 of 5 samples obtained from a sanitary landfill in Denmark; Ref. 37, Schultz and Kjeldsen, 1986) (10 to 15 ppb in samples taken underneath a landfill in Waterloo, Canada; Ref. 34, Reinhard et al., 1984) (0.3 ppb in groundwater underneath a landfill in Norman, OK; Ref. 5, Dunlap et al., 1976;). Triethyl phosphate has also been detected, not quantitated, in ambient air samples from Japan (Ref. 15, Haraguchi et al. 1985).

Tris(2-butoxyethyl) phosphate has been detected in a number of surface waters including the Delaware River (0.3 to 3 ppb) (Ref. 39, Sheldon and Hites, 1978; Ref. 16, Hites et al., 1979), the Weser River in Germany (125 ppb) (Ref. 2, Bohlen et al., 1989), and river water from Osaka, Japan (0.01 to 0.08 μg/L) (Ref. 18, Kawai et al., 1985). It has also been detected in a number of industrial effluents at concentrations of 7.3 to 1607 μg/L (Ref. 29, Neal et al., 1986).

Tris(2-ethylhexyl) phosphate, besides being detected at 0.3 ppt in raw water drawn from the Great Lakes (Ref. 22, LeBel et al., 1981), has also been detected in river water samples from Osaka, Japan (0.33–1.9 ppb) (Ref. 18, Kawai et al., 1985) and in one of three rivers in Germany (1–5 ppb) (Ref. 43, Weber and Ernst, 1983). It has also been found in samples of 32 different industrial sources in Japan (no quantitative data) (Ref. 17, Ishikawa et al., 1985).

I. Chemical Fate Information

Except for chemical fate information on commercial mixtures containing alkyl phosphates, shake flask and semi-continuous activated sludge biodegradation test data for tris(2-butoxyethyl) phosphate (Ref. 27, Monsanto, 1983), the Committee has no chemical fate information on the alkyl phosphates included in the list of chemicals following Table 1. Chemical fate testing is recommended because there are insufficient data to reasonably determine or predict physical/chemical properties and persistence.

II. Health Effects Information

No health effects testing is recommended at this time. The Committee recognizes that a number of short-term health effects tests have been conducted for many of the trialkyl phosphates (Ref. 8, Eastman Kodak Co., 1984; Ref. 40, Smyth and Carpenter, 1948; Ref. 26, MacFarland and Punte, 1966). Compounds tested for subchronic toxicity include triethyl phosphate for which there are two dietary studies available (Ref. 12, Gumbmann et al., 1968; Ref. 32, Oishi et al., 1982) and tris(2-ethylhexyl) phosphate for which there is a National Toxicological Profile (NTP) prechronic gavage study (Ref. 31, NTP, 1984), and an inhalation study (Ref. 26, MacFarland and Punte, 1966). Tris(2-ethylhexyl) phosphate was tested for chronic toxicity/carcinogenicity (Ref. 31, NTP, 1984). Triethyl phosphate was also tested in a one generation study for reproductive toxicity (Ref. 12, Gumbmann et al., 1968). Triethyl phosphate was tested for genotoxicity (Ref. 7, Dyer and Hanna, 1973; Ref. 42, Voogd et al., 1972; Ref. 7, Dyer and Hanna, 1973; Ref. 4, Degraeve et al., 1984; Ref. 9, Epstein et al., 1972; Ref. 8, Eastman Kodak Co., 1984). Available information suggests that some health effects testing may be necessary, but before testing is recommended, the Committee wants to examine any additional information that is submitted in response to this Report.

III. Ecological Effects Information

No ecological effects testing is recommended at this time. The Committee recognizes that acute LC_{50} values are available for triethyl phosphate for freshwater and saltwater

fish (Ref. 8, Eastman Kodak Co., 1984; Ref. 25, Loeb and Kelly, 1963; Ref. 19, Knie et al., 1983). The Committee also recognizes that LC_{50} values for tris(2-butoxyethyl) phosphate are available for fathead minnows and daphnids (Ref. 28, Monsanto, 1985). The Committee recognizes that trialkyl phosphates may have a different mode of action than mono- and di-alkyl phosphates which may act as surfactants in acute toxicity tests. Available information suggests that some ecological effects testing may be necessary, but before testing is recommended, the Committee wants to examine any additional information that is submitted in response to this report.

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