

STATUS OF POLYHALOGENATED DIBENZO-P-DIOXIN/DIBENZOFURAN TESTING AND REPORTING UNDER THE TOXIC SUBSTANCES CONTROL ACT (TSCA)

J. Remmers^a, J. J. Breen^a, J. A. Glatz^a, and J. Canterbury^a, D. H. Steele^b, and J. S. Stanley^b

^aUnited States Environmental Protection Agency, Office of Toxic Substances, 401 M Street, S.W., Washington, DC 20460, USA; ^bMidwest Research Institute, 425 Volker Boulevard, Kansas City, MO 64110, USA.

ABSTRACT

The United States Environmental Protection Agency (USEPA), under the authority granted by Sections 4 and 8 of the Toxic Substance Control Act (TSCA), has promulgated a testing and reporting Rule that requires manufacturers or importers of eleven chlorinated or brominated chemicals, structurally related to dioxins and furans, to submit analytical testing protocols for approval and carry out testing to determine whether the chemicals contain halogenated dioxins and furans above limits of quantitation set forth in the Rule. Twenty-one submissions, five for chlorinated compounds and 16 for brominated compounds, have been received under this provision of the Rule. Testing data for four of the chlorinated submissions have been received. In addition, manufacturers of 29 precursors chemicals are required to submit reports describing the process conditions under which the chemicals are produced. To date, 19 chemical manufacturers have submitted 85 reports covering 93 processes employing 16 of the precursors identified in the Rule. Also, as required by the Rule, existing test data has been submitted for 16 chemicals and health and safety data has been submitted for 48 chemicals. No submissions of worker allegations of adverse health effects have been received.

KEYWORDS

Halogenated dibenzo-p-dioxins; halogenated dibenzofurans; Toxic Substances Control Act; precursors; health and safety; gas chromatography; mass spectrometry.

INTRODUCTION

The United States Environmental Protection Agency (USEPA) recognizes the potential public health and environmental significance of a variety of polyhalogenated dibenzo-p-dioxins (HDDs) and dibenzofurans (HDFs). As a result, the USEPA has promulgated a testing and reporting Rule (USEPA; 1987) under Sections 4 and 8 of the Toxic Substances Control Act (TSCA) for chemicals that may be contaminated with chlorinated and brominated dibenzo-p-dioxins and dibenzofurans, substances which may be highly toxic even at trace levels.

The Rule requires analytical testing of chemicals for HDD and HDF contamination; submission of the analytical test data to USEPA; submission of existing test data; submission of HDD- and HDF-related health and safety studies; and submission of worker allegations of significant adverse reactions to HDDs and HDFs.

USEPA based its decision to require testing on a number of findings, among which are the following: certain chemicals (Table 1) may present an unreasonable risk to health or the environment, and available data are insufficient for making a reasonable determination of the health and environmental effects of these chemicals.

Table 1: Chemicals Requiring Testing
Chemicals Currently Produced or Imported

<u>Chemical Name</u>	<u>CAS No.</u>
Tetrabromobisphenol-A	79-94-7
3,4',5-Tribromosalicylanilide	87-10-5
2,3,5,6-Tetrachloro-2,5-cyclohexadiene-1,4-dione	118-75-2
2,4,6-Tribromophenol	118-79-6
2,4-Dichlorophenol	120-83-2
Decabromodiphenyl oxide	1163-19-5
Tetrabromobisphenol-A-bisethoxylate	4162-45-2
Allyl ether of tetrabromobisphenol-A	25327-89-3
Pentabromodiphenyl oxide	32534-81-9
Octabromodiphenyl oxide	32536-52-0
1,2-Bis(tribromophenoxy)-ethane	37853-59-1

Chemicals Not Currently Produced or Imported

<u>Chemical Name</u>	<u>CAS No.</u>
Tetrachlorobisphenol-A	79-95-8
2,6-Dichlorophenol	87-65-0
3,4-Dichlorophenol	95-77-2
2,4,5-Trichlorophenol	95-95-4
2,6-Dibromo-4-nitro-phenol	99-28-5
2[2,4-(Dichlorophenoxy)]-propionic acid	120-36-5
3,5-Dichlorosalicyclic acid	320-72-0
Tetrabromocatechol	488-47-1
2,3-Dichlorophenol	576-24-9
2,5-Dichlorophenol	583-78-8
Pentabromophenol	608-71-9
2,4-Dibromophenol	615-58-7
2,3,6-Tribromophenol	933-75-5
4-Bromo-2,5-dichlorophenol	1940-42-7
3,5-Dibromosalicylanilide	2577-72-2
Pentachlorophenyl laurate	3772-94-9
Tetrabromobisphenol-A-bis-2,3-dibromopropylether	21850-44-7
Bismethylether of tetrabromobisphenol-A	37853-61-5
Tetrabromobisphenol-A-diacrylate	55205-38-4
Alkylamine tetrachlorophenate	-
Tetrabromobisphenol-B	-

BACKGROUND

While a few chemical products, mostly pesticides, have been tested for contamination by specific chlorinated dioxins, only limited quantitative testing for contamination by brominated dioxins and furans have been performed. Further, earlier analytical testing programs for brominated dioxins and furans did not achieve the sensitivity of detection required by USEPA (Table 2) (National Toxicology Program, 1988; Hileman, 1988; USEPA, 1987).

Under the Rule, manufacturers and importers of the 11 chemicals listed in Table 1 are required to conduct quantitative analysis for chlorinated and brominated dioxin and furan contamination. The 21 other organic chemicals listed are not known to be currently manufactured or imported commercially in the United States, but if manufacture or import should resume, testing will be required. Table 2 lists the required LOQs which are based on toxic equivalency to 2,3,7,8-TCDD (Bellin and Barnes, 1984).

STATUS OF TEST RULE ACTIVITIES

USEPA reports that, as of May 1, 1990, the Rule has resulted in 57 applications for exclusions and waivers submitted by 8 companies. (The Rule contains a provision that allows the USEPA to waive the requirement for testing if process chemistry or reaction condition data, or other test data, support a decision to exclude a manufacturer from testing.) Of these 57 applications, 42 exemptions have been granted.

Table 2: LOQs Required by the Rule

<u>Isomer</u>	<u>LOQ (ppb)</u>
Tetra-HDD	0.1
Penta-HDD	0.5
Hexa-HDD	2.5
Hepta-HDD	100
Tetra-HDF	1.0
Penta-HDF	5.0
Hexa-HDF	25
Hepta-HDF	1,000

85 process reports for precursor chemicals have been submitted by 19 chemical manufacturers. The reports submitted cover 93 processes employing 16 of the 29 precursors identified in the regulations. Table 3 shows the structural classes of the chemicals associated with the 93 process descriptions received thus far. USEPA has reviewed the process descriptions for potential dioxin/furan formation (USEPA, 1989). 14 processes, which include 5 chemicals, were considered sufficiently high to have a significant potential for dioxin or furan formation. USEPA has received 48 submissions of health and safety data and 16 submissions of existing test data. No submissions of worker allegations of adverse reactions to HDDs and HDFs have been received.

Table 3: Structural Classes of Precursors for Which Process Information was Submitted

<u>Class</u>	<u>No. of Processes</u>
Chlorinated benzenes	71
Substituted chlorinated benzenes	15
Brominated benzenes	4
Pentabromochlorocyclohexane	2
Chlorohydroquinone	<u>1</u>
Total	93

Five testing submissions (analytical protocols) for 2 chlorinated chemicals have been received. One submission was for 2,4-dichlorophenol, and the other four were for 2,3,5,6-tetrachloro-2,5-cyclohexadiene-1,4-dione (Chloranil). USEPA has approved sampling plans and analytical protocols for all five, which is a requirement of the Rule. Analytical data for 2,4-dichlorophenol have subsequently been received and approved by USEPA as meeting the data quality requirements of the Rule. No HDDs or HDFs were found in this chemical at levels above the limits of quantitation required by the Rule. USEPA has also received three submissions of data for Chloranil. Preliminary indications are that the Chloranil manufactured or imported by these three companies is contaminated by HDDs and HDFs. However, the data quality objectives outlined in the Rule were not met for these analyses. USEPA is currently evaluating this data to determine if reanalysis is necessary.

Sixteen testing submissions (sampling and analytical protocols) for the nine brominated chemicals shown in Table 4 have been received and reviewed by USEPA. All 16 analytical protocols were judged to be inadequate to measure brominated dioxins and furans at the targeted limits of quantitation. Fourteen of the sampling plans have been approved by USEPA.

Three of the companies responding to the Rule for brominated compounds have formed an industry consortium to share method development and analytical costs associated with responding to the Rule. The Brominated Flame Retardant Industry Panel (BFRIP) has maintained a working relationship with the USEPA to address issues related to the Rule. To date, the BFRIP has met with the Expert Panel on three occasions to present progress reports and to exchange technical information concerning analytical methodology.

Table 4: Submissions for Brominated Chemicals

<u>Chemical</u>	<u>Number of Submissions</u>
Decabromodiphenyloxide	3
Octabromodiphenyloxide	3
Tetrabromobisphenol-A	3
Pentabromodiphenyloxide	2
1,2-Bis(tribromophenoxy) ethane	1
2,4,6-Tribromophenol	1
Allyl Ether of Tetrabromobisphenol-A	1
Tetrabromobisphenol-A-bisethoxylate	1
3,4',5-Tribromosalicylanilide	1

In the past year, progress has been made in the development of analytical methods which meet the Rule's data quality objectives. A retention index system has been incorporated for the identification of analytes for which standard analytical reference materials are not available. In addition, the BFRIP has generated and characterized a heptabrominated dioxin standard.

Despite the progress which has been made, analytical methods which fully meet the Rule's data quality objectives have not been developed. Limited solubility of several of the compounds, notably brominated diphenylethers, restrict the sample size which can be taken for analysis, making limits of quantitation difficult to reach. In addition, the submitters have not been able to meet the 50-150% recovery requirement for internal standards and matrix spikes. As a result of these difficulties, USEPA granted a request for an extension for the submission of revised protocols.

Additional details concerning the Rule may be found in Johnson, et al (1989 and 1990).

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