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**U S W A G**

**STATEMENT OF JIM ROEWER, EXECUTIVE DIRECTOR,  
UTILITY SOLID WASTE ACTIVITIES GROUP,  
AT MEETING OF THE COMMITTEE ON REVIEW OF EPA'S  
ASSESSMENT OF THE HEALTH IMPLICATIONS OF EXPOSURE TO  
DIOXIN**

**THE NATIONAL ACADEMY OF SCIENCES AUDITORIUM  
2101 CONSTITUTION AVE.  
WASHINGTON, D.C. 20418**

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Good afternoon, my name is Jim Roewer, and I am the Executive Director of the Utility Solid Waste Activities Group, or USWAG. USWAG consists of approximately 80 utilities, energy companies and trade associations, and is responsible for addressing solid and hazardous waste and toxic substance issues on behalf of the utility industry. USWAG's mission is to support its members' production and delivery of energy in an environmentally sound and economic manner.

USWAG shares the concerns expressed by others with the implications of using toxic equivalency factors ("TEFs") to determine toxic equivalent concentrations ("TEQs") for PCBs. Among our concerns are: how specific PCB congeners of interest and their associated TEFs are selected; the potential for change in those congeners and/or TEFs over time; and the use of TEQs as the basis for regulation.

I'd like to focus on one specific problem with the use of TEFs and TEQs as shown in Chapter 11 of Part I, Volume I of the draft assessment. This Chapter contains a table setting forth TEQs for certain PCB congeners; this table contains significant errors. Some background regarding PCB congener analysis helps to put the problem into context.

Anyone who has worked in an analytical laboratory knows that the analysis of individual PCB congeners is difficult. The correct identification and quantification of congeners at extremely low concentrations is fraught with problems. Even with the best analytical techniques and cutting edge equipment, the data often include uncertainties as a result of peak overlaps, interferences, and other problems inherent in such difficult and complex analysis. Laboratories do their best to resolve these ambiguities and produce numerical results, sometimes using analytical flags specifying the uncertainties involved.

Second, the end users of the analytical data frequently accept these results without looking further into the validity of the numbers generated. If the laboratory data were to undergo a review or validation, the final results could be significantly different from those presented by the laboratory. This type of review is not commonly done and, as a result, both the conclusions drawn and the actions taken based on the data could be incorrect.

Third, the TEQ calculations are done automatically, often by the laboratory, and the TEQ numbers for samples sometimes are the only numbers presented in the text or tables. These TEQ values then are compared or combined in summary statistics to make specific points or draw conclusions.

Finally, the uncertainties in the analysis, data flags, patterns and trends in the data, and the calculation process of generating the TEQ all become invisible when only the TEQ is presented. And, once presented, this TEQ frequently becomes the only number to represent a sample or set of samples when summary data are prepared. Unfortunately, when complex mixtures are distilled down to a single value, the TEQ, the

validity of comparing diverse sample results can be muddled since most of the chemical analysis information has been condensed or is hidden. Thus, there is a real danger that the true meaning of the sample results can be completely lost.

This is what happened in Chapter 11 of Part I, Volume I of the draft assessment. Table 11-3 on pages 11-31 and 11-32 highlights just how easy it is to make significant errors when condensing or combining PCB data into TEQs. There are several problems with this Table and associated text.

First, in Table 11-3, the PCB congener data for PCB Aroclors 1242, 1248, 1254, and 1260 were averaged along with congener data from other PCB mixtures, namely Clophens and Kanechlors. Clophens were produced in Germany and Kanechlors were produced in Japan and neither was used extensively in the United States. Apparently, the data for Aroclors, Clophens, and Kanechlors were combined in Table 11-3 to represent a single "mixture group" because the commercial mixtures had "similar chlorine content" (by weight percent and average number of chlorines per molecule).

While certain Clophens and Kanechlors had weight percentages of chlorine similar to those of the U.S. produced Aroclors, they did *not* have the same composition of homologs or congeners as the corresponding Aroclors. It is clear that congener data for Aroclors should not have been averaged with data for either Clophens or Kanechlors because their congener distributions are different and the resulting TEQs will be different. Doing so is misleading and scientifically unsupportable. For example, in one of the references used for Table 11-3, researchers (Schulz, 1989) analyzed Clophen and Aroclor mixtures for congener content. The resulting TEQs (based on WHO<sub>98</sub>-TEFs) were consistently higher for the Clophens than the Aroclors -- from 24% higher

(Aroclor 1242) to more than 40 times higher (for Aroclor 1260). Clearly, these are not comparable PCB mixtures and should not be treated as such.

<u>PCB Mixture</u>	<u>WHO<sub>98</sub>-TEQ in mg/kg (ppm)</u>
Aroclor 1242	3.4
Clophen 30	4.5
Aroclor 1254	19
Clophen 50	102
Aroclor 1260	11
Clophen 60	470

Without examining all of the other back-up data for Table 11-3, it is not possible to determine the exact difference between the TEQs generated in that table and the TEQs that would have been generated for only the Aroclor data. However, a recent article published in Chemosphere (Rushneck et al., 2004) compiled congener data and calculated TEQs for Aroclors only and includes several of the same data sets used for Table 11-3. Comparing those data to the TEQ data in Table 11-3 shows a clear difference in the TEQs for the “mixture group” results and the results for Aroclors only. The mixture groups have higher values than do the pure Aroclors; in some cases, perhaps 100 times too high.

<b><u>PCB Mixture</u></b>	<b><u>Table 11-3 TEQ</u></b>	<b><u>Rushneck et al TEQ</u></b>
Aroclor 1242, Clophen A-30, Kanechlor 300	7.5	
Aroclor 1242 only		3.2 (1.7 – 5.2)
Aroclor 1248, Clophen A-40, Kanechlor 400	17	
Aroclor 1248 only		9.3 (5.3 – 16)
Aroclor 1254, Clophen A-50, Kanechlor 500	126	
Aroclor 1254 only		22 (3.9 – 43)
Aroclor 1260, Clophen A-60, Kanechlor 600	188	
Aroclor 1260 only		4.0 (0.35 – 15)

Note: Table 11-3 TEQs are based on average congener concentrations for various studies and the Rushneck et al. TEQs are the average of TEQs with the range of TEQs given in parenthesis.

Second, the TEQ values listed in Table 11-3 for each “mixture group,” including data from Clophens and Kanechlors, were then used in the text of Chapter 11 to calculate TEQ levels directly from PCB Aroclor concentrations. For example, on page 11-52, the estimated releases of PCB TEQs in the U.S. were calculated for each PCB Aroclor using the “mixture group” TEQs. Even more troubling, on page 11-11, the TEQs for the mixture groups including Aroclors 1242 and 1254 were averaged to represent the TEQ content of PCBs released to the environment.

The dioxin assessment is going to be used by countless students, researchers, engineers, government workers and others as a key source of information about dioxin-

like PCBs. It is essential that EPA make certain the information presented is correct. Table 11-3 and the associated text gives the mistaken impression that certain Clophens and Kanechlors are essentially interchangeable with Aroclors and they can be grouped together as a single type of mixture. Furthermore, Chapter 11 implies that the results from those mixtures can be used as if they were for Aroclors only. Since combined TEQs for Aroclors, Clophens, and Kanechlors are higher than Aroclor TEQs, using the combined TEQs will overestimate TEQs for samples containing Aroclors only. The danger is that people will use the values in Table 11-3 to estimate TEQs for samples containing PCB Aroclors, just as the authors of Chapter 11 did, and that their results will be in error. Decisions made based on those wrong results also will be wrong.

Finally, there is no indication in Table 11-3 or the accompanying text concerning the accuracy of the data, nor were ranges of data presented to give the reader a firm sense of how close or how divergent the data were from the various studies. As a result, it is unclear if all of the studies had data of high quality or if there was any effort to examine data sets for outliers or unusual data points.

In summary, PCB congener analysis, data validation and reduction, and interpretation of resulting TEQ data are complex and difficult tasks. Great care needs to be taken to ensure and maintain data accuracy and appropriateness of data use. This was not done in Chapter 11. The combining of Clophen and Kanechlor data with Aroclor data (all of unknown quality) to produce one set of TEQs is not scientifically valid and is inappropriate. To then compound the error by using these combined TEQ values as if they were for Aroclors alone is not acceptable. It is similar to saying that

because oranges, lemons and apples are all fruits, you can make apple juice by combining all three. You can't, and you can't lump data for PCB Aroclors with Clophens and Kanechlors and call the results Aroclor data.

If EPA is interested in generating a TEQ value for each Aroclor so that persons can calculate estimated TEQs from Aroclor data, Table 11-3 and the associated text need to be replaced. In addition, text should be added concerning the appropriateness of using this type of TEQ for estimation purposes. Finally, more work needs to be done to determine the true congener content of individual Aroclors and to make sure that the values are of high quality. In its current state, Table 11-3 (and associated text) is a good example of how *not* to use PCB data as TEQs.