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Aroclor 1016 just another PCB

By DON JORDAN
H-T Environmental Writer

Even though Westinghouse continues to disagree with the U.S. Environmental Protection Agency refutation of the Westinghouse claim that Aroclor 1016 is a less harmful PCB than Monsanto fluids used until the last few years, evidence submitted and agreed upon by hearing officer Abraham Sofaer over PCB pollution of the Hudson River by General Electric in New York details the case against 1016.

Aroclor 1016 was the first of the Monsanto fluids to deviate from a numerical designation system where the first two digits indicated the number of carbon atoms in the biphenyl rings (12), and the last two digits the per cent of chlorine in the fluid (hence 1254 is 54 per cent chlorine).

THE 1016 FLUID was introduced in 1971 by Monsanto.

This was three years after the infamous Yusho PCB poisoning incident and the year before the federal legislation which mandated controls over PCBs and other toxic substances immediately but is still languishing in limbo.

As in the General Electric case, Westinghouse has switched from heavy use of Aroclor 1242 and 1254 to predominantly use of 1016.

New York's hearing officer, Abraham Sofaer, noted: "Aroclor 1016 is a deceptive numerical designation for that compound. The chemical has 12 carbons, not ten, and contains over 41 per cent chlorine, not 16. Monsanto's Manager of Product Acceptability testified that there was no scientific reason for the designation '1016,' and conceded that 'following the old nomenclature it should be called Aroclor 1241 plus.'"

SOFAER POINTS OUT that there is a difference between 1016 and 1242 in that 1016 has fewer biphenyls containing five or more chlorine atoms per biphenyl.

Monsanto, General Electric and Westinghouse

maintain that this difference means the 1016 fluid is less environmentally harmful.

"GE contends that, whatever the toxicity of PCBs in general, 1016 is far less toxic than the mixtures used in most experiments of PCB effects. 1016 is said to be less toxic, not because it contains a lower percentage of chlorine than other PCBs, but because it contains a relatively low proportion of PCB homologs with four or more chlorine atoms," notes Sofaer.

HE CONTINUES in his interim opinion and order to General Electric requiring clean-up, that the higher homologs are less biodegradable, that they bioaccumulate to higher levels, and that a PCB isomer with four chlorine atoms (tetrachlorobiphenyl) "may be metabolized into highly toxic hydroxylated PCBs."

Sofaer points out that the lower homologs in 1016 are more highly soluble than the higher chlorinated biphenyls and are more rapidly absorbed by fish swimming in contaminated water.

"**FURTHERMORE**, 1016 HAS been observed to cause effects similar to those caused by other mixtures in many contexts. After a series of experiments designed specifically to test the toxicity of 1016, because of its increased use, Dr. D.J. Hansen (*Environmental Research* 363, 1974) and his coauthors concluded that 'Aroclor 1016 is similar to other PCBs in its toxicity to, and uptake and retention by estuarine animals.'"

"Acute toxicities of Aroclor 1016 to oysters, brown shrimp and pinfish," said Hansen, "were similar to that of Aroclor 1242 and Aroclor 1254."

IN ANOTHER STUDY by Dr. Alan V. Nebeker noted by Sofaer, he found "not much difference in toxicity between trichlorobiphenyl and tetrachlorobiphenyl homologs which suggests that mixtures such as Aroclor 1016 and Aroclor 1242 would be similar in toxicity."

In yet another study on the relative toxicity of 1242 and 1016 on rainbow trout and bluegills based on data

from Fish-Pesticide Laboratory in Columbia, Mo., Sofaer said it was "apparent that their toxicity is similar."

Other studies showed that toxicity to some fish, including catfish and bluegills, is more serious with the 1016 PCBs than with the higher homologs.

"**FINALLY, THE EVIDENCE** that tetrachlorobiphenyl may be metabolized into an hydroxylated derivative is inconclusive: Aroclor 1016 contains 21 per cent tetrachlorobiphenyl, much of which has the isomers that are suspected of being particularly toxic," said Sofaer.

An expert who testified for GE, coauthored a 1975 article which noted: "lower chlorinated biphenyls are of special interest because their biological degradability might lead to metabolites of increased toxicity."

THAT ARTICLE, COAUTHORED by the GE witness, is entitled "In Vitro Metabolism of Polychlorinated Biphenyls" and was printed in *Environmental Contamination & Toxicology*, Vol. 42, 13 Bulletin, 1975.

Dr. J.R. Allen who has conducted and is continuing PCB studies with rhesus monkeys at the University of Wisconsin identified the tetrachlorobiphenyl as capable of altering DNA and RNA, and therefore linked with mutations, cancer and the death of living cells.

And, even if the Monsanto-GE-Westinghouse arguments for 1016 were acceptable, notes Sofaer, the simple fact is that there's still plenty of 1242 and other previously used Aroclor PCBs around in stream sediment and landfills.

"Counting the effects of all existing PCB mixtures in judging GE's liability is especially necessary, since the record indicates that mixtures of 1016 and higher chlorinated Aroclors are more toxic than the combined measures of their individual toxicities," says Sofaer.