Position Paper

on

CHLORINATED BIPHENYLS

by

G. Fred Lee, Professor Water Chemistry

and

Gilman Veith, Assistant Professor Water Chemistry

University of Wisconsin
Madison, Wisconsin

The chlorinated biphenyls are a class of chlorinated hydrocarbons which have industrial importance as plasticizers, dielectrics, lubricants, and flame retardants (1, 2). The chlorinated biphenyls are produced commercially by Monsanto Company under the trade name, Aroclor, and exist as mixtures of isomers with chlorine contents of 21, 32, 42, 48, 54, 60, and 62 percent by weight. In general, the chemical stability of the mixture increases with increasing chlorine content while the volatility decreases in the more highly chlorinated mixtures.

Many of the industrial applications of chlorinated biphenyls depend largely on the chemical stability of the mixtures. Their uses as dielectrics in transformers and capacitors and as additives to hydraulic fluids restrict the chlorinated biphenyls to closed systems. However, possible uses of chlorinated biphenyls in paints, varnishes, waxes, synthetic polymers, inks, dust-inhibitors, and pesticide formulations may lead to direct contamination of natural waters through industrial and sanitary waste discharges. Also, the stability of the more highly chlorinated mixtures to low temperature flames may result in aerial transport of the chlorinated biphenyls from industrial and municipal solid waste incinerators to natural waters.

The presence of chlorinated biphenyls in the environment has been detected only recently (3-11). In general, chlorinated biphenyls have been found in organisms associated with natural waters which receive wastes from urban centers. Concentrations of chlorinated biphenyls (as Aroclor 1254) in excess of 250 µg/l have been reported (11) in industrial discharges while those in municipal sewage treatment plant effluents and receiving streams typically range from

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the low ng/l to the low µg/l levels where detectable (10). The chlorinated biphenyls are similar to many chlorinated pesticides in that higher concentrations are found in organisms representative of the higher trophic levels. Concentrations of the chlorinated biphenyls in the predator food chain range from at or near the determinable limit in water to 75 to 100 µg/gm in fish-eating birds. Consequently, the chronic effects of the chlorinated biphenyls in higher organisms is a concern and requires evaluation.

Because of the recent disclosures of chlorinated biphenyls in the environment, current knowledge regarding the acute and chronic effects of the chlorinated biphenyls in biological systems is insufficient to directly determine permissible limits for these chemicals in drinking water supplies. Inhalation tests on animals indicate that maximum concentrations of chlorinated biphenyls as vapor which are "safe" are 1.0 mg/m^3 for the lesser chlorinated mixtures and 0.5 mg/m^3 for the more highly chlorinated mixtures (1). Continuous or repeated skin contact leads to a condition called "chloracne" which has been reported by industrial workers handling products containing the chlorinated biphenyls (12). The acute toxicity of the chlorinated biphenyls to house flies (D. melanogaster) decreases with increasing degree of chlorination and is approximately a factor of 1,000 less than that of dieldrin (13).

Two-year feeding studies with rats and dogs using Aroclor 1242 at dietary levels of 1, 10, and 100 µg/gm failed to produce clinical effects or changes in blood and urine chemistry (14). Aroclor 1254 produced depressed weight gains as well as increased liver weights at the 100 µg/gm level. Aroclor 1260 produced increased liver weights at the 10 and 100 µg/gm levels although body weight gain was unaffected. The data indicated the Aroclors have the same order of toxicity as that of DDT. The induction of hepatic microsomal enzymes in rats is minimal with the lesser chlorinated biphenyls but are significantly greater with mixtures containing greater than 60 percent chlorine (15). Induction by the chlorinated biphenyls is greater than that of DDT but less than that of heptaclor epoxide.

In view of the current lack of data regarding the mammalian uptake, storage, and toxicity of the chlorinated biphenyls, drinking water standards may best be established indirectly from the standards for common chlorinated pesticides (16) The permissible limits of pesticides in drinking waters range from 0.001 mg/l for endrin to 0.056 mg/l for lindane. The permissible limits

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of dieldrin, heptaclor epoxide and DDT are 0.017, 0.018 and 0.042 mg/l, respectively. Since biological effects of the chlorinated biphenyls may be greater than that of DDT but less than heptaclor epoxide and dieldrin, present drinking water standards can be set at 0.025 mg/l, subject to revision in accordance with future toxicological data.

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