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Excessive Fear of PCBs

When mentioned by the media, the polychlorinated biphenyls (PCBs) are described as cancer-causing chemicals. A more precise statement would be that huge daily lifelong doses of some of the PCBs are cancer-causing in rats. Many industrial workers were exposed to substantial amounts of PCBs during the 1950s, '60s, and early '70s. Some of the workers respired a total of 15 grams or more. But the industrial exposure led to no known cases of cancer. Nevertheless, as much as \$100 billion could ultimately be spent trying to remove PCBs from the environment.

The PCBs are synthesized by chlorination of biphenyl (C₁₂H₁₀). Two benzene rings are connected by a single bond. The products of chlorination potentially include 209 different compounds having one to ten chlorines. The highly chlorinated PCBs have extremely low vapor pressure, are practically insoluble in water, and are usually immobile in soil. Transformer oils were essentially a mixture of PCBs having five, six, or seven chlorines. These were manufactured in the United States by Monsanto and given the name Aroclor 1260 (12 carbons and 60% chlorine). Of the PCBs sold in the United States, Aroclor 1260 and more highly chlorinated PCBs constituted only 12%. Most of the tests for carcinogenicity in rats have been made using Aroclor 1260. These have revealed cancerous tumors in rat livers. However, a major study conducted in West Germany included PCBs with 60 and 42% chlorine content.* Rats ingesting daily the more highly chlorinated PCBs developed liver cancers in old age. The rats treated with the less chlorinated PCBs had a low tumorigenic response in the liver, had less total cancer than the controls, and lived longer than the controls.

In spite of such evidence the Environmental Protection Agency has moved to tighten its regulatory stance on PCBs. In the 30 January 1991 *Federal Register*, EPA stated that it agreed that "there is inadequate evidence of carcinogenicity of PCBs in humans." It mentioned the tests showing that "PCBs that are 60% chlorinated have been reported to be carcinogenic in animals, while PCBs with a lower chlorine content concentration (chlorine 54%) have produced cancer in animals that was not statistically significant." The EPA comment did not mention the important West German study. It instead stated that "it appears reasonable to regulate PCBs as a class of compounds with a cancer classification of Group B2.... Therefore, according to EPA policy, the MCLG [maximum contamination limit goal] for PCBs is zero. The proposed MCL is 0.0005 mg/l, the practical quantification limit."

The various experiments on the carcinogenicity of PCBs have been conducted at different laboratories using different strains of rats and different criteria in the pathologic examinations. The Institute for Evaluating Health Risks (IEHR) has just completed a project in which the pathological diagnoses in five key rat PCB studies were reassessed by a panel of expert pathologists. They reaffirmed the carcinogenicity of the 60% chlorinated PCBs. They "reaffirmed that chronic exposure to a PCB formulation that was 54% chlorinated did not yield a statistically significant increase of either benign or malignant tumors." Their examination of the relevant pathologic slides "revealed that rats chronically exposed to a PCB formulation that was 42% chlorinated did not develop any increase in malignant tumors or a statistically significant increase in benign tumors."

John A. Moore, a former EPA official who is president of IEHR, commented on the studies as follows: "These reassessment results indicate that the following two traditional EPA policy positions be reconsidered: 1) an assumption that *all* PCB formulations are probable human carcinogens; 2) the assumption that all PCB formulations have the same quantitative potency to cause cancer."

The fate of PCBs in the environment depends on chlorine content. Under aerobic conditions in nature mono- and dichloro- and even some tri- and tetrachlorodiphenyls are slowly metabolized by microorganisms. Aerobes in general are unable to metabolize highly chlorinated biphenyls. However, under anaerobic conditions partial dechlorination slowly occurs making the resultant substance vulnerable if aerobic conditions are later established.

Manufacture of PCBs in the United States ceased in about 1978. Since then they have been slowly disappearing. From the standpoint of health effects there is no justification to base regulations of all PCBs on tests with Aroclor 1260.—**PHILIP H. ABELSON**

*E. Schaeffer, H. Greim, W. Goessner, *Toxicol. Appl. Pharmacol.* 75, 278 (1984).