

AN APPRAISAL OF THE PCB SITUATION IN THE STATE OF WISCONSIN

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On Thursday, September 23, a newspaper in Madison carried front page headlines "*Find Deadly Poison in Lake Michigan Coho – Ban in State Possible.*" I have been studying the PCB (polychlorobiphenyl) composition of water and fish within the State of Wisconsin for the past three years and feel that I should comment on this headline because it tends to give an extremely distorted picture of the situation as it exists today.

For many years, the University of Wisconsin Water Chemistry Program and the Conservation Department, now Department of Natural Resources (DNR), have conducted cooperative studies on pesticides within fish and waters in the State. Several years ago, as part of the study on the persistence of toxaphene in lakes treated with this compound for rough fish removal, Paul Degerse of the Department of Conservation for the State mentioned that there were some fish taken from waters within the State which he found were impossible to analyze for certain pesticides such as DDT because of the large amounts of interfering compounds present in the fish. It was speculated then that the interfering compounds were the PCBs.

It should be noted that at about the same time, several preliminary reports had appeared in the literature in which the PCBs were being implicated as contaminants of fish and fish-eating birds in marine waters. At that time, Gilman Veith, then a graduate student in Water Chemistry, initiated his Ph.D. thesis with the purpose of isolating and identifying these compounds to see whether or not they are in fact PCBs and to determine in a preliminary way the concentrations found in selected waters and fish in the State. A grant proposal was submitted to the Department of Natural Resources to obtain funds in order to help support this investigation. The Department of Natural Resources provided two years of support for studies in this area for which the Ph.D. thesis work of Dr. Gilman Veith was completed in August, 1970.

G. Fred Lee was appointed a member of the United States Public Health Service Drinking Water Standards Subcommittee on Toxicology. As a member of this committee, he, together with the assistance of Dr. Gilman Veith, prepared a position paper which served as a basis for review of need to establish drinking water standards for PCBs. This position paper, as well as the other publications on the attached list, are available for review from the University of Wisconsin Water Chemistry Program.

The potential toxicological effects of PCBs on aquatic organisms and man is an area of active research at this time. The FDA action limit for PCBs in fish (5 ppm) is largely based on a lack of

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information on any known specific toxicological effects of these compounds to man. Because of this lack of information, it was decided that the DDT limits would be used because of the gross similarities between PCBs and DDT in their chemical structure. Several medical authorities (Health Officer for the State of Michigan) have examined the basis of the 5 ppm DDT level in fish and have expressed the opinion that there is no justification for this limit based on known hazards associated with the consumption of fish containing considerably larger amounts of DDT. These same medical authorities proposed that based on the information available today, the DDT limits which would serve as a basis for rejection of fish for sale in interstate commerce could be increased significantly without increasing the public health hazard that might be associated with the consumption of these fish. Because of the somewhat nebulous basis for establishing the DDT limit within fish and since the FDA action limit for PCBs is set at the same value as DDT due to their gross similar characteristics I feel that the FDA 5 ppm action limit should not be used to restrict the sale of fish taken from Lake Michigan since the PCB levels found in some of these fish exceed this limit. These recommendations are based on my current assessment of the information available on PCBs.

As mentioned above, the toxicology of PCBs is an area of investigation today in several laboratories in the United States. While it is possible that future studies might show PCBs should have a much stricter limit in foods such as fish than DDT, the current work is showing that the opposite seems to be true, i.e., the toxicity of PCBs to man appears to be less than DDT. On the other hand, the current work on the toxicity of PCBs to aquatic organisms is showing that this group of compounds tends to be much more toxic to these organisms than DDT. From an environmental contamination point of view, the PCB could be much more significant to aquatic organisms than DDT if in fact the current preliminary results are borne out by further studies due to the fact that the currently available information indicates that DDT is slowly degraded in natural waters while the PCBs seem to show no degradation whatsoever.

Often the procedures used to establish water quality standards or toxicity standards for chemicals in food are quite arbitrary. The procedure normally involves a group of individuals or a regulatory agency administrator selecting, based on the information available, what they feel is a reasonable number. Frequently, these criteria tend to be conservative (more strict than necessary) in an effort to try to provide a maximum protection for the public. More times than now, very little information is available which could serve as a basis for establishing a meaningful limit, with the result that the individual or agency responsible for setting the limit is guessing at what is the proper limit.

On several occasions in the past, subsequent studies have shown that the original estimated limit was probably too strict in that it was found that man or other aquatic organisms had been exposed to levels considerably in excess of the limit set for extended periods of time without any apparent harm. Unfortunately, the political situation today virtually prohibits the regulatory agency from raising the previously established standard. Any administrator or agency who attempted to set less strict standards would be accused by the conservation activists of being on the side of the polluters.

For example, the procedure that has been used to establish the limit on PCBs based on the gross similarity of PCB and DDT is a prime example of the somewhat arbitrary method by which some

standards are established. As mentioned above it appears that the current work on the toxicology of PCBs will show that their toxicity to man is considerably less than DDT. If the subsequent work does in fact show that this is the case, then it is reasonable to ask whether the five ppm action limit established for PCBs in fish should not be raised. However, any regulatory agency that attempts to raise this limit will be attacked by conservation activists where the agency will be accused of bowing to the wishes of Monsanto, which is the sole manufacturer of these compounds in this country.

The PCBs are largely associated with waters receiving industrial and municipal wastes. A major use of PCBs as dielectrics is unlikely to result in environmental contamination; however, the use of PCBs in packaging materials, printing ink, lubricants, and paints may lead to direct discharge to the environment, either through leaks in process lines or exposure of the products. Douglas Dube, a graduate student in Water Chemistry and chemist for the DNR, found PCBs in all municipal wastes tested from southeastern Wisconsin. Other studies have provided similar results for other regions of Wisconsin. In general, low levels of PCBs in sanitary sewage of small communities appear to arise from the use of PCBs in household products such as packaging materials, waxes and cleaners, and detergents. Accidental and/or continuous leaks in industrial processes using PCBs result in much higher levels of PCBs in sewage. For example, the PCB concentration in the Milwaukee River increases approximately 100 times to 2 ppb in passing from the rural areas to the industrial center of Milwaukee. Similar patterns are observed in other major river systems such as the Mississippi and the Fox.

The discharge of PCBs to Wisconsin waters tributary to Lake Michigan have contributed to the comparatively high levels found in Lake Michigan fish. The majority of large, oily fish such as lake trout and coho salmon may contain in excess of 20 ppm PCB, which is considerably above the FDA action level of 5 ppm. Dr. Gilman Veith of the University of Wisconsin Water Chemistry Program is currently conducting a detailed study of the levels of PCBs and other pesticides in fish and water from Lake Michigan with support from the University of Wisconsin Sea Grant Program and the Environmental Protection Agency. Although preliminary data suggest the levels of PCBs in Lake Michigan may have produced detrimental effects in populations of birds, fish, and other aquatic organisms, more detailed studies are needed to properly evaluate the significance of the problem.

The needless exposure of the environment to potentially hazardous chemicals by the use of PCBs in paper coating, ink, detergents, etc., is being controlled to some extent by judicious selling of the PCBs by Monsanto Company, the sole producer of PCB in the United States. For the past year, Monsanto has restricted the sale of PCBs to industries which use the PCBs only in closed systems. Data from the study of PCB sources to Green Bay by Dr. Veith have indicated that during the summer of 1971, it was not possible to detect PCBs in several streams which had substantial levels the previous year. The restricted use of PCB in industries which cannot adequately control the fate of the product must, in my opinion, be exercised.

PCB Publications or Presentations
University of Wisconsin Water Chemistry Program

Veith, G. D. and Lee, G. F. 1970. A Review of Chlorobiphenyl Contamination of Natural Waters. *Water Research* 4, 265-69.

Veith, G. D. 1970. Environmental Chemistry of Chlorobiphenyls. Ph.D. thesis (Water Chemistry) University of Wisconsin, Madison, 180 pp.

Veith, G. D. and Lee, G. F. 1970. Position Paper on Drinking Water Standards for Chlorobiphenyls, requested by U.S. Public Health Service.

Veith, G. D. and Lee, G. F. 1971. Chlorobiphenyls in the Milwaukee River, Presented at the Wisconsin Section AWWA September 24, Accepted for publication in the *Journal of Water Research*.

Veith, G. D. and Lee, G. F. 1971. Chlorobiphenyls in Fish from the Milwaukee River and Lake Michigan near Milwaukee; 14th Great Lakes Research Conference, Toronto, Accepted for publication in the Proceedings of this Conference.

To Be Presented

Veith, G. D. and Lee, G. F., "Environmental Chemistry of the Chlorobiphenyls," Geochemical Society Symposium on Organic Geochemistry and Environmental Pollution, Washington, D.C., November 3, 1971.

Veith, G. D., "Transport of PCBs in Industrial Wastes," Environmental Toxicology Seminar, University of Wisconsin, January 4, 1972.