NIOSH Testimony

Testimony
on
H.B. 250
Energy and Environment Committee
Ohio House of Representatives

May 16, 1985
Columbus, Ohio

National Institute for Occupational Safety and Health

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Mr. Chairman and members of the committee, my name is Dr. Sandra Susten. Appearing with me is Mr. David Brown. We are appearing today to provide information to the committee regarding the health effects of polychlorinated biphenyls (PCBs) as evaluated by the National Institute for Occupational Safety and Health (NIOSH) and to clarify the position of NIOSH regarding PCBs. NIOSH is an agency within the Centers for Disease Control, Public Health Service, Department of Health and Human Services. According to the Occupational Safety and Health Act of 1970, NIOSH is mandated to develop and recommend standards to protect the health and safety of workers exposed to potential hazards at their workplace.

Although production and sales of PCBs ended in 1979, exposure to the compounds may still occur among workers who service and repair electrical transformers or capacitors, among emergency response personnel following fire or failure of electrical equipment containing PCBs, and among the general population via ingestion of contaminated food products. Three factors stimulate continued interest in the potential long-term health effects of PCBs in humans: (1) evidence of liver cancer and other disorders in PCB-treated laboratory animals, (2) the tendency for PCBs to accumulate in animal tissues and organs, and (3) the persistence of PCBs in the environment.

In 1977 NIOSH published a criteria document entitled Criteria for a Recommended Standard--Occupational Exposure to Polychlorinated Biphenyls [1]. As mandated, NIOSH develops criteria documents to explain the basis for the recommended standards for occupational exposure to hazardous agents. These criteria documents are publications which are prepared from a critical evaluation of all known, relevant, published or otherwise publicly available, medical, biological, engineering, environmental, chemical, and trade information and data for the purpose of establishing a recommended occupational health hazard standard. It is the goal of NIOSH to identify in a candid and unbiased manner the injurious effects produced by an occupational hazard and to determine what amount of that hazard produced these effects. In the criteria document NIOSH recommends that PCBs be controlled and handled in the workplace as potential occupational carcinogens and that exposure be minimized to the greatest extent possible. The recommended exposure limit (REL) is one microgram per cubic meter of air determined as a time-weighted average for up to a 10-hour workday and a 40-hour work week. The recommendation was based on the findings of adverse reproductive effects in experimental animals; on the conclusion that PCBs are carcinogens in rats and mice and, therefore, potential occupational carcinogens in humans; and on the conclusion that occupational and animal studies have not demonstrated a level of exposure that will not subject the worker to possible liver injury. NIOSH will soon publish a current intelligence bulletin dealing with exposure to PCBs and related compounds following electrical equipment fires or failures.

Adverse health effects reported in workers chronically exposed to PCBs include: skin rashes; chloracne (similar to severe acne but with a different distribution on the body); eye, nose, and throat irritation; and

digestive disturbances. Similar health effects have been reported in over 3,000 people in Japan and Taiwan who ingested rice oil accidentally contaminated with PCBs and related compounds (polychlorinated dibenzofurans and polychlorinated quaterphenyls) [2]. Significant amounts of polychlorinated dibenzofurans have also been measured in PCBs manufactured in the United States [3].

Epidemiologic studies involving large study populations are useful in the evaluation of potential long-term health effects produced by exposure to hazardous substances. Several cross-sectional studies have been conducted in workers exposed to PCBs, but the study populations have been relatively small. In 1975, NIOSH initiated a study of three groups of workers occupationally exposed to PCBs [4]. No clinical symptoms related to exposure to PCBs were observed in the workers. Serum PCB levels were many times greater among workers employed in capacitor manufacturing than among the general population. Increased serum PCB concentrations were significantly associated with increased serum enzyme activities, increased plasma triglyceride levels, and decreased plasma high density lipoprotein-cholesterol levels. The simultaneous changes in these measurements are suggestive of an effect on the liver due to exposure to PCBs; however, the biological significance of these changes is not yet clear. These results are in agreement with those of other published cross-sectional studies.

Retrospective mortality studies of workers exposed to PCBs have also been reported. This type of study is designed to assess long-term health effects, such as cancer. NIOSH conducted a retrospective mortality study of 2,567 workers in two capacitor plants in the United States [5]. The number of deaths from liver cancer, cirrhosis of the liver, and rectal cancer was slightly higher than that expected, assuming that the study cohort died at the same rate as the general United States population, but the numbers of deaths were small and the excess could have been due to chance. This study was limited for several reasons. The average time of observation for individuals in this study was approximately 15 years; whereas latency periods of 20 to 30 years are not uncommon before cancer deaths are observed. In addition, the statistical power of the study was limited since relatively few deaths (163) had occurred in the total cohort at the time of follow-up. Statistical power is a measure of the probability of being able to detect an actual excess risk in the study population. An update of this study is currently in progress, in which an additional 119 deaths and 7 years of observation are included. The results of the update will be available within the year.

A study of 30 deaths among 89 workers involved in the production of PCBs in the United States revealed a significant increase in circulatory disease, exclusive of arteriosclerotic heart disease, in white male workers [6]. A larger mortality study of 2,100 workers at a capacitor manufacturing facility in Italy has been completed [7]. There was a significant increase in cancer deaths in male and female workers. The findings included

significant increases in blood-related cancers in female workers and in digestive cancers in male workers. These studies are also projected to be updated at appropriate time intervals. There is an obvious lack of agreement of the results between the three retrospective mortality studies at this time.

In conclusion, although little significant epidemiologic information on long-term adverse health effects from exposure to PCBs has become available since 1977, NIOSH considers PCBs to be potential occupational carcinogens as described in the criteria document.

References

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50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. PB91-169052
4. Title and Subtitle NIOSH Testimony on Polychlorinated Biphenyls by S. S. Susten, May 16, 1985			5. Report Date 1985/05/16 6.
7. Author(s) NIOSH			8. Performing Organization Rept. No.
9. Performing Organization Name and Address NIOSH			10. Project/Task/Work Unit No. 11. Contract (C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words) This testimony presents the health effects of polychlorinated biphenyls (PCBs) as evaluated by NIOSH and clarifies the position of NIOSH regarding PCBs. Three factors stimulate continued interest in the potential long term health effects of PCBs in humans: evidence of liver cancer and other disorders in PCB treated laboratory animals, the tendency for PCBs to accumulate in animal tissues and organs, and the persistence of PCBs in the environment. Adverse effects to workers include: skin rashes; chloracne; eye, nose, and throat irritation; and digestive disturbances. Epidemiologic cross sectional studies have been conducted, and increased serum PCB concentrations have been noted in exposed workers. A study of 30 deaths among 89 workers involved in the production of PCBs in the United States revealed a significant increase in circulatory disease, exclusive of arteriosclerotic heart disease, in white male workers. A significant increase was noted in cancer deaths in male and female workers.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms NIOSH-Publication, NIOSH-Author, NIOSH-Testimony, Susten-S-S, Liver-cancer, Chlorinated-hydrocarbons, Electrical-equipment, Environmental-contamination

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages 4
	22. Security Class (This Page)	22. Price