

Birth defects linked to hexachlorophene

Severe birth defects, 50 times more than would be expected, were found among the children of nurses who, while pregnant, washed their hands 10 to 70 times daily with soap containing hexachlorophene. This finding, based on a retrospective study of 693 nurses who had worked in the geriatric wards of six Swedish hospitals, was reported last week by Hildegard Halling, chief physician of the department of chronic somatic diseases at Sodertalje Hospital in Sodertalje, Sweden. Halling delivered her findings at the International Conference on Health Effects of Halogenated Aromatic Hydrocarbons in New York City. The meeting was one of three environmental conferences sponsored last week by the New York Academy of Sciences.

Of 460 children born to nurses using soap containing one to three percent hexachlorophene, 25 had severe congenital defects including heart and lung malformations, cleft lips and palates, central nervous system disorders and a missing hand. Another three had Down's syndrome, a type of chromosome abnormality, and 46 more had minor deformities such as slight heart problems and positional foot deformities.

None of the children born to women in the non-exposed "control group" had any severe defects, although there were eight minor ones. Swedish surgeon Jan Lindfildt, translating for his mother at a press conference, said the normal incidence of severe congenital defects was only on the order of one per 1,000 births.

Carl Keller, acting chief of the epidemiology branch of the National Institute of Child Health and Human Development in Bethesda, Md., said, "I think this is potentially a real problem and should be looked into further." Although hexachlorophene is no longer used in over-the-counter health care products (it had been used in deodorant soaps and acne medicines), it is still used by the surgical staffs in many hospitals throughout the United States because of its antibacterial effects. "Whether the results are verified or not," Keller said, "I think the evidence is strong enough" to recommend that pregnant women not use products containing hexachlorophene because there are substitutes available. Based on Halling's results, he will soon recommend that follow-up studies begin in this country.

Able to penetrate unbroken skin, hexachlorophene migrates quickly into the blood, fat tissue and cells of the brain, liver and other organs. In her paper, Halling cited a U.S. test, reported in 1972, involving 75 male and female volunteers. Each washed his or her hands with 5 milliliters of a three percent solution of hexachlorophene four times daily. Within 21 days, the

mean hexachlorophene concentration in their blood was 0.21 micrograms per ml of blood, although "women consistently had high values, 0.78 $\mu\text{g/ml}$, 0.84 $\mu\text{g/ml}$ and 0.90 $\mu\text{g/ml}$," she said.

Halling, a geriatrician, chose to study hexachlorophene use by geriatric-ward nurses because of the unusually high frequency with which they wash. She said they make a good study population because they are exposed to fewer toxic substances, such as anesthesia gases, than many hospital colleagues.

Women in the control group were matched to exposed counterparts on the basis of age, duties and whether they smoke, Halling said. In interviews, each of the 693 was questioned extensively about possible exposure to other teratogens during pregnancy, such as viruses, drugs and diseases like rubella. It was found that most mothers of severely deformed infants had a double exposure to hexachlorophene — that is, they used either two forms of the soap or a combination of soap and hand cream at each cleansing.

Unlike many pesticides and toxic chemicals, the body rids itself of hexachlorophene quickly; within 72 hours the antibacterial will be completely gone, Halling said. Therefore, birth defects will probably result only if exposure occurs during pregnancy, particularly during the first, formative weeks. The Swedish government, which received a preview of Halling's findings last year, is planning a major follow up, Lindfildt said. □

Incineration breeds very toxic chemicals

Firefighters, steelmakers and workers at municipal incinerators are among occupational groups that are possibly being exposed to dangerous levels of a previously unrecognized occupational hazard — toxic chemicals formed in the burning of PCB (polychlorobiphenyls) and other polyhalogenated aromatic chemicals. Not only does burning these chemicals at temperatures below 800°C to 1,000°C not destroy them, it increases the quantity of toxic isomers (chemicals with the same components but different structure) and newly formed variants contaminating the original chemical, according to Christoffer Rappe, an organic chemist from the University of Umea in Sweden. This "uncontrolled burning" can thus increase the toxicity of the original chemical, Rappe and co-authors Hans Rudolf Buser and Hans-Paul Bosshardt of the Swiss Federal Research Station in Wädenswil reported at the New York Academy of Sciences symposium on Halogenated Aromatic Hydrocarbons.

Rappe said that due to the prevalence of polyhalogenated benzenes and toluenes, biphenyls (PCB's), terphenyls (PCT's), naphthalenes (PCN's), chlorinated

phenols, phenoxy acids and diphenyl ethers, it can be assumed that they routinely arrive in wastes at municipal incinerators. PCB's alone are found in electrical capacitors (including those in autos), plastics, paints, carbonless copy paper, pesticides, heat-transfer liquids and casting waxes (for molten iron), Rappe told a press conference last week.

In laboratory studies, Rappe showed that pyrolysis of "technical PCB mixtures" produced "about 30 major and more than 30 minor" polyhalogenated dibenzofurans (PCDF's). "One of the main constituents was 2, 3, 7, 8-tetra-CDF, the most toxic of the PCDF's," Rappe said. His calculations show a yield of PCDF's "between 3 and 25 percent calculated on the amount of PCB decomposed." This confirms PCB's as a source of PCDF's, he says. Until now, dioxin — the chemical that caused widespread health problems in the July 10, 1976, explosion at Seveso, Italy (SN: 12/4/76, p. 359) — has been concentrated on as essentially the only source of polyhalogenated dibenzodioxins (PCDD's) and PCDF's.

What's more, a 1970 Dutch study by J.G. Vos and colleagues found that the toxicity of PCB's contaminated with PCDF's was directly related to the levels of PCDF's. Most of these halogenated aromatics degrade slowly, if at all, and tend to accumulate in the body. Their toxicity has been measured in laboratory animals in the parts-per-million (ppm) to parts-per-trillion (ppt) level, Rappe said.

The incineration problem is not hypothetical. During a fire involving an electrical transformer in downtown Toronto last year, PCDF levels in PCB's increased by a factor of 50, Rappe said. PCDF's have also been identified in fly ash and flue gas. In their study, Buser and Bosshardt found 0.2 micrograms per gram of PCDD and 0.1 $\mu\text{g/g}$ PCDF's in fly ash from a Swiss municipal incinerator and 0.6 $\mu\text{g/g}$ PCDD's and 0.3 $\mu\text{g/g}$ PCDF's in fly ash from a Swiss industrial-heating plant. A "striking similarity" between the patterns of PCDF in fly ash and pyrolysis studies "suggests PCB's to be the precursors."

The researchers also described a heat-exchanger fluid containing PCB's that acquired a fourfold increase in PCDF's — to 15 or 20 $\mu\text{g/g}$ — in only two years of operation. The dominating isomer was 2, 3, 7, 8-tetra-CDF at 1.25 $\mu\text{g/g}$. Rappe suggests that the heat-exchange process slowly converts PCB's into PCDF's.

Once diluted in outside air, these chemicals are hardly noticeable against background levels prevalent throughout the world, Rappe said, but for workers in confined spaces, the dose could be dangerous. Many of these chemicals are suspected carcinogens or teratogens and are known causes of skin lesions and nervous disorders. Worker exposure, however, can be cut to near zero, Rappe said, with installation of proper filters to incinerator exhausts and leaks; he said such filters are not commercially available, however. □