

Insects in wartime, reached peak agricultural use in 1959.

the food chain, long retention in fatty body tissue and death of wildlife.

DES



Synthetic sex hormone DES, for diethylstilbestrol, was used increasingly from the 1940's, particularly after 1960 as a prescription drug for pregnant women to deter spontaneous abortion; and in veterinary medicine, from 1948 until it was banned in 1979, as a livestock and poultry growth stimulant, thus entering the food chain.

DES findings bring protests

Carcinogenicity in animal tests as early as 1938 was ignored. In 1971 young women whose mothers had been given DES in pregnancy began appearing with uterine cancers, leading to the discovery not only of elevated cancer risks among the pregnant women treated with DES but also among their female offspring. This led to questioning of DES in livestock feed.

The most serious exposure levels came as a result of the widespread oral administration of DES as a drug taken by pregnant women. DES in meat and poultry exposed the entire U.S. population to low levels through 1979. The E.P.A. estimates that DES is still prescribed for 500,000 people annually, mostly men being treated for prostatic cancer.

Since 1977 the F.D.A. has ruled prescription formulations inadvisable for pregnant women and has required special product labeling and "educational" literature in packages on cancer risks for any use. In 1979 the F.D.A. forbade the use of DES in food-producing animals.

The latest N.T.P. report on carcinogens says that the risk of continuous low-level exposure in meat and poultry has been "completely removed" and that "educational materials" now required in packages for prescription use inform "both the patient and the doctor of the risks."

Dioxin



Not a product in itself. An unwanted, unavoidable contaminant in the manufacture of some herbicides and defoliants such as Agent Orange, used in Vietnam from 1962 to 1970, and 2,4,5-T, a World War II substance later widely used commercially as a weed killer on U.S. pasture and range land.

Cleanup in Times Beach

There were findings of dioxin's acute non-cancer toxicity in laboratory guinea pigs and reports of non-cancer illness among production workers exposed in the 1960's to accidental spills of 2,3,5-T. But dioxin was not isolated as a carcinogen in rats until 1977. There is so far no evidence of the carcinogenicity of dioxin in humans or of death from any dioxin-related cause in man.

More than 800 plant workers and 67,000 nearby residents worldwide have been exposed through spills; also residents of Times Beach, Mo., and Midland, Mich., a manufacturing site. American servicemen exposed may total tens of thousands. Consumer exposure at large through food and water contamination has not been estimated.

Birth defects in animals exposed to 2,4,5-T led the Agriculture Department in 1970 to suspend most uses. In 1979 the E.P.A. banned 2,4,5-T except on range land and rice fields. After Dioxin contamination was found at Times Beach, the E.P.A. limited waste disposal to licensed landfills. The E.P.A. recently proposed water quality criteria for dioxin-contaminated products.

Dioxin itself remains unregulated; debate continues over the extent of its danger to humans, and litigation continues over health effects of Agent Orange on exposed war veterans.

EDB



EDB, for ethylene dibromide, is chiefly used as a chemical additive and scavenger of lead oxide residues from the combustion of gasoline in automotive engines using leaded fuel, but also as a pesticide and preplanting soil fumigant in agriculture, principally in citrus.

Testing produce from Mexico

In 1976 and 1977 the National Cancer Institute published evidence of EDB-induced cancer in laboratory animals. In 1980 an E.P.A. study of EDB disclosed possibly persistent contamination of fruit and grain fumigated in storage. By 1983 serious ground water contamination was reported in Georgia, California, Hawaii and Florida.

NIOSH estimated that 227,000 production and process workers were potentially exposed. In 1977 it estimated that 650,000 gasoline stations workers were exposed to leaded gasoline, but use of leaded gasoline containing EDB is declining. Most of the population has been exposed to low-level risk, over the short term, from food products.

In September 1983 the E.P.A. banned use of EDB for soil fumigation. On Feb. 3 the E.P.A. banned fumigation of grain and set limits on EDB residues in consumer baking mixes, cereals and snack foods. On March 2 it ordered a limit of 30 parts per billion on EDB residues in fruit. All uses of EDB are to be banned Sept. 1.

On March 2, 1984, the E.P.A. it ordered a limit of 30 parts per billion on EDB residues in fruit, and all uses of EDB are to be banned Sept. 1 to guard against potential long-term risk of exposure.

Formaldehyde

A colorless, pungent gas most widely used, in a water solution called formalin, in plastics and in such building materials as particle board, plywood and foaming home insulation products. Also in automotive parts, textiles, embalming fluid, room deodorants, fungicides and as a fingernail hardener and preservative in cosmetics.

Toxic effects and formaldehyde's characteristic as a strong sensitizer — promoting acute reactions in exposed persons — were observed when it went into wide production after 1900. After 1976 epidemiological studies disclosed increased cancers among such occupationally exposed groups as beauticians and morticians.

NIOSH estimates 8,000 workers are potentially exposed to inhalation or skin absorption in direct production and that up to 1.7 million others may be potentially exposed in the manufacture, installation and use of end products. E.P.A. estimates 27.7 million people living near manufacturing plants could receive low ambient exposure.

OSHA in 1980 limited occupational exposure in formaldehyde manufacture for reasons of toxicity other than cancer. The Consumer Safety Product Commission requires a label warning as a "strong sensitizer" on some household products. In 1982 the Commission banned the use of urea-formaldehyde home insulation. F.D.A. regards the content in cosmetics as too small to regulate.

Although the insulation ban was overturned last year on appeal to the courts, little of this product is now believed to be marketed.

Permanent hair dyes

Permanent dyes are used largely at home by millions of women and unknown numbers of men. Beauticians are also exposed. No risk has been proved in hair rinses.

In 1977 tests suggested a link between the widely used compound 4-methoxy-m-phenylenediamine (4-MMPD) and cancer of the breast and bladder. The F.D.A. was petitioned for a warning label. Manufacturers voluntarily withdrew some components. The National Cancer Institute began testing ingredients in 1973.

Used by 33 million women, largely in home applications.

In 1979 the F.D.A., after being petitioned by the Environmental Defense Fund to regulate hair dyes, proposed a rule requiring a warning label on preparations containing the suspected carcinogen 4-MMPD. The regulation was challenged in court and a stay was issued. The rule is not yet in effect.

Under a consent agreement with manufacturers in 1980, the F.D.A. has withheld the label requirement pending a formal study assessing the risks. Some manufacturers have voluntarily withheld 4-MMPD from their products.

Kepone



A pesticide, used chiefly against fire ants and in cockroach traps.

Chemical production in Virginia

In a public health detective story that began in the summer of 1975, a Virginia doctor sent blood samples to the U.S. Centers for Disease Control taken from Kepone production workers he was seeing as patients. The patients had a variety of severe neurological symptoms. Hurred animal tests of carcinogenicity were begun.

By 1976 the Allied Chemical Company, the only maker of Kepone, quit production and turned the process over to a small concern in Virginia, where some workers became ill. It is not known how many people were exposed to Kepone as a result of illegal dumping into the James River or by eating contaminated fish.

Production stopped in July 1975. In 1976 a NIOSH study disclosed that Kepone is carcinogenic in rats. Kepone was banned in 1977.

Residues in the James River remain an environmental hazard.

Nickel

In a wide range of metal alloys in the shipbuilding, aerospace and other heavy industries, and in a variety of electroplating, chemical and catalyst applications. In ceramics, dyes, paints, magnets, welding.

In 1932 British investigators found cancers of the lung and nasal passages among nickel workers in Wales.

NIOSH estimates one million U.S. workers are exposed to organic nickel in the workplace. An estimated 720,000 people live within 12.5 miles of nickel plants. The E.P.A. says the entire population may be exposed to low levels in air, food and water.

Some regulatory limits on nickel content of workplace air were set in 1962, preceding OSHA. Water effluent standards were added in 1975, and hazardous waste disposal standards were set in 1980.

Decisions on regulatory control of emissions in the environment, particularly by coal-burning electric power plants, are under study by the E.P.A.