17.7.6

Site: Baird + McGuire
Break: 17.7
Other:

DIOXINS
FACT SHEET

A. CHEMICAL PROPERTIES There are roughly 75 compounds which make up the group of chemicals known as dioxins. Of these isomers, several find a chlorine atom in four positions on the molecule. This group is called TCDDs or Tetrachlorodibenzoparadioxin. Of all the isomers, the 2,3,7,8-TCDD are felt to be the most toxic. Measurement of "dioxins" in environmental or human/animal samples is complicated by this variety of forms. The tetra-dioxin isomers are felt to be more toxic than other forms; thus TCDD are often considered as a group when making toxicity estimates.

PHYSICAL PROPERTIES Dioxins have a very low physical stability in water and when released in rivers and lakes can become tightly bound to suspended solids and eventually settle to and accumulate in the bottom sediments. As dioxin binds tightly to clay soils, this tendency limits migration through the soil to groundwater resevoirs. The half-life of the dioxin-soils, particularly when deeply settled and not exposed to ultraviolet rays of the sun, may be in the order of years.

B. SOURCES OF DIOXIN Low levels of dioxin are formed during the production of hexachlorophene in the herbicide 2,4,5-trichlorophenoxyacetic (2,4,5-T). Both processes involve trichlorophenol. Much of the dioxin around today resulted from these production processes, which have now been substantially modified and/or eliminated. Additional evidence suggests that dioxin is also a product of the combustion of materials containing chlorine in high temperature facilities such as industrial and municipal incinerators, coal burning plants and others. Small quantities may also be formed during the combustion of diesel fuel. Pesticides are the most significant group of organic chemicals in relation to dioxin occurance.

C. FATE IN THE ENVIRONMENT Soil, water, air, plants and animals

- Biodegradation - dioxins have a strong resistance to biodegradation
* Photodegradation - ultraviolet wavelengths most effective. Dioxins may be photolytically degraded by natural sunlight.

PHYSICAL TRANSPORT

- Dioxins bind tightly to soils, especially with high organic content. Dioxins usually remains in upper 6-12 inches in such soils which poses little threat to groundwater and are relatively immobile in soils. Any movement in soils is usually horizontal or by biological transfer (other than by plants).

WATER TRANSPORT

Three main possibilities: 1-direct application from drafting sprays from forest uses, 2-overland transportation after heavy rains, and 3-transportation of dioxin contaminated soils into lakes and streams by erosion.

AIR TRANSPORT

Dioxin has a very low vapor pressure. Losses due to volatilazation are very low.

-Water mediated evaporation of dioxins may take place.

-Dioxins may be transported by airborn particulates.

BIO TRANSPORT

Small amounts accumulate in plants.

OPTIONS FOR DISPOSAL

1. Out of Site storage - Sanitary landfills
2. Other proposals: chemical fixation, deep well disposal, burial in salt mines, and inclusion of chemicals with nuclear fission products by secured cavities.

* Most extensively tested measure is incineration- high temperature oxidation of dioxin.

PHYSICAL METHODS

1) Use of solvents to concentrate dioxins into smaller volumes for final disposal or incineration
2) detoxification including ultraviolet light exposure and Gamma radiation

PROPOSED CHEMICAL TECHNIQUES - Ozone or special chloroiodide compounds. Biodegradation is also being used.

D. CURRENT EPA REGULATIONS

All persons who generate, transport, treat, store, or dispose of a dioxin-containing substances are required to notify EPA or a state authorized EPA to operate the hazardous waste program of their activities under Section 3010 no later than April 15, 1985.

Due to the lengthiness of the regulations, please refer to "EPA Rules and Regulations", Federal Register, Vol. 50, NO. 9, Monday, January 14, 1985 for an outlined review of the current EPA regulations.

Action Levels - The levels of TCDD in wastes are of concern in terms of the potential for serious harm to human health if they are released to water or air, either in soluble form or adsorbed to soil particulates. Based on its carcinogenic potential, the Water Quality Criterion for 2,3,7,8-TCDD is 10^{8}-10^{7} ppb (U.S. EPA, 1978b).

E. PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS OF DIOXIN EXPOSURE

PUBLIC HEALTH

2,3,7,8-TCDD is perhaps the most poisonous synthetic and has an extremely high potential for producing adverse effects under conditions of chronic exposure. Such exposure to 2,3,7,8-TCDD has induced chloracne (dermatologic disorder), polyneuropathy (multiple lesions of peripheral (nerves), nystagmus (involuntary rapid movements of the eye), and liver dysfunctions.

On the question of whether dioxin causes cancer in humans, the results are mixed. It is felt to be specifically related to the development of soft tissues carcinoma, but in at least one study no specific tumor types predominated among the cancers found in a group of workers occupationally exposed to agricultural chemicals.

The epidemiological evidence collected to date does not implicate dioxin as a cause of birth defects or miscarriages in humans. Reproduction of populations of workers and those exposed incidentally to common dioxin exposures were not found to be adversely affected.

ENVIRONMENTAL IMPACTS

Due to the physical properties of dioxin, there is an accumulating effect if three requirements are not met. These requirements are 1) dissolution in a light transmitting film, 2) presence of an organic hydrogen donor, and 3) ultraviolet light.

Without these factors, dioxin can pose a serious threat to any living creature in the area due to this dangerous accumulating effect. Plants have not been known to be significantly affected by dioxin.