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PCBs—In Perspective

Walter L. Bouchard

PCBs are very stable compounds which do not break down readily in the environment, but instead concentrate as they move up the food chain. Their effects on the environmental species and humans vary due to a number of factors.

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PCBs (Polychlorinated Biphenyls) have received much attention recently because of the public's concerns over their potentially damaging effects on the environment and human health. These concerns have prompted a search for answers to questions about PCBs and how their effects can be controlled. This article will broadly outline the PCB problem with emphasis on PCBs in the United States.

What are PCBs?

The term polychlorinated biphenyls, or PCBs, refers to a class of organic chemicals introduced into United States industry in 1929-1930. A 1979 report by The National Academy of Sciences [1] listed Monsanto Industrial Chemicals Company as historically the only important U.S. producer of PCBs. Monsanto's plants were located at Anniston, Alabama and Sauget, Illinois, where production of PCBs ended in 1970 and 1977, respectively.

PCBs have also been produced, imported or exported by a number of other countries. Some producers are Italy, France, Japan, the United Kingdom, Austria, Czechoslovakia, the Federal Republic of Germany, Spain, and the U.S.S.R.

According to the U.S. Environmental Protection Agency (EPA), countries which have imported PCBs include Finland, New Zealand, Canada, France, Italy, Norway, Sweden, and the United Kingdom. Countries which have exported PCBs include France, Italy, and the United Kingdom (EPA 1976).

It is important to be aware of the chemical structure and nature of PCBs because it is a critical prerequisite to understanding their toxicity and control.

PCBs are man-made compounds manufactured by chlorination of a biphenyl molecule. The biphenyl is composed of two six-sided carbon rings in which one carbon on each ring has joined together. This leaves ten sites for chlorine atoms to join the biphenyl molecule. The number of chlorine substitutions on the molecule corresponds to the ten possible chlorinated biphenyls which may be formed. These are monochlorobiphenyl, dichlorobiphenyl, trichlorobiphenyl, etc. Within each of the ten possible chlorinated biphenyls, the chlorine atoms may join the rings in various configurations creating many isomers.

Typically, the PCBs are sold as mixtures of the various possible chlorinated biphenyls. Commercial PCB mixtures typically contain various contaminants, including polychlorinated dibenzofurans (PCDFs) and polychlorinated napthalenes. These contaminants have been implicated as being partly responsible for some of the toxicity observed from PCB mixtures.

The chlorine content of the mixture is used as one method of describing it. For example, some common PCB mixtures are sold as AROCLOR^{R} 1248, 1254, and 1260. These contain 48 percent, 54 percent, and 60 percent chlorine, respectively.

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Use and Distribution of PCBs

A 1976 report by Versar, Incorporated, for EPA [2] summarizes the various uses and distribution of PCBs.

PCBs have been used extensively in many industrial applications, but primarily in "closed" or "semi-closed" systems such as electrical transformers and capacitors, heat transfer systems and hydraulic systems. Much of the PCB marketed to U.S. industry is still in service, primarily in electric equipment. A significant portion has entered the environment and persistently remains, while the remainder has either degraded in the environment or been destroyed by man. Figure 1 describes estimates of PCB production, use and gross environmental distribution between 1930-1975.

FIGURE 1 PCBs In The U.S. 1930-1975*

PERCENT	MILLIONS LBS.	STATUS
3.9	55	Degraded or incinerated
20.7	290	Landfills and dumps
10.7	150	Free in the environment
53.4	750	Currently in use in Capacitors and transformers
0.6	8	Other than electrical uses, e.g., heat transfer, carbonless copy paper, hydraulics, lubricants, plasticizer uses, and other miscellaneous industrial uses
10.7	150	U.S. exports
100.0	1,403	Total U.S. commercial production/ sales

*Condensed from EPA (1976)

Evolution of Concern over PCBs 1929-1975

Over the years since their first introduction in the U.S. in 1929-1930, the effects of PCBs have become better known.

Reports as early as 1936 described choracne among persons occupationally exposed to PCBs. Later observations noted possible liver effects associated with some human exposures.[3] In 1968, an outbreak of "Yusho" disease occurred in Japan following accidental human consumption of rice oil contaminated with Kanechlor 400, a PCB manufactured in Japan (48 percent chlorine). The total number of "Yusho" patients exceeded 1,000. They exhibited a variety of effects which included increased eye discharge, acne-like eruptions, hyperpigmentation of skin and nails and various nervous system effects. Other studies of PCBs showed that they persist and accumulate in the environment and may cause damage there as well as to humans.

By the late 1960s it had become apparent that, while PCBs generally show relatively little acute toxicity, they do show chronic toxicity after accumulation in the tissues of many biological species, even when exposed to very low concentrations. Some researchers have reported significant widespread PCB contamination in U.S. foodstuffs, human tissue, and throughout the general environment.

Industry and government have responded to concerns over PCB contamination and its effects. By mid-1971, Monsanto voluntarily stopped sales of Arochlors (PCBs and polychlorinated triphenyls (PCTs)) for uses other than closed electrical systems. They also offered incineration service for waste liquid PCBs and ended production of the higher-chlorinated Arochlors. During 1972 and 1973 the Food and Drug Administration (FDA) developed

rules to control PCBs in food. In 1975 a national conference on PCBs was held in Chicago.

Between the years 1929 and 1975, a span of 46 years, PCBs were controlled mainly through voluntary industry efforts which evolved in intensity and scope. An example of this control is ANSI Standard C107.1-1974 which outlines an *American National Standard Guideline for Handling and Disposal of Capacitor- and Transformer-Grade Askarels Containing Polychlorinated Biphenyls.*

The year 1975 is a convenient break point in the discussion of PCBs because, in 1976, Congress and the EPA changed the PCB picture radically through broad new federal regulations. These changes will be described later in this discussion.

Environmental Distribution and Occurrence

It was mentioned earlier that a substantial amount of PCB has found its way into the environment. Some methods of entry may be through air, water, and land discharge during manufacture and handling of PCB mixtures; PCB equipment manufacture; spills and leaks during final use of PCB-containing products; and through leaching from disposal areas.

PCBs become widespread through certain natural and man-made mechanisms and may be found at various levels and locations in the soil, air, and water.

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Agricultural soils rarely show detectable PCB levels, however, urban soils do. Soils within city limits show higher levels than suburban soils.

Nineteen cities were sampled between 1971 and 1974 in the National Soils Monitoring Program, EPA. Twelve cities showed detectable PCB levels in soils. Many sites were sampled in each city. Typical numbers of positive findings ranged from 0.5 percent—6.3 percent of total samples. Levels of PCBs detected generally ranged from 0.09—3.33 parts per million (ppm). One sample showed 11.94 ppm PCBs.[4] PCB contamination in urban air has been reported at levels in the range of 100 mg/m³.[5] Some U.S. waters and sediment also show PCB contamination.[6,7]

PCBs are found at various levels in biota. One national study conducted between 1970 and 1974 by the U.S. Fish and Wildlife Service showed PCB residues in various freshwater fish, mallard and black duck, and starlings.[8] A 1972-1974 study of three Lake Michigan fish species taken in the eastern part of the lake showed mean whole fish concentrations ranging from 5.24-5.66 ppm in bloaters, 10.4-12.2 ppm in Coho salmon and 12.9-22.9 ppm in lake trout.[9] Other studies have shown PCBs in ocean-dwelling animals.[10]

PCBs have been found in foodstuffs in the United States. This may include low level contamination in some general food products, commercial fish species and other foods. Researchers are watching closely levels found from early years to more recent, and predicting trends for future years.[11,12]

PCBs have been found in the general U.S. population. Samples of human adipose tissue and milk, collected in 1973 and 1974 in a national survey, showed that 35.1 percent and 40.3 percent of the samples, respectively, showed 1 ppm or more PCBs on a wet-weight basis; 5.5 percent and 4.9 percent, respectively, showed greater than 2 ppm PCBs. Adipose tissue extracts were examined by gas chromatography/mass spectrometry (GC/MS) and found to contain penta-, hexa-, and heptachlorobiphenyl compounds most frequently. Less chlorinated isomers seemed to be metabolized and excreted more rapidly in a biological system.[13]

One sample survey in Canada showed human contamination to be about 1-2 mg/kg PCB in adipose tissue in Canadians sampled. PCB residues in human milk of Ontario residents were about 1 mg/kg fat.[14]

Health Effects and Human Exposure

There are two major areas of exposure to PCB mixtures which give a reasonably direct indication of human health effects. These are occupational exposures and one episode of accidental exposure of persons in Japan.

Reported occupational exposure levels vary. Workplace air levels have typically ranged from very low levels up to 10.0 mg/m³ PCBs in air depen-

ding on environmental conditions; type of operation (for example, electrical equipment manufacture or chemical manufacture); work procedures; and controls in effect. Very high levels, in fact up to 86 mg/m³, have been reported in exceptional cases.

Effects of occupational exposure center on a few major areas and mainly depend on dosage, route of exposure, and individual biological variation among exposed persons.

Common effects are skin disorders. These include, but are not limited to, chloracne, hyperpigmentation, rashes, and irritation. These effects have been observed both in areas of the body contacted directly by PCB mixtures and in areas not directly contacted.

Other effects may include dry sore throat, upper respiratory irritation, asthmatic bronchitis, eye irritation, nausea, gastrointestinal disturbances, headache, dizziness, and liver effects.

The National Institute for Occupational Safety and Health (NIOSH) reports that there are no adequate studies to confirm or deny that PCBs are carcinogenic; that PCBs have little mutagenic potential, but may alter mutagenicity and carcinogenicity of other compounds by stimulating microsomal enzyme activities; and that teratogenic potential does exist. NIOSH further admonishes that there are no reports of infertility or abortions attributed to PCB consumption or exposure, or undesirable effects in children born to mothers exposed to PCBs in the diet, or undesirable effects developing from nursing such mothers.

Based on available data, PCBs should be handled as if they are potentially carcinogenic and potentially teratogenic.

Recalling the previously mentioned outbreak of "Yusho" (literally translated oil disease) which occurred in Japan between 1968 and 1975, approximately 1,300 cases were reported in which patients were found or presumed to have ingested rice oil which was accidentally contaminated with a PCB mixture, Kanechlor 400. Samples of oil contained 800-1,000 mg/kg PCB with some reaching 3,000 mg/kg. Concentrations of polychlorinated dibenzofurans (PCDFs) were in the range of 5 mg/kg. These levels of PCDFs are about 250 times more than are usually found in PCB mixtures. Intake of contaminated oil was estimated at 2.0 g (10 mg PCDF) among a highly exposed group. Minimum amounts ingested may have been 0.5 g.

The effects of "Yusho" are widely described in the literature. In the early stages these include ocular discharge, swelling of upper eyelids, dermatological symptoms mainly associated with follicular keratosis, and various nervous and general symptoms. Other features described are hypertriglyceridaemia with normal plasma cholesterol, adrenocortical and ovarian dysfunction, bronchitis (cough and phlegm), hepatomegaly, hypobilirubinaemia, low immunoglobulin levels and (possibly) disturbed calcium metabolism.[20]

While "Yusho" effects are generally attributed mainly to PCBs, Japanese researchers have suggested a need to investigate the role of PCDFs more fully.[21]

Effects on the Environment

The full impact of PCB contamination on ecological systems is not fully understood. However, there have been a number of attempts to summarize currently apparent effects and to estimate future possible impacts.

In general, PCBs may cause the following impacts on wildlife when high concentrations of PCBs are encountered: reproductive disorders, increased mortality, growth changes, and behavior changes. Other effects have been reported. [15,16]

PCBs resist degradation in the environment and persist for long periods of time. As they persist, they tend to accumulate in animals as they move up the food chain. This is most strongly demonstrated in aquatic ecosystems. [15,16,17,18,19] In any biological system, effects depend, among other things, on: dosage, route of exposure, and various species and individual biological factors.

Controlled Studies of Toxic Effects

Controlled studies typically involve dosing various animal species with lethal or sublethal levels of a test chemical under well-defined conditions.

Depending on the route of administration (oral, inhalation, dermal applications, etc.), the dose, the specific test species, individual biological factors and other factors, one can draw reasonably well-defined

conclusions about the possible toxic effect of a chemical on man. The results of the studies noted below suggest a possibility of similar effects in man. However, one should bear in mind that animal data are not directly extrapolatable to man without careful evaluation of differences between the actual test species and man, the levels of exposure used in the experiment and many other factors.

A "Criteria Document" prepared by NIOSH in 1977 gives an exhaustive review of some important studies.[3]

The absorptions, distribution and excretion of PCBs have been described in various animal studies. PCBs are readily absorbed into the body from the digestive tract and respiratory system. Depending on the degree and pattern of chlorination, they are excreted in the feces, milk, and hair of animals. Trace amounts are excreted in the urine.

Metabolites of PCBs have been found in the urine, feces, and milk of mammals. Among mammals there appear to be quantitative differences in PCB metabolism and effects related to age and sex. In general, the lower chlorinated biphenyls are more rapidly metabolized than the highly chlorinated ones, which may persist in tissues for years after intake has been discontinued. Some metabolites found in urine, bile, feces and milk indicate that, at some point, PCBs may be metabolized to highly toxic arene oxides with may present a potential risk of carcinogenesis or mutagenesis.

Inhalation and dermal application studies of PCB mixtures in animal tests show a variety of effects. Inhalation studies show changes in liver, kidney, heart, spleen, thyroid, blood and growth rates. Dermal studies show changes in skin, liver, and kidney which suggests that PCBs may be absorbed through the skin. Some of the toxicity demonstrated by some PCB mixtures may be due to contamination by PCDFs.

Administration of PCBs to test animals by the oral route is the most common type of study. Oral dosage studies show that as the degree of chlorination increases the acute toxicity decreases. Effects observed include, but were not limited to, some immunosuppressive activity; changes in the liver, kidney, skin, blood, protein levels, DNA levels and RNA levels; growth changes; gastrointestinal disturbances; and loss of body weight.

Animal work done on reproductive and teratogenic effects of PCB mixtures shows that PCBs appear capable of crossing the placental barrier and having an effect on reproductive performance.

There is some evidence of the possible mutagenic and cytotoxic potential of PCB mixtures. One study using the Ames bacterial test showed that, as the degree of chlorination decreases, the mutagenic potential increases. The more highly chlorinated biphenyls showed very little mutagenic activity. The cytotoxicity of PCB mixtures increases with decreasing chlorination.

Tumors have been produced by PCB mixtures in a variety of animal test systems. Liver tumors were typical. Tumors of the pituitary gland have also been observed.

Regulatory Requirements

The Federal Government has taken an approach to regulation of chemicals in the U.S. that includes cradle-to-grave cognizance over their import or production, transport, handling, and disposal. PCBs fit into this regulatory philosopy.

There can be some problems in living with government rules. There are at least four U.S. government departments or agencies administering six laws which, in part, cover PCBs. Some regulations overlap confusingly, or are vague. Smaller businesses in the regulated community, which typically have small or nonexistent environmental/legal staffs, can be overwhelmed by the synergistic effects of these regulations.

It is clear that if the U.S. regulatory system is going to be involved in PCB control; clearer, more reasonable and more effectively-coordinated rules should be provided.

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Some of these rules are listed below by agency or department. This list is extensive, but not meant to be all inclusive.

Environmental Protection Agnecy (EPA)

- Toxic Substances Control Act (TSCA):
  section 6e mandates broad control over manufacture, distribution, handling, and disposal of PCBs (refer to *Federal Register* May 31, 1979).
- Resource Conservation and Recovery Act (RCRA):
  mandates specific rules to regulate various aspects of disposal.
- Federal Water Pollution Control Act (FWPCA):
  mandates rules to regulate discharges of PCBs to waterways.

Department of Transportation (DOT)

- Hazardous Materials Transportation Act (HMTA):
  mandates rules to regulate transportation of PCBs.

Food and Drug Administration (FDA)

- Food, Drug and Cosmetic Act:
  mandates rules to regulate PCB residues in foods, etc.

Department of Labor (DOL)

- Occupational Safety and Health Act (OSHA):
  mandates rules to regulate occupational exposures to PCBs.

Summary

In response to the scientific evidence which indicates a potential problem from PCB overexposure, and because of the need to comply with existing laws and regulations, the following goal is appropriate for most applications: Persons who use PCBs should completely identify the disposition and quantity of all PCBs in their system; control its use by insuring it remains in a closed system or is quickly and adequately cleaned up in the event of a spill, or otherwise handled safely during necessary handling operations; and ultimately remove all PCBs from their system for safe disposal and substitute PCB equipment with non-PCB equipment as old gear wears out.

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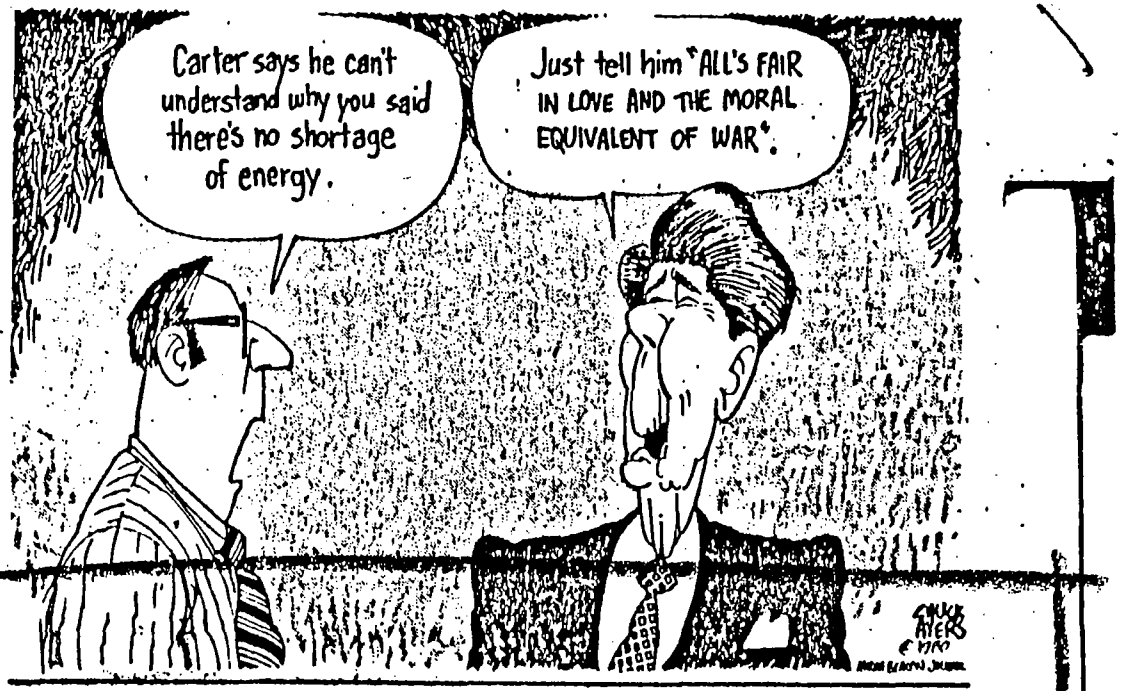

Editorials

Debates could help us sort out our problems

RONALD REAGAN'S speech in Cleveland on energy provided an example of why the country needs debates between the presidential candidates to help sort out their positions.

The process, however, in this election year amounts to more than just sorting out who among the three candidates is the best choice. In this year, it is also a means for the country to sort out where it should be headed during this crucial decade.

In Cleveland, Mr. Reagan delivered a blistering attack on the Carter energy program, contending that the country has plenty of oil, gas and coal for many years and that the problem is not the supply but administration policies that have discouraged its exploitation.

The microphones were barely turned off after Mr. Reagan's speech in Public Square when President Carter fired back from Washington that the Republican candidate had "again made an accusation without checking the facts."

Well, as is often the case in political battle, it is not as simple as either candidate pretends. There is some truth on both sides.

Yes, as Mr. Reagan said, there is a lot of gas, oil and coal in the ground in America. In the case of oil and gas, artificial price controls, in part kept in place by Republican presidents who were part of Mr. Reagan's own party, helped contribute to less exploitation. Mr. Carter, to the dismay of some within his own party, took the lead toward gradually eliminating price controls.

Coal is a different matter. It is dirty and its effects are often dangerous to health. When oil and gas were still cheap, the nation abandoned coal as a matter of policy; now it is going back to coal, which is, as Mr. Reagan said, an abundant energy resource.

In this part of the country, to which the Republican candidate was directly speaking, the problems of exploiting coal for energy have been heightened by the long feud between the Environmental Protection Agency and the state over its use. Both sides have too often been intransigent. The Carter administration has not worked diligently enough to end the dispute. Neither have Ohio's Gov. Rhodes and his Republican administration.

Mr. Carter's angry statement of rebuttal to the Reagan comments conveniently made no mention of the President's discredited U. S. Department of Energy. This newly created federal agency is full of bureaucratic bloat; whether its existence has helped or hurt the country's energy program is hard to tell. It is expensive, overstuffed in size and meddlesome in some instances when that might well be unnecessary.

Mr. Reagan's speech made it sound as though everything would automatically be fine if the government played no role at all in the country's energy future. That notion would be too simplistic even to those in the energy business who can make a strong case that there is too much government regulation.

Again, the political point and counterpoint have not addressed the

Voice of the people

PCBs' indictment is premature

AS AN environmentalist, I must comment on Bill O'Connor's Aug. 29 article concerning PCBs.

All would naturally applaud Goodyear, and Dane Parker in particular, for their efforts to break down PCBs.

My comments relate to his descriptive characterization of PCBs, which was contrary to the facts as the scientific community now knows them (National Academy of Science studies published in 1979).

Though PCB is bioaccumulative, this in itself does not demonstrate its toxicity. PCBs are nowhere listed in EPA, DOT, or OSHA hazardous substance lists as "high toxic." It is only correct to call PCBs a "priority pollutant."

The only consistent findings from 1968 to 1980 are industrial chloracne eruptions on the skin.

To give the complete story, the public should know that several authorities, including Dr. Frank Whitmore representing EPA itself, believe that the real culprit in the 1968 Japanese incident was not a "normal" PCB at all, but one by-product of a heated PCB (600 degrees F) — polychlorinated dibenzofurans, which may be 500 times more toxic than PCBs.

Ironically, EPA stated that "it is probably inappropriate to use the data from the (Japanese) episode to make

Robert Parrish

quantitive estimates of the toxic hazard posed by PCBs to humans." It is like comparing apples with oranges.

Yet this is just what EPA considers now as their primary evidence in indicting all PCBs.

Like everything else, it seems we go from one extreme to the other. All I ask is that we look at the PCB issue rationally.

The obvious conclusion that the National Academy made was that more extensive testing is required before any definite conclusion can be made.

It is fair to say that the long-term effect of PCBs on the food chain may not be known for 20 or 30 years. There is no supportive evidence today that ordinary PCBs are a human carcinogen or mutagen. At the same time, the best practice is thus to minimize PCB exposure to the environment because of the unknown factor.

Therefore, during this time of uncertainty, let the media seek out the full story rather than stating opinions as facts.

Since environmental needs are so many and our financial resources are limited, I want us to deal with the environmental issues that are indeed significant and will require all the public support that has to be mustered.

ROBERT H. PARRISH
Stow

Catcher is happy

I WOULD LIKE to take this opportunity to thank everyone who helped to make my Guinness' world record attempt a success. The biggest thanks goes to the friends and relatives who came to watch my catch and cheered me on.

JEFF KURTZ
Brimfield

Editor's note: Kurtz, a 21-year-old Kent State University senior, caught a

faster than other systems in use, but that the present sensitivities for some chemicals, such as phosphorus and ammonia, are too high for EPA use at this time. Elly said that the system is good for highly polluted water, but not for clean water. EPA has been testing the IQAS for the last four to six months.

Elly said that if purchased the instrument would be used by EPA primarily to test lake water, rather than water samples required for granting a National Pollutant Discharge elimination system permit.

John Wilson, of the Department of the Interior's Geological Survey laboratory at Denver, Colo. said that USGS has purchased one of the machines, and is continuing testing of another one at this time.

Wilson said that the instrument is being used on a "broad range of natural water samples," such as lake water. USGS decided to purchase the machine primarily because the speed at which the tests are done compensates for its inability to do multiple testing simultaneously.

Radiation

EPA ISSUES TECHNICAL REPORT ON GUIDANCE FOR TRU EXPOSURE

The Environmental Protection Agency issued a technical report containing its responses to all comments received on its proposed radiation protection dose guidelines for persons exposed to transuranic elements in the environment (44 FR 61104).

The guidelines were proposed in the Federal Register on November 30, 1977 (42 FR 60956). The final guidelines, which currently are awaiting the signature of EPA Administrator Douglas M. Costle, will be subject to Presidential approval and would apply to all federal agencies which have statutory authority for producing or using transuranic elements, or licensing or regulating such activities.

The guidelines would limit the radiation dose the general population may receive from exposure to transuranic elements to one millirad per year to the lung and three millirad annually to the bone. (Current Developments, September 21, p. 1197).

Single copies of the technical report, EPA 520/4-78-010, are available upon request from Gordon Burley, Environmental Standards Branch Chief, Criteria and Standards Division, Office of Radiation Programs (ANR-460), EPA, Washington, D.C. 20460, or telephone (703) 557-8610.

General Policy

EPA ADVISORY PANEL PLANS MEETING TO DISCUSS CADMIUM REPORT, SLUDGE RULES

The Science Advisory Board's study group on cadmium in sludges will hold a meeting November 7 to discuss a draft report by the Environmental Protection Agency's Office of Research and Development (ORD) on the human health effects on cadmium (44 FR 61105).

The group is expected to focus on ORD's support of proposed interim regulations for land application of treatment plant sludges (Current Developments, September 21, 1183).

Persons wishing to attend the meeting, which will be held at 9 a.m. in room 2117 of Waterside Mall, 401 M St., S.W., Washington, D.C. 20460, should contact Joel Fisher at (202) 472-9444, by November 5.

Copies of the health effects document may be obtained from Richard Marland, in EPA's R&D office at (202) 755-2532.

Economic Analysis Subcommittee Meeting

SAB's Economic Analysis Subcommittee also is planning to meet November 20 to prepare a report to EPA on "The Potential Role of Economic Analysis in Environmental Policy" (44 FR 61105).

Person wishing to attend, participate, or obtain information concerning the meeting, which will be held at 9 a.m. in room 1101 West Tower at the above address, should contact Douglas B. Sells on (202) 472-9444 by November 16.

Chemicals

HAZARDS OF PCBs CALLED OVERBLOWN, CAUSING NEEDLESS DISPOSAL PROBLEMS

TAMPA, Fla. — (By an Environment Reporter staff correspondent) — The hazards of PCBs (polychlorinated biphenyls) are overblown, causing needless disposal problems, according to scientists, engineers, and Environmental Protection Agency officials speaking at a hazardous waste management seminar.

PCBs are a "political pollutant" — a substance which EPA, the Food and Drug Administration, or some other federal agency has banned, resulting in no one wanting to touch, or dispose of the material, said John Dickinson, chief of the hazardous waste section of EPA Region IV in Atlanta, Ga. Dickinson told the October 15-19 seminar, sponsored by the Toxic Substances Control Institute, that "political pollutants" are ones which can be safely and securely disposed of, but ones which industry does not want to handle or "take the heat" from society for disposal.

Dickinson said the reason for concern about PCBs is that the substance is bioaccumulative and persistent in the environment and does not break down into simpler chemicals.

Dickinson said, however, that other chemicals are much more dangerous than PCBs, but just have not received the media attention that PCBs have.

He said that incineration of PCBs is the "sleeping giant" because EPA has not yet begun evaluating emissions from burning PCBs, and EPA does not know the products of its combustion.

PCBs Caught in Political Controversy

Dickinson's views were supported by Raymond D. Harbison, director of the toxic substances control laboratory at Vanderbilt University in Nashville, Tenn. Harbison said PCBs are totally immobile and not carcinogenic to humans. According to Harbison, benzpyrene and other chemicals are far more hazardous to humans and the environment than PCBs and are proven human carcinogens.

Harbison pointed to many cases of human ingestion of PCBs without resulting carcinogenic side effects.

An April 1979 EPA environmental impact statement and economic impact analysis of the PCB regulations said that PCBs are carcinogenic to rats and mice and "pose a carcinogenic risk to man."

"The hysteria and money spent over PCBs are not worth the human health effects," Harbison said. "I see no reason why we are having problems disposing of PCB," he said in referring to industry problems in obtaining PCB disposal permits because of public opposition to disposal facilities.

PCBs, the only substance specifically outlawed by Congress in the Toxic Substances Control Act, are the target of very strict federal disposal regulations.

Robert Landmesser, president of Advanced Environmental Technology Corp., Morrisplains, N.J., recommended that industry get rid of its transformers and capacitors containing PCBs as soon as possible. Many seminar participants

from industry said they had large quantities of PCBs stored onsite and were looking for permanent ways to dispose of the substance.

Industry Must Police Itself

Industry must police its own hazardous waste transportation and disposal activities more than it ever has in the past, according to Landmesser.

Landmesser said increased federal enforcement of EPA's soon-to-be released hazardous waste regulations (Current Developments, October 19, p. 1423) and the Department of Transportation's hazardous materials handling rules will be an incentive for industry to police itself to avoid expensive prosecution and violations.

According to Landmesser, of all the federal agencies his firm comes in contact with, DOT has the strongest and largest enforcement staff to deal with the hazardous materials handling regulations. He said that DOT intends to upgrade its enforcement staff for the regulations. He said that, because DOT's hazardous materials handling regulations are strong, consistent, and already on the books, unlike EPA's yet-to-be-released hazardous waste regulations, firms must comply with all aspects of the DOT regulations. "Compliance with DOT's [hazardous materials handling] regulations is imperative from top to bottom," Landmesser said.

Landmesser recommended that industries not mix different types of their wastes into one waste stream. "Classification and separation of materials will be most important for offsite disposal," he said.

Landmesser also said that industry generally has "not had a consistent moral hazardous waste policy." He said in the past industry may have been disposing of its wastes legally under then-existing laws, but quite often industry knew it was polluting groundwater and land and endangering the environment (April 13, p. 2326). He said industry has been legally, but not morally, correct in the way it handled hazardous wastes.

Discussions at the seminar also focused on the difficulty of siting hazardous waste treatment, storage, and disposal facilities.

Wilsonville Case Will Have Far-Reaching Effects

The recent court decision prohibiting continued operation of Illinois' Wilsonville hazardous waste landfill, whose operation the EPA supported, will have far-reaching effects on the siting and operation of hazardous waste disposal sites, said Jeffrey R. Diver, counsel for environmental affairs of Waste Management, Inc., of Oak Brook, Ill.

Diver said the court decision to keep the site closed under nuisance law (October 5, p. 1277) was based on "very little evidence" that the site posed a potential harm to the area. He said the decision goes far beyond the disposal of hazardous wastes and is a considerable extension of the principle of nuisance.

Diver said that present common tort law is adequate for dealing with causes of actions arising out of hazardous waste disposal and abandoned hazardous waste sites.

Water Pollution

GREAT LAKES WATER QUALITY MAY BE RECOVERING MORE RAPIDLY, SAYS NOAA

Water quality in the Great Lakes may show improvement much faster than originally expected if predictions based on a National Oceanic and Atmospheric Administration computer model analysis are accurate.

Dr. Steven Chapra of NOAA's Great Lakes Environmental Laboratory in Ann Arbor, Michigan, calculated the largest of the Great Lakes may be cleaner in one-tenth of the time predicted in earlier studies and Lake Erie may show improvement in less than one year, NOAA said October 29.

Chapra's calculations are based on a model that simulates the effects of phosphorous in the Great Lakes and the results of pollution abatement efforts. NOAA said Chapra includes sedimentation as a natural cleansing mechanism in the lakes, a factor which was ignored in earlier studies.

Although earlier studies concluded it might take centuries for pollution abatement efforts to show water quality improvements in Lake Michigan and Lake Superior, Chapra's studies show the longest time for water quality recovery from a dose of phosphorous is 32 years for Lake Superior. NOAA said Chapra's calculations show Lake Erie could readjust after phosphorous inflows in less than a year; Lakes Ontario and Huron would take nearly eight years, and Lake Michigan would take 13 years.

Chapra calculated that the amount of phosphorous added to Lake Ontario has dropped from 16,500 tons a year in 1972 to a current rate of about 11,000 tons. Overall, he estimated that phosphorous loadings have dropped about 25 percent by 1978 after peak loadings experienced in the spring of 1973, NOAA said.

General Policy

ADVISORY PANELS PLAN MEETINGS ON TOXIC WASTES, MONITORING PROGRESS

Hazardous waste disposal issues will be discussed at a two-day meeting to be held by the executive committee of the Environmental Protection Agency's Science Advisory Board November 5-6 (44 FR 60157).

The committee also will be briefed by EPA's Office of Research and Development on its new policies and procedures for reviewing and awarding research grants and cooperative agreements (Current Developments, October 12, p. 1351).

The meeting will begin at 9 a.m. on both days in room 1101 West Tower, 401 M St. S.W., Washington, D.C.

Persons wishing to attend should contact Richard M. Dowd, SAB director on (202) 755-0263 by October 29.

Environmental Measurements Committee Meets

The monitoring progress of EPA's Environmental Monitoring and Support Laboratory in Research Triangle Park will be evaluated at the November 13 and 15 meeting of the Environmental Measurements Committee (44 FR 60157).

The meeting will begin at 9 a.m. in room N303 of the laboratory in RTP, N.C.

Persons wishing to attend, participate, or obtain additional information should contact Douglas Sebal, Executive Secretary on (202) 472-9444 by November 5.

Impact Statements

CEQ DRAWS UP LIST OF AGENCIES WITH ENVIRONMENTAL JURISDICTION

The Council on Environmental Quality October 19 proposed a list of federal and federal state agencies, with jurisdiction by law or special expertise on environmental issues (44 FR 60353). The list is intended to ease agency compliance with the National Environmental Policy Act (NEPA) and the CEQ Regulations in preparation of environmental impact statements (44 FR 60353).

NEPA regulations define "jurisdiction by law" in Section 1508.15 as authority to approve, veto, or finance all or part

PMNs claimed to be confidential will be transferred within five days, the notice said.

Under the terms of its contract, Walk may not reveal to anyone outside the organization the fact that EPA requested a review of a PMN submission. The contractor also must safeguard from unauthorized disclosure the PMN and any information generated during its review.

Industry Structure

EPA said it selected Springborn Laboratories, Inc., Enfield, Conn., to assist in identifying industry structure, issues, and problems within the markets associated with the PMNs and possible substitutes for a PMN substance (45 FR 50420).

The agency said it will need to disclose confidential business information to Springborn, but added that any prepared reports that include this information will be treated as confidential. EPA said information submitted to Springborn could include chemical identity, product formulation, and company identity, as well as end use and PMN property information.

Pesticides

EPA PUBLISHES TOLERANCES, PERMITS, RECEIVES NOTICES OF CRISIS EXEMPTIONS

The Environmental Protection Agency July 25-30 received four pesticide petitions, acted on 12 petitions, and received three notices of crisis exemptions.

Tolerance Amendments

The agency July 30 established a tolerance for residues of oxamyl on bell peppers at three parts per million (45 FR 50568).

For further information, contact Jay Ellenberger, Registration Division, Office of Pesticide Programs, EPA, 401 M St., S.W., Washington, D.C. 20460.

On July 25 EPA proposed to set maximum levels of pendimethalin on potatoes and sorghum fodder, forage, and grain at 0.1 ppm (45 FR 50600).

Comments may be sent by August 25 to Robert J. Taylor at the above address.

Temporary Tolerances

The agency renewed a temporary tolerance for the herbicide oryzalin on wheat at 0.1 ppm. The new expiration date is July 9, 1981.

Tolerance Petitions

Shell Chemical Company petitioned the agency to set tolerances for cyano (3-phenoxyphenyl)methyl-4-chloro-alpha-(methylethyl)benzeneacetate on apples and lettuce at two ppm; tomatoes at 1 ppm, meat and fat of cattle, goats, hogs, horses, sheep, and in milk at 1 ppm; and the meat byproducts of cattle, goats, hogs, horses, and sheep at 0.5 ppm.

A petition also was submitted by American Cyanamid Company proposing that maximum levels of pendimethalin on sunflower seeds be set at 0.01 ppm.

Experimental Use Permits

Permits to use pesticides in experiments were issued by the agency to:

- DMB Packing Corporation, for 3,000 pounds of isobutyric acid on grapes to increase yield.
- Forest Service, for 0.5 pound of polyhedral inclusion bodies of *N. sertifer* nucleopolyhedrosis virus to evaluate control of European pine sawflies.
- Dow Chemical Company, for 150 pounds of chlorpyrifos on cotton to evaluate control of bollworms and bollweevils.
- Chevron Chemical Company, for 75.2 pounds of acephate on rangeland to evaluate control of grasshoppers.
- U.S. Soil, Inc., for a mixture of 1,500 pounds of methyl alphaeleostearate [methyl ester of (E,C,E,)-9,11,13-octadecatrienoic acid] and xylene on cotton to evaluate control of bollweevils.

Registration

The agency announced the receipt of an application from American Cyanamid Company to register AMDRO-20 Insecticide containing tetrahydro-5, 5-dimethyl-2(1H)-pyrimidinone (3- [4-(trifluoromethyl) phenyl] -1-2- [4-(trifluoromethyl)phenyl] ethenyl-2-propenylidine) hydrazone 0.88%. The application proposed to classify the product for use in fire ant control.

American Cyanamid also submitted an application to register AMDRO Fire Ant Insecticide containing the active ingredient tetrahydro-5,5-dimethyl-2(1H)-pyrimidinone 3-[4-(trifluoromethyl) phenyl]-1-2-[4- (trifluoromethyl)-phenyl] ethenyl)-2-propenylidene) hydrazone 0.88%.

Crisis Exemptions

EPA announced that notices of crisis exemptions for the use of pesticides in emergencies were received from:

- California, for the use of diazinon on citrus pulp to control vinegar flies.
- Delaware, for the use of azinphosmethyl to control carrot weevils on carrots.
- New Jersey, for the use of azinphosmethyl to control carrot weevils on parsley.

Specific Exemptions

Specific exemptions were granted by the agency to the following applicants:

- Arkansas, for the use of thiobencarb alone and a tank mixture of Machete and propanil to control weeds in rice fields.
- Florida, for the use of ethylene dibromide to control soybean cyst, southern root-knot, peanut root-knot, reniform, and sting nematodes on soybeans.
- Idaho, for the use of acephate to control black vine and strawberry root weevils on hops.
- Maryland, for the use of fenvalerate to control the Colorado potato beetle on potatoes.

Health Hazards

BENZENE, ASBESTOS, PCB EXPOSURE PROBLEMS REVIEWED AT HEALTH ASSOCIATION MEETING

MILWAUKEE — (By a BNA special correspondent) — The Supreme Court should not be blamed for refusing to lower the benzene standard, because occupational medicine "simply foisted its own statistical uncertainties on the courts," Dr. Irving Selikoff told environmental health professionals July 28.

"The court was grappling with the same insecurities we are," the physician from New York's Mt. Sinai Hospital said. "If we were dealing with absolute certainty, the case would never have gotten to the Supreme Court."

At the same time, Selikoff declared the numerical standards required by the Supreme Court "cannot be acquired" at the present time, and will never be acquired unless industry provides worker exposure data to occupational health researchers. "We simply will never determine carcinogenicity without data which only industry has," he said.

Addressing the National Environmental Health Association's educational conference, Selikoff said he does not believe there is such a thing as a total or absolute

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threshold level for exposure to cancer-causing agents, but there are certainly practical thresholds.

How much residual risk we accept for others depends on ethics and morality," he said. When asked about cost-benefit analysis being applied to occupational exposure levels, he said the "costs should accrue to the same person who will enjoy the benefits," and "a worker should not have to put his life on the line."

Asbestos Exposure

In reviewing his research on asbestos exposure, Selikoff noted that there never will be developed any valid dose-response relationships for low level exposure and family-contact disease, because "nobody does dust counts on shaking out father's clothes after work, or even on such groups as ship repair workers. The data is not there," he said.

Selikoff reported the results of a soon-to-be-published study of 282 ship repair workers done by Mt. Sinai Hospital, which showed that thirty years after presumably low-level exposure to asbestos, approximately 85 percent have abnormal chest x-rays. He noted that if mesothelioma were not such a rare disease in the general population, its connection with asbestos would probably never have been noticed.

There is also a great dearth of data on possible reversal of risk for occupationally exposed workers, he said. It is possible that, by removing workers from benzene exposure when certain benign blood changes occur, their risk of leukemia is lessened in the same way that quitting smoking eventually reverses lung cancer risk, he said, but added this is an almost unexplored field.

Benzene Decision

Dr. Bailus Walker, Jr., director of health standards programs for the Occupational Safety and Health Administration, told the conference, "It would be a mistake to conclude that the Supreme Court's decision in the benzene case put OSHA on 'hold' or in fact completely destroyed the OSHA standard-setting process and related efforts to protect the American workforce."

He said, however, the decision may result in a slowdown in the promulgation of standards, since a considerable portion of the agency's resources will have to be diverted to meet the Court's expectations.

Walker noted that the decision is simply another impediment in the already "difficult, slow, and contentious" process of standard-setting. In addition, he said "the court did not reject the secretary's conclusion that there is no known safe level of exposure to a carcinogen, that benzene causes leukemia, or that benefits may be derived from reducing exposure to benzene." "The Court did indicate that those conclusions standing alone may not be adequate to support regulation," he said.

Walker called for additional public health professionals to aid in the enormous data-gathering required, and for full acceptance of environmental health personnel in the community health profession. Full acceptance is essential, he said, because "80 to 90 percent of the illnesses recognized and dealt with by private and public health services are environmentally or occupationally related."

Risk Assessment

Connecticut Department of Health official Anthony Sardinas told the group on July 29 that environmental health professionals should get out of the business of giving the public advice and get back into the business of gathering and evaluating data.

"All the courts are interested in, and all we should be interested in, is what happens to people as a result of the sea of carcinogens we live in," Sardinas declared.

In spite of millions of dollars spent on eliminating PCBs from food and other contaminating sources and considerable public confusion, Sardinas said there is no conclusive data showing that PCBs are indeed carcinogenic. Similarly, he said, a study his department has just completed of its handling of complaints about the installation of urea-formaldehyde foam insulation has shown that the state program has been completely ineffective in diminishing either the rate at which problems occur, or their severity. His findings also indicate that health effects from the installation linger for an average of 2.3 years after, he said, and hypersensitivity to formaldehyde may last for much longer.

Society would be able to evaluate risk and prioritize its goals more efficiently if epidemiology concentrated on its basic function — that of data management, according to Sardinas. Epidemiology should be capable of integrating complex data from all fields into a risk assessment schedule, he said. Since the resources allotted to public and occupational health are severely limited, priorities must be assigned on the basis of data available.

Data on the long-term effects of chemicals need not be expensive to gather, he maintained. Connecticut is currently undertaking a study of blood by-products, particularly triglyceride by-products from samples drawn from local fisherman who habitually eat fish from the state's rivers, and therefore ingest low levels of PCBs. Sardinas said he expects the results to be released early next year. "It should help us determine what the risks are of eating five to 10 fish a week which are contaminated with PCBs," he said.

Such studies are neither expensive, nor hard to perform, he insisted, and they offer an excellent opportunity for local and county health departments to become involved in the research effort. The role of local municipalities in environmental health efforts is often unclear, Sardinas said, when in fact they are often the ideal source for the long-term data that is needed.

FDA's Role

The issues raised by last year's PCB contamination of animal and poultry feed in a Billings Mont., mill have not been resolved, although the Food and Drug Administration and other agencies have made some procedural changes, according to Dr. Sanford Miller, director of FDA's Bureau of Foods. Although the contamination was discovered during a routine safety inspection, the fact that the annual inspection occurred during the contamination episode was "just plain luck," Miller said. The issues have not been resolved because of the limited resources and uncertain effects involved, he added.

The clean-up effort has stimulated a more efficient interagency communication system, greater cooperation between the FDA, Environmental Protection Agency, and USDA's Food Safety and Quality Service, and a greater awareness of the hazards of PCBs in general, he said. The agencies involved are seeking to remove electrical equipment containing PCBs from food handling, servicing and packing areas, to prevent further accidents, he said, but political and economic pressures have made this a difficult and slow process.

Chiefly, the episode has resulted in a reexamination of FDA's responsibility in matters "affecting the public health," Miller said. "We recognize that we are no longer concerned solely with the quantity of life affected, but also with its quality," he said.