20 November 1975

Session VI:

GENERAL SESSION

Christopher M. Timm*
Session Chairman

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DR. JOHN BUCKLEY (Environmental Protection Agency, Washington, D.C.): I'd like to call to order the evening session which is our General Session. There are some papers to be presented tonight that are technical papers appropriate to other parts of the session but which just didn't fit in. In the rest of the sessions we've tried to avoid people expressing their opinions. So with that, I'd like to turn it over to our Chairman for the evening, Chris Timm, who is the Director of the Surveillance and Analysis Division for EPA here in Chicago.

MR. CHRISTOPHER TIMM (Environmental Protection Agency, Chicago, Illinois): Thank you, John. I have at the present time 26 registered speakers. There won't be any discussion during this session.

I'd like to start off by introducing the groups that have been most directly impacted by PCB's in the environment, at least as far as their livelihoods. They are the real reason we have conferences like this. We have a group of commercial fishermen, commercial as far as both the market and as far as recreational aspects in the charter fishing, who are here from Lake Michigan and some of the surrounding areas. I will lead off with them. I'll mix it up after that with technical presentations, industrial viewpoints, environmental groups, etc.

MS. JEAN HERMES (Spokesperson for Commercial Fishing Interests, Green Bay, Wisconsin): I would like you to know that hardships are already being inflicted on families because of the PCB poisoning of our waters. We are fourth-generation commercial fishermen out of Green Bay. We have four children and have had our livelihood taken away because of high levels of PCB's in the Green Bay waters.

On the last part of July of this year, the FDA shut down our business when fish tested from our nets measured 54 ppm of PCB's. Overnight we've lost a business it's taken 15 years to build.

As PCB's are almost indestructible, any further discharge, no matter how small, would only add to an already insurmountable problem. The mills dumping PCB's into the waters have gotten rich at everyone's expense but their own. It is time they make a few sacrifices. Industries have been allowed to pollute and poison the waters long enough. Every commercial fisherman in Wisconsin will soon face our situation.

The commercial fisherman provides the public with a food that is 75 percent protein. In these days of food shortages, it is a crime to let this commodity be destroyed. But the commercial fisherman will not suffer alone. Sportfishing, all water recreation, and tourist towns are threatened. Even our drinking water will become, if it is not already, hazardous. Someone must be held responsible for stopping PCB discharge into our waters before they are destroyed beyond repair. Thank you.

MS. GLORIANNE HERMES (Spokesperson for Commercial Fishing Interests, Green Bay, Wisconsin): We are from another family with seven children that fishes carp commercially from the waters of Green Bay. We have also lost our livelihood because of the high levels of PCB in carp taken from Green Bay waters. Our fish measured up to 57 ppm when tested by the Agriculture Department and we were forced to release the 15,000 pounds of carp that were in our holding ponds at that time.

The PCB problem so far has been handled backwards. My husband and his brothers were stopped from fishing carp on Green Bay, while nothing has been done to stop the sources of PCB's. The fisherman who had no part in the PCB pollution has been inflicted with great hardships after many years of building his business.

The innocent have been made to pay the price for the destruction caused by a few industries that are getting richer everyday and do not want to reinvest a small part of their profits into the treatment of their waste.

We believed that the EPA and DNR were keeping the waters clean and safe, which is supposed to be their job. How has our water been allowed to become so chemically polluted as to make its fish inedible even for animal consumption or even for use as a fertilizer? Some people have not been doing their job. For if the industries' discharges were safe, so would the water and fish be safe.

The DNR still plans to plant trout and salmon into the waters although the levels of PCB in these fish tested out even higher than some of our carp. Also, they claim that no money is available to compensate commercial fishermen for their losses due to the PCB problem when they still plan on planting trout and salmon into the polluted water.

It isn't going to help to lower the limit of PCB's

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from 5 ppm to 2 ppm, as nothing has been done to stop the dumping of PCB's even at the 5-ppm level. To lower the limit of PCB's in fish from 5 ppm to 2 ppm would destroy the fishing industry all over the United States. The levels of PCB in all other edible products, such as meat, would also have to be lowered and sport fishing would have to be stopped altogether. The fishermen would have to be compensated for their losses, which resulted from other parties' ruthlessness and carelessness.

Please attack this problem where it started by stopping all PCB discharges into the water immediately. Thank you.

MR. GENE LAMBRICH (Spokesperson for Commercial Fishing Interests, Green Bay, Wisconsin, and representative of Lambrich Brothers Live Fish Company): We haul fish from the Hermes Brothers and I think something that a lot of people don't realize is that carp is a good fish. It's just not a scavenger, it's something that's a necessity. We have two fishing resorts in St. Louis, Missouri. It has cost us roughly over 100 thousand dollars since July of this year and I think that our load was a sample load that the Federal Food and Drug Administration took the samples off of and said they were polluted.

Now if these fish were polluted at the time we inquired, in February 1975, they did state that there were PCB's in the water; why weren't they periodically checked and sampled, and if there was pollution at that time, why wasn't it stopped? We're just one of a few fish haulers. This goes all over the United States. For the life of me I can't figure out why they cannot do something with the people putting these pollutions in the waters. Thank you.

LEE WEDDIG (National Fisheries Institute, Washington, D.C.): We're a trade association consisting of 550 companies engaged in the commercial fish and seafood business.

This is somewhat of an old refrain here. In the last several years we've talked about things like DDT in our waters, which had its toll. After that it was mercury, and today it's PCB. In each of these situations, there was a cost to our business, which is a 6 billion dollar industry in the United States. It represents the livelihood of 140 thousand people throughout the entire country. In each of these situations, our industry faces three losses. The first is the direct loss of income, such as has been related to you by the people who were up here a few minutes ago, as their products become unsaleable. Then we have the loss that is harder to define yet was alluded to today, and that's the destruction of habitat for our resource. Many of our resources are failing. We're running out of fish, there's been speculation that perhaps we're overfishing. But as we learn what these chemicals do to the ability of fish to reproduce, we would have to believe that the real cause of some of the failures in our resources is because of the pollution that has been caused by the unchecked dumping of chemicals into the water.

And then finally we have a loss of consumer confidence. People don't understand that in a case of PCB's, there are certain fish that are taken from the market because they do exceed the Food and Drug Administration tolerances. The consumer doesn't really understand that this affects only a very small portion of the total and the reaction is—Well, let's not use any fish—which is certainly an unjustifiable attitude, but nonetheless, it does exist.

It's also very easy for one to say the percentage of loss is small. We are a 6 billion dollar industry; we supply something like 10 billion pounds of fish a year to the consumer. One can listen to the folks from Green Bay and say, "Wall, perhaps you could lose several hundred thousand pounds of fish a year and it doesn't really amount to much in the way of percentage." But yet for these folks, it's 100 percent.

Those are the losses that our industry has. What we're recommending to this group to do, is to muster its strength, to come up with six different points. We have to solve the problem. We cannot just live with the DDT's, the mercury, the PCB's, or whatever it will be next year. We have to come to a solution. So we're recommending six things.

First for the immediate. The Government should immediately ban further sale, production, importation, or recycling of PCB's in any form, with perhaps an exception for use in existing electrical transformers where usage should be strictly controlled. But after hearing this afternoon's statement about possible substitutes that have been used in other countries, I'm not too sure I even agree to my exception any more.

Efforts should be made to achieve an international agreement to the same goals. If legislation is necessary to achieve such a ban, then we should all get together to get it passed.

Number two, we must establish a national system to provide for safe disposal of PCB's already used in electrical equipment. We were shocked to hear of the hundreds of millions of capacitors that are in use and we can just envision that over the

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next 30 to 50 years these elements are going to be disposed of without any control whatsoever, and eventually they are going to leak into our environment.

Number three, the Toxic Substances Control Act must be passed. We must avoid future problems of this type with other chemicals. I admit our industry has not worked hard enough to get this bill passed. We did support it as it went through the various stages of the Congress, but we did not really get behind it and scream loud enough. I can assure you we will do this from this point on.

Number four, we believe the present Food and Drug tolerance of 5 ppm in fish should be retained pending further research on the toxic effects on humans of PCB's. We believe that any reduction in tolerance should be selective, based on the role and the specific effect of the food in the diet.

Five, compensation, in all justice, must be made to commercial fishermen whose livelihood is destroyed by prohibition of sale of the species of fish in which the presence of PCB exceeds the Food and Drug tolerance. One element of our society must not pay for the mistake of the entire society.

And sixth, Congress should investigate the Environmental Protection Agency to determine why effluent standards for PCB's have not yet been established despite the clear mandate of the Water Quality Act to do so. If EPA doesn't have the funding, we have to get it. If the deadlines were unreasonable as set by Congress in 1972, then Congress should know they were unreasonable. Nonetheless, our industry would have expected results from this act at this time. Thank you.

PCB BODY BURDENS DENY FULL USE OF THE GREAT LAKES FISHERY RESOURCE

Carlos M. Fetterolf, Jr.*

The 1954 Convention on Great Lakes Fisheries between the United States of America and Canada led to establishment of the international Great Lakes Fishery Commission in 1956. The Commission has two major thrusts, control of the sea lamprey and determination of research and management strategies to provide sustained productivity in the convention area of any stock of fish which is of common concern to the parties. The Commission works cooperatively with the Canadian and U.S. Federal agencies and the provincial and State governments of Ontario and eight Great Lakes States to improve and perpetuate Great Lakes fishery resources.

The statement below is not Commission-approved. It is an expression of my personal opinions as the Commission's executive secretary.

The U.S. Food and Drug Administration guideline of 5 μg/g (ppm) in edible tissue of fish has been exceeded in numerous species in lakes Michigan, Huron, Erie, and Ontario, and in their connecting waters. Several important sport and commercial species are included with those that exceed the guideline. This situation casts a pall over the social and economic aspects of Great Lakes fisheries. It creates a very real problem for commerical fishermen, processors, and retailers; a shadow of doubt in the minds of every consumer and sport fisherman; an added question for the fishery manager; a symbol of defeat for the water pollution control agencies; and a mark for every environmental management critic to flaunt as an example of the failure of the "system." It denies full use of the Great Lakes fishery resource.

I hope none of you have the feeling that if residues in Great Lakes fish diminish to below 5 μg/g that all is well. A few years ago commercial mink ranchers fed their animals Great Lakes fish until they noticed a disturbing phenomenon, reproduction was falling off alarmingly. This led to studies of the effects of PCB's in ranch mink. Ringer et al. (ref. 1) demonstrated that 2 μg/g PCB's in fish flesh prevented survival of newborn animals, and Platonow and Karstad (ref. 2) demonstrated that reproduction was eliminated in mink fed a beef diet containing 0.64 μg/g Aroclor 1254, a PCB compound. If regulatory agencies consider fish as animal feed a use to be protected, application of a modest 0.2 safety factor provides a tissue level of 0.1 μg/g PCB in whole fish. There aren't many adult fish in the Great Lakes system that can meet that objective at this time.

The presence of PCB's in Great Lakes fish continues to deny full use of the fishery resource. The Great Lakes Fishery Commission is not a regulatory agency. We must

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depend on legislative action to pass the laws and enforcement agencies to furnish the muscle which will provide an aquatic environment that will produce usable fishery products. It appears to me that some foot dragging has been going on. How do we get response from a regulatory agency? Dr. Nisbet expressed disappointment that so few people were aware of his $8 publication and concluded that to have impact one must release large amounts of reprints into the environment. I don't think that's the answer.

How about development of data and publication by the regulatory agency itself? You heard Charlie Walker state that PCB's in fish were added in 1970 to the National Pesticide Residue Monitoring Program participated in by EPA. Data showing PCB body burdens as high as 213 μg/g in the Hudson River and 133 μg/g in the Ohio River were available 5 years ago. FDA guidelines of 5 μg/g were the same then as they are now.

How about the regulatory agency funding a study to recommend allowable levels of contaminants? EPA funded such a study by the National Academy of Sciences/Engineering in 1971 and the first draft was delivered on schedule to EPA's Washington office in December 1971. The recommendation for PCB's in that draft of Water Quality Criteria 1972 (ref. 3) read similarly to that in the published document:

> "Aquatic life should be protected where the maximum concentration of total PCB in unfiltered water does not exceed 0.002 μg/l at any time or place, and the residues in the general body tissues of any aquatic organism do not exceed 0.5 μg/g."

The National Academy report concluded that water quality levels alone were insufficient to predict what body burdens could result and therefore combined a body burden recommendation. If the body burden exceeded the recommendation, then obviously the water concentration was too high and should be further restricted.

In the four years since EPA received that recommendation from the National Academy of Sciences, sufficient date have been developed so that the recommendation of the Water Quality Objectives Subcommittee to the International Joint Commission made in June 1975 (ref. 4) could read:

> The concentration of total polychlorinated biphenyls in fish tissues (whole fish, calculated on a wet weight basis), should not exceed 0.1 micrograms per gram for the protection of fish consuming birds and animals.
>
> NOTE: The Subcommittee expresses concern that a water concentration objective for this ubiquitous contaminant is unavailable. Based upon poorly defined bioconcentration factors it may be concluded that PCB's in water should not exceed 0.001 micrograms per litre (1 ppt). However, this level may not be adequate to provide protection to certain predators, and could presently not be enforced because of insufficiently sensitive quantification limits.

This was a reduction to 0.1 μg/g body burden in whole fish from the NAS recommendation of 0.5 μg/g and a reduction in water level concentration from the 0.002 μg/l of the Blue Book to stating that 0.001 μg/l may be inadequate.

I am pleased that EPA is currently releasing for review their proposed Quality Criteria for Water. Remember yesterday Tom Kopp showed us the recommendation for PCB's, "0.001 μg/l for freshwater and marine aquatic life and for consumers thereof." Wastes go into systems, different systems have different capacities of response to PCB's. Is a blanket nationwide water level fair to industry, the environment, and the people? Will this water concentration alone do the job?

Apparently there is no accompanying body burden recommendation. This is disturbing to me. I didn't know EPA was so confident that bioaccumulation from 0.001 μg/l won't be a problem. Remember I told you that 0.64 μg/g Aroclor 1254 in the diet of ranch mink eliminated reproduction? A modest safety factor of 0.2 provided a recommended residue in fish of 0.1 μg/g used to feed mink. You heard several speakers mention bioconcentration factors greater than 100,000, some as high as 270,000. Two hundred thousand multiplied by a water concentration of 0.001 μg/l yields a body burden of 0.2 μg/g, double the recommended residue if you're in the business of selling fish to mink ranchers.

I don't believe the concentration of PCB in the waters of Lake Superior is known accurately enough that it appears in the refereed literature. It is generally believed to be 0.001 μg/l, the concentration recommended in EPA's proposed Quality Criteria for Water. An analytical chemist of EPA's National Water Quality Laboratory at Duluth on the shores of Lake Superior estimates the PCB concentration in Lake Superior water at 0.0004 μg/l, 0.4 parts per trillion. The total PCB body burden of whole Lake Superior adult ciscoes is 5 μg/g and greater. Depending on which water concentration one chooses, we have a bioconcentration factor of at least 500,000 times. I don't believe the proposed EPA water concentration is going to do the job necessary so that Great Lakes fishery resources can be fully used. Canada shares the Great Lakes with us. The November 17, 1975, announcement by its Department of Health and Welfare, lowering its PCB regulatory level to 2 μg/g

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in edible tissue is going to further restrict the full use of Great Lakes fishery resources.

You heard Dr. Munson say this morning that 99 percent of the PCB content in upper Chesapeake Bay water is associated with suspended sediment. Obviously it's going to affect analytical results if you measure water concentrations unfiltered, settled, or filtered. I was surprised EPA's proposed recommendation for PCB did not include a mention of whether suspended materials should be included in the analysis. By the way, are PCB's adsorbed to suspended materials biologically important? If not, perhaps the water should be filtered before analysis. Do regulatory agencies know the answers to questions so critical to our environment and economic welfare?

There are several avenues of problem solution open to EPA. There are tough choices, and fortunately it is not my responsibility to make a recommendation. All I ask is that something be done, and that what is done will permit full use of the Great Lakes fishery resource.

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3. *Water Quality Criteria 1972*, National Academy of Sciences, National Academy of Engineering, U.S. Environmental Protection Agency Ecological Research Series, EPA-R3-73-C33, Superintendent of Documents, Washington, D.C., pp. 595.
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DR. WILBUR P. MCNULTY (Oregon Regional Primate Research Center, Beaverton, Oregon): I will summarize briefly a series of experiments on the toxicity of polychlorinated biphenyls (PCB's) in rhesus monkeys. Three preliminary conclusions can be drawn from the results.

First, PCB's produce a unique and reproducible constellation of pathologic changes in monkeys over a wide range of doses. These changes are different from those reported for other laboratory animals. Furthermore, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) causes exactly the same constellation.

Second, rhesus monkeys are lethally poisoned by very low levels of intake of PCB's in the diet, roughly 100 times less than the levels which cause serious illness in rats.

Third, some individual PCB components are quite toxic for monkeys and some are not. Contaminating chlorodibenzodioxins or -furans probably cannot account for the toxicity of commercial Aroclor 1242 in monkeys.

Figure 1 shows extensive downgrowth of mucous glands into the submucosa of the stomach of a monkey which died after 8 months consumption of regular monkey chow to which Aroclor 1242 was added at 3 ppm. The development of this gastric lesion was studied by monthly biopsies in monkeys fed Aroclor 1242 at 3 to 10 ppm, and the results will be discussed by my colleague Dr. Bell.

An early clinical sign of PCB poisoning in rhesus monkeys is thickening and reddening of the eyelids. The Meibomian (sebaceous) glands were completely converted to squamous cysts (figure 2). Sebaceous glands associated with hair follicles in the face and and scalp similarly underwent squamous metaplasia, with atrophy of the gland or, occasionally, cyst formation (figure 3).

The thymus became markedly atrophic (figure 4); the thymocytic cortex disappeared entirely, and the corpuscles formed small cysts.

Exactly the same pattern of changes was found in monkeys accidentally poisoned with what subsequent chromatographic analysis of the tissues showed was probably Aroclor 1260, presumably used in construction materials in the pens. And finally, the same pattern followed experimental poisoning with TCDD—in only 12 days at an intake of 20 ppb in the diet.

The spectrum was the same at exposure of from 3 to 800 ppm of Aroclor 1242, though of course

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Figure 1a. Normal gastric mucosa of young male rhesus monkey. H&E, 30x.



Figure 1b. Gastric mucosa of young male rhesus monkey fed diet containing 3 ppm Aroclor 1242 for 8 months. Extensive mucous epithelial invasion of submucosa. H&E, 30x.



Figure 2a. Normal eyelid of young male rhesus monkey. Transverse section, conjunctival surface below. H&E, 30x.



Figure 2b. Eyelid of young male rhesus monkey fed diet containing 3 ppm Aroclor 1242 for 8 months. Squamous metaplasia and cystic dilation of Meibomian glands. H&E, 30x.

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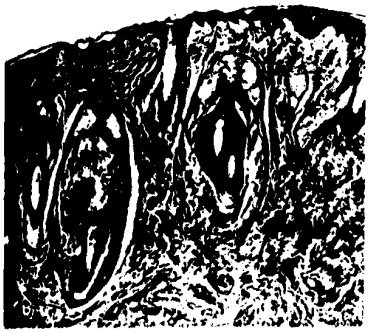

Figure 3a. Normal vibrissae or sinus hairs in lip of young male rhesus monkey. A garland of sebaceous glands encircles the hair follicle at the upper end of the blood sinus. H&E, 30x.

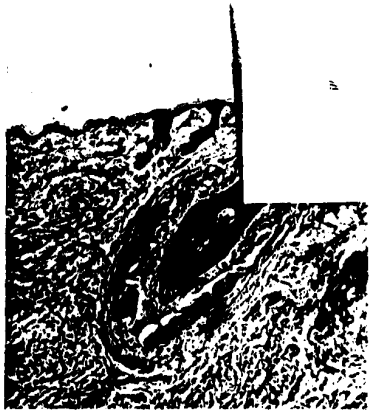

Figure 3b. Sinus hair of lip of young male rhesus monkey fed diet containing 3 ppm Aroclor 1242 for 8 months. Garland of sebaceous glands is absent. H&E, 30x.

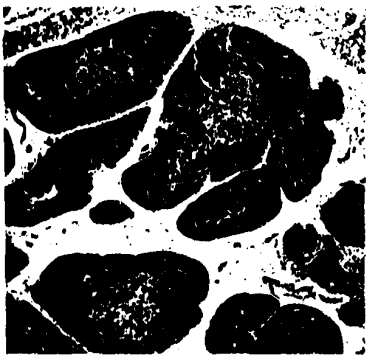

Figure 4a. Normal thymus of young male rhesus monkey. H&E, 30x.



Figure 4b. Thymus of young male rhesus monkey fed diet containing 3 ppm Aroclor 1242 for 8 months. Severe atrophy and cyst formation in corpuscles. H&E, 30x.

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illness and death came sooner at higher doses. A dietary level of 3 ppm corresponds to an intake of 150 μg/kg/day, or about 40 times the level that Dr. Nisbet calculated might be the intake of a fisherman or a nursing baby today.

At least with respect to the affects on sebaceous glands, the disease in monkeys resembles that reported in the victims of Yusho, an accidental poisoning of Japanese people.

I have tested three pure PCB compounds at 10 ppm; this is a reference level which, in the case of Aroclor 1242, causes barely discernible histologic changes in 30 days, slight clinical illness in 45 days, and outspoken disease in 60 days.

At this level, 2,4,4'-trichlorobiphenyl and 2,4,5,2',5'-pentachlorobiphenyl, both major components of Aroclor 1242, caused no clinical or histological changes in rhesus monkeys experimentally fed for 80 days. On the other hand, 3,4,3',4'-tetrachlorobiphenyl, which is not significantly present in Aroclor 1242 killed a monkey and caused the usual pathologic changes in 34 days. This finding invites the speculation that the metabolites of some PCB's may be the actual toxins. For example, 2,3,7,8 tetrachlorodibenzofuran (TCDF), which is known to be quite toxic for laboratory rodents but has yet to be tested in monkeys, could conceivably be formed from the 3,4,3',4'-tetrachloro-biphenyl by hydroxylation and condensation. But this lot of tetrachlorobiphenyl has yet to be analyzed for possible preexisting contaminants.

However, it is not likely that contaminating dioxins or furans can account for the toxicity of commercial PCB's. Pilot experiments have indicated that TCDD is about 10,000 times as toxic as Aroclor 1242 on a per gram basis. TCDF can be expected to be somewhat less active. Since our analysis of Aroclor 1242 has shown contamination to be not more than 1 ppm, there is not enough dioxin or furan present to account for the effects of the Aroclor.

ULTRASTRUCTURAL FEATURES OF GASTRIC MUCOSA AND SEBACEOUS GLANDS AFTER INGESTION OF AROCLOR 1242 BY RHESUS MONKEYS

Mary Bell, Ph.D.

The effects of PCB's on the stomach, skin, and liver of rhesus monkeys have previously been described by Allen and his associates (refs. 1-5) and some of these affects by McNulty (ref. 6). Of these organs, the liver has been the only one on which any electron microscopic observations have been made. In the liver, PCB administration results in a proliferation of the smooth endoplasmic reticulum and, in some cases, the accumulation of fat droplets within the hepatocyte. Because the cytological features of these organs are extremely diverse, it is important to document the effects of PCB's of all of them.

McNulty (ref. 6) has described a series of rhesus monkeys that were fed either 3, 10, 30, or 100 parts per million (ppm) Aroclor 1242 until they became moribund. The stomach and lip of each animal were serially biopsied at monthly intervals beginning 2 weeks after first ingestion of these compounds. The tissues were processed according to routine procedures for light and electron microscopic observation. This report describes the effects of ingestion of Aroclor 1242 on the cellular components of the stomach and of the sebaceous glands associated with the large tactile, facial hairs, vibrissae, of these animals.

Figures 1 and 2 demonstrate the changes seen with the light microscope in the gastric epithelium of an animal fed 100 ppm Aroclor 1242. After 2 weeks ingestion, the stomach was still essentially normal (figure 1). The mucus-secreting surface and the gastric glands that contain parietal cells (hydrochloric acid secretors) and zymogenic cells (enzyme secretors) showed no pathologic changes. After ingestion of 100 ppm PCB's for 2 months, however, the mucus-secreting surface had become hyperplastic (figure 2); the parietal and zymogenic cells of the gastric glands had totally disappeared and had been replaced by mucus-secreting cells. These effects, though demonstrable at varying times after onset of PCB administration, were identical in all animals at any of the dose levels used. Figures 3 and 4 show the

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Figure 1. A light micrograph of the gastric mucosa of a rhesus monkey fed 100 ppm Aroclor 1242 for 2 weeks. The mucus-secreting surface mucosa and the gastric glands containing parietal and zymogenic cells are of essentially normal appearance (x140).



Figure 2. An oblique section of gastric mucosa from a rhesus monkey fed 100 ppm Aroclor 1242 for 2 ½ months. Most of the gastric glands have been replaced by mucus-secreting cells (x140).

effects after 5-½ months on the stomach of an animal fed 3 ppm Aroclor 1242. At this time, most of the gastric glands had been replaced by mucus-secreting epithelium.

At the electron microscope level, the first PCB-related changes were seen in the parietal cells of the gastric glands, and some of these changes were observed at the higher dosage levels shortly after the onset of PCB ingestion. These cells normally have a distinctive cytology, which includes intracellular canaliculi through which the hydrochloric acid is secreted, many small cytoplasmic vesicles, and large numbers of mitochondria. After PCB ingestion, the intracellular canaliculi became somewhat distended, the cytoplasmic vesicles became less discrete and tended to break down, and small dense bodies, presumably containing hydrolytic enzymes, accumulated (figure 5).

In the bases of the gastric glands, mucus-secreting cells were interspersed among zymogenic cells after ingestion of PCB's. Zymogenic cells normally contain extensive concentrations of granular endoplasmic reticulum located basally in the cells; this reticulum is responsible for the production of enzymes. After PCB ingestion, however, mucus-secreting cells with typically little endoplasmic reticulum began to appear adjacent to the zymogen-secreting cells (figure 6). In some cells still recognizable as zymogenic, the endoplasmic reticulum was dilated and the cells contained large autophagic vacuoles (figure 7). The latter usually occur in cells that are undergoing degradation.

Figures 8 and 9 show the changes seen at the light microscope level in the sebaceous glands associated with the tactile hairs of the face after PCB ingestion. Normally, lipid production by the sebaceous glands begins close to the peripheral portions of the glandular alveoli and continues to the more central portions where the

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Figure 3. Gastric mucosa of a rhesus monkey fed 3 ppm Aroclor 1242 for 5 ½ months. Most of the gastric glands have been replaced by mucus-secreting cells. The effects are similar to those shown in figure 2 (x140).



Figure 4. A higher magnification of a portion of figure 3. The gastric glands are almost completely composed of mucus-secreting cells. Only one gland (at the left center of the field) contains zymogenic cells (x560).

lipid is secreted onto the hairs. After ingestion of Aroclor 1242, lipid synthesis and accumulation became increasingly limited to the central zones of the alveoli; ultimately, only small buds of cells no longer secreting lipid droplets were found adjacent to the hair follicles in the sites normally occupied by sebaceous glands. These effects were identical in all animals fed PCB's, but they occurred most rapidly at 100 ppm, least rapidly at 3 ppm Aroclor 1242.

As observed at the electron microscope level, sebaceous cells normally contain large Golgi zones that are the site of synthesis of the lipid droplets and many profiles of agranular endoplasmic reticulum, which are considered to participate actively in the production of lipid (figure 10). After PCB ingestion, these membranes acquired a softened appearance during stages when they were still prominent. Many small electron-opaque bodies, probably indicative of the presence of hydrolytic enzymes, also occurred in these cells after PCB ingestion. When no lipid droplets were detectable after PCB ingestion (∿ 2-½ months at 100 ppm, ∿ 4-½ months at 3 ppm), filaments usually associated with epidermal-type cells (from which sebaceous glands are embryologically derived) often increased in abundance in the sebaceous cells, they continued to contain a few profiles of granular endoplasmic reticulum, but smooth membranes could no longer be detected (figure 11). Ultimately, the sebaceous cells no longer even resembled the epidermal cell type, and they no longer appeared capable of producing lipid.

These studies do not enable us to determine whether cells can change their direction of differentiation under the influence of PCB's or whether they merely differentiate in the only direction available to them when PCB's are present. They do tell us, however, that cells, depending on their location and function in the body, respond in very different ways to PCB's.

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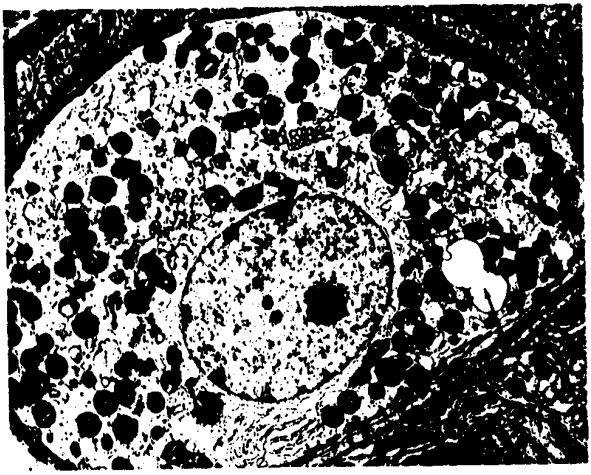

Figure 5. An electron micrograph of a parietal cell from the stomach of a rhesus monkey fed 30 ppm Aroclor 1242 for 2 weeks. Many small perinuclear cytoplasmic vesicles (v) are disrupted and a portion of an intracellular canaliculus is distended (arrow) (x6300).

MONS 065005

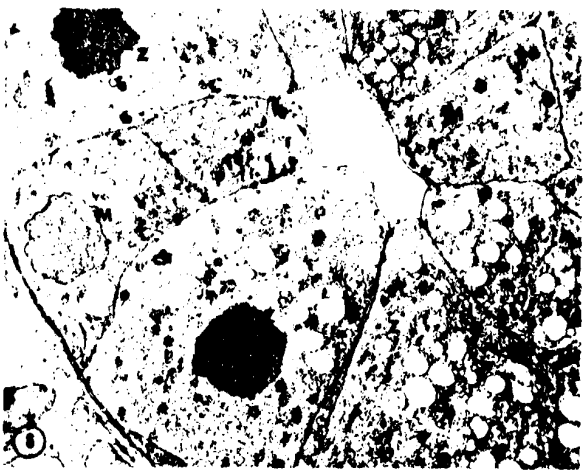

Figure 6. An electron micrograph of a portion of a gastric gland from a rhesus monkey fed 10 ppm Aroclor 1242 for 4 ½ months. Mucus-secreting cells (M) have become interspersed with zymogenic cells (Z) in this location (x3400).

MONS 065006

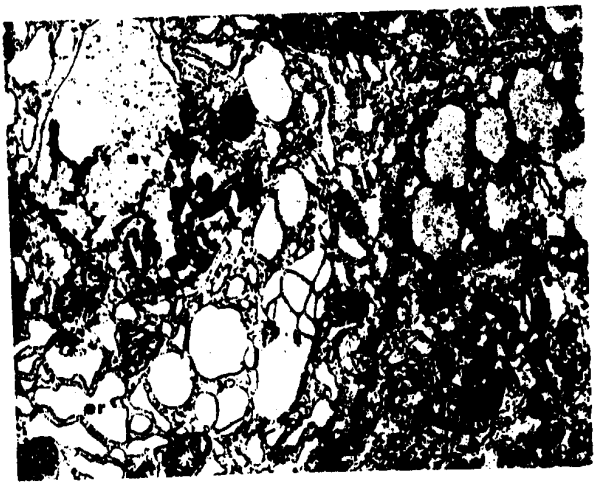

Figure 7. Portions of two zymogenic cells containing large autophagic vacuoles (av) and dilated granular endoplasmic reticulum (er). The animal from which the tissue was biopsied had been fed 3 ppm Aroclor 1242 for 5 ½ months (x13,150).

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Figure 8. An oblique section through a tactile hair with associated sebaceous glands. Though the glands are small, cell differentiation, evidenced by sebum droplets, is still occurring close to the periphery of the alveoli (arrows). This tissue was taken from an animal fed 3 ppm Aroclor 1242 for 3 ½ months (x140).



Figure 9. A light micrograph of a comparable site as that shown in figure 7 but after 3 ppm Aroclor 1242 for 4 ½ months. No sebum droplets or differentiating cells are visible in the sites (arrows) normally occupied by the sebaceous glands (x140).

MONS 065008

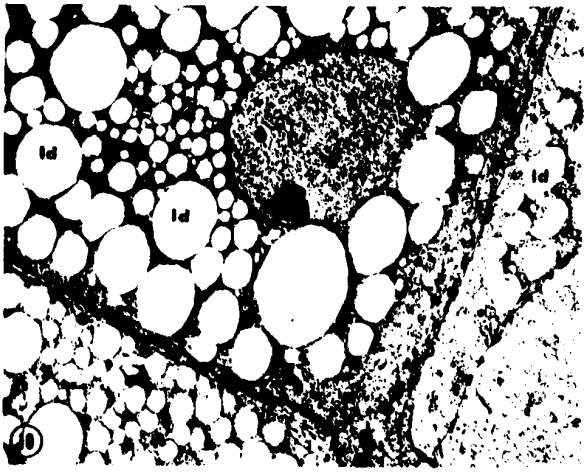

Figure 10. An electron micrograph of cells with essentially normal features in a sebaceous gland associated with a large tactile hair. The animal from which the tissue was biopsied had been fed 30 ppm Aroclor 1242 for 2 months. Although these cells are close to the periphery of an alveolus, they are producing abundant lipid droplets (ld) (x5600).

MONS 065009

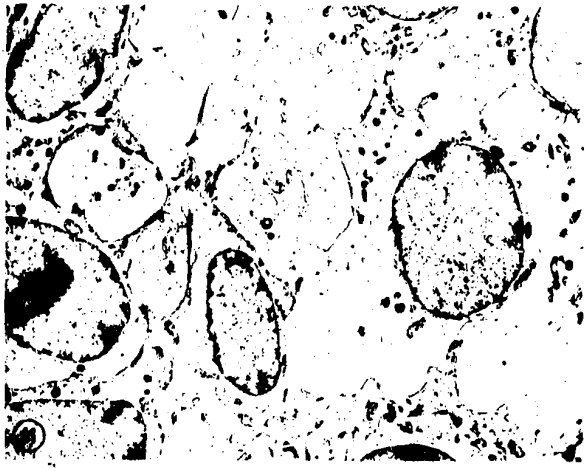

Figure 11. An electron micrograph of cells from a site similar to that shown in figure 10, but from an animal fed 3 ppm Aroclor 1242 for 4 ½ months. The cells contain no lipid droplets, and their cytoplasm appears largely amorphous (x7200).

ACKNOWLEDGMENT

All of the specimens and much of the data for this study were collected at the Oregon Regional Primate Research Center. Work was supported in part by Grants AM08445 and RR00163 of the National Institutes of Health and ES-00159-10 of the National Institute of Environmental Health Sciences.

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MONS 065010

THE VIEW OF THE PAPER INDUSTRY ON THE OCCURRENCE OF PCB'S IN THE ENVIRONMENT AND THE NEED FOR REGULATION

Paul E. Trout*

My name is Paul E. Trout. I am Director of Environmental Control for Container Corporation of America and am presenting the following comments on behalf of my company and the American Paper Institute.

The American Paper Institute is a national organization composed of manufacturers of pulp paper, and paperboard. Members utilize both virgin and recycled fiber in the manufacture of paper products. In 1973, the American paper industry and its wastepaper suppliers recycled nearly 15 million tons of wastepaper (ref. 1) an all time high. In the same year, approximately 41 percent of the fiber used by Container Corporation of America's 13 paperboard mills was derived from wastepaper.

This recycling of wastepaper unwittingly plunged my company and similar recyclers into the morass of the PCB problem in late 1970.

I. THE PAPER INDUSTRY DOES NOT USE OR INTRODUCE PCB'S INTO THE ENVIRONMENT BUT RATHER RECIRCULATES PCB'S ALREADY PRESENT, WHICH ARE UNAVOIDABLY INCLUDED IN ITS MANUFACTURING INPUT

PCB's are not a part of the paper manufacturing process. Consequently the paper industry does not add new PCB's to the environment. PCB's are, however, unavoidably included in certain inputs into the paper manufacturing process. In particular, the water supply used in paper making contains PCB's from other unrelated sources. The paper manufacturing process is not designed to remove PCB's and consequently effluents do contain low levels of this chemical which have entered the mills in the intake waters.

The other PCB input to the paper manufacturing process is the raw material used by recycling mills as a fiber source. Until early 1971, NCR paper (carbonless copy paper) used Aroclor 1242 enclosed in microcapsules coated on the paper. Thus business forms made with carbonless copy paper have been a component of office waste paper, a portion of which is recycled in the papermaking process. Inevitably the PCB's present in the office waste have been introduced into the paper recycling process.

Again, no new PCB's are added to the environment by paper mills but, rather, existing PCB's are simply recirculated. If the paper mills could not recycle the office waste containing PCB-bearing paper, the paper would just as surely enter the environment either through leaching in landfills or volatilization in incinerators which are unable to destroy the PCB's. In either of those events, municipal solid waste systems would have a very substantial new burden added to their normal operating loads and the important national recycling would be significantly injured. Moreover, the PCB present in the old NCR paper still occasionally finding its way into the waste stream is Aroclor 1242, the one not accumulating in the environment. It is this PCB that is found both in the paper products and in the effluent of paper mills.

Since 1971, when the use of PCB in the manufacture of carbonless carbon paper was halted, PCB levels in recycled-fiber paperboard used for food packaging have continued to decline. The industry monitoring program showed that, in the third quarter of 1975, 99.63 percent of such paperboard had a PCB content less than 10 ppm and 91.3 percent had a PCB content less than 2.5 ppm. These results have been achieved through the most careful selection of the wastepaper used in the recycling process with rejection of all types of wastepaper suspected to contain PCB's.

II. THE PCB RECIRCULATED BY THE PAPER INDUSTRY, AROCLOR 1242, IS NOT FOUND TO ACCUMULATE IN ANIMALS, MAN, OR IN THE ENVIRONMENT

The PCB occasionally detected in paper products and in the effluent of paper manufacturing plants is Aroclor 1242. For the years 1960 through 1971, Aroclor 1242 represented from 48.15 to 68.9 percent of the total domestic PCB production, reaching this maximum percentage in 1967 and 1968 and decreasing thereafter. Accordingly, it would necessarily be the PCB most widespread in the environment if all PCB's were all equally degradeable. In fact, however, Aroclor 1242 is neither found in the tissues of man or animal nor in the aquatic environment generally. This indicates that the lower chlorinated PCB's such as Aroclor 1242 are either metabolized, decomposed in aqueous environments, or degraded by photolysis. If accumulation of PCB in aquatic environments, and thereby in the food chain and

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men, is perceived to be a potential threat to human health, it is a threat unrelated to Aroclor 1242. Any PCB regulation based on environmental needs must accomodate this fact.

III. THE CURRENT LEVELS OF DIETARY INTAKE IS MANY ORDERS OF MAGNITUDE LOWER THAN THE ALLOWABLE DAILY INTAKE AS FOUND BY THE FOOD AND DRUG ADMINISTRATION

Evaluation of the need for regulatory controls of the source and distribution of PCB's must begin with the threat PCB's pose to the health of man or other parts of the living environment. In the case of PCB's, the possible threat to human health is through the food supply. Accordingly, that evaluation should start with the levels of dietary intake of PCB's with reference to the levels posing a threat to man.

As a distinguished committee of the National Academy of Sciences, National Research Council stated, "For every chemical there is some finite level sometimes called the 'safe' level, at or below which it can be present in food without prejudicing safety (ref. 2)." Conversely, as three other NAS committees have recently noted, "There is no substance which under certain circumstances, could not be dangerous and unsafe (ref. 3)." The possible need for regulatory controls of PCB's therefore must be assessed in terms not of the conceivable danger posed by some amount of a substance but rather in terms of the available margin of safety between conceivably harmful dosages and actual consumption.

According to the Food and Drug Administration's Director of the Office of Science, Dr. Albert C. Kolbye, Jr., the allowable daily intake of PCB's in the adult human diet is 200 μg/g/day. This conclusion is based upon Dr. Kolbye's analysis of available animal toxicity studies including the recent investigations of Dr. Kimbrough as well as upon analysis of human toxicity data arising from the "Yusho" incident in Japan involving massive intoxication by PCB's.

The Food and Drug Administration's "Total Diet Studies" demonstrate that PCB average dietary intake levels have never been remotely near this 200 μg/adult/day figure. On March 18, 1972, FDA stated in a *Federal Register* notice that its total diet studies indicated an average daily intake of 7/μg/day/adult or 4.7 ppb in the total diet. This is 3.5 percent of the amount Dr. Kolbye concluded was plainly safe. Those data reflected the period of August 1969 through March 1972 when PCB exposure must have been at its peak since the steps taken by Monsanto Company in early 1971 to confine the sale of PCB's to closed systems had not yet had time to be reflected in the data base.

Fifteen months later, on July 6, 1973, FDA announced that the quantitatively measurable residue of PCB's were equivalent to an average dietary intake of 4.2 μg/day/adult. This corresponds to a dietary intake of 2.8 ppb or about 2 percent of the level Dr. Kolbye identified as safe. According to FDA's total diet studies for fiscal year 1973, the dietary intake of PCB's was 1 μg/day/adult or .67 ppb. This is less than ½ percent of the safe amount calculated by Dr. Kolbye. According to these studies for the period of October 1972 to January 1975, the average dietary intake was .178 μg/day/adult or .118 ppb (118 ppt), or below 1/10 of 1 percent of Kolbye's safe level. An examination of the total dietary intake as shown by FDA's total diet studies from January 1, 1974, through June 1975 shows PCB intake has been *zero*: that is, not a single quantifiable residue of PCB has been detected in the total diet study which would allow any quantitative estimate whatsoever.*

In short, dietary intake of PCB has been declining rapidly since approximately the time Monsanto implemented its voluntary controls on the distribution of PCB's to its customers. Even during the maximum exposure period, the average dietary intake was nowhere near what the Food and Drug Administration states to be an allowable daily intake. At the present time, there is an even vaster gulf—many orders of magnitude—between the allowable daily intake and the amount of PCB posing any conceivable hazard to man.

IV. ANY ADDITIONAL CONTROLS MUST ACHIEVE MAXIMUM ENVIRONMENTAL COST-EFFECTIVENESS

The paper recycling industry has been a participant in the PCB drama through circumstance, not by choice, and our industry is not alone in this. We thus appreciate the need for procedures to prevent similar happenings in the future as well as to correct remaining PCB problems.

Our industry approves the principle of restricting the use of hazardous substances. We do not, however, support far-reaching regulation of the nature of Senate Bill S776. Such legislation simply would amount to the "Biological and Analytical Chemist's Relief Act of 1975" and would, in addition, open a new Pandora's box of legal mischief. We believe duplication of existing legislation should be avoided and that deficiencies in existing legislation be corrected by specific amendment in order to maximize environmental benefit at minimum cost to the public.

*It is also significant that for FY 1975 the total diet studies did not detect a single trace of Aroclor 1242, the PCB associated with the recycled paper manufacturing process.

MONS 065012

We particularly urge States now considering new regulations to combat the PCB problem to develop rational rather than simplistic solutions. Destruction of the wastepaper recycling industry will benefit neither the public health nor the public purse.

We commend the Environmental Protection Agency for establishing a task group to investigate PCB imports. We urge that they continue to track down specific uses of these materials in the United States and publish this information so that further unknowing use of PCB's can be avoided.

We urge EPA to publicize abroad the self-regulatory action taken by Monsanto Co. to minimize further PCB contamination of the environment. Hopefully, such enlightened action may spread worldwide.

And, finally, we urge the Environmental Protection Agency to implement a program whereby PCB-containing wastepapers issuing from Federal agencies are disposed of by incineration at a temperature sufficient to destroy PCB. If Aroclor 1242 is an environmental hazard, this procedure would prevent the reservoir of this material now residing in the files of the world's greatest recordkeeper from contaminating the environment.

All of these control actions can be initiated immediately, without need for additional legislation and with immediate positive results.

To conclude, I would like to summarize these points:

I. The paper industry does not use or introduce PCB's into the environment but rather recirculates PCB's already present which are unavoidably included in its manufacturing input.

II. The PCB recirculated by the paper industry, Aroclor 1242, is not found to accumulate in animals, man, or in the environment.

III. The current levels of dietary intake is many orders of magnitude lower than the allowable daily intake as found by the Food and Drug Administration.

IV. Any additional controls must achieve maximum environmental cost-effectiveness.

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MR. BERNARD A. KERNS (Westinghouse Electric Corporation, Pittsburgh, Pennsylvania): I very much appreciate the opportunity to make these comments at this conference. It is the hope of Westinghouse that this conference will bring together all of the scientific and technical information that is available to identify the positive aspects of the current mixtures that are being used by the electrical industry.

The Westinghouse Transformer Divisions and the Westinghouse Distribution Apparatus Division are users of a substantial quantity of polychlorinated biphenyls in the production of transformers and capacitors. At this point I should point out that Westinghouse uses a term inerteen for the mixtures of PCB's it uses as a dielectric, and that the generic term used in the electrical industry is askarel. These terms are really not interchangeable with the term PCB's. While there are 209 isomers of PCB's; the electrical industry uses only several mixtures of PCB isomers as dielectric.

Of these, Westinghouse utilizes primarily only two askarels, Aroclor 1242 for transformers and Aroclor 1016 for capacitors as inerteen. Since the early 1970's, when scientific studies indicated that PCB mixtures presented some hazard in the environment, Westinghouse has expended considerable money and effort to reduce the amount that might escape into the environment.

Measures that have been employed are: The sealing of drains in manufacturing areas where inerteen is used; utilizing specially designed incineration facilities for the destruction of scrap inerteen and special scientific landfills for the disposal of inerteen-contaminated materials: instructing operation personnel and our customers regarding the need for

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care and that special waste disposal is required; and reducing the number of pounds of inerteen per KVA in transformers and capacitors. Most of these measures were implemented prior to the enactment of the Federal Water Pollution Control Act amendments of 1972. It is significant to note that France has just enacted regulations on the use of PCB's which require actions that have been taken by Westinghouse since 1972.

Westinghouse recognized that these measures could not prevent the total elimination of inerteen escaping into the environment. Therefore, concurrent with the above measures, we have conducted extensive evaluation programs designed to utilize those mixtures of PCB's having low persistence and high biodegradibility in the environment.

By February 1968, Westinghouse determined that a mixture of PCB's sold by Monsanto as Aroclor 1242 would be satisfactory as inerteen for transformers. Aroclor 1242 contains about 91 percent of the lower isomers, containing four chlorines or less that more readily biodegrade in the environment.

This material has been used by Westinghouse since that time, with the understanding that over 90 percent of the small amount that did enter into the environment would have relatively low persistence. Monsanto subsequently developed a new material from Aroclor 1242 which contains more of the lower chlorinated isomers and marketed this material as Aroclor 1016. By the first quarter of 1972, this material was introduced by Westinghouse into the manufacture of all capacitors.

This material contains 99 percent of the lower biodegradible isomers, four chlorines or less, so that less than 1 percent of this material that might escape into the environment might be more resistant to biodegradation. The industry, Monsanto, our own research, scientific literature, and most of the papers presented at this conference have indicated that the lower chlorinated mixtures of polychlorinated biphenyls are more biodegradible and do not present the same long-term toxic environmental problems as those which contain the higher chlorinated isomers.

It is interesting to note, in this regard, that EPA researchers have found a significant difference between the effects of Aroclor 1242 and Aroclor 1016 on rats, confirming our position. But they published this information in Great Britain and did not make the information available during the toxic hearings of 1974. We believe the U.S. scientific community should determine the benefits and the environmental impact of the two or three askarels used by the electrical industry on a scientific basis and not let the desire to see a toxic substance bill passed stampede us into a selection of an alternate fluid which is more potentially dangerous to man and to his environment. Thank you.

STATEMENT RELATING TO POLYCHLORINATED BIPHENYLS ON BEHALF OF THE WISCONSIN PAPER COUNCIL

James S. Haney*

The Paper and Paper Recycling Industries in Wisconsin

I appear today on behalf of the Wisconsin Paper Council, the trade association for the pulp and paper industry within Wisconsin. I am chairman of the Wisconsin Paper Council's Government Relations Committee.

There are 49 pulp and paper mills in Wisconsin employing 46,000 people who produce in excess of 5 million tons of pulp and paper products annually. Wisconsin manufactures more than 11 percent of the total production of pulp and paper products in the United States and is the number one paper-producing State in the country.

Not only do we lead the nation in *papermaking*, but we are also the number one State in paper *recycling*. At least 19 Wisconsin paper firms recycle fibers to some extent and several firms make a specialty of it. A *fifth* of Wisconsin's annual paper production, about 780,000 tons, is made from *recycled, post-consumer wastes*. Some Wisconsin papermakers, like my own company, have been producing recycled paper and paperboard since the turn of the century.

*Public Affairs Director, Bergstrom Paper Company, Neenah, Wisconsin.

MONS 065014

What Has The Wisconsin Paper Industry Done For The Environment?

Manufacturing any product is not a clean, tidy process. Generally, it is noisy, usually it is dirty, and often it involves work with large machinery. It normally takes skilled labor, of which Wisconsin is fortunate to have an ample and sufficient supply. The point being, however, that in the manufacturing process certain natural resources are consumed and related byproducts are discharged or emitted as a part of the process itself.

Recognizing this impact on the environment upon which our industry depends, the Wisconsin paper industry had expended approximately $126 million on water pollution abatement equipment prior to 1975. It is estimated by the industry that within the next 5 years an additional $153 million, at a minimum, will be expended for a total investment of approximately $280 million for water pollution abatement equipment alone, not one cent of which is attributable to new production equipment.

As to air pollution, prior to 1975, the Wisconsin paper industry had invested approximately $34 million in air pollution abatement equipment and anticipates that between 1975 and 1980 it will invest minimally an additional sum in excess of $60 million. In rough figures, therefore, the paper industry in Wisconsin alone will have spent approximately $375 million by 1980 for air and water pollution abatement equipment—approximately $8,200 per employee—on what is very environmentally necessary, but absolutely unproductive, equipment.

The Issue of Polychlorinated Biphenyls

In light of previous comments at this conference, I think I need spend little time in identifying polychlorinated biphenyls (PCB's) or their historical uses. One of the many varied uses of PCB's prior to 1971 had been in carbonless copy paper, which has accumulated in the files of many businesses and numerous governmental agencies. From time to time, some of this paper is discarded and becomes part of the solid waste chain.

At this time I wish to make one point very clear. *Wastepaper collectors and recyclers do not manufacture PCB's nor do they use them in their manufacturing process.* To the extent that recyclable wastepaper does contain traces of PCB's, this contaminant is introduced into the industrial system and becomes part of the industrial waste discharge of recycling facilities. The only other known PCB's on a paper mill's premises might be PCB-containing transformers or capacitors.

The Wisconsin Paper Council is vitally concerned that overly restrictive regulations of PCB's, both in finished paper or paperboard products or in effluent discharges, could destroy the Nation's recycling efforts. We strongly urge that those who are drafting regulations concerning PCB's more fully analyze the impact of such regulations on recycling industries.

You must understand, for example, that a very small portion of the total amount of PCB's manufactured domestically by Monsanto Company were used for carbonless paper, which is the chief assumed source by which wastepaper contains the PCB contaminant. Aroclor 1242, by weight containing relatively lower amounts of chlorine than other domestically produced and sold PCB's, was used in the production of carbonless paper. Between 1958 and 1971, at which time the use of PCB's in the manufacture of carbonless paper was ceased, approximately 48 percent of Monsanto's PCB production was of Aroclor 1242. However, of its entire domestically sold production during those years, only about 22 percent was used for "plasticizer applications." Plasticizer applications include not only use for carbonless paper, but also for adhesives, textile and other surface coatings, inks, investment casting wax, and sealants. Therefore, we know that something considerably less than 10 percent of Monsanto's total PCB production between 1958 and 1971 was used in the manufacture of carbonless paper, all of it being of the Aroclor 1242 variety.

Aroclor 1242 has significantly different structural constituent characteristics, whereby its stability and persistence are less and its degradeability appears to be significantly higher than its comparatively more highly chlorinated Aroclor relatives. At least 1,500 reports in scientific literature have been written relating to PCB's and, whereas most of these deal with only the question of reporting the presence of PCB's in the environment, invariably these reports describe and relate to Aroclor 1254 and 1260, the more highly chlorinated PCB's produced by Monsanto. In fact, a Monsanto spokesman has indicated that it was his opinion that "if we could just turn the clock back" and have produced only Aroclors 1221, 1232, 1242, and no others, we probably wouldn't be holding hearings today. We are told that the principal Aroclors being found in Wisconsin fish are Aroclor 1254 (Mississippi River) and Aroclor 1248 (lower Green Bay). Predominantly it is Aroclor 1254 that is found in the environment. In terms of degradation and degradeability, there is a definite difference between Aroclors 1242 and 1254.

On the issue of bioconcentration, the EPA has stated that Aroclor 1242 bioaccumulates on the order of 8 times less than the more highly chlorinated Aroclors. On the issue of removal from effluent, the EPA has predicted that we can look forward to significant reductions in discharge concentrations as the program and

MONS 065015

projected treatment systems required by the NPDES program become effectively operational.

All of the above can be restated concisely as follows. Only a small portion of total PCB's domestically produced were utilized for purposes of manufacturing carbonless paper and, as to those particular Aroclors, they are relatively less stable and persistent, appear to be more degradeable, and are less susceptible to accumulation in fish than are their related, more highly chlorinated Aroclors. *As a result, the impact of the waste paper recycling industry on the issue of PCB's must be put into a more proper and positive perspective.*

Concluding Remarks

I think the time has come for us to recognize that we all know less than we would like to know about PCB's. Because of their persistence and because of uncertainties about their impact, the new production of this substance has all but been eliminated and is now used for only very specific purposes. *An inventory must be made of where PCB's are coming from; the type of Aroclors that are being discharged, emitted, and landfilled; the best methods of decreasing these discharges, emissions, and landfilling; and to put some proper perspective on the existence of this substance in our environment.* We know of no current practical method by which to separate out of the wastepaper mass that portion of paper that contains PCB's—particularly since PCB's have been recycled into paper products other than carbonless paper. *PCB's cannot be legislated out of the recycled paper system.* The whole concept of recycling wastepaper is at stake in considering the promulgation of regulations particularly at a time when, as a national industry, the pulp and paper industry is expanding its papermaking capacity at a faster rate than it is expanding its ability to produce pulp. It simply must be a national priority to encourage recycling.

The Wisconsin Paper Council recognizes that there is a potential problem with the introduction of PCB's into the environment. We strongly support strict controls on the manufacture, distribution, and use of PCB's and we favor a national ban on the importation of PCB's. But the paper industry has not created this problem, it does not use PCB's in its processes, and it finds itself caught in the middle of this controversy merely because of its recycling efforts, which would be halted by the adoption of overly restrictive regulations.

For example, proposed regulations in Wisconsin place an incredible burden on our industry, requiring removal of PCB's to levels 1,000 times smaller than the Food & Drug Administration's temporary tolerances as applied to food.

Our industry has a history of cooperation with government agencies to reduce PCB levels in our finished products. We will continue to cooperate with the Food & Drug Administration, with the EPA, and with our own DNR to find solutions to the PCB problem in effluent. We concurred with Mr. Schweitzer when he testified in Wisconsin that "It is important to clarify the portion of the PCB contamination problem which can be attributed to specific discharges and the *practical feasibility of reducing the discharges.*" We hope that his Department recognizes that there is a difference in terms of environmental acceptance of various forms of PCB's and that this should be taken into account when dealing with any proposed regulations.

But we continue to appeal to you for reason. Let us admit together that we do not know enough, at least at this point, to promulgate reasonable regulations and that ill-conceived rules could mean economic catastrophe for a significant portion of Wisconsin's paper industry. The commitment of this industry is to Wisconsin and to its environmentally pure future. It has invested and will invest over $300 million prior to 1980 to accomplish that goal. We only hope that realistic, reasonable, feasible, and responsible regulations will be proposed by the EPA which will bolster its reputation as a defender of the environment while at the same time not place it in a position of ridicule because it has suggested regulations so badly researched that they are either unenforceable or that they destroy recycling—one of the this country's most environmentally considerate industries.

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CHAIRMAN TIMM: Now for another change of pace, David Kotelchuck, followed by Lee Botts.

DR. DAVID KOTELCHUCK (United Electrical Workers Union, New York, New York): At present, several States are proposing new PCB standards while EPA is actively considering such a standard. New standards for PCB's are clearly in process. I would like to discuss a matter that is of great importance to electrical workers, the people first affected by PCB's in the environment and the people whose lives are most immediately affected by the changes in the standards, both in terms of the health and jobs.

MONS 065016

We want to point out that attempts to regulate PCB's use State by State leaves workers in existing plants subject to job loss through plants moving. United Electrical Workers represents over 1,000 workers at GE Capacitor plants at Fort Edwards and Hudson Falls, New York. Presently a New York State law is being considered phasing out PCB by next year. If the New York State laws pass in the absence of a Federal standard, then workers in New York and other States with stringent standards face possible plant moves and subsequent job loss.

Local GE plant officials have already publicly threatened to move if proposed New York State standards pass. We recognize the need for change in PCB standards to protect the health of workers and the general public. But we insist that this must be done by promulgating a Federal standard so as not to subject workers to this threat and not prejudice their job security relative to workers in other States.

It is incumbent upon EPA to set a new Federal standard. We want to point out that this is also the most effective way to regulate PCB in the environment.

One further point. We commend scientists who have examined health and environmental hazards of PCB. But a report of the results in medical and scientific literature does not end the scientist's responsibility in our opinion. We believe that scientists also have a responsibility to inform electrical workers, those most directly affected by any PCB health hazard, of their results. In the past several years neither workers at the Fort Edward and Hudson Falls plants nor their national Union were informed by scientists or government officials of their findings or proposals. One cannot claim to be helping mankind by researching PCB hazards and regulating its use while ignoring precisely those individuals most intimately effected by PCB.

We request that as new scientific studies are conducted the authors please inform us of their results. Our address: Research Department, United Electrical Workers, 11 East 51st Street, New York, New York 10022. Thank you.

BETTER LATE THAN NEVER: THE CASE FOR TREATING PCB'S AS TOXIC SUBSTANCES NOW

Lee Botts*

My name is Lee Botts, and I represent the Lake Michigan Federation, a coalition of citizen groups and individuals with members in Wisconsin, Illinois, Michigan, and Indiana. Our affiliates include organizations of conservationists, of sports fishermen, of organized labor, of school children, and of people who could be classified under many other labels but share a common concern for protection of Lake Michigan from manmade pollution. Today I am here to express the dismay of our organization over the failure of the Government of the United States to protect the lake and those of us who depend on it for drinking water, for food, and for the quality of our lives in the future against contamination by polychlorinated biphenyls (PCB's).

The fact that such contimination exists is not news. Attention was called to PCB's as a potential danger in a Lake Michigan Enforcement Conference in 1971. We worked for and celebrated the passage of the Water Pollution Control Act amendments in 1972. We have asked for and waited for regulatory action on toxic substances that would include PCB's as provided for under Section 307. In the past year we have become increasingly alarmed over the failure of EPA to make use of its powers under Section 504.

Under this section, the administrator may bring suit on behalf of the United States to stop pollution that threatens either the public health or the means of livelihood of people. PCB's do both, and yet what has EPA done?

EPA ACTIONS TO DATE

Since 1972, EPA officials have been assuring themselves, if not the rest of us, that, in the words of John Buckley, chairman of this conference, "The PCB problem is fairly well in hand." This statement was attributed to him in a *Science* magazine discussion of PCB's in October, 1972 (page 388, Vol. 178). Just how EPA reached this conclusion is a mystery, since it was not

*Executive Director, Lake Michigan Federation, Chicago, Illinois.

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confirmed by the monitoring efforts being made by agencies here in Region V, including the National Water Quality Laboratory in Duluth and the Great Lakes Fishery Laboratory in Ann Arbor.

When confronted with the rising levels of PCB's found by monitoring in the Great Lakes, Washington EPA officials dismissed the problem as a regional one. Now this is a fairly large region, and it might have seemed reasonable to investigate whether PCB's were present in other waterways when their existence in the largest fresh water system in the world was so widespread. But evidently the thought was that if you do not look for a problem, you will not have to deal with it. Unfortunately, the problem was not only present elsewhere; research confirmed that it was growing worse.

NATURE OF THE PCB PROBLEMS

In various research efforts, the nature of the problem was becoming clear. First, there is the fact that PCB's have high concentration factors, considerably higher than those of the chlorinated hydrocarbon pesticides. Evidence suggests that PCB's may not be as soluble in water, but there is no doubt now that biomagnification of PCB's in the food chain is very great.

Second, a number of the 190 different PCB compounds degrade very slowly. The U.S. Department of Agriculture found in experiments reported in a 1972 conference that the isomers in the intermediate range of chlorine content were more toxic to chickens than those with either very small or very high chlorine content.

Third, it was learned that, like DDT and other pesticides, PCB's are stored in fatty tissues of animals and man, ready to be released with metabolism of the fat. One 1974 report on this phenomenon in the Bulletin of Environmental Control and Technology found that normal persons seem to have small blood level concentrations of both DDT and PCB's even if they have higher levels in stored fat. But nine persons with cancer were found to have extremely high levels of both the degraded form of DDT and PCB's in their blood, suggesting that the toxic chemicals had been released into the bloodstream during an illness that causes weight loss through fat metabolism. The authors of this report speculate that this mechanism may offer a much more serious long-term threat to health than was previously realized, since it would affect people already sick, or growing old, or even those trying to improve their health by dieting to lose weight.

The point is that for several years many investigators have been trying to find out not only whether PCB's are toxic but how they cause trouble. That is, many investigators outside EPA were studying the problem.

WHAT EPA HAS NOT DONE

In this connection, let us consider what EPA has not done that might have reasonably been expected of the agency that has the charge of protecting the environment and public health in general but has the power to regulate specific toxic substances.

The major action to determine sources of PCB's was to request information from industries that might have occasion to discharge wastes containing PCB's into waterways, that is, to be point sources of PCB's. Since Section 308 applies only to owners and operators of such sources, this inquiry was not adequate to disclose all the industrial users of PCB's nor means of distribution from manufacturers through middlemen to actual users. Strictly speaking, an industry that did not discharge PCB's directly would not have to provide information under Section 308 letters about whether it made and sold products containing the chemicals that might ultimately reach the environment by other means.

Conceivably, EPA might have been trying to find out for itself just how the PCB's were being scattered so widely. But EPA did not, for example, investigate whether PCB's are finding their way into rivers and lakes from sanitary landfills. Nor did it obtain information about possible atmospheric transfer, even though the fact that other substances are carried into bodies of water like Lake Michigan by rainfall is stimulating attention to this mechanism.

Having failed to take advantage of PL 92-500, it might have been supposed that EPA would turn to other means of regulation. Again, not so. PCB's are not regulated under the Safe Drinking Water Act, either.

CONCLUSION

I spoke in the beginning of the failure of the Federal Government to deal adequately with the PCB problem, but in truth some agencies have already taken some initiative. The Food and Drug Administration is amending its food packaging regulations to prevent contamination by plastic wrappings. The Department of Defense and the General Service Administration have indicated willingness to restrict purchase and use of items containing or using PCB's.

Some States have acted, at least to protect the public even though such actions can do little to prevent continuing environmental contamination. Wisconsin and Michigan have issued warnings to the public about eating

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fish caught in Lake Michigan more than once a week. This warning, of course, is cold comfort indeed to the fishermen, whether for sport or for a living. Present at this meeting are representatives of both groups who will speak to their own interests in this matter.

In calling for decisive regulatory action by the Environmental Protection Agency now, I would like to submit to you several petitions signed by individual members of one of the member organizations of the Lake Michigan Federation, the National Council of Jewish Women. This is tangible evidence of their concern, but I can assert with confidence that it is shared not only by other members of the Lake Michigan Federation but almost everyone who understands the nature of this problem. EPA must understand that its leadership is needed to deal with this national problem now.

A FAILURE OF GOVERNMENT

Richard R. Knabel*

Representing:
The Hudson River Fisherman's Association
The Hudson River Sloop Restoration
The Federated Conservationists of Westchester County

The Hudson River Fisherman's Association, the Sloop Restoration, and the Federated Conservationists of Westchester County together represent the major elements of the environmental movement in the Hudson Valley. They have collectively helped to define many of the environmental safeguards, such as they are, that have come into being since public awareness of ecological problems came into its own during the past 10 or 12 years.

My comments today, on behalf of these groups, are intended to raise the "decibel level," as Administrator Train commented yesterday, but not intended to criticize the efforts of this conference or its participants. What we in the Hudson Valley have experienced over the past 3 months, and all that I have heard since arriving in Chicago, indicates that the decibel level has not yet reached the pain threshold in government offices. We are astonished at the delays. We cannot understand why it has taken so long for the PCB menace to surface, and we are horrified that so little action seems to be contemplated. We wonder what would have happened if the exposé begun by Commissioner of Environmental Conservation, Ogden Reid, in New York State had not occurred.

As many of you may know, this conference owes its genesis, in part, to the almost unbelievable revelations in the Hudson Valley last August. On August 8, 1975, Commissioner Reid dropped a bombshell on the public by warning them not to eat striped bass from both the Hudson River and Lake Ontario because data given him by the EPA indicated levels of PCB's exceeding 5 ppm were found in the fish taken from both waterbodies. He identified the culprit in the case of the Hudson River as primarily the two General Electric facilities at Fort Edward and Hudson Falls, New York, whose massive capacitor plants there were dumping an average of 30 lb. per day of PCB. The river is apparently contaminated for a distance exceeding 100 miles, and the entire fishery is in question.

As one might imagine, the reaction to this stunning announcement was one of shock, frustration, disgust, dismay and confusion. The reasonably successful clean-up of sewage and industrial waste in the Hudson Valley, while far from complete, was making visible progress. The water was not only cleaner to the eye, but the increased variety of fish returning to the river in numbers not seen by commercial fishermen for over 20 years inspired confidence and pride. Since 1972, the Sloop Restoration had been sponsoring an annual shad sail in which thousands of people had participated by eating freshly caught shad. Eating fish from a cleaner Hudson was a natural outgrowth of the cleaner water we all thought existed. Imagine the concern, and fright of all these people on the morning of August 8th.

When the shock wore off somewhat, many of us asked; was this a new discovery? Was this just another layer of contamination that no one had looked for before? Did new analytical techniques, or a fortuitous

*Director, Hudson River Fishermen's Association, Yorktown Heights, New York.

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investigation produce this damaging information? To our horror, consternation, and anger, what we found, in New York State anyway, was an Environmental Watergate that knows no parallel. The confusion rapidly changed to an angry feeling of betrayal.

As early as February 17, 1971, we discovered, efforts were made by Mr. Robert Boyle of *Sports Illustrated*, and perhaps others, to alert New York State environmental officials, notably Mr. Carl Parker, chief of the Bureau of Fisheries, to the presence of dangerously high PCB levels in striped bass eggs, and levels approaching the cutoff of 5.0 ppm in fish tissue. Mr. Boyle describes the response he got as "derisive." Not only was no action taken by State officials, but considerable evidence exists that active efforts to suppress any information about PCB contamination persisted within the department for several years. All of this despite reports of the problem written by Boyle in both *Sports Illustrated* and *Audubon Magazine* in 1970.

In June, 1971, the New York State Department of Health certified that the water quality of the discharge from the two enormous General Electric plants met its criteria. In spite of the fact that 5.7 million lb of PCB's are used at these plants each year, no mention of PCB's was made by the health department.

In July and through September 1972 (1½ years after Boyle first signaled trouble), New York State undertook PCB analyses in the mid-Hudson area and discovered concentrations exceeding FDA limits of 5.0 ppm in fish. This information never saw the light of day. The then Commissioner, Henry Diamond, recently disclaimed any knowledge of the study or its damaging results. His successor, James Biggane, also denies knowledge, and the new Commissioner claims he found out from Federal sources, not from within his own department. Reid said in a *New York Times* story, by Richard Severo, "There has been a failure of government here...," referring to the suppression of information within his newly aquired department. That was a masterful example of understatement.

Subsequent further investigation revealed that between 1970 and 1975, 99 analyses of Hudson River fish were conducted by State officials, and in 52 cases the PCB levels were greater than the maximum allowable level of 5.0 ppm. A largemouth bass caught at the mouth of Esopus Creek, about 80 miles north of New York City, in 1970, but not analyzed until 1972, contained 53.8 ppm, or more than 10 times the maximum allowable limit. Subsequently, levels were detected in several species that ranged to over 100 ppm, with levels generally decreasing as distance from the GE discharges increased.

On September 8, 1975, GE was ordered by the State to stop dumping its average of 30 lb per day by September 30, 1976, and to immediately curtail its discharges to 2 lb per day as of September 30, 1975. Reid required GE to post a $2 million performance bond to back up his order. GE's response was to contest the order, as it did the provisions of its NPDES permit, which also required a major curtailment of PCB discharges, and to claim that it had already voluntarily reduced the discharge levels to under 2 lb per day. However, in the course of hearings, going on at this moment in Albany, it has been revealed that in the 24 hour period between October 17 and 18, 1975, 75 lb of PCB's were dumped at the Fort Edward Plant, by virtue of "heavy rain during sewer line repair." On September 13-14, 1975, a horrendous 116 lbs of PCB's were dumped by the Hudson Falls plant with no reason stated. Both pieces of data came from GE's own written responses to questions raised by State environmental lawyers. Based upon data the EPA has presented at this meeting, both of these occurences represent major spills. I wonder if the EPA is aware of them, and what they will do about them.

In any case, it is clear that GE has not curtailed its discharges, and it seems probable that this random and massive dosing of the Hudson will continue to poison and jeopardize the health, safety, and welfare of residents not only in the valley, but all along the northeastern seaboard, where commercial fishermen catch fish born and raised in the Hudson Estuary.

While the record of State officials is both shameful and scandalous, the EPA has not acted with openness, or alacrity either. I should say that Region II's behavior has left much to be desired in this matter. Without providing the full details, which I will gladly do for anyone desiring them, our investigations of the Region II office's actions indicate that it too had knowledge of the severity and extent of the PCB problem in the Hudson long before it forwarded the data to Albany or made it public themselves.

An internal EPA memo dated May 31, 1974, reveals a request from Sandra Kunsberg, attorney in the Water Enforcement Branch, to Dr. Richard Spears, Chief of Surveillance and Analysis Division, to conduct sampling at the GE plants and in the Hudson River, to "Determine whether or not there exists a health hazard within the meaning of Section 504 of the Water Pollution Control Act." This request was occasioned by testimony at the May 1974 EPA hearings on toxic substances standerds where GE revealed the extent of its PCB discharges into the Hudson River.

The EPA lab report on this investigation, dated October 1974, concluded "that the biotic component of the river ecology are heavily contaminated with PCB's,

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grazing populations as well as carnivorous piscine populations," and notes that certain areas around Fort Edward and Hudson Falls "are fished primarily by the youngsters of Fort Edward. Ingestion of these fish by the populus would certainly lead to contamination of specific tissues in their bodies...." There was no health alert. No news release. There wes nothing.

Almost 1 year went by before this information finally reached the new environmental commissioner of New York. The question again is why? We must ask, how can so-called public servants walk around with the knowledge that commercial and sports fishermen up and down the North Atlantic as well as on the Hudson were catching Hudson River striped bass, shad, small mouth bass, and eels for human consumption, knowing full well that the likelihood of their contamination was great, that the fish posed a health hazard, and that their oaths of office required action. That this situation could persist for literally years is unforgiveable. A failure of government? No. Indictable criminal offenses more suited to investigation by a grand jury than discussion at a conference such as this one.

As far as action to end the problem nationwide is concerned, we decry the procrastination, fear, or whatever, that seems to underlie the apparent lack of direction and assertiveness thus far displayed. There still appears to be a question about what comes first, the national health or the business interests of the electrical and other industries that rely upon PCB's for their profits.

We fail to see how a proposed standard of 1 part per trillion ambient in the Nation's waterways will solve the problem. Is it low enough? Can it be enforced? How was it arrived at? Can we live with PCB's at all? What will happen, or rather what should happen to the more than 100 million lb of PCB still available to be degraded or released into the environment? How will we deal with this problem?

It is equally alarming to note that the FDA has not stated here one syllable about any proposed change in the permissible PCB levels in food or fish. We wonder why fish have highest permissible PCB level in the first place. The suggestion that PCB levels are decreasing in all foods except fish seems to contradict the ubiquitous nature of PCB's, and creates a false sense of security. Our Canadian neighbors have announced a new lower standard of 2.0 ppm in food, and Commissioner Ogden Reid has taken the position, to his credit again, that a standard of 1.0 ppm seems to be desirable. When will the FDA take some action?

Getting back to the Hudson Valley, which we hope is not the average situation around the country, the fledgling Hudson River fishery, thanks to GE, is dead for all intents and purposes. Commercial fishermen who had hoped to go back to fishing full time have scrapped their plans. Even if their catches were not contaminated, fish markets won't buy them or pay such low prices that no profit is possible. The public is now convinced that Hudson fish are tainted, and will continue to think so for many years regardless of cleanup requirements or measurable improvements that may or may not take place. The implications for the North Atlantic fishery have yet to be explored or defined, but the potential economic impact of the August 8th revelation, an environmental Pearl Harbour, for fishermen everywhere is devastating. Confidence in government and in the Hudson's recovery is at a new low.

In conclusion, the time to act is now. Administrator Train said yesterday that he hopes this will be his last PCB conference. Well, we also hope that no more conferences on PCB's will be necessary. How much data does it take before action can be justified? Must we suffer an outbreak of Yusho disease before the problem assumes real proportions? We must have more than conferences. And we expect more than talk.

Thank you for your attention, and for this opportunity to speak.

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MS. EILEEN JOHNSTON (*Concerned citizen*): Thank you, Chris. Well, I would like to thank the U.S. Environmental Protection Agency for putting on this stimulating meeting. I felt privileged to be in the room with so many fantastic research members and I was a little encouraged and discouraged. I happen to live in the Lake Michigan basin. I was wondering, too, where are all the concerned citizens. I really saw very few people from Illinois that I felt should have been here if they were concerned about PCB's.

I also want to congratulate the State of Wisconsin for the hearings that they have held, and I'll be very anxious to see what comes from those, and also to congratulate the State of Michigan for the fine presentation that John Hesse made. I will be interested to follow House Bill 5619 in Michigan.

My own great concern for PCB's in the environ-

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ment is due to my own Illinois Environmental Protection Agency. Last February the agency was asked to host the February meeting for the Governor's five-State Interdisciplinary Council on Pesticides. Jim Frank, a very capable young man from EPA, put on an all-day meeting on PCB's. I was the only citizen at this meeting and it was so stimulating that I started out to do what an individual citizen can do. I talked to a few citizen groups that I am associated with and we decided to put on a meeting to help warn the Lake Michigan fishermen about this and we hold the meeting in March or April.

I urged more citizen groups to do this sort of thing—to take positive action. Citizens need more education. I hope that USEPA and everybody else concerned with PCB's will really listen to Carlos Fetterholf, who really socked it to people tonight.

Getting back to Illinois, I've talked to 225 citizens quite recently and explained to them the perils of PCB's and they signed petitions for me to take to the Illinois Pollution Control Board to ask it to hold informational hearings on PCB's, to get them informed, and to get our own Illinois EPA and interested citizens to be better informed. They decided to wait until after these meetings to decide whether to hold hearings.

Another thing I heard today that the researchers mentioned is that we ought to get together and get some standardized analytical methods. Remember when we were concerned about DDT? I attended a 2-day seminar out on Pershing Road at EPA headquarters. Everybody was analyzing whole fish, half fish, and it seems to me from what I heard that they really should get together and develop uniform procedures.

I think it was a great conference but I really want to know what EPA is going to do. What are you guys going to do? I have great faith in the U.S. Environmental Protection Agency. I know so many people in Region V—but what are you going to do? Are you going to Congress? Are you going to take action? Are you going to answer the questions tonight, Chris? Thank you.

Session continued on next page.

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MR. RAY OLTMANNS (Illinois Wildlife Federation, Blue Island, Illinois): I am a delegate from the Illinois Wildlife Federation. I am going to read a letter (figure 1) that is going to go to Mr. Train; it is from Frank Goetschel, our president. Thank you.

ILLINOIS Wildlife FEDERATION

13005 S. WESTERN AVE., BLUE ISLAND, ILLINOIS 60406

P. O. BOX 116 PHONE 312-388-3995

November 18, 1975

Mr. Russell B. Train
Administrator
U. S. Environmental Protection Agency
Washington, D. C. 20460

Dear Mr. Train:

The Illinois Wildlife Federation concurs with the need for immediate and strict regulations of production, distribution and use of the industrial chemicals called polychlorinated biphenyls (PCB).

Failure of the Environmental Protection Agency to have restricted these chemicals as toxic substances under the Federal Water Pollution Control Act of 1972 cannot be excused. Their widespread distribution in the environment and the threat they pose to public health has been fully documented and are well known to your agency. Yet to date EPA has contented itself with requests for voluntary action by industry even while PCB's have continued to accumulate in ever higher levels in all water wastes, and while research evidence has continued to confirm their toxicity.

The chance to take preventive action was missed when EPA delayed and delayed its regulations of PCBs as a toxic substance. We feel action is now mandatory to ban the use of PCBs.

Sincerely yours,

Frank B Goetschel

Frank Goetschel
President

FG:sa
cc: Ace Extrom, Exec. Sec.

PUBLISHERS OF ILLINOIS Wildlife

NATIONAL WILDLIFE FEDERATION AFFILIATE

Figure 1. Letter.

MCNS 065023

MR. BURNETT BAUER (State Senator from South Bend, Indiana): First of all, I want to congratulate the EPA for holding a meeting at which it can't really win. I've heard in this meeting that they've done too much and then I've heard them damned for doing too little. And they don't have to do that; we in politics every election have to stand up and take it, but they really don't have to. But they did call this meeting and I think it's been very beneficial and the fact that we've had discussions is a real step toward solving what all of us recognize is a real problem.

Now the reason I want to talk here is because I want to make one suggestion for those who want the government to take some action. That was suggested a number of times. It'll also maybe warn those who don't want the government to do a darn thing. What I'm suggesting is this, that you not wait for the Federal Government to start action on PCB's But you start it in the States. I know that's contrary to most of the procedure and most of the thoughts that people have, particularly those in State Government. But the historical fact is most of the social changes in our country started in States first. The women's sufferage movement was not suddenly brought on by the Federal Government; the States first started allowing women to vote. We know that most of the environmental actions were started in a locality and in the State.

It's just a fact that once the Federal Government sees States acting that this indicates to them seriousness, and then they go in and invest the time and money that they have. Now there are several reasons why we want the States to do this. First of all, most of the legislatures are citizen legislatures. In one sense, we're not as vulnerable to lobbyists. Most of us are serving there because we want to better our State. We want to give our children a better place in which to live, and we are doing what we think primarily would be best in the long run.

Second, we are closer to specific problems and when we put a solution in there, it is probably a lot closer to a genuine solution. It's much harder for people in Washington to try to legislate something that applies over the 50 States. If you start with your actions at home—and God bless these women out here who have these groups, they'll bring you specific instances you'll start legislating laws that will work. I'll give you just one instance and then I'll sit down.

In Indiana we have pollution of a lot of our fine lakes and we heard it was because of phosphates. Indiana passed the first statewide ban against phosphates in detergents. I'm the grandfather of that bill because it was my son, who just happened to be in the House, who got it passed. He had more energy than I did. The real fact was that I was out for 2 years and the lobbyists went out of the State. They didn't think the bill would be brought up. By the time they found out, the Governor had already signed it. So there's something in passing the work onto the next generation.

We have found as a result of that ban that our State's lakes are clearing up fantastically. That law works. New York now has it. We hope other States of the Great Lakes will adopt it. One reason I'm here is I have met with groups that are around the Great Lakes and the Great Lakes are in danger of many things. And I just want to urge you people who are in favor of having something done to go home and start working on your State legislatures. I know I'll get some letters from some of those guys saying, "why don't you shut up, Bauer, we've got enough work to do." But do that if you really are genuine in your interest of getting some action toward cleaning up our environment, and in passing on to the next generation an atmosphere and environment that can make us happy, and can make us really enjoy the greatest country in the world.

I want to congratulate again EPA and every one of you who came here from industry. I've learned a heck of a lot here, and I think that all those who participated in this meeting are really leaders and genuine pioneers in this country. I salute you.

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MR. BARRY SCHADE (Minnesota Pollution Control Agency, Roseville, Minnesota): The Minnesota Pollution Control Agency is a member of a task force made up of 11 agencies which represent the various interests of two States and the Federal Government.

This task force was formed to investigate the PCB pollution problem in the upper Mississippi River and its tributaries. In response to preliminary information provided by this task force and by various other studies, the Minnesota Pollution Control Agency board passed a resolution related to PCB's on June 24th, 1975. This resolution, which supports a Federal ban on the sale and use of PCB's, is submitted as figure 1.

CERTIFICATE OF MINNESOTA POLLUTION CONTROL AGENCY'S

AUTHORIZING RESOLUTION

I, Peter L. Gove, do hereby certify that I am Executive Director of the Minnesota Pollution Control Agency, and that the attached is a true, complete and correct copy of a resolution adopted at a meeting of the Board of the Minnesota Pollution Control Agency duly and properly called and held on the 24th day of June, 1975, that a quorum was present at said meeting, that those present unanimously voted for the resolution and that said resolution is set forth in the minutes of said meeting and has not been rescinded or modified.

IN WITNESS WHEREOF, I have hereunto subscribed my name this 25th day of June, 1975:

Peter L. Gove
Executive Director

Subscribed and sworn to before me this 25th day of June, 1975:

MARY E. WYATT
NOTARY PUBLIC — MINNESOTA
DAKOTA COUNTY
My Commission Expires July 30, 1981

Notary Public

Figure 1. Resolution of Minnesota Pollution Control Board.

MONS 065025

STATE OF MINNESOTA
MINNESOTA POLLUTION CONTROL AGENCY
June 24, 1975

RESOLUTION

WHEREAS, the Agency is charged with the administration and enforcement of all laws relating to the pollution of any waters of the state as given in Minnesota statutes of 1971, Chapter 115.03, and;

WHEREAS, no sewage, industrial waste or other wastes shall be discharged into any of the interstate or intrastate waters classified as fisheries and recreation so as to cause any material change in any other substances or characteristics which may impair the quality of interstate or intrastate waters or the aquatic biota in any manner render them unsuitable or objectionable for fishing, fish culture or recreational uses as per Minnesota Pollution Control Agency regulations WPC 14 and 15, (1973 Supplement), and;

WHEREAS, significant concentrations of persistent organic compounds known as polychlorinated biphenyls (PCBs) have been identified within the Mississippi River near the border areas of Minnesota-Wisconsin known as Lake Pepin, and;

WHEREAS, the United States Food and Drug Administration has enforced the "Action Limit" of five (5) parts per million total PCBs on several shipments of commercially caught rough fish from the Lake Pepin area resulting in voluntary disposal of the fish by the industry, and;

WHEREAS, as a result of the above, commercial fishing operations have temporarily been ceased in the Lake Pepin area, and;

Figure 1. Resolution of Minnesota Pollution Control Board (con.).

MONS 065026

WHEREAS, on May 27, 1975 Dr. Warren R. Lawson, Minnesota Commissioner of Health advised the public to limit consumption to no more than one meal per week of fish taken from the Mississippi River from the Minneapolis-St. Paul metropolitan area and lower Lake Pepin, and;

WHEREAS, a major study completed by Dr. J.R. Allen of the University of Wisconsin (1974) indicated short-term toxicity to a low-level exposure to PCBs in nonhuman primates, and this study and others suggests that there exists a significant potential for harmful effects to humans, and;

WHEREAS, and as a result of the above actions significant environmental effects on the aquatic life and economics of commercial and sports fisheries as well as tourism have occurred, and;

WHEREAS, the Great Lakes Environmental Contaminant Survey (GLECS) conducted yearly by Michigan's Departments of Natural Resources and Agriculture, the U.S. Food and Drug Administration - Detroit Region, and the Great Lakes Fishery Laboratory has determined that Lake Superior lake trout collected near Isle Royale are showing a pattern of elevated PCB residues similar to Lake Michigan.

NOW THEREFORE BE IT RESOLVED, that the Minnesota Pollution Control Agency Board hereby supports a Federal ban on the sale and use of PCBs.

Figure 1. Resolution of Minnesota Pollution Control Board (con.).

MCNS 065027

MR. RICHARD T. FERRY (Bio-International, Inc., Woods Hole, Massachusetts): Bio-International, Inc., is principally located in Ft. Lauderdale, Florida, and holds four U.S. patents covering its processes for the microbial degradation of petroleum and petroleum byproducts. Bio-International holds one United States patent for a microbial degradation facility; that is, a mechanical facility comprising an interconnected initial and final degradation system, each containing an inlet and outlet and a conveying means together with aeration or stirring devices and a drainage means.

This patent was issued only 3 months ago, on August 11, 1975. Of particular interest to the group here today is a patent held by the company relating to the microbial degradation of polychlorinated biphenyls that was issued on December 18, 1973 (see figure 1).

Bio-International is currently engaged in the optimization of its processes at three leading universities in the Southeast. The purpose of this ongoing work is to further increase the efficiency of the integrated system and to broaden the scope of field applications.

In the process, a significant amount of scientific and technical data is being electronically stored for quick retrieval when circumstances demand. This information is also being synthesized in order to prepare an affirmative response to the revised Annex Ten of the National Contingency Plan relative to the introduction of microbial additives to the environment.

Additionally, Bio-International maintains a staff of internationally recognized scientific authorities whose main thrust is in the area of environmental consulting. The company is now analyzing the effluent of major industries who recognize their own obligation to solve their own effluent problems, particularly where PCB contamination is involved. Upon the completion of these analyses, it is envisioned that the company's integrated processes will be brought to bear on the problem effluents.

I would be remiss if I did not note in closing that our ongoing studies relative to the problems of PCB's in the environment would be much more difficult were it not for the cooperation of Mr. Papageorge and his colleagues at Monsanto as well as other representatives of government and industry, particularly the fishing and marine-related industries. For those of you who may be interested in the biodegradation approach to environmental problems, you're invited to contact me here or by letter and we'll be happy to provide you with more specific data. Thank you very much.

Figure 1 on following page.

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UNITED STATES PATENT 3,899,376
August 12, 1975

MICROBIAL DEGRADATION FACILITY

ABSTRACT

A facility for the microbial degradation of petroleum and oil wastes, as contained in, e.g., industrial effluent discharge materials, comprising an interconnected initial and final degradation system, each of which contains at least one tank means, associated inlet and outlet means, conveying means, aeration or stirring means and drainage means. The effluent to be degraded is introduced into the initial degradation system together with the microorganisms employed and nutrients therefore, and degradation proceeds with aeration or stirring with the formation of a protein-containing cell mass. The substantially degraded effluent is conveyed to the final degradation system where additional microorganisms are added to obtain the final degradation or polishing. The resulting effluent, after filtering, is clean and clear and may be discharged safely into the environment.

UNITED STATES PATENT 3,779,866
Dec. 18, 1973

MICROBIAL DEGRADATION OF POLYCHLORINATED BIPHENYLS

ABSTRACT

A process for the microbial degradation of polychlorinated biphenyls (PCBs) which comprises treating the PCBs with certain non-pathogenic, hydrocarbon-utilizing strains of Cladosporium cladosporiodes, Candida lipolytica, Nocardia globerula, Nocardia rubra and/or Saccharomyces cerevisiae until the PCBs have been substantially degraded. The process is applicable degrading PCBs as they may be present as pollutants or contaminants in water, in industrial effluents, in various land areas such as industrial sites and tha like or in varied laboratory or commercial installations. The process may also be used to clean up and degrade mixtures of PCBs and various hydrocarbon oils or petrochemicals whenever their presence constitutes a deleterious pollution.

Figure 1. Abstract of patent relating to the microbial degradation of polychlorinated biphenyls.

* * * * * * * * * * * * * * * *

MAJOR GORDON GOFF (U.S. Army Materiel Command, Alexandria, Virginia): The following description of the spill of 265 gallons of PCB's into the Duwamish Waterway in Seattle is presented here as an ongoing practical problem that we're facing in the recovery and disposal of contaminated bottom sediments from a busy waterway in this industrial area.

The spill itself occurred on September 13, 1974, when a large electrical transformer fully sheath-crated for open-deck shipment to Alaska was being sling-loaded aboard a barge. As the slung crate was about 2 feet off the dock the bottom members gave way, the transformer fell to the dock, and the outboard cooling fins struck the bull rail, rupturing them and leaking approximately 265 gallons of PCB material in the transformer onto the dock and into the waterway.

At that point in time, because of a lack of awareness of the people on the scene as to exactly what was in the transformer and the lack of labeling or warning on the crating itself, the normal oil spill procedures used at that dock were instituted. Within 2 or 3 days, however, the possibility that PCB's were implicated in the spill appeared. Subsequent investigations bore out the fact that the spill was indeed PCB's. EPA and the State of Washington Department of Ecology instituted an emergency cleanup procedure. Handheld dredges manned by divers recovered the visible pools of PCB's which were lying on the bottom of the waterway.

A filtration unit was then moved into the area

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and the recovered material was run through this filtration unit and the sludge that resulted was drummed and was subsequently disposed of by a commercial contractor.

In this emergency operation, approximately 80 gallons of visible pools of PCB's were recovered. The remaining PCB's are now in the bottom sediments and subsequent sampling has established an area of relatively high PCB contamination in the area of the spill.

To cover the proposed procedures for the recovery of this I'd like to ask Mr. Jack Thompson, who is a fisheries biologist with the Seattle District Corps of Engineers, to cover the details of it.

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MR. JOHN S. THOMPSON (Seattle District, U.S. Army Corps of Engineers, Seattle, Washington): The previous speaker described events leading up to the accidental loss of PCB's into the Duwamish Waterway, Seattle, Washington, and partial removal of the PCB's by EPA and Washington Department of Ecology. There remains about 185 gallons of Aroclor 1242 in the immediate area where the spill occurred. About 2 months ago the Corps was requested by the Department of Defense to remove the contaminated sediments. This decision is supported by EPA and the State of Washington.

The Duwamish Waterway is a dredged channel in the Duwamish River. It is dredged a distance of 5 miles from salt water with one-half of the channel dredged to 30 feet below mean lower low water (MLLW). The spill occurred at about river mile 2, where the dredged channel is 30 feet below mean lower low water.

Background levels of PCB's in bottom sediments run from 0.16 ppm to about 2.5 ppm. Levels of PCB's in the area of spill range from about 5.4 ppm up to 390 ppm in the sediments. We propose to remove the contaminated sediments, which will require dredging up to 40,000 cubic yards.

We plan to use a dredge called Pneuma pump, which is manufactured in Italy and represented in the United States by a Chicago firm. This type of dredge has never been used in Puget Sound country and it is a little experimental for us. The advantage of this particular dredge is that small amounts of water are used for the pipeline dredging; in other words, about 60 percent of the material that will enter the pipeline is sediments and about 40 percent water. Also, this dredge is excellent for controlling turbidity and has excellent control of dredging depth.

We plan on including predredging and post-dredging monitoring sampling, which will be performed by EPA. There will be sampling during the actual dredging. We have looked at a number of disposal sites and methods and we have selected one. All of the areas have one thing in common and that is that no one wants the stuff.

The proposed disposal method is as follows: (1) We will pump, using the pneumadredge, into a watertight 4,000-yd^3 barge; (2) When full, the barge will be hauled 2 miles upstream to the disposal area; (3) The pneumadredge will then be placed into the barge and sediments will then be pumped into a disposal area.

The disposal area will be prepared beforehand and will be roughly 300 feet from the waterway. In the Seattle area, we have a tide drain from about plus 12 feet down to about minus 2 feet below MLLW. The disposal area bottom will be at 0 feet MLLW elevation. Consequently, this material will be placed in the water table. The disposal area will be filled to about the plus 14 foot level. The disposal area will be covered with 2-3 feet of clean dredged materials after dredging is completed and material has solidified. All effluents leaving the disposal area will be run through a sand filter to remove suspended sediments.

The cost of this operation will be between $300,000 and $500,000. This is about $2,500 per gallon of PCB's removed. This case study has been presented to you to show one removal operation and illustrate the problems involved in removal and disposal of hazardous materials. Thank you.

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CHLORINATION OF WATERS FOR DISINFECTION—A STUDY OF THE PRODUCTION OF UNDESIRABLE CHLORINATED PRODUCTS

Richard Johnsen, Ph.D.*

The current emphasis on environmental preservation and human health is resulting in an increased use of chlorine for disinfection and waste treatment. Few efforts, if any, are being made by those proposing such procedures to determine the possible adverse impact of increased usage.

The use of chlorine for water treatment falls into two categories: protection of public health, and industrial use for antifouling and for waste treatment. In the United States, chlorination of municiple water supplies and wastewater treatment plant effluents is the most common procedure for disinfection. Most biologists who have maintained aquatic animals in laboratories are aware of the toxicity of chlorinated tap water. Brungs (ref. 1) thoroughly reviewed the current knowledge of the effects of residual chlorine on aquatic life. However, this paper is not concerned directly, per se, with chlorine toxicity but rather its reaction with other constituents of waste waters to produce unwanted chlorinated products. The utility of chlorine in water treatment is attributable to its toxicological characteristics and its oxidative capacity. Chlorine is employed to destroy pathogenic and nuisance bacteria and other microorganisms, to modify the chemical constituents of the water being treated (e.g., reduction of tastes and odors), or both.

In Fort Collins, as well as in most other Colorado cities, chlorination is used not only for disinfection of community water supplies, but also in the disinfection of effluent waters from the two sewage treatment plants. This latter water is released, usually directly, into the Cache La Poudre River, which is part of the South Platte River system.

There are two sewage treatment plants in Fort Collins, with the most recent one (onstream in 1969) currently undergoing a large expansion. The newer plant currently handles about 5.5 million gallons per day of waste waters with a near tripling in capacity nearing completion. Terminal chlorination at this plant site is carried out on the effluent stream from the clarifying tanks and just before the effluent enters the chlorination holding basin from which the water is released to the river.

The question that arises is whether this terminal chlorination treatment, with a desired disinfection as its goal, can give rise to undesired chlorinated products. Recently considerable concern was voiced in the national wire services over the findings by regulatory agencies of certain chlorinated compounds in the drinking waters of numerous communities (e.g., New Orleans) which are potentially dangerous to human health. Most of those cited to date include chlorinated alkanes (methanes and ethanes, etc.) and chlorinated phenols. The sources of these compounds were not ascertained but were being attributed to industrial effluents.

The high reactivity of chlorine with many organic compounds may provide another answer. Since sewage effluent waters from one community become the eventual drinking waters of communities downriver, it is of considerable importance that it be known that a disinfection process at one point does not contribute to the pollution burden at a second point. Another concern is the effect on aquatic fauna of such chlorinated compounds as may be formed by chlorination of waste waters. Although tremendous amounts of data are available on many chlorinated compounds having deleterious environmental effects (e.g., the insecticide DDT and the herbicide 2,4,5-T), very little is known about chlorinated compounds that may emanate from chlorinated sewage effluent waters.

Review of the Literature

A recent release of preliminary results of an Environmental Protection Agency (EPA) survey of U.S. drinking waters suggest that chemical contamination is a national problem (ref. 2). The report states that all 79 cities surveyed contained some amount of chloroform, ranging from 0.1 part per billion (ppb) to 311 ppb. This and other chemicals found were reported to be partially due to chlorination of drinking waters, Delfino (ref. 3), in response to earlier related reports, doubted the formation of chloroform in the chlorine disinfection process but called for more research in this area. Schwartz (ref. 4), in response to Delfino, cites the relative ease in which one may expect to find chlorinated compounds after chlorination considering all the possible organic compounds found just in sewage effluents. Laubusch (ref. 5) stated that when chlorine is added to water, a mixture of hypochlorous (NOCl) and hydrochloric (HCl) acids is formed and that this reaction is complete in a few seconds. He points out that under some conditions,

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chlor-addition or chlor-substitution products may be formed, but gives no further data. Gaffney (ref. 6), in a letter in *Science*, found polychlorinated biphenyls (PCB's) in a sewage treatment plant's trickling filter bed. These PCB's were the result of a high biphenyl influx from a textile mill coupled with waste water prechlorination.

Our interests in this area were rekindled with the paper by Carlson et al. (ref. 7). They reported that not only were 10 organic compounds, ranging from phenol to benzene, chlorinated but also that biphenyl, used as a fungicide, was chlorinated under various conditions to varying extents. This latter compound was of particular interest since we have been working with PCB's for several years as an industrial pollutant. Glaze et al. (ref. 8) found a number of chlorinated compounds by gas chromatography (GC) after extracting waste-water effluents containing from 10 to 100 ppm chlorine. Only chloroform was identified although it was evident from their chromatograms that higher molecular weight chlorinated compounds also were involved. Although levels of chlorine can be quite variable in effluent waters, depending on the chlorine metering devices and operator control, there are known to be some treatment plants that discharge effluents containing as high as 15 ppm total chlorine residual (ref. 9, p. 456).

The literature is replete with references to PCB's in aquatic animals, such as fish, crayfish, snails, shellfish, etc., in fish-eating birds, predatory birds, and other vertebrates, and the question that now arises is whether some of these PCB's are industrial pollutants or those produced by chlorination of waste waters.

Background Experience

We have studied and monitored PCB concentrations in digested sewage sludge, fish, and effluent waters for several years. We have shown that PCB levels have stabilized in sewage sludge at about 4-6 ppm, that they are in the effluent discharges from the sewage plants, and that they are concentrating in the fish in the Poudre River at levels often exceeding 5 ppm (refs. 10,11). Although we have tried, we have been unsuccessful in determining the source of PCB's into the sewage treatment plants. In addition, the gas chromatograms of extracts from effluent waters and fish tissues are not the same as those from digested sludge. If this is not due to some metabolic process, it may possibly be due to chlorination of the effluent water. This we would like to determine.

The fact that PCB's have been reported in effluents from paper mills which use biphenyl in slime control and chlorine in bleaching processes, gives credence to the preliminary work we report below and that already cited.

Preliminary Work

Recently we have conducted some preliminary work using biphenyl in water (5 ppm) to which was added chlorinated water to give chlorine concentrations of 8, 83, and 830 ppm. Under ambient conditions and after aging for 24 hours and 1 week, the samples were analyzed, along with suitable controls, by gas chromatography. The chromatograms shown in figure 1 indicate at least 8 peaks attributed to PCB's. If the individual chromatograms of A and C were superimposed over B, one would see striking overlaps although relative peak heights of most of the peaks aren't comparable. The standard (B) is Aroclor 1221, an industrial formulation containing 21 percent chlorine by weight. This is just one of eight formulations. It is evident that the higher level of chlorine resulted in higher chlorine substitution levels, as indicated by the longer retention times. The above data have not yet been quantitated nor have PCB isomer assignments been made to the various peaks. However, we have on hand over 50 pure PCB standards ranging from several monochloro to decachloro biphenyls which will be used for identification. Present work has indicated that biphenyl is chlorinated readily under conditions similar to those in the local sewage treatment plants. Other work done has involved use of sodium and calcium hypochlorite as chlorine sources. Discussion of these preliminary studies need not be included here since chlorine gas is used locally and we will confine our work to this source initially.

Work Plan

Since we have on hand a very sizable supply of chlorinated PCB isomers, it is our intent to study the chlorination process initially in the laboratory using biphenyl and later Aroclor 1221, to determine the parameters necessary for chlorination. Some of these parameters would be pH, concentration of reactants, reaction time and lastly, chlorine source. Since Fort Collins and most other communities use chlorine gas, and since that is what we have used primarily in the preliminary work, we will continue using this form. After this work has been completed, we plan on using effluent waters obtained from the sewage treatment plant and conduct time-course studies to determine extent of chlorination with time. Chlorine concentration would be the next factor studied. Probably of utmost concern is the unequivocal identification of the products formed. The fact that we have many of the potential products is extremely beneficial. The water samples will be routinely extracted with hexane and analyzed by GC using our Micotek MT-220 equipped with four columns and dual Ni 63 electron-capture detectors. An infrared spectrophotometer (Perkin-Elmer 337) is on hand for determination of

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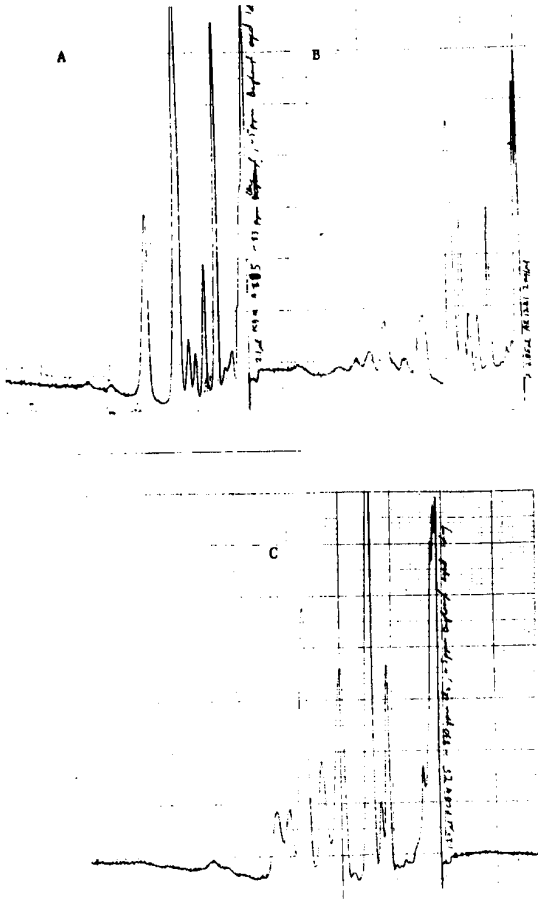

Figure 1. Gas chromatograms of extract of biphenyl reacted with Cl_2-water (83 ppm Cl) for 1 day (A), 830 ppm Cl for 1 day (C) and comparison to Aroclor 1221 (B).

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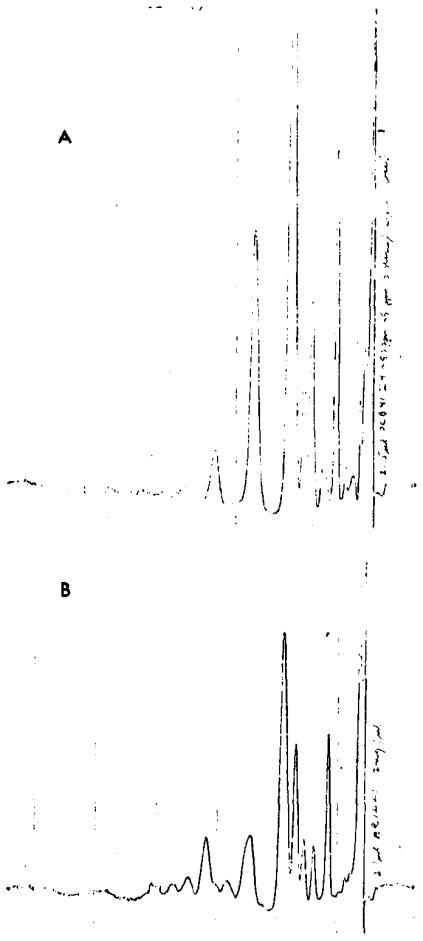

Figure 2. Gas chromatograms of extract of biphenyl reacted with Cl_2-water (83 ppm Cl) for 1 week (A) and comparison with Aroclor 1221 (B).

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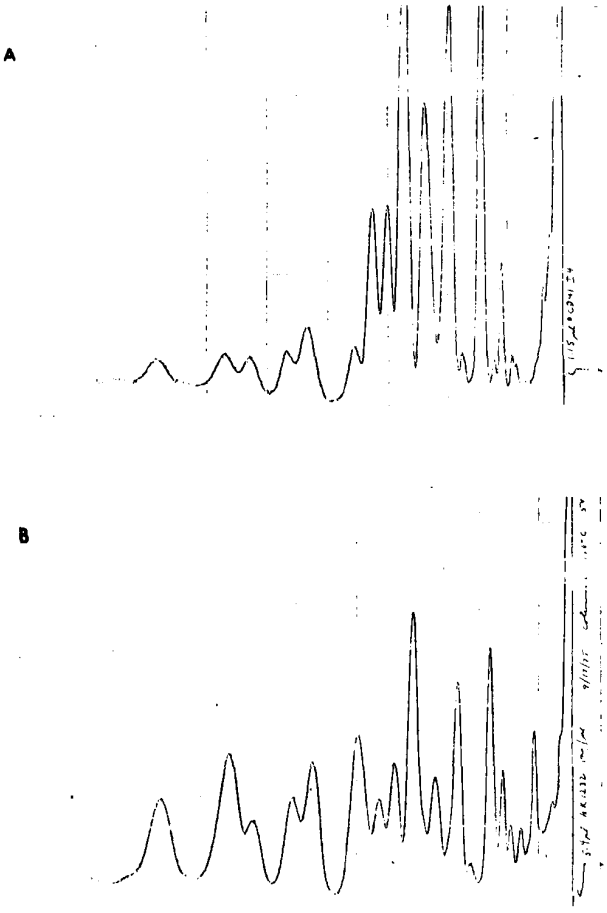

Figure 3. Gas chromatograms of extract of biphenyl reacted with Cl_2-water (830 ppm Cl) for 1 week (A) and comparison to Aroclor 1232 (B).

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infrared spectra of products isolated by thin-layer chromatography. Confirmation of identities is planned using a mass spectrometer coupled with a GC.

Figure 2 illustrates the similarity of the extract (A) (the reaction of 83 ppm Cl_2 water with 5 ppm biphenyl incubated 1 week) with that of Aroclor 1221 but not in the same proportions. Using a light table, the peaks are superimposable on one another. This is true also of figure 3, where the chromatograms show the results of 830 ppm Cl and 5 ppm biphenyl incubated for 1 week in comparison to Aroclor 1232. It is evident that increasing chlorine dosages result in greater degrees of chlorination. The chromatograms in both figure 2 and figure 3 were very similar also after 1 day in incubation with the exception that the later eluting peaks are more pronounced. In figure 3 as in 2 above, all the peaks in the extract are in the Aroclor 1232. It was surprising to us that biphenyl was so readily chlorinated in light of its assumed unreactivity.

Further work is planned along these lines using shorter reaction time spans (hours), utilization of thiosulfate to terminate the reaction, use of CCl_4 or $CHCl_3$ instead of hexane as extracting solvent, and use of glass-distilled water (rather than from Barnstead still) distilled over basic $KMnO_4$. We have used reagent-grade Cl_2 gas and have not noticed any problem with bromine as an impurity. We would like to get access to a MS to check our peaks for chlorine content. We have checked the pH of the saturated Cl_2-water and found it to be 2.4 and after bubbling air through it, via a fritted disc, to be 2.45. So apparently the HOCl and HCl formed by the reaction of Cl_2 gas with water is quite stable. Some early peaks showing up in our blanks, especially the Cl_2-water blanks, are due possibly to the chlorination of hexane. This is the main reason we went to terminate the chlorination reaction with thiosulfate prior to extraction.

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HERBERT GILNER (Tivian Laboratories, Providence, Rhode Island): I would like to address myself briefly to the methods used to gather information about polychlorinated biphenyls as environmental contaminants. I do not argue with the need, only with the methods.

It has been claimed both in the press and at this conference that of the 84 firms to whom letters were sent in August concerning the use of PCB's, only one has refused to respond. That company has been named in the press. That company is Tivian. However, to our knowledge, there is at least one other company which has also refused.

There are two distinct principles involved in this refusal. The first is that Tivian Laboratories does not use PCB's. On hearing this, the Environmental Protection Agency demanded information concerning Tivian's use of polychlorinated terphenyls, a series of compounds qualitatively different from PCB's. There has been, to our knowledge,

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no evidence that the PCT's accumulate in human tissues. Moreover, we state and have stated in the past that Tivian Laboratories do not pollute the environment.

Furthermore, and this gets us to the second principle, Tivian feels that the information demanded is proprietary and that EPA, having been set up by executive order, has no constitutional or statutory right to demand such information or to make threats concerning penalties for noncompliance. The company I represent feels that the harassing activities of the EPA, including trial by the press, are totally illegal.

EPA has sought to vilify the name of Tivian by passing its name to the press, claiming that Tivian has contaminated the environment with PCB's, which our company does not use.

Tivian Laboratories has filed a $20 million damage suit against EPA for this release of false information to the public. Tivian has further requested the U.S. Marshall's Office in Providence, Rhode Island, to issue a warrant for the arrest of EPA personnel for the violation of Constitutional laws and congressional statutes in its dealings with Tivian.

It is ironic that the company most responsible for the manufacture and distribution of PCB's in this country continues to do so, but a small company which does not handle PCB's is harassed.

At our request, the EPA supplied us with a list of companies to whom questionnaires were sent. However, the names of certain firms, as we heard again yesterday, were excized from the list. Is it not strange that the name of one company is pejoratively released to the press while the identity of others is concealed? Why?

Is it not capricious that under our unelected administration in Washington, these names as well as those of the companies dealing with the Arabs and cooperating with the Arab boycott of Israel are kept secret? The objectives of EPA are without a doubt useful, necessary, and worthy, and we still support them, but we will not submit to an agency which is so blatantly being used as a tool of an unethical policy.

Figure 1, literature handed out by Tivian Laboratories, is on the following pages.

MONS 065037

NEWS

TIVIAN LABORATORIES INC
P.O. BOX 6408 . PROVIDENCE, R.I. 02904

FOR IMMEDIATE RELEASE

November 18, 1975

PROVIDENCE COMPANY HITS BACK AT EPA

Tivian Laboratories of Providence R.I. today announced that it has initiated actions against the Environmental Protection Agency and Mr. Michael Deland for allegedly ruining the Company's reputation and its business relations with what the President of the Company described as unfounded, hysterical harrassment, which resulted in a newspaper story instigated by the EPA.

Specifically, a $20,000,000.00 claim has been filed against the Environmental Protection Agency for damages. The newspaper story was released to the Providence Journal Bulletin alleging that the Company contaminated the environment with PCB's, which, incidentally the Company does not deal with. Tivian described the story as highly exagerated. Furthermore, the Company has requested that the U. S. Marshall's office, and particularly Marshall Wyatt, 305 Federal Building, Providence, R.I. issue a warrant for the arrest of certain Environmental Protection Agency Personnel such as Michael Deland New England Enforcement Officer for violating various sections of title 18 of the U. S. Code, namely

> Section 242, "Whoever, under color of law, statute or ordinance, regulation, or custom, wilfully subjects any inhabitants of any state to the deprivation of any rights, privileges, or immunities secured or protected by the Constitution or Laws of the United States... shall be fined no more than $1000 or imprisoned one year or both."
>
> Section 241, "If two or more persons conspire to injure, oppress, threaten or intimidate any citizen in the free exercise or enjoyment of any right or privilege secured to him by the Constitution or laws of the United States ...they shall be fined no more than $5000 or imprisoned not more than ten years or both."

Andrew J. Melechinsky, constitutional attorney for Tivian Laboratories stated that the EPA harrased the Company with registered letters which were

Figure 1. Tivian Laboratories handout.

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refused by Tivian. When Tivian requested the exact contents of these letters and their nature, they were not given a definite answer as to their content. After Tivian had refused these letters, a letter was served upon Tivian by a U.S. Marshall, which contained a very lengthy questionaire form.

Melechinsky charges the EPA with several Constitutional violations in sending out the form particularly Amendment XIII of the U.S. Constitution, which states "Neither slavery nor involuntary servitude.....shall exist within the United States..." Any involuntary response to the subject letter would constitute involuntary servitude.

Melechinsky further maintains that it is becoming a disgusting practice for many states and federal agencies to harrass businessmen with lengthy forms. He asks: 1. Do not such forms add to a tax bill which is already fantastically high? 2. Who pays companies for the time and effort required for filling them out? 3. If such funds are available, isn't that a further unwarranted expenditure of tax monies? 4. How can governments justify adding another nuisance load to the many which various governmental agencies are already seeking to impose on businesses? 5. Isn't this an invasion of privacy? 6. What Constitutional authority is there for such forms?

The claim against EPA has been filed by Tivian's Vice-President of Legal Affairs, Paul Wallins.

Marvin Antelman the President of the Corporation, has stated that he believes that the Agency harrassed him because of his constant criticism, in his capacity as an officer of the National Leadership Conference for The Security of Israel of Kissinger and Ford for their hard line against the State of Israel and Commerce Secretary's Morton's support of the Arab Boycott. Antelman stated that the Company will attempt in its litigation to document this. In a terse reply to Michael Deland Antelman stated "This most recent incident smacks very much like that of a medieval antisemitic libel

Figure 1. (con.).

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such as 'the Jews poisoned the wells."

Antelman further has stated that he views EPA extremism as following in the spirit of Karl Marx who wrote "A World Without Jews", and Marx equated Jews with capitalism and urged their destruction. Acusing EPA of adopting a middeval scenario in which the capitalist replaces the Jew; Antelman stated "This is one Jew who does not pollute the wells and who refuses to be intimidated by an anti-semitic EPA blood libel" and accused EPA of attempting to dishonor responsible businessmen and to portray them before the public as polluters.

Furthermore, Antelman stated it would be a good idea for Congress to investigate intensively the backgrounds of some EPA people, as he has found that there are members of the EPA today who have had past left wing associations with radical militant anti-business groups such as the Black Panthers and S.D.S. as well as strong Communistic leanings or who have worked for various foundations whose main programs and goals appear to be the destruction of American business and the substitution of a Socialist or Communist state here in the U.S. and who fund radical organizations.

Antelman feels that while it is true that there are irresponsible individuals who have polluted the environment and that measures should be taken to improve the environment, the EPA smacks of too much harrassment and too much hysteria and has substituted realistic objectives with impossible and technologically unfeasible goals. Above all, if ther are polluters that must be dealt with they should not be denied their Constitutional rights in our society. Instead, EPA intimidation has resulted in vast destruction of the industrial capacity of the United States and has weakened our economy. Melechinsky in his reply to Marshall Wyatt accused EPA of practicing a vicious form of extortion characteristic of a totalitarian government.

Figure 1. (con.).

MONS 065040

The Providence Journal, Tuesday, September 30, 1975

Providence firm given ultimatum on data request

BY ROBERT FREDERIKSEN
Journal Bulletin Corporation Writer

PROVIDENCE — Tivian Laboratories, Inc., 330 Silver Spring St., was identified yesterday as the only firm in the nation that has ignored government requests for data on highly toxic PCBs — polychlorinated biphenyls.

As a result, the Environmental Protection Agency has formally ordered officers of the firm, said to be a "major PCB user," to supply the data, or face penalties of up to $25,000 a day, a year in jail, or both.

Marvin S. Antelman of Newton, Mass., president of the six-year-old chemical manufacturing firm, said it does not use PCBs in its business of making plating solutions for the jewelry and electronics industries.

He confirmed that two certified EPA data request letters were ignored because of company policy against accepting certified, or registered, letters on grounds that this might be interpreted legally as consenting, or complying, with the contents.

Antelman also confirmed that a U.S. marshal had served the formal EPA order, but said, "It was not properly served because it was not placed in my hands, as is required. I read it and will respond, however."

He accused EPA and the federal Occupational Safety and Health Administration of "harrassing and bugging" him because of his past criticism of them and of President Ford and Secretary of State Henry Kissinger for their "hard treatment of Israel."

The state Health Department, which was notified by EPA, but has taken no action in the case, said the firm appears to be on a city sanitary-storm sewer that overflows into the Moshassuck River after heavy rains.

Antelman said, however, that only domestic waste from two toilets and two sinks goes into the sewer. Laboratory wastes are hauled away. "We don't use any PCBs. We don't put any in the sewer," he said.

Blake Biles, of EPA's Washington office, said Tivian Laboratories, was one of 84 firms, including eight in New England, that were sent letters in August, requesting PCB use and disposal data for use in developing controls because of growing concern over effects on public health.

Tivian was the only one of the 84 firms that ignored the letters, despite several follow-up phone calls by EPA's Washington and Boston offices before the formal order was issued, he said.

The firms' names were taken from customer lists of the Monsanto Chemical Co., the nation's largest PCB manufacturer, U.S. Customs and EPA hazardous materials data, Biles said.

PCBs are chlorinated hydrocarbons resembling DDT, which EPA banned in 1972, the same year it limited PCB use to closed electrical systems to reduce water and fish contamination, according to a recent news release by John A. S. McGlennon, EPA regional director in Boston.

Health effects associated with PCBs include eye discharge, acne, ulcers of the uterus, abnormal skin pigmentation and reproductive failures. New York recently urged the public not to eat striped bass and certain other fish from the Hudson River and Lake Ontario because of dangerously high PCB levels, McGlennon noted.

Because some striped bass spawned in the Hudson River migrate to New England waters, extensive tests have been started to determine PCB levels in food fish here, he said.

"Final results of the testing will not be available for a few months, but preliminary data indicate that PCB levels are well below the five parts per million tolerance level established in 1972 by the U.S. Food and Drug Administration," McGlennon said.

"There is no need for New Englanders to stop eating striped bass or any other fish because of possible PCB contamination," he said, but added that it is crucial to continue existing controls and may be necessary to extend them as a result of current studies and tests.

Figure 1. (con.).

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TIVIAN LABORATORIES INC.
330 SILVER SPRING STREET
PROVIDENCE, R. I. 02904
(401) 421-1208

November 1, 1975

United States Marshal
ATTN: Marshal Wyatt
305 Federal Building
Providence, Rhode Island 02901

Dear Sir:

I am in receipt of your Certified envelope No. 155215, containing a letter from the United States Environmental Protection Agency to Tivian Laboratories, Inc., dated October 16, 1975 and a four page brochure entitled POLYCHLORINATED BIPHENYL (PCB) COMPOUNDS OR MIXTURES.

As you may now realize, after our phone conversation of 10-27-75, the E.P.A. letter has no validity or authority under the United States Constitution.

In referring to a non-existent "authority" contained in the unconstitutional Water Pollution Control Act and the equally illegal Clean Air Act and in demanding that certain (private) information "must be provided" within certain time limits, the Environmental Protection Agency is practicing a vicious form of extortion, characteristic of a totalitarian government.

By its unsupported attack on chlorinated terphenyls and its unwarranted demands for confidential information and trade secrets, the Environmental Protection Agency is breaking numerous laws, some of which follow:

The Constitution of the United States of America:

1. Amendment IV, "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, ..." The demands in the E.P.A. letter constitute an attempted search of Tivian Laboratories, Inc., and seizure of our trade secrets.

Figure 1. (con.).

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TIVIAN LABORATORIES INC.
330 SILVER SPRING STREET
PROVIDENCE, R. I. 02904
(401) 421-1208

2. Amendment IV, "no Warrant shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized." The E.P.A. letter is not a warrant and has no claim to legality.

3. Amendment V, "No person shall be ..... compelled in any criminal case to be a witness against himself, ..." Tivian Laboratories, Inc. is made up of people who enjoy the same rights collectively as we do individually. Any possible adverse information might be used against Tivian Laboratories, Inc. We would be violating the Constitution and our own best interests if we answered the E.P.A. letter.

4. Amendment V, "No person shall be ..... deprived of liberty, ... without due process ....." This includes the liberty to ignore the illegal demands of the E.P.A. letter.

5. Amendment IX, "The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people." This law guarantees the right of Tivian Laboratories, Inc. to do as we please without government interference of the kind represented by the E.P.A. letter, unless we clearly do harm to others. The E.P.A. letter contains no claims that Tivian Laboratories, Inc. has harmed anyone. We do not have to prove our innocence. The intent of the E.P.A. letter is to coerce us into producing such proof.

6. Amendment X, "The powers not delegated to the United States by the Constitution ..... are reserved ..... to the people." This means that the government cannot demand information from Tivian Laboratories, Inc. unless it has the backing of exact wording in the Constitution. There is no wording in the Constitution which backs or authorizes the Freedom-destroying provisions of the Federal Water Pollution Control Act and Clean Air Act.

7. Amendment XIII, "Neither slavery nor involuntary servitude, ... shall exist within the United States, ..." Any involuntary response to the subject letter would constitute involuntary servitude.

Figure 1. (con.).

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TIVIAN LABORATORIES INC.
330 SILVER SPRING STREET
PROVIDENCE, R. I. 02904
(401) 421-1208

Title 18, U. S. Code:

8. Section 242, "Whoever, under color of law, statute, or ordinance, regulation, or custom, wilfully subjects any inhabitants of any state to the deprivation of any rights, privileges, or immunities secured or protected by the Constitution or Laws of the United States ..... shall be fined no more than $1000 or imprisoned one year or both."

9. Section 241, "If two or more persons conspire to injure, oppress, threaten or intimidate any citizen in the free exercise or enjoyment of any right or privilege secured to him by the Constitution or laws of the United States ..... they shall be fined no more than $5,000 or imprisoned not more than ten years or both."

Also, consider the nuisance, inconvenience and additional expense which a conscientious response would entail.

As Tivian Laboratories' Chief Executive for Federal Affairs, I am assuming responsibility for declining to respond to the letter of the Environmental Protection Agency.

As stated previously, the "laws" quoted by the E.P.A. are illegal. "An unconstitutional law, ... is as inoperative as if it had never been passed ..... imposes no duties, confers no rights, creates no office, bestows no power or authority on anyone, affords no protection, and justifies no acts performed under it ....." (16 Am Jur 2d Sec. 177)

The Constitution provides that (as stated in 16 Am Jur 2d Sec. 177) "No one is bound to obey an unconstitutional law ....."

The Constitution is the law which we will obey, and that law guarantees the right of Tivian Laboratories, Inc. to stand up against the kind of tyranny represented by the E.P.A. letter.

Figure 1. (con.).

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TIVIAN LABORATORIES INC.
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(401) 421-1208

You should take action against the Environmental Protection Agency which, as you can see, has broken many laws, rather then assist in the persecution of Tivian Laboratories, Inc., which has not broken any valid laws and which has not done harm to anyone. I will be pleased to sign the complaint.

Constitutionally Yours,

Andrew J. Melechinsky
Constitutional Attorney
for Tivian Laboratories, Inc.

Info to:
Mr. Robert Thompson
Environmental Protection Agency
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Mr. Jeffry G. Miller
Acting Assistant Administrator for Enforcement
U. S. Environmental Protection Agency
Washington, D. C. 20460

Figure 1. (con.).

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THE NEED FOR COST-BENEFIT ANALYSIS IN TOXIC SUBSTANCE USAGE

A. Eatock*

INTRODUCTION

Yesterday, mercury had the limelight; today, it is PCB's; tomorrow—what? We face a recurrent problem in dealing with toxic substances in the national-social context. Thus, this paper discusses the overall problem of toxic substances rather than just PCB's.

The purpose of this paper is threefold:

a. to show the absolute necessity of cost-benefit analysis in achieving an equitable balance between private and social costs and benefits;
b. to illustrate the need in cost-benefit analysis for researchers to be specific in delineating the chain of consequences together with the risks involved in toxic substances; and
c. to illustrate the elements of a simplified cost-benefit analysis based on PCB's.

Conceptually, cost-benefit analysis is quite simple in that one places a value on the costs of an action or program and a value on the benefits resulting therefrom. If the dollar benefits exceed the dollar cost, then one proceeds with the action or program. However, simple ideas do tend to get complicated in practice and cost-benefit analysis is no exception. One complication, which will be ignored hereafter, is what interest rate to use in finding the present value of future benefits such that they can be compared to the costs. Another complication is how to value intangibles (such as good health and aesthetics) that do not have an established price from being traded on the open market. There is no easy, or even commonly accepted, method for valuing the unintended effects of toxic substances resulting in social costs. This results in considerable conflict due to the judgmental valuing in estimating social costs and, frequently, the ignoring of the whole issue of intangibles.

MAGNITUDE OF THE PCB PROBLEM

To illustrate one aspect of the magnitude of the PCB problem and to lay the groundwork for a cost-benefit analysis, a hypothetical case on the accumulated PCB loading to the Lower Great Lakes from U.S. sources is worked out. There are three categories of inputs as follows:

1. Uncontrolled Imports:
   a. Estimate (ref. 1) of uncontrolled imports of PCB's as part of other products in 1972 ≅ 375,000 lb.
   b. 1971 U.S. population in the Lower Great Lakes Basin (ref. 2) 13×10^6 ≅ 6.3 percent of total population.
   c. Lower Great Lakes water volume converted to weight ≅ $4{,}575 \times 10^{13}$ lb.

Assumptions:

a. The PCB distribution is similar to the population distribution (ref. 2).
b. The continuing flow of import products results in a continuing equivalent amount going into the environment.
c. Thirty percent of PCB's are of the persistent (nonbiodegradable) types (ref. 4).

Then, 375,000 lb of uncontrolled imports result in an equivalent lake water PCB load of 1.5 ppt. Please note the word "equivalent;" in actual fact, the lake water has a very much lower level since PCB's tend to accumulate in the biota and sediment.

2. Existing Pool:

It is reported (ref. 3) that the U.S. consumption was approximately 1 billion lb of PCB's during the 40-year period from 1930 to 1970. The majority of this PCB consumption must now be in the environment, primarily in garbage dumps and sediment. If 0.1 percent of this pool is released annually from the various sources, then the equivalent lake load is 4 ppt PCB's in the water.

3. Continuing Use:

The third category is continuing authorized use for transformers and power factor capacitors, which constitute a consumption of more than 50×10^6 lb/yr (ref. 4). An assumption of a 0.1 percent leakage rate to the environment results in an equivalent lake load of 0.2 ppt in the water.

This is the U.S. loading on the Lower Great Lakes, to which the Canadian contribution must be added. Keeping in mind that these figures are based on unsupported assumptions, it is still interesting to compare them with the proposed water quality target of 1 ppt. It does indicate that, since PCB's are so persistent, the problem will have to be lived with for a long time. How far to go in rectifying the problem is where

*Social Sciences Division, Inland Waters Directorate-Ontario Region, Burlington, Ontario, Canada, L7R 4A6.

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A COST-BENEFIT FORMAT

Benefits

The chief benefit of PCB's is their nonflammability in the liquid phase. This has resulted in *only* PCB-cooled transformers and power factor capacitors being allowed in the upper floors of tall buildings. On similar safety grounds, it is the only fluid permissible for use in electrostatic precipitators that keep the particulate pollution from going up the stack of most industries. No estimates for the value of these benefits, and others which are not considered, are readily available, but they must be substantial or the OECD (ref. 8) group would not have recommended continuing these uses. While not ignoring the necessity of confirming these benefits, the cost-benefit analysis may be simplified to the tradeoffs between direct costs of controlled usage and the cost of damage to the natural and human environment.

At this point, the three sources of contamination can be incorporated in the cost-benefit analysis, as shown in table 1. These figures give some indication of the most cost-effective tradeoffs between various control methods and damages to the natural and human environment.

COST OF CONTROLLING USAGE

The cost of controlling the authorized usages of PCB's consists of the direct and indirect costs (table 2). The direct costs include containment devices to avoid leakages and losses; the handling of contaminated containers, cloths, etc.; the decontamination of equipment; the incineration of contaminated cleaning solvents, clothes, etc.; and the cost of monitoring and policing these activities to minimize leakages to the environment.

Indirect costs could include the monitoring and policing required to reduce unauthorized imports of PCB's as part of other products, and sewage incineration to reduce the environmental levels of PCB's. This latter indirect cost is of considerable interest since high-temperature incineration appears to be the only practical method of destroying PCB's, and sewage sludge incineration has the potential to break the continuing cycle of PCB through the environment. In Ontario, approximately 40 percent of the sewage sludge is incinerated, principally by the larger centers that are the main sources of PCB's. Unfortunately, temperatures well in excess of 860° C are required to destroy PCB's and the normal incinerator operation is just at or below this temperature. Further, since considerable energy is required to burn the wet sludge, optimization of sewage plant operations dictates operating at even lower operating temperatures as the cost of fuel increases. Obviously, there is a need to optimize sewage plant incinerator operations with the destruction of PCB's included in the criteria. The higher cost of fuel can possibly be alleviated by exhaust gas heat recovery to dry the incoming sludge, which apparently is not common practice at present.

SOCIAL COSTS

Social costs, including damage to the environment, as shown in table 3, are again split into direct and indirect costs. The direct costs include loss of commercial fishing and loss of recreational industry business due to the contamination by PCB's of the larger predatory fish which are at the top of the bioaccumulation chain (ref. 5). Another direct cost is the loss of foodstuffs due to contamination during production and packaging. Should PCB's continue to be dispersed to the environment from sewage incineration stacks, and sewage sludge utilized as fertilizer, there is a good possibility that the level of PCB's in milk, presently as high as 0.1 ppm near industrial centers in southern Ontario, will continue to rise and result in value lost when the milk is not fit for consumption. The occasional poisoning of industrial workers working with PCB's, or the poisoning of individuals in the general population due to accidental spills, gives rise to costs from lost work time and medical attention.

Indirect costs (table 4) include such things as fish-eating birds that have all but disappeared from the lower lakes; these include osprey, bald eagle, cormorant, bittern, herons, and loons (ref. 6). The herring gulls would also disappear except for the influx from the East Coast and the Upper Great Lakes (refs. 6,7). There are two aspects related to the loss of these birds. One is that, if the predator fish population declines, the alewife population will increase, and if the gull population declines, who is going to clean up, and at what cost, the mess resulting from massive alewife dieoffs such as we had a few years ago. This is what can happen if the balance of nature is disturbed. However, the main interest at the moment is the social cost aspect. How does one cost the aesthetic value of the bird population? This problem is typical of the multitude of social costs that must be considered, and there is no easy answer or agreement on methods.

EXAMPLE OF SOCIAL COST ANALYSIS

One approach taken to illustrate the problem is as follows. According to the Federation of Ontario Naturalists, there are approximately 750 bird watchers

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Table 1. Functional organizational model

Benefits	Due existing pool	Due continuing usage	Due uncontrolled imports
Transformer and power factor capacitators safety			
Reduction in property loss			
Reduction in loss of life			
Reduction in mdeical costs			
Reduction in employment loss			
Reduction in pollution (electrostatic precipitators)			
Reduction in cost of controlling pollution			

Table 2. Costs of controlling the authorized usages of PCB's

	Risk (cost) due existing pool	Risk (cost) due continuing usage	Risk (cost) due uncontrolled imports
Cost of controlling usage			
Direct costs			
Containment			
Contaminated articles disposal			
Decontamination			
Incineration			
Monitoring and policing			
Indirect costs			
Monitoring and policing (imports)			
Sewage sludge incineration			

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Table 3. Social costs of PCB's

	Risk (cost) due existing pool	Risk (cost) due continuing usage	Risk (cost) due uncontrolled imports
Cost of controlling usage			
Social costs (environmental damage costs)			
Direct costs			
Commercial fisheries			
Recreation industry			
Contaminated food			
Worker lost time			
Worker medical costs			
Nonrecycling of paper			

in Ontario who report on migratory birds and spend approximately 500 hours a year observing; there are another 15,000 bird watchers who pay $12.00 per year to belong to the organization, and it may be arbitrarily assumed that they spend 10 days a year watching birds, for a total of 60 hr/yr. Assuming this is an exponential function tailing off to the 8 millionth person in Ontario, who never looks at birds, it can be calculated that 125,000 hours are spent in bird watching. Again being arbitrary, it could be assumed that 10 percent of the pleasure in bird watching for Ontario residents is lost with the loss of the previously mentioned birds. The loss is then 12,500 hours of enjoyment, and there is still the problem of putting a value on it. In the past, economists have attempted to value recreation on the basis of travel costs, money spent on equipment, the leisure hours tradeoff against employment income, and many other methods. The potential loss of employment income probably sets the upper limit, while the casual observer, at no cost, sets the lower limit. At this stage, no attempt to put a value on leisure hours will be made.

The point to be made here is that the researchers have to provide risk data on the consequences of varying levels of toxic substances in the environment. Without the probabilities of resultant consequences being specified, no cost-benefit analysis can be performed and resource allocation cannot be optimized. Note that the incremental increases in social costs in the Legal Usage columns and the Uncontrolled Imports columns in the figures can be balanced against the same columns in the Cost of Controlling Usage subsection. Alternatively, the cost and effectiveness of sewage sludge incineration may result in a considerable reduction in the Social (Risk) Costs such that other Controlling Usage Costs may be reduced. The combinations and permutations are manifold, but operational research methods are available to find the optimum least-cost arrangement.

STRUCTURE OF TOXIC SUBSTANCE RESEARCH

In conclusion, it will be indicated how cost-benefit analysis relates to the overall scheme of things, along with a few comments about the organizational structure. The following (figure 1) shows a conical structure with the research disciplines at the base, leading up through Economic and Social Cost and Social Goals Policy to Legislation and Regulation at the apex.

It may be observed that, at present, the research

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Table 4. Indirect costs of PCB's

	Risk (cost) due existing pool	Risk (cost) due continuing usage	Risk (cost) due uncontrolled imports
Cost of controlling usage			
Social costs (environmental damage costs)			
Indirect costs			
Aesthetics - loss of osprey, bald eagle, cormorant, bittern, heron, loon			
Recreational fishing			
Recreational hunting			
Cleanup of alewife dieoff			
Human - loss of physical well-being (including abortions)			
Loss of mental well-being			
Loss of social well-being			

tends to be fragmented and uncoordinated. The transportation model (second level in the cone), which shows how a particular toxic substance cycles through the natural, biological, and economic environment, tends to tie together all the various disciplines. The next level, economic and social cost assessments, should also provide a unifying force among these disciplines, as well as linking the research with the social goals.

Further, the ultimate unifying research objective may be stated as:

> To determine the tolerable level of specific toxic substances in the environment with a holistic approach that balances the direct and indirect, private and social costs and benefits relevant to the use, or nonuse of the substance.

Clearly, to meet this objective, some form of centralized body is needed in each country to integrate and coordinate toxic substance research among the various agencies and disciplines involved. These bodies would specify and insure the planning, implementation, and control strategy for achieving the research objective, including:

a. the organization and allocation of research projects and subobjectives among the various agencies;
b. the identification and effective communication of available information and data;
c. the periodic communication of the overall strategy and progress in meeting objectives; and

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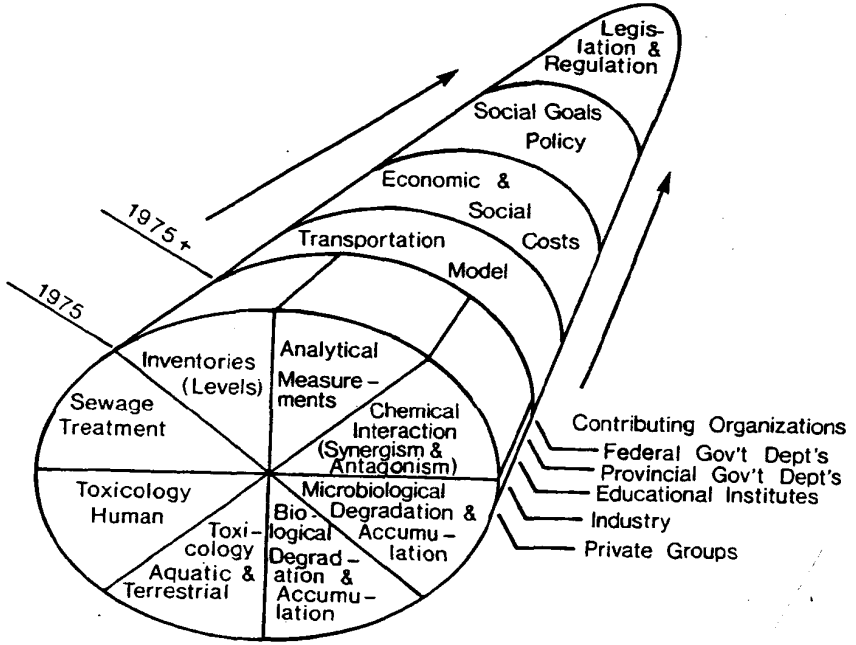

Figure 1. Toxic substances simplified function organization.

d. the formulation of recommendations based on the research findings, and their communication to policy and decisionmakers.

Clearly, to meet this objective, some form of centralized body is needed in each country to integrate and coordinate toxic substance research among the various agencies and disciplines involved. These bodies would specify and insure the planning, implementation, and control strategy for achieving the research objective, including: (a) the organization and allocation of research projects and subobjectives among the various agencies; (b) the identification and effective communication of available information and data; (c) the periodic communication of the overall strategy and progress in meeting objectives; and (d) the formulation of recommendations based on the research findings, and their communication to policy and decisionmakers.

All the elements for the lead agencies, the Department of Environment and the Environmental Protection Agency, appear to be present, such that they could grasp the authority and carry out the above objectives. It is suggested, as a first step, that each of these lead agencies appoint a Toxic Substances Research Coordination Committee. Both these national committees should be endowed with the power, through interdepartmental agreements, to carry out their objectives effectively. If we can proceed in this direction and if everyone promotes these objectives, an effective solution to the toxic substances problem will be realized.

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4. I. C. T. Nisbet and A. F. Serofim, "Rates and Routes of Transport of PCB's in the Environment," *Environmental Health Perspectives*, Experimental Issue No. 1 (April 1972).
5. *Great Lakes Water Quality, Third Annual Report to the International Joint Commission*, Great Lakes Water Quality Board, July 1975, p. 641.
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7. D. P. Peakall, "PCB's and Their Environmental Effects," *CRC Critical Reviews in Environmental Controls*, Vol. 5, No. 4 (September 1975).
8. *OECD Council Takes Major Decision with Regard to the Control of Certain Toxic Chemicals*, Organization of Economic Cooperation and Development, Press/A(73)3, Paris, February 14, 1973.

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CHAIRMAN TIMM: I have just a few comments on what kind of comes through to me, about three things really. Hopefully it came through to you on the various types of presentations we've had. Obviously we are dealing with a very real problem that impacts the livelihood of people in this country, other countries, etc. Another big thing to come through was that the technical people and the scientific people have got to improve our communication of the scientific facts that we know to the people that are effected. I think this is probably the biggest frustration on the part of the average citizen—he just doesn't understand what we're doing or what we find out or maybe does not know what it means. But I think we've got to continue to try.

Finally, no matter what action is taken, it will have an adverse effect on some people, which of course is an impact on the environment. I think like the Senator says, EPA is in a "no win" situation as far as everybody is concerned. But I think we've learned some things tonight and gained some comments good and bad that are going to help us to go forward. Carlos wants to have some additional comments and then we'll open to the floor.

MR. CARLOS FETTEROLF: I am very disturbed by an item in the statement of the man from the Hudson Valley representing the Sloop Restoration Society. He told us that Ogden Reid, Commissioner of the New York State Department of Environmental Conservation, applauded the Canada Department of Health and Welfare for establishing its fish

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PCB regulation at 2 ppm and that Reid felt the number should be 1 ppm.

I am also disturbed by the Indiana Senator urging that we all go home and pound on our legislators for action on PCB's.

There may not be one immediately correct solution to the PCB problem, but there is a best solution. The best solution is one which recognizes all phases of the problem; weighs the advantages, disadvantages, and costs; evaluates the impacts on the environment, the industry, and the people. I don't think Ogden Reid can do that off the top of his head, nor do I think a State legislature can do it without great thought and the wisest technical guidance. I'm worried. I don't want to see a panic situation. I hope USFDA does not panic. Once regulators deviate from scientifically defensible environmental actions, everyone loses. We waste resources, we trade one problem for another, and we create unnecessary costs and limitations on important segments of society. EPA must take some action. Hopefully, it will be scientifically defensible and not emotionally or politically motivated.

MR. JOHN CHASTAM (Lake Erie Cleanup Committee, Toledo, Ohio): I represent the Lake Erie Clean Up Committee, Michigan United Conservation Clubs, and the Associated Yacht Clubs of Toledo, Ohio. I wasn't going to get up to make any statement whatsoever, but after what I've heard here tonight, I feel very much like Carlos.

Several years ago, you remember taconite was a big issue after the mercury scare. Everybody was under the impression that everything was all settled and all of a sudden we had taconite. We got asbestos and that worried me.

I contacted as many of the Governors and as many of the State officials as I possibly could around the Great Lakes for the simple reason that you people out there as well as me own a part of our Great Lakes. Industry doesn't own them, individuals don't own them, they're a collective thing that we all have to enjoy. I just want you people to know that the fight is ours. Industry should realize what its doing to the very people they need for help, the people that they employ.

GENERAL CHAIRMAN BUCKLEY: I want to say about three words and they really are that I deeply appreciate your being here. Obviously I can't agree with each comment because there have been some mutually exclusive ones, but I certainly found it informative and really appreciate this. And the other thing I have is a personal observation. I think you're an enormously courteous audience and you've sat, you've listened to views that were entirely different from your own. I really enjoyed it, and thanks again.

MR. TIMM: Good night. I got roasted literally as well as physically.

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COMMUNICATIONS
TO THE CONFERENCE

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SOME ADDITIONAL COMMENTS WITH RESPECT TO AMBIENT AIR SAMPLING FOR PCB'S

Gordon H. Thomas*

The ORF, under contract to the Air Resources Branch of the Ontario Ministry of the Environment, has conducted ambient air sampling for PCB's.

The ambient air was sampled for gaseous constituents by metering the air through impingers containing ethylene glycol. In addition, sampling of the ambient air for suspended particulates was performed concurrently with the impinger sampling. For this purpose, a Hi-Vol suspended particulate sampler using a glass fiber filter was employed.

Standard analytical procedures for the extraction, cleanup, and separation of PCB's from interfering components were followed. Final extracts were analyzed by gas chromatography using electron capture detection. Confirmation of the presence of PCB's in some of the extracts was obtained with the aid of gas chromatography-mass spectrometry.

PCB's were detected in both gaseous and particulate sample extracts. Levels found were as follows:

Gaseous - 0.9 - 2.6 ng/m^3

Particulate - 0.14 - 0.61 ng/m^3

*Senior Research Scientist, Ontario Research Foundation, Sheridan Park, Mississauga, Ontario, Canada, L5K 1B3.

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JACK TAYLOR: Gedcor Corporation markets a solvent swellable polymer manufactured by Dow Chemical Company that possesses the unique ability to absorb or imbibe a broad range of hydrocarbons, including chlorinated ones such as askarels. The polymer, sold under the name "Dow Imbiber Bead," draws the hydrocarbon fluid into it's molecular structure, thereby capturing and containing the hazardous substance. The sealoff attribute of the bead allows valves to be manufactured that will allow water to pass and prevent free hydrocarbon escape into the environment.

MS. DORCAS THOMPSON (private citizen): I would like to speak on citizen involvement awareness and communication. It is not enough to have hearings on toxic substances, pollution problems, energy problems, transportation. Ordinary citizens feel they have much to do. They will not get interested in any problems they should be concerned about, because they are not at all aware of the problems. If a problem such as PCB's is identified, EPA must issue "educational" public releases before hearings regularly to inform people of this threat to our health. Of registered attendees at the conference there are few Chicago suburban citizens—all attendees connected with companies or agencies such as EPA. Not one suburban environmentalist or health person is registered. Several citizens such as L. W. Van Audobon are present.

If dangers are identified, we need to be educated by "decree;" signs must be posted on all areas of known PCB traces or presence—such as in air, parks, streets, buildings, beaches, water, markets, and fish and other foods. (We need to treat this similarly to the warning signs on cigarettes.) The knowledge of the presence of PCB's in breast milk must also be imparted to hospitals and new mothers—if all of these warnings were posted with addresses of persons to write, people would be concerned and would know their opinions and concerns are important. I disagree with Dr. Muir's concern over industry—he is compromising by his "philosophical" remarks. As we see Dow, Corning, and Shell have a new product (we are not so entrenched that we must consider economic factors of companies). Relocate company personnel, reeducate personnel to new job, retread personnel, computerize information, and compare notes industry to industry. After all, none of our businesses were in business 100 years ago (in the same States they are in today) so let us gear for change and not allow any industries dangerous ecologically or environmentally.

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LETTER TO CONFERENCE ON POLYCHLORINATED BIPHENYLS

Susan E. Caswell
Friends of the Earth, Madison, Wisconsin

November 19, 1975

I am sending this statement to the Environmental Protection Agency technical conference on polychlorinated biphenyls for the 200 members of the Madison, Wisconsin, branch of Friends of the Earth. We are deeply concerned about the growing PCB contamination of rivers and lakes in the Midwest and throughout the country. We are particularly disturbed by the apparent high levels of these chemicals in fish and fowl taken from Lake Michigan and from the Upper Mississippi River.

Both of these great bodies of water have been major sources for recreational and commercial fishing in the Midwest and provide the municipal water supplies for many communities. It seems to us that irreparable harm has already been done to the sport and commercial fishing industries which utilize these water resources and that a very real threat exists to the health of persons ingesting PCB contaminated fish and fowl or drinking from PCB contaminated waters.

We feel that scientific studies have proven the toxicity of PCBs to a wide variety of wildlife including primates even at levels below the standards set by the Federal Drug Administration. That they are also toxic to man has been shown by the tragic Japanese experience.

The fact that polychlorinated biphenyls are virtually indestructible by ordinary chemical or microbial processes means that they will persist in the environment for all time, and since their uses in industry are so diverse and widespread, the possibility for environmental contamination seems to us to be even more serious in the long run than the analogous situation with DDT. Indeed, there is evidence that PCBs are already ubiquitous in the environment—having been detected in the sewage of all major cities, in snow melts, in organisms from the Atlantic Ocean, as well as in fish and sediments of many lakes and rivers.

Therefore, we feel that the time to take effective action on this grave pollution problem is long past due. We favor an outright Congressional ban on production and use of PCB's, but in the meantime, we call on the Environmental Protection Agency to develop a comprehensive monitoring program for identifying sources of PCB pollution of Lake Michigan and the Upper Mississippi River as well as other lakes and rivers and immediately begin to exercise its authority under the Water Pollution Control Act of 1972 to regulate or eliminate PCB discharges. Thank you.

/s/ Susan E. Caswell
Friends of the Earth
Madison, Wisconsin

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LETTER TO THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY

Mrs. Meredith C. Tucker

September 8, 1975

Russell Train, Administrator
U.S. Environmental Protection Agency
Waterside Mall
Washington, D.C.

Dear Mr. Train:

We are most concerned with the lack of action the EPA is taking with regard to PCB pollution in Lake Michigan and other waterways. The seriousness of PCB pollution has been well known since 1972, yet nothing has been done to control the release of PCB's into the environment.

It seems clear that Monsanto Company is not going to voluntarily withdraw the chemical from the market; nor are imports of PCB's going to cease through informing industrial users about chemical concentrations in our water. Much stronger enforcement measures are needed.

Banning the use of PCB's clearly seems to be the only real solution to the problem. Since substitute chemicals are available for all uses of polychlorinated biphenyls, banning PCB's should present no real hardship.

As a first step toward eliminating PCB's from Lake Michigan and other water sources, we advocate participation in the National Conference on PCB's. Industrial users should be alerted to the dangers of PCB's and to alternative chemicals they could use. In addition, the public should be aware of the dangers the chemical poses in use or through human consumption of fish and water.

We urge you to take strong and immediate action to eliminate the environmental pollution of PCB's. Thank you for your attention to this matter.

Sincerely,

/s/ Meredith C. Tucker (Mrs.)
Pesticide Control Committee
Chicagoland Chapter
Friends of the Earth
498 N. Inverway Road
Inverness, Palatine
Illinois 60067

cc: Senator Percy
Senator Stevenson
Lake Mich. Fed.

MCNS 065057

LETTER TO LAKE MICHIGAN FEDERATION

Chairperson, Pesticide Committee
Knob & Valley Audobon Society of Southern Indiana

November 17, 1975

Lake Michigan Federation
53 W. Jackson
Chicago, Illinois 60604

Dear Sirs,

By unanimous decision the Knob & Valley Audobon Society of Southern Indiana voted to advocate the ban of PCB's or the severe restriction of their use. This recommendation is based on several factors:

1. The permanent nature of PCB'S. They are not biodegradable and are stable to heat making them very difficult to be destroyed.
2. The high levels of PCB's already found in fish in the Hudson River, Lake Michigan, and other bodies of water.
3. The toxic nature of PCB's to human life.

If possible please have our position presented at the EPA conference in Chicago.

Sincerely,

/s/ Chairperson, Pesticide Committee
Box 237
Lanesville, Indiana 47136

LETTER TO THE ENVIRONMENTAL PROTECTION AGENCY, REGION V

Douglas V. Whitesides, Jr.

November 16, 1975

U.S. – EPA, Region V
Chicago, Illinois

Re: PCB Problem Conference
November 19-20-21, 1975, Chicago, Illinois

Gentlemen:

Due to the buildup of PCB's (polychlorinated biphenyls) in the environment and the serious problems caused by this material, I believe that its manufacture and use should be completely banned immediately.

Surely the world will be a much better place without this extremely environmentally degrading substance.

Thank you,

/s/ Douglas V. Whitesides
Rt. 1, Box 296
Lanesville, Indiana 47136

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