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Energy, Natural Resources, and the Environment
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Our society and its technology have brought us into a very peculiar relationship with our environment. We have developed a huge, and increasing, body of products and processes which are used by consumers and thrown away by consumers, but we have just begun to learn how to throw them away without threat to our health or our environment. We have tended to act in the belief that the world is flat, and that a waste product, once thrown away, will drift to the edge of the world and fall off into space, never to reappear.

We are, however, beginning to believe that the world is round, and that throwing something away does not make it disappear. The tons of unburned hydrocarbons, oxides of nitrogen, and lead thrown away from our automobiles will be controlled, partly by improved waste treatment at the point of discharge, and partly by eliminating from the fuel the non-essential additives. The discharge of tons of phosphates, which has increased the rate of eutrophication of many of our waters, will be controlled by limiting the phosphates entering the treatment plant, and by improved waste treatment. This general approach of better treatment of discharge streams coupled with limitation of the total quantity of pollutants entering the treatment system, offers great promise for the preservation, and perhaps eventual reclamation, of the environment.

Existing laws have tended to concentrate largely on industrial discharges and on a few specific major pollutants. A wide variety of products containing potential environmental pollutants reach individual consumers and are disposed of by them, and such disposal is largely unregulated. I will confine my specific remarks to mercury, for which I have data, but the problem is of course not confined to mercury.

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At the time this subcommittee had hearings last spring and summer on The Effects of Mercury on Man and the Environment, the major source of waste mercury to the environment was the chlor-alkali industry, which was losing mercury to air and water at the rate of 500 tons per year, about four tenths of a pound per ton of chlorine produced. The most recent figures I have seen indicate that this loss has been cut to about two hundredths of a pound per ton, a twentieth of the former rate. Direct discharge of mercury to the waters has been cut even further, and is now measured in pounds per day rather than thousands of pounds per day.

The second largest use of mercury is in electrical products, and about 500 tons is used annually in making batteries. How is this 500 tons of mercury thrown away when the batteries are burned out? Most probably goes to dumps or landfills where the cases eventually corrode away and the mercury is released to contaminate the groundwater. Some of the batteries are burned, and their mercury is added to the atmospheric burden. The annual disposal of 500 tons of mercury by the chloralkali industry has been controlled; the annual disposal of 500 tons of mercury by consumers of mercury batteries has not been controlled. Surely mercury batteries are very fine gadgets, and everyone should have some. Their use presents minimal health or environmental hazard, but their disposal does. We need leadership in developing reclamation procedures for these products, and we need regulations preventing careless disposal.

Most other uses of mercury are small, involving tens or at most a few hundred tons, and the industrial discharges associated with these uses are already subject to regulation. However, a significant fraction of this mercury ends up in consumer products, to be thrown away by the consumer. I have in the past estimated that two to three hundred tons of mercury are discharged into the environment each year through disposal of consumer goods, about half to the atmosphere and half to the waters. This estimate was based on tabulations of the uses of mercury, and also indicated that a city of a million people would annually discharge into its sewers about 1000 pounds of mercury.

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This mercury is in part removed by the sewage treatment plant, and the balance is discharged into some water body.

I have since made a few measurements, to check the estimate. The Holland Michigan treatment plant serves about 30,000 people and handles only domestic wastes. Over a tne-day period last month, mercury entered the plant at an average rate of 27 grams per day, or 22 pounds per year. This would correspond to 750 pounds per year per million population. The Grand Rapids Michigan treatment plant serves about a quarter of a million people, and handles both domestic and industrial wastes. Over the same period, mercury entered this plant at a rate of 360 grams per day, or 290 pounds per year. This would correspond to 1100 pounds per year per million population. Significantly, the rate of discharge was highest on the weekend, when industrial activity is at a minimum. Treatment of the influent removed, on the average, only about one quarter of the mercury. The balance was discharged to rivers. The Lake Michigan water which enters these cities contains mercury at a concentration of about 0.02 ppb, so the entering waters contain less than half a pound of mercury per year for Holland, and less than 2 pounds for Grand Rapids.

The results indicate that the earlier estimate was close, and that non-manufacturing uses of mercury do lead to significant discharges. Where does this mercury come from? Hospital and college laboratories are a source. Mercury-containing pharmaceuticals are a source. Paint brushes and paint rags are washed out, and this is a source. In a recent report to the Michigan House of Representatives Dr. Frank M. D'ltri of Michigan State University listed some of the many uses of mercury. He states

"...mercury and especially the phenylmercurials have been used as preservatives or fungistats in consumer and industrial products such as floor waxes, furniture polishes, fabric softeners, air conditioner filters, toothbrushes, mattress inner components, cellulose sponges, rope, canvas, drywall products, wall plaster, adhesives, scatter rugs, brooms, furniture polishing rags, dust mops, and a variety of dust

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control preparations. And mercury is commonly used as an antimicrobial agent in many consumer products manufactured with plastics, rubber, leather, and textile components."

We have analyzed a few of the products listed by D'ltri. All contain mercury in small amounts ranging from 0.3 ppm for a cellulose sponge and a floor wax, to 0.1 ppm in some fabric softeners. The total mercury contained in all the cellulose sponges in the country must be very small, but when added to the mercury in floor wax and fabric softeners, in pharmaceuticals and paints, the total becomes large, and this total is collected from all over the city, combined, and discharged at a point into a water body.

Mercury in these consumer products is of course, quite dilute when discharged, the concentrations being a few parts per billion. In an earlier study involving sewage outfalls discharging into the ocean, I found that the sediments around these outfalls do concentrate the mercury, and the organisms living in such sediments do show higher body burdens of mercury. In other words, mercury acts like mercury, regardless of the source and concentration.

If my data for western Michigan can be extended, then the Detroit area with a population of about three million, annually discharges about 3000 pounds of mercury into the troubled waters of the Midwest; This is about 8 pounds per day. A chlor-alkali plant with this discharge would be shut down quickly under the 1899 Refuse Act, but the mercury coming from the sewage outfalls is specifically exempted from action under this act.

Much of what I have said about mercury is true, at least in a general way, of other environmental hazards. They occur in small amounts in a wide variety of consumer goods, the quantity in each class of consumer goods is quite small, but the total quantity, when collected, combined, and discharged, may be very large.

We need to extend our efforts in environmental protection to include those goods

not now regulated. We need to evaluate new chemical products, and to re-evaluate old ones, to find out whether, or when, they endanger the environment. Environmentally hazardous substances should not be used unless there is no substitute. If there is no substitute, then the disposal of these substances must be regulated, and the total quantity in circulation must be limited.

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