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COMMITTEE NOTICE

TO: MEMBERS OF THE SENATE HEALTH COMMITTEE
FROM: SENATOR JACK SINAGRA, CHAIRMAN
SUBJECT: COMMITTEE MEETING - January 17, 1995

The public may address comments and questions to Eleanor H. Seel, Committee Aide, or make scheduling inquiries to Sophia Love, secretary, at (609) 292-1646.

The Senate Health Committee will meet on Tuesday, January 17, 1995 at 10:00 AM in Committee Room 7, Legislative Office Building, Trenton, New Jersey.

The committee will hear testimony from invited speakers on the topic of the health effects of mercury contamination in our environment and in our food.

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Assistive listening devices available upon 24 hours prior notice to the committee aide(s) listed above

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SENATOR JACK SINAGRA (Chairman): We might as well get started. Good morning everyone. I called this meeting on mercury for a host of reasons. Number one, I don't feel that we have adequately, either informed the public, or addressed the issue of mercury poisoning.

I have some ideas, and the reason I want testimony today is I intend to put in a piece of legislation that will be the Mercury Poison Prevention Act. There are two things that jump off from both reading the papers and reading information from both the Department of Environmental Protection and the Department of Health I think, certainly, need to be addressed.

Number one, in New Jersey, everyone in order to fish in fresh water needs a license. I think it would be the most cost-effective and best way of communication if we gave adequate warning to those, who on an annual basis, go out and take a license.

Presently, the only notification when someone gets a license -- we just did this ourselves yesterday -- is they get the "Fish and Wildlife Digest." Quite frankly, and I think most of the professionals will agree, very few people read it. They go and get their license and they may skim through it, but I don't believe that the advisory in here is an adequate warning to those who take a license out.

So, at the very least, in this Act I intend to introduce, it will be required to have a separate warning that everyone would receive, that would certainly draw attention to the problem when they take a fishing license out.

Also, one thing that makes sense looking at the population that is affected, and those most vulnerable are children and pregnant women, I would recommend and put in this Act -- and, hopefully, pass in this Committee -- that all pediatric and obstetric offices in New Jersey be posted with a

warning to their patients, that it be clearly posted in all those offices as long as the problem exists.

So those are bases for which I intend to draw legislation and today's testimony will, hopefully, give us more insight into some other things we might be able to do in order to address this problem.

Having said all of that, our first testimony will be from Dr. Gochfeld.

Good morning.

SENATOR SINGER: Good morning, Jack.

SENATOR SINAGRA: Good morning, nice of you to come.

M I C H A E L G O C H F E L D, M.D., Ph.D.: Thank you, Senator.

If I may take the liberty, Dr. Joanna Burger, who is my colleague and spouse, was also invited but was unable to attend because this is the first day of classes -- so she couldn't very well make other arrangements -- but she did give me some comments which, with your permission, I'll briefly summarize and then leave with you.

Dr. Burger is a professor of ecology at Rutgers University and for 14 years was the director of their graduate program. Her work is largely in the area of the behavioral effects of low levels of heavy metals, particularly lead and mercury and also environmental biomonitoring.

She says she is "disappointed that an academic conflict precluded making a personal presentation." She recently had the good fortune to participate in an international conference on organic mercury poisoning which called attention to the global problem of mercury, which, contrary to what most of us believed a few years ago, is accelerating rather than declining.

Almost as with lead, where we thought in the '70s that lead poisoning was under control and it wasn't until the mid '80s that we realized there was still lead exposure going on in

the inner cities, many of us thought that mercury was under control. But, in fact, there is an increasing amount of mercury exploitation worldwide.

"The oft-heard statement that -- and I'm quoting now from her remarks -- much of the mercury to which we are exposed is of natural origin is misleading. Because, of course, all of the mercury is of natural origin, but it tends to stay put in the soil until disrupted, primarily by human activities.

"These activities include both industrial activities, incineration, combustion activities, and now, on a worldwide basis, gold mining.

"New Jersey had quite a bit of mercury industry until about the 1970s, when, for a variety of reasons -- primarily economic -- they closed down and moved away, one of which left a legacy of mercury pollution in the Meadowlands second only to that at Oak Ridge, Tennessee."

She lists here a number of the sources, which I'm sure you're familiar with, as to where mercury is found in commerce. Other places with which we're concerned for mercury exposure include the release from coal-fired power plants, from incinerators of all sorts, not just municipal incinerators, and also hazardous waste sites of which New Jersey is unusually well-endowed. There are consumer uses, some of these are accidental and, in a few cases, intentional.

Some of you may have read about the mercury exposure that occurred at a Florida university when two students stole some mercury and distributed for amusement around a dormitory.

She mentions something about the global transport of mercury and, particularly, the increasing amount of mercury released into the environment by gold mining activities in the former Socialist countries, which now have all these new entrepreneurs who are going out and mining gold and using mercury amalgamation as the technique.

There is not much we can do about that, obviously, in New Jersey. But we certainly need to understand the relative contribution of global inputs from other parts of the world versus our indigenous inputs from industrial and former industrial sites, from combustion sources, and from other sources.

One of the areas in which she has done a lot of research -- I won't read all the details -- is in the area of how much fish fishermen eat and what they do with it. This is based on studies both in Puerto Rico, New York, and New Jersey.

What she has found, and what other people have reported, is that although the EPA estimate of how much fish people consume is okay for the average person -- for most of us -- there is a significant subset of the population which consumes far more fish than the "average." Most of us eat maybe one fish meal a week or one or two a month, but there are people even in New Jersey who eat fish once or twice a day and some of these are fish they catch themselves, sometimes in waters which we all think of as polluted and unhealthful.

So it is important to understand the subset of the population that is at the greatest risk of exposure. I'm not talking now about health effects. We believe that as far as organic mercury exposure is concerned -- and I'll elaborate on that in my remarks -- fish are the primary source, the source of greatest importance. So we have to be concerned with identifying and reaching out to those people who are most likely to have that exposure.

I think, Senator, that goes to your introductory remarks of making sure the advisories are what we might call user-friendly.

We're not even talking now about language. Because, of course, many of the subsistence fishermen are not primarily English speaking, so that is a challenge as well.

Finally, she wanted to encourage the State and, particularly, the DEP to continue to investigate the issues of the transport and distribution of mercury. We know a lot about the health effects, but how mercury behaves in the environment, how it reaches the fish, for example, and maybe at what points one could interdict it, are really areas where further study is required.

There are some surprises that have come out of recent work, one of which is the fact that there is methylmercury, organic mercury, in the atmospheric transport. It used to be thought that that couldn't happen. But, in fact, in measurements that have been made both in Europe and the United States, about 1 percent of the mercury that reaches us -- or, I suppose, that leaves New Jersey and goes elsewhere -- is in the methyl form already.

There may be other surprises that await us in adequately protecting our environment and our public health. These require eternal vigilance on the part of our agencies and academic scientists.

So I'll leave with you her remarks and I'll proceed now to my own.

I'm Michael Gochfeld. I'm a clinical professor of occupational and environmental medicine at the Robert Wood Johnson Medical School and part of the Environmental and Occupational Health Sciences Institute.

I began working with mercury actually in New Jersey in the late 1960s as a physician dealing with workers who worked in those factories that manufactured mercurial products, mainly for paints.

It was suggested that I make some remarks about the different mercury compounds and the health effects related to each. A lot of this is well-known, but I'm going to sort of say it from a medical, from a clinical perspective and also make remarks from a toxicological perspective.

Mercury comes in several different forms. In the earth's crust it's in an inorganic form, usually cinnabar, which is a beautiful red ore of mercury sulfide. That is one of the inorganic forms. From that we extract or refine the metallic mercury, which we're familiar with as quick silver. It is a liquid at room temperature and it volatilizes -- that is the mercury vapors evaporate at room temperature even without heating. That is the primary form that enters commerce.

It is very important because from an occupational perspective that is where a lot of the exposures take place. We've even had a couple of household exposures of note in New Jersey where children have brought home this metal, left it on their nightstand, it evaporated over time, and they became symptomatic.

But in a way, the very rarity of that event highlights the fact that inorganic mercury poisoning is primarily an occupational health concern. Of course, as an occupational physician, I instruct our trainees in how to recognize it and how to prevent it.

From a community, from a populationwide perspective, we're mainly concerned with organic mercury poisoning. Among the organic mercury compounds, the most prevalent, the most important, and the most toxic is methylmercury, but it is not the only one.

For example, in New Jersey, we used to manufacture something called Phenylmercuric Acetate, which was added to paint to put on the bottom of boats so that nothing would live on it, so that barnacles wouldn't grow on it. We called these antifouling paints. New Jersey was one of the important manufacturing sites for this additive.

In the '70s, when it was recognized that organic mercury compounds bioaccumulated and were toxic to aquatic organisms -- no surprise, you'll understand, since it was used to poison aquatic organisms -- they substituted other compounds.

Today, the most common one is an organic tin compound which we call tributyl tin. It also is highly toxic to aquatic organisms, but its effect on humans is not nearly as well understood, and it hasn't caused, as far as we know, any outbreaks.

Back in the 1950s, in Japan, there were outbreaks of a mysterious disease which we now know was methylmercury poisoning, or Minamata disease. In adults, they developed tingling sensations, pins and needles, visual disturbances, that is they got tunnel vision, they couldn't see to the sides. Their hearing was impaired. They couldn't taste. Their speech became slurred. They had difficulty chewing. In the severe cases, it progressed to coma, convulsions, and, in a few cases, death.

It took a while to pin this down to methylmercury, and it took even longer to figure out that the methylmercury was actually being formed from mercury that was emitted from an industry. The effluent went out into a bay, as has been done all over the world, but bacteria in the bottom of that bay converted the inorganic mercury to methylmercury.

We now know that is a very widespread occurrence and that bacteria of many nationalities are capable of methylating mercury. We know that goes on in waters here in New Jersey and elsewhere. We actually have a biologist at Rutgers who has studied that process quite extensively, Dr. Bartha.

What is really of greater concern to us today, I think, is what the effects of the mercury are not on the adult but on the developing fetus and, particularly, on the developing fetal nervous system.

It produced in Japan a syndrome which we call congenital Minamata disease and not a very pretty picture of children in the most severe cases being born blind, deaf, paralyzed, and severely mentally retarded. Sort of the most severe kind of cerebral palsy that one can imagine. We know

that occurred from in utero exposure to methylmercury ingested by the mothers. I guess I should add that this was a population that ate fish very frequently, so it had a very high exposure to methylmercury.

We don't expect to ever see that kind of syndrome in New Jersey. It requires much too high a level of exposure. It would be very, very surprising if we saw a congenital Minamata full blown here in New Jersey.

But more recent research has demonstrated that this is a spectrum. At the low end of the spectrum, as we've learned with lead, are children who may have slight impairment in their ability to learn, perhaps in their school performance, perhaps in fine motor tasks.

We don't really understand at all the prevalence of that condition or the doses at which it's produced. That is an area of study that really is progressing worldwide. There are a number of studies going on in different fish eating communities around the world that are trying to establish what we call a dose response relationship between mercury and the most subtle effects.

But these are clearly the effects that would concern us in New Jersey if we have pregnant women who consume, either during pregnancy or even before pregnancy, substantial amounts of fish that are contaminated with methylmercury. We do not have good quantitative estimates on how much mercury will produce this syndrome, but we don't have any basis for complacency, certainly.

It's disappointing to me that at this recent workshop the Japanese presenters made it clear that Japan neglected to study this population and to identify the levels at which more subtle defects occurred. So we don't have information that might really have helped us interpret what goes on in New Jersey.

As you've read no doubt in the press, organic mercury does something called bioaccumulation and bioamplification. It does this by virtue of being lipid soluble. Such that, although you might have minuscule concentrations in the water, the minute, microscopic organisms in the water that consume the water actually extract the mercury from the water and deposit it in their tissues. They're then eaten by, let's say, a shrimp and the shrimp does the same thing. It extracts the mercury from its prey and stores it in its tissues. Then they're eaten by a small fish, which are eaten by bigger fish, and so on up the food chain; every level accumulating a higher concentration, not merely a larger total amount but a higher concentration than the levels below it on the food chain.

So this is the basis, this bioamplification, for suspecting that humans may have much higher exposure than one might imagine simply if one were going out and sampling the amount of mercury in water or in sediment. This is clearly an area that requires further understanding.

Now, I have prepared some brief descriptions, that I won't read to you, of a little bit more about the different compounds. I think we have a pretty good idea of the toxicity of the different mercury compounds to humans, to adults, certainly, a little less good as far as the developing fetus, but we know that that is the most vulnerable life stage. So in a risk assessment that is the end point that we want to use. What are the possible impacts on a developing infant?

Now, one can have a highly toxic material, like methylmercury, and it is entirely possible that if no one was exposed there wouldn't be any risk. So it is really our job, as health professionals, to get a better handle on the amount of exposure.

With that in mind, we are undertaking a study in New Jersey in which we're going to try to recruit 300 women early in pregnancy to understand their diet, as well as other possible

sources of mercury that they might be exposed to, some of them, perhaps, occupationally. Also, we'll be sampling their blood and hair and actually measuring the total mercury and methylmercury in order to understand the extent to which they may be exposed. This, I think, will give us a much better handle on the prevalence of mercury exposure in the general population.

We're also going to try to do a special subset in which we're going to deliberately target those who might have the highest exposures so we won't miss them in our general survey. I'll leave you a brief description of that project.

I'll be happy to answer questions about specific aspects of the toxicity of mercury. I should say that with regard to inorganic mercury, I've heard remarks -- not necessarily here, but in the newspapers -- about, "There is good mercury and there is bad mercury. Methylmercury is the bad mercury." I want to know: What's the good mercury?

Inorganic mercury is a toxic material. Lots of people have been poisoned by inorganic mercury. In fact, in terms of throughout the course of history, inorganic mercury was well-described in Roman times in slaves who were often chained to the walls of mines to hack away at the rock and extract this material.

Inorganic mercury was well-known to cause neurological symptoms, tremors, incoordination, abnormal gait, some of the same things that methylmercury causes, although not quite as potent. It is also highly toxic to the kidney. So toxic, that when I was in medical school, we used to use it regularly to relieve people in heart failure. We could give people an injection of a mercury diuretic and within about five minutes there would be a massive outpouring of urine because we'd simply prevented the kidney from doing its job. Obviously, in people who have mercury poisoning it's not a deliberate effect, but it can also damage the kidney and interfere with its function.

So I don't think we want to exonerate, in any way, shape, or form, inorganic mercury. Inorganic mercury is often the item that is first released to the environment which is later converted to organic mercury.

Before taking some questions, I'd like to make some remarks about some unique things about New Jersey and remind people that New Jersey really is a special State. We're small in size but highly populous. We're the most densely populated state, number one. In fact, some areas of northern New Jersey I've checked recently are among the most densely populated areas in the world.

So, when we hear remarks in the newspaper about, "Why should New Jersey have more rigorous environmental regulations than the nation as a whole," I think the answers are clear. We're a very different State and we really need to protect ourselves more. We have to do it sensibly and it has to be scientifically based. I think New Jersey has been very fortunate.

You know, when I was growing up, New Jersey used to parasitize Philadelphia and New York for its biomedical science. In the last 20 years we've turned that around. We've got, between Rutgers and UMDNJ, two world-class research institutions. The Departments of Health and Environmental Protection have both built up research areas: the Office of Science and Research, and the Division that I briefly headed of Environmental and Occupational Health. Both have really contributed a lot toward our understanding of environmental hazards in New Jersey.

I'm very concerned about recent rumors that funding for these efforts are in jeopardy. I think that is very shortsighted, sort of penny-wise and pound-foolish. I think the nation has learned to look to New Jersey for leadership in the area of environmental research, environmental regulation, hazardous waste, and risk assessment. I think it's really

important not just for mercury but for all the other contaminants we have to deal with that these efforts be protected and even expanded.

I'll be happy to answer any questions regarding mercury or anything else.

SENATOR SINAGRA: The one question I have is: I understand the relationship between mercury and pregnant women and also children, and I notice that all the advisories are to adults also on not eating more than four ounces every two weeks of certain fishes, what is the effect in adults, Doctor?

DR. GOCHFELD: The effects of organic mercury?

SENATOR SINAGRA: Right.

DR. GOCHFELD: Again, any health effect, whether it becomes manifest or not, depends on the dose that the body accumulates and the period of time over which it accumulates.

If we were to eat a large amount of fish that had a large amount of mercury contamination, we would very quickly develop and exceed a toxic threshold and begin to manifest symptoms.

The first symptom would probably be tingling in the fingers and lips, slurring of speech, and maybe difficulty in swallowing. Now, whether we get to that level depends on two things, the concentration in the fish and the frequency or the amount that we consume. I suppose that's three things.

We can reduce that risk by identifying which fish or bodies of water have the contamination, and keep people away from them either voluntarily or otherwise, or by encouraging people to consume fish less often or in lower quantities.

Now, remember the counterpoint is that there are a whole lot of people out there saying, "You should eat more fish. That is a good thing in the diet." So we do have to balance the fact that there are benefits to fish, and we'd like to retain those benefits without the offsetting exposure to mercury.

We can do that by knowing which fish are more or less likely to have high levels of mercury. Now, we can learn that in two ways, really. We can do repeated monitoring of our fish supply, that is both what is caught and brought into our markets, and actually have announcements as to what our fish supply looks like -- someone was just showing me a newspaper article which did that very attractively -- or we can make generalizations about the kinds of fish that are likely to accumulate high levels of mercury.

It's no surprise, from our bioamplification, that the fish that are highest on the food chain -- the predatory fish like shark, swordfish, and tuna -- are, just as a blanket guess, going to have higher levels than those that are low on the food chain like sunfish or, what I like to get at our local market, tilapia, which is a farm-raised fish that is a vegetarian and is very low on the food chain.

We had the opportunity to study that fish at a Puerto Rican hazardous waste site that was contaminated by organic mercury, and we found that fish had very low levels of mercury even in a questionable environment. So we can make biological inferences, and we can also complement those by actual analytical monitoring of the food source.

This is done, as you know, by the FDA but on a fairly, how should I say, only a very small part of the food source actually gets monitored in any given year.

SENATOR SINAGRA: Senator Singer, do you have any questions? (negative response)

Thank you, Doctor.

Leslie McGeorge.

If you have time and would like to stay, Doctor--

DR. GOCHFELD: I unfortunately have to be back for a meeting at noon, but I would be happy if you have another time that you would like to meet.

SENATOR SINAGRA: Thank you.

A S S T. D I R E C T O R L E S L I E M C G E O R G E:

Good morning.

SENATOR SINAGRA: Good morning.

ASST. DIRECTOR McGEORGE: Thank you for the opportunity to speak with you today on the issue of environmental mercury. Copies of my testimony are available to you if you're interested up at the front of the table.

I'm Leslie McGeorge. I'm the Assistant Director for the Environmental Research and Health Assessment element within the Division of Science and Research in the New Jersey DEP. Dr. Robert Tucker, who is in the back of the room, is the Director of this Division and is with us here today.

DSR provides the Science foundation for the DEP's programs and conducts research programs to address New Jersey-specific environmental issues such as the occurrence of mercury in various components of our environment. DSR scientists also provide the State with health assessments of environmental contaminants such as mercury.

Environmental mercury studies in the past few years have become a focal point of a significant portion of what our Division is doing in the Department. Indeed, these activities have consumed the majority of our increasingly limited research budget for environmental studies.

I'd like to talk to you this morning about four major areas regarding environmental mercury. First of all -- and Dr. Gochfeld has covered a number of these issues -- what is mercury and what is important to know in terms of environmental contamination?

Why is mercury receiving attention today not only in New Jersey but also in the region, nation, and globally?

What are our two primary environmental health concerns in this State regarding mercury?

Why is the DEP, in particular the Division of Science and Research-- What are we doing about developing accurate

information regarding this environmental contaminate, so that we can develop sound policy based on this information?

To the first of these four areas -- what is mercury -- I'd like to cover five points. It is a metal -- you heard Dr. Gochfeld talk about this -- as such, it's an element that does not degrade in the environment. It can move around in the environment. It is transformed from one form to another, but it does not degrade such as other contaminants you're familiar with like benzene, for instance. It occurs naturally, but it is also released into the environment through man's activities.

Mary Shiel is here, from our Office of Legislative Affairs, to talk to you a little bit more about what we know about the sources of mercury in New Jersey's environment, as well as in the rest of the nation.

Thirdly, it's transported easily in the environment from one medium to another. As Dr. Gochfeld mentioned, the element and many of its compounds are volatile and can be transported long distances in the atmosphere. Therefore, releases of mercury into the air can contaminate soils, lakes, sediments, and, ultimately, fish. This is not a site-specific type of contaminant issue. It is a widespread contaminant.

As Dr. Gochfeld has mentioned, all forms of mercury have long been known to be toxic to humans, as well as to elements of our ecosystem. Dr. Gochfeld mentioned the primary effects are on the nervous system and on the kidney. He also discussed with you the fact that there are three general forms of mercury.

Elemental mercury, which he mentioned, is the type of mercury that is found in silver-bulb thermometers and that has, primarily, nervous system effects. This type of mercury is rarely found in the environment at health significant levels. I won't be discussing that further.

The other two forms of mercury-- Other inorganic forms, such as mercury salt, the primary concern is through

ingestion. The primary health effect of concern, as Dr. Gochfeld mentioned, is on the kidney. This is the form that we are finding in New Jersey's groundwater, the inorganic salt form of mercury.

The third form of mercury, organic mercury, the primary concern is methylmercury, which is the most important type of mercury from a human/environmental exposure standpoint. Concern here, again, is through ingestion. In adults, Dr. Gochfeld mentioned, the fact that low levels of exposure can result in effects on the nervous system. The fetus, again, as you know, is believed to be the most sensitive to exposure to methylmercury.

The mercury found in fish tissue is almost exclusively methylmercury. There has been some debate regarding that, but, indeed, that is the case. This is the form we are talking about. When we talk about fish advisories, we're talking about methylmercury.

Mercury converts from one form to another in the environment. Again, the most significant conversion is from inorganic mercury to methylmercury in the food chain. The levels in fish tissue may be as great as a million times higher than the levels you might find in the water in a lake. So there is a very significant increase in the levels that you would see in fish tissue versus what you would see in the water.

The second general area I want to discuss with you today is: Why is mercury receiving attention now? It is generally recognized as being one of the major environmental contamination issues in this country and around the world. I think this is because of the convergence of a number of factors.

First, there is more data available on human health effects. Dr. Gochfeld mentioned the poisoning incidents in Japan. There has also been one in Iraq and these have produced severe effects. There is growing discussion in the literature of subtle developmental effects on the fetus.

In one estimate, that has been provided by one of our scientists, Dr. Alan Stern, who is with us today, is that an effective dose might be as low -- for these types of subtle effects on the fetus -- of only 43 micrograms per day, which is a relatively low dose.

Another reason why we're focusing our attention now on this issue is that we're testing more. We're testing more, other entities are testing more. We also have more accurate techniques and more sensitive techniques to look for mercury in our environment, which is important when we're looking at the water column, for instance. We're talking about parts per trillion levels, not parts per billion or million levels. So we're improving our testing techniques and we are testing more. Particularly, fish tissue is being tested more frequently across the nation.

Another reason why this is receiving attention is there is evidence that mercury levels in the environment, at least some components of the environment, are increasing. This evidence is in regard to global atmospheric levels, as well as sediment levels in some of the lakes in North America.

Again, there is more information coming in regarding wildlife effects. There is a lot more attention to emission source characterization. Of particular note here in New Jersey, there has been concern expressed regarding municipal solid waste incinerators as sources of atmospheric contributions of mercury.

Finally, in our State two areas have drawn attention to this issue. Groundwater contamination in South Jersey and contamination of fish, which in some cases has exceeded Federal action levels. So all of these factors, I believe, have converged and increased our attention to this particular environmental contaminant.

The third area: What are the two issues of greatest potential concern resulting from environmental exposure in our State? There are two. One, you've heard about already and

you're aware of, that regards fish. The only significant source of human exposure to methylmercury is through the ingestion of fish. Again, virtually all the mercury in fish is methylmercury. Most of our citizens do not appear to be at risk from this mercury exposure route, but our greatest concern, again, is fetuses through maternal consumption of fish.

An important step in determining whether this is a problem is to find out what the mercury levels in fish are and how much fish is being consumed. No Statewide data were available before we began a study on this issue for our fresh water fish species.

The second area of concern for environmental health regarding mercury in our State is groundwater, something that has received a little bit less attention than the fish issue. But since the late 1980s, there has been an increasing amount of data available that private wells that draw their water from the Kirkwood-Cohansey aquifer in South Jersey have levels of mercury that exceed the Federal and State drinking water standard of two parts per billion.

We know of approximately 300 wells at this time that have levels greater than the standard. This aquifer is a very important drinking water aquifer for the State. There are over 300 public supply wells in this aquifer and an estimated 100,000 private wells drawing their drinking water from this supply.

Values as high as 42 parts per billion have been reported in these private wells. That is over 20 times the standard. This is a geographically extensive problem. We're not aware of any other states that have seen a problem with mercury in groundwater at these levels and to this extent.

I should mention that as this problem is being uncovered, the homeowners are being provided assistance with point-of-entry treatment units to reduce their exposure to mercury. But we are concerned about the extent of this issue.

The form of mercury in the groundwater, again, is the inorganic form.

The fourth area I want to discuss with you is: What is the DEP and the Division of Science and Research doing to obtain accurate scientific information about mercury in our environment?

We've done a number of research projects, as well as technical evaluations. We have put on symposium on this issue and our scientists have participated in national peer review committees on environmental mercury. We began our work in '91 on this issue.

I have a handout for you listing what the research projects regarding mercury have been in the last four years. I'm just going to cover a few of notable ones in each of these years and give you some chronological understanding of where we were and where we are going here.

In '91, we started looking at the issue of mercury contamination in fish by issuing a request for research proposals on mercury in New Jersey's fresh water fish.

In terms of groundwater, there were two major efforts in this year. First, the Division of Science and Research's geological survey investigated whether or not the mercury that was being found in the groundwater was naturally occurring or was the result of man's activities.

A report was produced, which is available, looking at the natural sources of mercury in this aquifer. This report concluded that natural contributions of mercury in our groundwater in South Jersey could not solely account for the elevated levels reported. So this is something that is influenced by man's activities. We're not certain, at this time, exactly what all of those sources might be.

Second, regarding groundwater, we initiated a project to determine what the form of the mercury in the groundwater was. We have a research project summary, also available to you,

on this that looked at mercury species in groundwater and used advanced analytical techniques to make sure it was mercury we were seeing in the groundwater, because there were questions regarding that. There are a number of analytical interferences that could possibly have led us to believe it was mercury when it was not. Indeed, it is mercury and the form that is being found is inorganic mercury, predominantly, not the organic form which is the more toxic form for ingestion.

In 1992, we initiated a project that I think most of you are familiar with, in terms of looking at mercury in fresh water fish throughout our State. We collected samples, with the Academy of Natural Sciences in Philadelphia, of over 300 fish in 55 of our water bodies. We targeted top predatory fish, large-mouth bass and chain pickerel, because these are those where you're likely to find the highest levels of mercury.

We found 15 water bodies with at least one fish that had mercury levels greater than one part per million, which is the Food and Drug Administration's action level for actions associated with interstate commerce of fish. Our average levels were about .3 or .4 parts per million. We did have one fish that was approximately nine parts per million, which is relatively high. The results of this work were released in February of 1994 and this report is available to you.

In 1992, we also did a project -- or initiated a project -- a multi-year project, with the United States Geological Survey, to try to determine what the sources and the extent of mercury contamination in our groundwater were.

To date, we are aware that this problem effects six of our South Jersey counties. We have data on over 2000 wells. There is a map of some of the sites that we have found to be effected available to you, showing the widespread distribution of this problem.

To date, no known point sources of mercury are present in the vicinity of most of these contaminated wells, leaving

nonpoint sources, such as atmospheric contributions or past agricultural applications as significant possible sources of this problem to the groundwater.

In 1992, the Department also established a Task Force on Mercury Emission Standard Setting. This Task Force was to set standards for municipal solid waste incinerators, involved a significant amount of work by the Division of Science and Research in accumulating what we know about the available occurrence information of mercury in the environment, as well as health assessment investigations.

This Task Force recommended research in a number of areas. One was further look at the mercury levels in our fish. Two was looking at the exposure to the pregnant population in this State, which resulted in the project that Dr. Gochfeld just described to you. Three was looking at what forms are actually being emitted in the stacks of various types of atmospheric sources in our State.

In 1993, there were two major areas of emphasis. One was to start a multimedia investigation of water background levels of mercury associated with the lakes where we found concerns regarding mercury in fish, looking at water column sediments, precipitation. Where does the mercury come from? What are the sources? What are the sinks? This is a project to begin to develop our abilities to identify the answers to those questions. The report on this project is currently undergoing final review and should be available shortly.

Again, some work was done in '93 to establish the acceptable intake of methylmercury for the pregnant population. This work was done by Dr. Alan Stern who published a paper in risk analysis on this issue. He also estimated that a significant portion of the U.S. population could possibly exceed the value that he estimated as an acceptable intake of methylmercury for the pregnant population. That paper is also available for your review.

Last year, 1994, following the receipt of the Academy of Natural Sciences' report on mercury in New Jersey fresh water fish in February, the Division of Science and Research provided this information to the inner-agency committee, called the Toxics in Biota Committee, which is charged with developing fish advisories for the State. This is a DOH, DEP, and DOA agriculture committee.

The Division of Science and Research was responsible for chairing a subcommittee of this group, which developed the framework for the advisories. This was a risk-based, consumption-based framework, and it did provide for additional protection for the at-risk population, pregnant women and children.

These advisories were issued in July of last year for large-mouth bass and chain pickerel, and, in general, the public was advised to eat no more than one meal per week, with the sensitive subpopulation advised to eat no more than one meal per month.

For the Pinelands area, where we had found higher levels in general of mercury in fish, presumably due to the naturally occurring low pH at the lakes in that region, we suggested more restrictive consumption of the fish from those water bodies.

Mr. Jim Blumenstock, Director of the DOH's Consumer Health Services, and Chairperson of the Toxics In Biota Committee will speak to you next regarding more activities of this Committee and all the outreach and communication efforts, which I believe you're particularly interested in, in terms of health advisories.

We also started a follow-up study to look at additional fish species in those lakes where we found the highest levels of mercury in large-mouth bass and chain pickerel in '94, initiated the study on pregnant population exposure levels that Dr. Gochfeld mentioned earlier, and a study to

develop methods to determine the mercury deposition from various atmospheric point sources, such as solid waste incinerators and coal-fired power plants in this State.

In summary, mercury is an important, persistent contaminant that can be toxic at relatively low environmental levels. Our knowledge of mercury as an environmental contaminant is beginning to increase rapidly, as we learn more about its potential effects and apply newly developed testing tools for its detection in the environment.

New Jersey isn't alone in its concern for environmental mercury. It is a global issue. However, we do have evidence that we have some problems with elevated levels of mercury in our fish, as well as some problems with elevated levels in our domestic wells in the Kirkwood-Cohansey aquifer. Although we have initiated a number of efforts to provide New Jersey with a basis for policy making related to this contaminant, much still needs to be done.

Testing of selected fish species could only be conducted in less than 5 percent of our 1200 public access lakes in this State, and little is known about what controls the levels of mercury in the fish. Few data are available on our marine species. In fact, there is no routine monitoring program for contaminants in fish in this State, be it mercury or any type of contaminant.

Atmospheric deposition is know to introduce--

SENATOR SINAGRA: Excuse me, I hate to interrupt you, but why, after 10 minutes of saying what a problem it is and how serious it is, why don't we have more? Is that strictly budgetary?

MS. McGEORGE: To the best of my knowledge, that is a budgetary issue. In approximately 1990, there was specific funding allocation for detection of contaminants in fish. It was provided to the Department of Environmental Protection. It

was a funding allocation of \$100,000 per year. That allocation was eliminated, I believe, in 1990 and it is now zero.

SENATOR SINAGRA: Okay.

MS. McGEORGE: Also, the Division of Science and Research's research budget has been almost eliminated in terms of general State appropriations. That has been a source of research programs to evaluate mercury in fish. Many other states have routine monitoring programs to look at contaminants in fish, we do not.

SENATOR SINAGRA: Did you want to--

SENATOR SINGER: Yes, I have a few questions.

SENATOR SINAGRA: I saw you ready to jump in.

SENATOR SINGER: First of all, Mr. Chairman, forgive me because I'm going to have to leave. The reason being is there was a large ransacking of the Allentown High School in my district, and the Governor and the Attorney General are coming down to take a look at that with me in about an hour and I have to leave for there. But I did have a couple of concerns, and valid concerns.

Number one is: Does anybody pretest the fish prior to stocking the lakes?

MS. McGEORGE: Our Division of Fish, Game, and Wildlife has done that. Particularly, I believe, it is in terms of some trout sampling that they did and has found that the levels are quite low.

SENATOR SINGER: Quite low?

MS. McGEORGE: Yes.

SENATOR SINGER: Did they ever try to track some of them at all, in any form, to see from when we release them to when they're caught as to what the level of mercury from that period is?

MS. McGEORGE: To the best of my knowledge there hasn't been any specific tracking of given fish. But you are right that there could be a concern regarding accumulation once

they are placed into the environment. Levels in trout are generally fairly low compared to what we're talking about here, though, to the best of my knowledge.

SENATOR SINGER: Okay. I'm glad we're at least testing before releasing them into--

MS. McGEORGE: That's a very good question.

SENATOR SINGER: The last point I want to make is on something that has always been, shall I say, a bone in my craw. My county, which I sit on as Secretary/Treasurer of the County Board of Health, is the only county in the State of New Jersey that by ordinance requires that every new well, and every time a home is sold with an existing well, must go through a scan test.

This State still has an antiquated requirement for a bacterial test before a home well or a commercial well -- we're talking about a water supply, but a commercial well for individual use, a restaurant -- does anything more than that. I had a piece of legislation for years -- I never got support from the Department -- to require every county, especially effective in South Jersey, that at least the test required when someone builds a new well or sells a house that has an existing well go through more than just the bacterial test.

You have just stated that in six counties you're aware there is a serious problem with mercury. I'm sure if you want to start testing there is a problem with lead, also, in those same areas. Yet, we have done nothing as a State, nor have you made any requirements or suggestions -- whether it's statute change or not to do anything -- to require homeowners to do more than a basic bacterial test when they drill a new well.

So, in essence, the only time you really find out about it is not because you go out there and do sampling, it's because by chance when someone happens to do some type of test for some reason -- and usually it's because someone says

something tastes bad or something else like that -- do we start to find out there is pollution.

I think you are falling way short to the public and your obligation by not coming together with the Health Department requiring counties for individual wells, as well as construction and selling of new homes, as well as transfer of property when someone has a real estate transaction, to do at least a test for mercury and lead contamination, especially when you're telling us you know there is a problem. This problem can be widespread.

I just built a new home that, unfortunately, has well water because I can't bring in city water. I had to do the scan test. It cost \$250, but at least I know from the day I started my well that I don't have a mercury or lead problem or a lot of other contaminants.

That should be a top priority, to be able to do that. To at least know that people, when they dig a new well, are drinking safe water. We don't do it. You have not mandated it. You have not pushed it -- and I don't mean you per se, I'm talking the Department -- nor has the Department of Health. I think it is 100 percent wrong.

MS. McGEORGE: In response, I would just say I share your concern about private well testing. It is my understanding that historically a lot of those requirements have been with the county or local governments.

One of the reasons we did this study was to gather all the data that was available from county and local governments in one place, so we could see the extent of the problem and if we should require such testing. These reports are coming in scattered from the different counties. We wanted to know what the extent of the problem was, put it all on one geographic information system, mapped, so we could make recommendations for what level of testing should be done.

SENATOR SINGER: If you want to take a look at every major contamination problem we've had in Ocean County, you will see that every one was triggered when someone dug a new well or someone bought a house that had an existing well and had to have the test -- major lead contaminations, and everything else like that. Our county requires it. It is a requirement now of the banks in our county to get a mortgage. We do a termite inspection, but we don't worry to see if the water is safe in that house to drink, which not only affects the--

By the way, as you know, we don't accept treatment for lead and mercury in our county as acceptable. Because you know what happens, people do not maintain those filtering systems. It has always been a major concern of ours. We require them to either dig a deeper well or to find another alternative water source. That is a major problem, you know that.

But at least, I think we should require, and you should ask the Commissioner through your channels, that they make that a priority to see that that is done. The scan test, it's a one-time fee. By the way, it should be done more regularly than that one time, but at least at transfer of houses.

If you want examples of how a county has found pollution problems, just take a look at Ocean County which requires it. Look at the difference prior to our passing that ordinance as to how many problems we had with home wells to after we passed that ordinance. You will see, tremendously, the problems facing that county came up strictly because of that. Because we required that, we saw systematically how, because those tests were taken, we were able to map the problems and, again, solve the problems by extending public water systems and things like that.

People really believe that their well water is safe because they had a bacterial test. That is an easy, easy test. It's an inexpensive test. It is \$25. By the way, people with

home wells don't even do that once a year. So that was just a point I wanted to make.

SENATOR SINAGRA: Thank you.

Do you by any chance-- One of the things I was listening to, especially your testimony about not having the funding and we're not doing the testing, which was interesting-- Do you know how many fishing licenses are issued in New Jersey a year?

MS. McGEORGE: No. I'll open that up to anybody in the audience, if anybody knows.

SENATOR SINAGRA: Does anybody out there have any conception of how many fishing licenses--

M A R Y S H I E L: We can get that information for you, Senator.

SENATOR SINAGRA: Okay. I now have a pose, and I'm not saying that it is the way to go. I don't know whose job it would be. People are, at least administration, so opposed to raising fees. But I bet if you asked every fisherman who took a license whether he would be willing to spend another dollar on a license in order to have all the fresh water bodies tested for contaminants, where he's going to go fishing with his children or bring the fish home, I would be very surprised if you didn't get a 90 percent reaction that they would be willing to pay a small surcharge to make sure that we're doing the testing that we're supposed to be doing.

That is only an idea. It's not the Health Department. I don't know whose committee that would go to.

MS. McGEORGE: That would be a very reasonable idea.

SENATOR SINAGRA: But just listening and understanding the magnitude of the problem today, I think we're woefully remiss if we don't do more testing of fresh water while we're allowing everyone to take licenses to go fishing.

I don't know where the \$16.50 goes to for the license anyhow. We actually went out and got one to see what we were

handed. As I said, we were handed a "Digest" that I think is woefully inadequate in advising the public of the risks associated with certain bodies and fish.

MS. McGEORGE: It is certainly the anglers and their families who are most affected by this. That might be a reasonable proposal.

Thank you.

MS. SHIEL: Senator, on the notification to people as to the problems with fish and the contamination, we do have some documents here that list who will be notified or who has been notified. Jim Blumenstock from the Department of Health will also go through what the Department of Health has done concerning notification and the plans for notification.

We are developing, right now, an extensive fish advisory. This will be sent to everyone who is on this list, which is a very extensive list of people who will get that notification. Because we would agree with you the "Fish Digest" is not-- They put out that digest so they just put this notification in there, but that wasn't meant to be the only notification.

SENATOR SINGER: I understand, but I don't know how long we wait before we actually do some of this. That is why I want to introduce some legislation. It seems like the most effective way to get the communication out there to the person fishing in these bodies is, technically, they do have to have a license. I assume most of them do that.

I can't help but ask, there are a lot of studies, rainwater studies and things that seem to be due in the early part of this year, next month, is there any preliminary indication of how severe some of these problems may turn out to be, being you're here today?

MS. McGEORGE: In terms of the rainwater?

SENATOR SINAGRA: Right.

MS. McGEORGE: First of all, I should say that this is a pilot study. This is the first time mercury has been looked at, to the best of my knowledge, in precipitation. We have presented some of the preliminary results in our mercury symposium which was held back in October.

Basically, we're looking at just a very small sample number in a few locations. What we're finding for the most part is the results are consistent with the literature results for areas that are not directly impacted by point sources of mercury.

We had an exception to that and that was a sample that was collected in the Camden area, one time, and not confirmed by subsequent sampling. The levels that were found there were more consistent with levels that have been reported in the literature that are in the vicinity of point sources.

In other words, levels in the literature are kind of divided into two categories, ones that are seen away from point sources that are lower, and levels that are seen in the atmosphere in the vicinity of point sources. We have observed one value to that effect in the Camden area. We went back and tried to sample again and have not been able to confirm that.

SENATOR SINAGRA: One other thing from your testimony and listening, would it be safe to say that we are not 100 percent sure of the source of some of our contamination? Listening to the doctor before, a lot of it sounds like in knowing auto emissions, clean air, and how much of our air ends up from coal-fired plants in Ohio and ends up being a pollution problem for us, how much of our mercury problem is internal to our boarders? Do we have any conception of what is our problem and what someone else's problem is?

MS. SHIEL: No, and we don't know the answer to that. To try to get a handle on that the Commissioner formed a regional group of six states, from Delaware, north to Connecticut. Massachusetts will probably also become a part of

that group, so it will be seven states. That is a question we don't know the answer to: how much of it is transported into the State of New Jersey from other sources, and how much we also transport out.

What I have here for you is just to show you what are some of the sources of mercury and where the emissions come from. (witness uses charts) There are essentially two general categories, natural and human-related, or anthropogenic, as it is commonly called.

Natural comes from the ocean, vegetation, volcanoes, rocks, soils, wildfires. So, if you have a lot of volcanic activity, which we don't have in New Jersey, but the volcano in the Oregon area, contributed to sources like that. Then, how far does that deposition go? How far is it carried is the question.

But these are what we are more concerned about, and this has significantly increased since World War II in the postindustrial period because of the uses of mercury in industry. (indicating on chart)

So you have area sources where you have electric lamps. It was used extensively in paint. Latex paint was one of the paints that had a lot of mercury in it. This has been curtailed to quite an extent. It is used in laboratories, dental preparations, as we know -- a lot of us probably have mercury if we ever had fillings -- crematories are also a source, and that is actually from the dental.

Then you have mobil sources; the fossil fuels are a source. We use gasoline in our cars, we use oil, so you get mobil sources of mercury. Agriculture burning and landfills are also sources because of materials that were dumped in those landfills. We don't know much about these two sources here.

The other large sources are combustion from utility boilers. The EPA is doing a lot of work right now with the utilities. We have also started to work with the utilities to

ask them to do some testing. Mercury was not one of the contaminants they listed in their permit. They are beginning to do some testing so we can get a handle on just how much is coming from here.

Commercial industrial boilers, residential boilers -- if you burn oil in your home -- natural gas has some, but it is very insignificant in terms of mercury sources.

Municipal waste incinerators is really what we've concentrated on in New Jersey. The reason for that is because it is a major new source, potential source, of mercury. So our first rule we put out and was adopted in September of '94 addressed mercury from municipal incinerators. We expect that source to significantly reduce because of certain things we've put into place.

Two of the laws that we put on the books in '92 were the Dry Cell Battery Management Act, which requires that batteries sold in New Jersey must significantly reduce the mercury in those batteries, and the other was the Toxic Packaging Act, which requires reductions of heavy metals in packaging materials, and mercury was one of the heavy metals specifically identified.

The Toxic Packaging Act was developed through a regional group, the Coalition of Northeast Governors, and about 16 or 17 states have already implemented that model. We expect the Dry Cell Battery Management Act that New Jersey put on the books to also be looked at by other states and put into place. So batteries are significantly reduced in terms of the amount of mercury that is in batteries. That has occurred ahead of schedule. The industry is really cooperating very well.

We are also looking at other things. Florescent lightbulbs are another source of mercury that falls into the waste stream. They are increasing because of what they call the "Green Lights Program," which is to get more efficient lighting. Florescent lightbulbs provide that, so you see something that

has the impact of mercury, but it also has another environmental benefit. But we are developing programs. Union County, who just recently opened their incinerator-- In opening that incinerator, they put in a florescent light collection program, and that seems to be working very well, and other counties with incinerators are also looking at that.

The other things are mercury switches, and we have a pilot program ongoing with major manufacturers of mercury switches, Honeywell, Coomis, (phonetic spelling) and Camden County is doing a pilot program for mercury switches. So this was a major new source in New Jersey that we expect to significantly reduce once our laws fully take effect and source reduction of the waste stream takes effect.

Medical waste incinerators are another source because of the mercury usage.

SENATOR SINAGRA: Who regulates medical waste incinerators?

MS. SHIEL: We do.

SENATOR SINAGRA: Okay.

MS. SHIEL: We regulate them.

Sewage sludge incinerators and wood combustion, in manufacturing, many of these we don't have in New Jersey any more. We used to have chlor-alkali, and cement manufacturing is another big source. We don't have any cement manufacturers in New Jersey.

These are some of the miscellaneous sources (indicating). Leslie mentioned turf products and she talked about the contamination of wells in South Jersey. We don't know where that contamination is coming from, but we do know that years ago mercury was used in a lot of pesticides, and it was a recommended application for certain types of crops. If you look at the history behind it, that could have be used extensively particularly in agriculture areas.

SENATOR SINAGRA: But wouldn't you find that same condition in other states that did a lot of farming and other areas? It certainly wouldn't just be South Jersey.

MS. SHIEL: Right, but there was a lot of agriculture. We're not really saying that that is totally the source.

SENATOR SINAGRA: Well, you're inferring that.
(laughter)

MS. SHIEL: Well, let me back up on that one.

But we're saying that turf products are one of the uses. Golf courses used mercury extensively in terms of keeping them green and keeping mold down. Snow mold was a big issue on golf courses. There was one registration left in New Jersey for use of mercury on turf and that was for snow mold and that has not been renewed. So this activity is no longer occurring. It was stopped in agriculture many, many, many years ago when they realized the harm of using mercury.

MS. McGEORGE: I was just going to add-- You asked why that might be particularly an issue in South Jersey and not other places. We have particularly low pH groundwater in some of these areas. The question of how the mercury would actually get from the soil to the groundwater is something that is somewhat unusual and is being studied -- why this is so mobil in our groundwater. Perhaps it could be some unique features of the characteristics of our water here. We're not certain. That is a possible contributing factor as to why we're seeing it and other states are not. The other is that they are not testing as much. So we're not certain that it is totally because it is not there or because they haven't looked that much.

SENATOR SINAGRA: Okay. While you're both up here, we're trying to refresh our memory, and as I get older my memory isn't as good. Wasn't there a period of time, whether it was swordfish or tuna or something, we didn't eat for a lot of years because it contained high levels of mercury? Wasn't that in my lifetime?

MS. SHIEL: There was a period of time. I don't recall exactly when it was myself, but there was a period of time when swordfish--

SENATOR SINAGRA: I mean, recently, like 10 years ago or 8 years ago, maybe 15 years, time does go fast.

MS. McGEORGE: It's been known for quite a while that shark and swordfish, in terms of the commercial fish that we eat, have higher levels of mercury than other fish.

SENATOR SINAGRA: But then they're back on the market.

MS. McGEORGE: They're back on the market. What's important for you to know is what recently has happened regarding that, in terms of the Federal level.

In September, the Federal Food and Drug Administration issued through its consumer magazine an article. This is their guidance that they have issued to this article on mercury in fish, in which they have suggested limits on consumption of shark and swordfish. They have suggested that they be limited to one meal a week for the general population and one meal per month for the pregnant population.

So they are acknowledging, again, that there is concern and have issued advice regarding limiting consumption of those two species, because those two species have higher levels of mercury in them than other commercially available fish.

SENATOR SINAGRA: The only reason I asked the question was, if my memory was correct then, at some point, you couldn't -- they banned, or you weren't allowed to eat commercially fished swordfish or shark, or whatever, for a period of years. Then, obviously, something changed that allowed it back. The levels went down. Now, obviously, something is happening that the levels have gone up again. It was a short cycle, when I really do remember this happening--

MS. McGEORGE: I really can't speak to why that changed. I don't know.

MS. SHIEL: The Department of Health might know a little bit more of that history.

SENATOR SINAGRA: Well, maybe somebody else out there will. We'll ask the Department, they know everything.

Being you presented this study, I would like to hear-- Is Dr. Stern here? Alan Stern?

A L A N S T E R N Ph.D.: (off microphone) Yes.

I'm Dr. Alan Stern. I'm a Research Scientist in the Division of Science and Research of the New Jersey Department of Environment Protection.

SENATOR SINAGRA: There was a report that you had written on the effects of mercury?

DR. STERN: A journal article, yes. A scientific journal article.

SENATOR SINAGRA: Could you go over the article for us while you're here so we can get a better--

DR. STERN: Well, yes. That paper was an outgrowth of the work that we had done in the Mercury Emissions Task Force. In the course of the Mercury Emissions Task Force work, we were required to come up with an estimate of the acceptable daily intake of methylmercury for both the general population and the sensitive population, which would be pregnant women and women of childbearing age, and to use that as a way of estimating the background level of exposure for methylmercury in the population, to which any exposure from a municipal solid waste facility would be added.

Basically, what that estimate involved was going back to the scientific literature. There was some new work at that time which had been published in the scientific literature, but which had not, at that point yet, been evaluated in the context of overall advisories.

The EPA's equivalent of what we call the "acceptable daily intake" is called the "reference dose." It is essentially the same thing. The existing EPA reference dose, at that time,

was based on effects not to the developing fetus but to adults. It had become, in the interim, common knowledge in the scientific community that the developing fetus was probably several times more sensitive to the effects of methylmercury and the effects were somewhat different than to adults.

So what I had done was to go back to the scientific literature and evaluate these new studies in light of that evidence and to suggest an acceptable daily intake, or, as the paper is entitled, "A Reference Dose," which was about four times lower than that for the adult population. The EPA subsequently -- the EPA Office of Water, I should say, the U.S. EPA Office of Water -- issued advisory guidance for fish consumption for methylmercury, which essentially followed the same reasoning.

The Federal government is now, the larger EPA, in the course of reviewing its draft report to Congress on mercury, of which I am one of the invited reviewers from the Federal government, as well as Joann Held from our Division of Air Quality. As part of that, they are reviewing the reference dose. The Office of Water actually doesn't produce the reference dose, that is Fish Advisory. It is somewhat of a bureaucratic hash, but the actual reference dose comes out of a different part of the agency.

As part of this report to Congress, they are reviewing the reference dose. While that is still in draft form, it appears that they are closing in on pretty much the same sort of judgement that supports both their Office of Water and our work on that.

SENATOR SINAGRA: As it pertains to-- I'm just trying to understand your scope of knowledge as it pertains to New Jersey's fresh water bodies. What would you-- Listening to testimony of how few lakes that we actually go out and test, what would be your advise? I notice nobody mentions children, although some of the things I've read include children in the

high-risk group, but everybody talks about the pregnant woman, the fetus, and the adult, but no one seems to be talking about children at all. Is there as equal a risk to children as it is to-- Are they a high-risk part of this population or not?

DR. STERN: Well, that is a very good question. Let me first say that in our advisories that the Department did issue, which were based on the work of the Toxics In Biota Committee, we did include children in that category. We included children up to age five in the same category as pregnant women.

Nonetheless, it is a good question, and the reason that children are not addressed as explicitly as the pregnant population or the potentially pregnant population is because the scientific data is much more incomplete on children.

The scientific information on which we base these advisories is really based on two or three major poisoning episodes. Those episodes originally focused, as Dr. Gochfeld said, on the adult population and, secondarily, on the population which was exposed in utero.

It is very difficult to separate out children who are exposed in utero as opposed to children who were exposed as young children, as neonates, perhaps, but not in utero. So there is much less work done.

The inclusion of children in our advisory, as well as in the advisory of the U.S. EPA Office of Water, is based much less on specific scientific studies than on general scientific principles about the production of the nervous system during development and the fact that the central nervous system continues to develop for a long time after birth. Therefore, we assume on general principles that it remains sensitive to the effects of methylmercury. But that is something that we would like to get a lot more data on.

SENATOR SINAGRA: Okay. Now, in your studies, is New Jersey -- I know everybody keeps-- When we talk about mercury,

we talk about three states it seems to be, for whatever reason, Minnesota, Florida, and New Jersey. Would that be fair?

DR. STERN: Well, I would include, perhaps, Michigan in that list and, perhaps, Oregon. But there are a handful of states which seem to have taken the lead including New Jersey.

SENATOR SINAGRA: From the previous testimony, I'm still a little confused. Why would these four states be disproportionate to the rest of the country as it pertains to mercury? We don't even have a handle if our sources are coming from external borders. Why wouldn't it be Pennsylvania, Ohio, states around us versus-- I'm a little confused on that issue. One of the reasons I held this meeting is to try to not be confused.

DR. STERN: I think that is a very reasonable question. I think the reason, my perception that the reason for that is not so much that the states which have the biggest problems are the states which are taking the lead in addressing the issue, but rather the states with the greatest scientific expertise in their Departments of Environmental Protection and Departments of Health are taking the lead in this issue.

Other states which do not have the capacity to make these independent assessments and independent judgments and to do the research in collecting samples and analyzing samples are following the leads of these other states, as well as the Federal government, and are hanging back until the policy is in place in these other places.

Which is why I think it is very important, given the importance of the issue generally, the density of the population, and the potential for exposure in New Jersey, that this capacity remain in place to be able to make these independent assessments and independent judgments. I don't think that is a reflection that New Jersey's problem or, for instance, that of Minnesota is any worse. In the case of Minnesota, perhaps, one should add that sport fishing is a very

big part of their tourism industry. Although I know that it is also part of New Jersey's industry, perhaps even more so in Minnesota. That is what is perhaps prompting Minnesota, as well as their ability to make the judgments.

SENATOR SINAGRA: What more do we need to do in New Jersey as far as testing?

DR. STERN: Well, I think Leslie McGeorge outlined a lot of that. I would echo what she said. There are some very important gaps in our knowledge. We do not yet have a handle on the specific sources of contamination in the groundwater. We are only just beginning to scratch the surface in terms of understanding the fate and transport of mercury in New Jersey from specific point source facilities, as well as from regional sources, that is those sources which cross our border.

We have a study that is underway now, looking at exposure in the pregnant population which will be very important in determining what the level of exposure is, and then using that to be able to make some sort of guess as to levels of risk in the population.

However, that study, while extremely important and a very good start, is not designed specifically to focus on the high end of the exposure in the population. That study, as a first reasonable step, is to look at the overall population. But because we expect a lot of the people who are in the high end of that exposure are subsistence fishermen -- people who do not generally fall within the system often, or groups which are very specific, such as fishing communities or families of professional fishermen and that sort of thing -- we are making attempts to find them, but the study is not specifically looking at them. It would be very important to follow up that study with a study of the high-end population, where the greatest risk would probably reside.

So I think those are the major issues: sources of contamination, groundwater, fate and transport issues, both specific and regional sources, and exposure in the population.

SENATOR SINAGRA: One thing that is perplexing, as a scientist, is it-- There was testimony before by, as I mentioned, just about everyone that the problems with the levels seem to be increasing rather than decreasing -- and logic probably dictates we've cleaned up a lot, we've been more environmentally conscious, in both New Jersey and the nation -- would you assess that to more and better testing, or doing something different today as far as how we analyze our data, or is the problem actually getting worse?

DR. STERN: I think it depends on how-- The answer to that question sort of depends on how you ask it. If you're asking about levels in fish, I think the evidence -- and there isn't a lot of good evidence there, it's a very reasonable question -- the FDA, the Federal Food and Drug Administration, has generated, in terms of looking at their monitoring levels in indicator species of fish over time, suggests that levels are more or less constant. Some arguments have been made that the levels are dropping not because there is less contamination but because we're overfishing the fisheries and so we're catching smaller fish. But, in general, the levels have remained more or less constant in fish.

Statements about levels increasing in the environment in general, I think, are somewhat in a different ballpark. To backtrack a little bit, the reason we're more conscious of levels in fish now is because I think we're more conscious of the mercury issue. There has been more testing done, and the testing is more accurate. We're able to look at lower levels more consistently. So we're seeing it more because we're looking at it more in fish.

In terms of levels in the environment in general, there are studies out there which suggest that levels in the

environment are on the rise. I think there are two reasons for that. One is because the cycling of mercury in the environment is on a very long life. So we, to some extent, are seeing the effects of uses of mercury in industrialization that began, perhaps, decades ago.

The other reason is because we are burning more fossil fuels, particularly coal, than we were some decades ago. Although we're burning lower sulfur fuels, we're not necessarily burning lower mercury fuels.

The study that comes to mind is one in which they have been looking at levels in midocean, so they are not influenced by any particular sources, following those over the course of several decades, taking very accurate measurements -- going across the equator into the southern hemisphere/northern hemisphere, and the northern hemisphere obviously indicating more large-scale industrialization -- and noting the levels, particularly in the northern hemisphere in midocean, have been increasing, which suggests that this is a function not necessarily of specific mercury issues -- which we have, I think to some extent, gotten a handle on -- but more general issues, such as fossil fuel burning, that being a function of increasing population demands, increasing use of utilities, increasing industrialization.

SENATOR SINAGRA: Someone mentioned to me that small utilities, little independent utilities, aren't regulated and tend to pollute. Is that a function of what is happening in South Jersey and other places?

DR. STERN: I have to pass on that one. That is not really within my scientific purview. I am sure there are people here who can answer that.

SENATOR SINAGRA: Okay. I'll ask someone else the question. Thank you.

DR. STERN: You're welcome.
Jim Blumenstock and company.

J A M E S S . B L U M E N S T O C K: Good morning, Mr. Chairman.

My name is Jim Blumenstock. I am Director of Consumer Health Services for the State Department of Health. I am also privileged to be serving as the Chairman of the Toxics In Biota Committee for the State of New Jersey.

As Leslie had mentioned, the Toxics In Biota Committee represents three Departments: Health, Agriculture, and Environmental Protection. It is made up of technical support professionals and management staff responsible for evaluating chemical contaminants in edible biota.

It is a pleasure to be here this morning. I have been asked to give an overview of the Department's efforts to date in educating and outreaching to the general public with regard to fish contaminants and existing fish advisories.

With your permission, what I would like to do is just briefly go over the chronology of events that brought us to this date in time. Then, more importantly, share with you our agenda for the future as to how we really plan on being more effective and efficient in educating the public with regard to fish consumption advisories.

I'm very hopeful, after hearing your opening remarks, that you will agree that our strategies and agenda are compatible. I would look forward to a dialogue of really how we can work together to be more effective and efficient in the near future.

If I could bring you all back to about a year ago, as you may recall, the two Departments were preparing for the release of the National Academy report that Leslie summarized earlier. As part of that preparation, the Department felt it absolutely necessary to bring the local health departments into the fold, really give them the basic information that we would soon be releasing to the general public through the print and electronic media.

That was the first week of February, at which time all of the effected health departments were notified of the preliminary results and invited to attend a technical briefing on February 4. That technical briefing for local health officers was held in concert with a press availability that Friday afternoon, February 4.

During that event we shared with the public the preliminary findings but, more importantly, issued an integrum public health notice, advising individuals not to consume certain species of fish from approximately 15 water bodies that were found to have elevated levels of methylmercury.

I think I really should stop here for a moment just to emphasize the vital and critical importance the local health departments play in addressing a tremendous number of environmental health and environmental protection issues. We, as the State Health Department, and I can certainly speak for the Environmental Protection Department (sic), rely on local health departments.

SENATOR SINAGRA: That's probably not something I would agree with. I must tell you that there are good local health departments and there are nonexistent local health departments. This Health Committee will probably take that up some time in the next quarter. Your only leverage to some nonfunctioning health departments is to cut back their funding and that doesn't necessarily protect the public.

MR. BLUMENSTOCK: Agreed.

SENATOR SINAGRA: So I think that I would not be very comfortable in making a blanket statement like that. I just want to tell you that is coming down the pike.

MR. BLUMENSTOCK: I appreciate that.

SENATOR SINAGRA: I think we were very remiss in making sure that the local health departments-- Maybe we have to look at that whole structure.

MR. BLUMENSTOCK: Fair enough.

With regard to, again, briefing the local health departments, that did occur the first week in February. At that point in time, the two Departments commissioned the Toxics In Biota Committee to establish the risk assessment subcommittee, which really did a very in-depth risk assessment to look at the data and came up with more final public health protective advisories, which were issued in early July.

On July 13, a mass mailing was provided to all local health agencies informing them of the new public health advisories that we were issuing. We basically retracted the interim public health notice that was issued in February and made some very sight-specific consumption advisories for approximately 27 fresh water bodies, as well as Statewide advisories for Pinelands and general water bodies throughout the State.

SENATOR SINAGRA: May I interrupt you just for a second?

MR. BLUMENSTOCK: Sure.

SENATOR SINAGRA: Unless I misunderstood some of the other testimony, we only tested-- We certainly didn't test every lake, stream, that people go fishing in?

MR. BLUMENSTOCK: Correct. There were approximately 55 water bodies that were part of the Academy's study. Of the 55, we found 15 that had elevated levels comparing it to the FDA standard. So those were the 15 water bodies that the interim advisories were issued against back on February 4, 1994.

Then we went through the risk assessment process, at which time we issued more in-depth, detailed fish consumption advisories, which was applicable to 27 of the 55 water bodies studied. Plus, looking at the data, we drew some conclusions and assumptions to make certain Statewide advisories to be applicable to all those other water bodies that were not tested. I've been told there are approximately 1200 fresh water bodies available for fishing in the State of New Jersey. So clearly we

could not test them all. Certainly, as part of the preliminary study--

SENATOR SINAGRA: Now, as far as the public goes, which is one of the main purposes for having this hearing-- I go and I look at a list of places that I shouldn't-- Is it the Department of Health's strategy that -- whatever this says in here as far as Blackdale reservoir and a whole bunch of other places -- if it's not in here, it's okay?

MR. BLUMENSTOCK: What the public should be aware of is that there are-- In that brochure, there should be a general advisory section that would inform the public of the water bodies that are not tested. There are specific general advisories given to water bodies, either Pinelands or otherwise.

SENATOR SINAGRA: Okay. First of all, I think it's a stretch that anybody is actually going to go through this. One of the things I want to do is have a more definitive warning when someone gets a license. But it would be a stretch that anybody would actually go through here and read all of the verbiage in this entire thing. I would say that most of the people would go and look, go down the list. They don't see where they're fishing and would say, "Okay. It's okay."

MR. BLUMENSTOCK: We surely don't disagree with you. What we planned on using the "Fish Digest" for was, it was an existing instrument that is available to disseminate information. So certainly it was going to be one of the many avenues to present information to the public. It is not the only mechanism we planned on using.

SENATOR SINAGRA: I guess my real question is: For those 1200 or 1400 places people fish that we haven't tested, what is the message to people who are fishing? Is there any message to people who are fishing there?

MR. BLUMENSTOCK: Yes. There are general advisories. For those water bodies not tested, in there, there should be a formula that would advise people whether they are of the general

population or considered high-risk, on the amount of fish that you should limit your consumption based on your own category and the species of fish caught. So that message is conveyed in that brochure, in that Digest.

SENATOR SINAGRA: In other words, without the list of where adults shouldn't -- I guess it is more pertaining to adults in some respects -- a pregnant woman should, basically, not eat fresh water fish anywhere?

MR. BLUMENSTOCK: If I'm not mistaken, I think it would say once a month for water bodies not tested.

SENATOR SINAGRA: For water bodies not tested, once a month?

MR. BLUMENSTOCK: Correct. Then water bodies that are tested we would have specific advice as to what level of restriction would be applicable in that regard.

SENATOR SINAGRA: Would it be prudent for us to test all the water bodies where people fish? I'm not asking about the expense yet, but would it be prudent?

MR. BLUMENSTOCK: Looking at 1200 water bodies that are theoretically subject to public recreational fishing, that is a very difficult question to answer, because I don't have the actual experience to reflect on a sampling program of that magnitude.

I think what would make the greatest sense is to basically prioritize or triage the water bodies based on volume and popularity and maybe work a list in that regard as far as targeting water bodies beyond the 55 that were originally tested.

SENATOR SINAGRA: So more testing would be prudent?

MR. BLUMENSTOCK: Yes. To answer your question, yes.

SENATOR SINAGRA: It may not mean all 1200, but obviously more testing is prudent.

MR. BLUMENSTOCK: Yes. I would say so.

SENATOR SINAGRA: So I would assume then, in someone's budget, whether it's the Department of Environmental Protection or your budget -- that I will see next week -- that I will see an increased line item amount for that task?

MR. BLUMENSTOCK: I personally can't respond to that question or that statement. (laughter)

SENATOR SINAGRA: Well, you're representing the Department of Health (laughter), so I assume if it would be prudent to do for the public health, that that would be a line item that would be worthy of consideration.

MR. BLUMENSTOCK: With all due respect, again, it would be inappropriate for me to respond because I honestly don't know the answer to that question.

SENATOR SINAGRA: I try to be too logical, I'm sorry.

MR. BLUMENSTOCK: The other issue in regard to sampling is we're trying to, again, utilize our resources to the best way possible, and two ways of doing that are cooperating and communicating with neighboring states, so, if there are shared water bodies, pooling our resources and intelligence to address those water bodies that have multiple jurisdictions.

We have also been communicating with the various public utilities that have initiated their own sampling programs, because they're concerned of the water quality and the fish in the reservoirs that they maintain. So that is a source of data available to us, and different companies have already come forward and provided that information for our review. So that is one other mechanism whereby we would not necessarily rely on State dollars, but yet, the scientific intelligence may be available that we could use to make public health decisions.

SENATOR SINAGRA: Good. We just had to buy Sterling Forest, so I don't know how much other states are going to kick in to protect the environment, but that's besides-- An editorial comment--

MR. BLUMENSTOCK: Subsequent to the July 13 mass mailing and notification of local health departments, as Leslie mentioned, the Departments cosponsored a two-day event in early October. One was a technical symposium on October 6, followed by a work session of the six states participating in that regional work group, to discuss regional mercury issues with a tremendous emphasis on fish contamination and consumption advisories.

Two of the main players in that activity represented the medical community. I think it's appropriate for me to raise this at this time, because I know in your opening remarks you had mentioned notification of patients at the different medical services.

SENATOR SINAGRA: Obstetrics and pediatrics.

MR. BLUMENSTOCK: Correct.

The Medical Society of New Jersey and the New Jersey Chapter of the American Association of Pediatrics participated in the program. Even the two delegates from those entities served as consultants to us in their field of medical toxicology in reviewing the risk assessment report that was generated as part of this fish consumption advisory initiative.

So they are very much aware of the problem. They are involved. They have been of great assistance to the Department of Health. Certainly, in the near future, we plan on utilizing them and their resources to inform their membership and to provide more extensive education and outreach to the population as a whole, especially the high-risk individuals that we have talked about.

SENATOR SINAGRA: Well, you know it is my intention to make it statutory that they post the notice of warning?

MR. BLUMENSTOCK: I understand that from your earlier remarks, yes.

The one final formal notification was on December 6. The Department of Health, again, our Seafood Safety Program,

sent out a communication to all of the health departments summarizing a whole host of seafood safety issues, one of which included the current status of all fish consumption advisories and, specifically, the mercury advisory that was in existence at that time.

Where do we go from here? Well, clearly, we all agree with the fact that the advisories issued to date were not in a format that can be considered user-friendly. So we are, in essence, weeks away from making available to the public a brochure that we would consider consumer or reader-friendly that basically consolidates all the existing advisories in effect in New Jersey. This goes beyond just the contaminant of mercury. It will cover all others such as PCBs, dioxin, and chlordanes.

We will make reference to advisories that exist that have been issued by some neighboring states. We also will have a section in there summarizing the Federal position with regard to salt water fish.

So, again, we look forward to making that available to the public and, certainly, to the Legislature for their review and assistance in disseminating that information.

We have also been in communication with other states not only within the region but nationwide to really learn from their efforts as to what their successes and failures were with regard to risk communication and outreach.

In dealing with the medical care community, for instance, there was a lot of discussion as to whether or not a companion document should be prepared to share with expectant mothers to aid them in understanding the potential risks of eating contaminated fish, but, also, being aware of the nutritional value and benefit of eating seafood products as well.

For instance, the State of Minnesota, which you may be familiar with, did prepare a document specific for expectant mothers. We are taking a careful look at this and seeing if

this would certainly have a good application in the State of New Jersey to assist us in this effort.

Many other states have formed regional approaches, you mentioned a few earlier. We are also aware that the southern states-- There is basically a 12-state task force that is in the process of doing exactly what we started back in October, a total coordinated effort not only on the monitoring of mercury in the environment but also communicating with the general public the potential risks associated with eating excessive quantities of contaminated fish.

So, again, we are communicating with the various states and the various regions other education and outreach efforts. We do know for a fact that the State of Arkansas has prepared a 15-minute video on not only mercury contamination in fish but also sharing with the observer the existing advisories. This brochure was previewed by our technical staffs, and we've even had the opportunity to share it publicly in various forums in the past month or two.

SENATOR SINAGRA: I know other states have done an 800 number. Are we also planning or contemplating having an 800 number where someone could call in and ask about a specific body of water? Is that anywhere in anybody's thoughts?

MR. BLUMENSTOCK: The discussion--

SENATOR SINAGRA: Because, if we're going to do that, another idea would be to put it right on the fishing license that they always have to have with them. They may lose this book. (indicating) They may lose the advisory. They may go fishing somewhere or are out with their children somewhere. But if you had it clearly on the license which they have to carry with them when they go fishing, it would be very easy for them to call up and find out before they fish somewhere whether it is safe. That would only be a recommendation, unless we put that in our bill. (laughter)

MR. BLUMENSTOCK: I'll certainly take that back to the Committee. (laughter)

SENATOR SINAGRA: You're going to do it one way or the other so you might as well. (laughter)

SCOTT ALLOCCO: Will you have some funding for that, Senator? (laughter)

SENATOR SINAGRA: Well, I would hope-- I don't set your priorities, you set your priorities. You're there as I am, my Committee, trying to protect the public. That is your only job to do.

MR. BLUMENSTOCK: Certainly, in the brochure I talked about a few moments ago, there will be a section that we would refer to as a resource directory that would, in essence, list the names and contacts of all the entities within the various departments that would provide valuable additional information to a consumer should they wish an explanation or clarification of some of the information.

SENATOR SINAGRA: I think it would be more likely that they would call an 800 number than try to get through that bureaucratic maze.

MR. BLUMENSTOCK: I agree with you, exactly.

In your briefing packet I think you will also find a--

SENATOR SINAGRA: I got one? (negative response)
Well, next time. (laughter)

MR. BLUMENSTOCK: I know we did bring them.

You will also find a list of some of the outreach organizations that we do plan on working with at a local level. Because clearly we will have a brochure available, hopefully, by the end of the month. Both Departments have networks in existence to communicate public health issues at a local level.

For example, the New Jersey Department of Health has a very strong Office of Minority Health, that can help us outreach to various entities, especially if there are cultural barriers that we have to overcome. Fish and Game certainly have

their sportsman groups. Our Offices of Communication has an outstanding working relationship with the media. So, again, this is all being taken into consideration as far as our strategies for effective dissemination of information.

That is it in a summary. I certainly would be glad to answer any specific questions that you may have as far as what we really have on the drawing board to date.

SENATOR SINAGRA: No, I really have no other questions. One of the main purposes for this meeting today was to get information to the public, to the Committee. As I said, we want to draft legislation, and you have given us a lot to think about on what we're doing.

I am going to send a transcript of this to Senator Kyrillos, who chairs Natural Resources, and Senator McNamara, who chairs the Environment Committee, with some recommendations from the testimony today that would not be appropriate for the Health Committee to take up. Theirs might be more concerned with point sources, and Senator Kyrillos on other issues associated with the problem.

The reason the Health Committee took it up was because I really believe it's a health issue. It has transcended. It's what happens in everything, it goes from the Environment Committee as a problem to the Health Committee as a real problem. I believe it is at that stage today that we really need to do a better job informing and protecting the public as per eating the fish. It is also a job that both Senators Kyrillos and McNamara can do something about the pollution itself. So that is the way we're going to proceed.

I want to thank everybody for attending. That's it.
Thank you.

MR. BLUMENSTOCK: Thank you.

(MEETING CONCLUDED)

APPENDIX

REMARKS FROM JOANNA BURGER, PHD. Jan. 17, 1995

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I am disappointed that an academic conflict precluded my making a personal presentation this morning. I do have some information which may be helpful. This is based on my experience in biomonitoring heavy metal (including mercury) distribution in a variety of organisms in New Jersey as well as on my laboratory studies of the effects of metals on neurobehavioral development. I also had the good fortune to participate recently (November 1994) in an international conference on ecologic and health effects of global mercury exposure.

1. Mercury is a highly toxic chemical which unlike many other metals has no known beneficial biologic function in any organism.
2. The oft-heard statement that much of the mercury to which we are exposed is of "natural origin" is misleading. All mercury originates in the earth's crust, but the vast majority stays there until it is disturbed by human activities (mining) and thence widely distributed by commerce and industry. Then there is the opportunity for human exposure and ecologic effects.
3. The mercury in New Jersey's environment comes from both local sources and from global atmospheric transport. Local sources include
 - a) industrial and former industrial sites
 - chlorine and lye (increasing but not in NJ)
 - paints (nearly eliminated)
 - stabilizing pharmaceutical (stable)
 - mercury batteries (decreasing)
 - measuring and control instruments (decreasing)
 - dental works (stable or decreasing)
 - mercury bulbs (decreasing)
 - laboratory and research uses (increasing)
 - b) combustion sources such as coal-fired power plants and incinerators
 - mercury in coal
 - mercury in batteries
 - c) hazardous waste sites
 - d) consumer uses

However, there is also global transport of mercury which is being greatly accelerated by the increase in gold mining in the developing world including China and the former USSR as well as South America, Africa, Asia, and New Guinea. The quest for hard currency has stimulated many countries to promote small-scale gold mining which is a heavy user and releaser of mercury. Global atmospheric transport of mercury is expected to rise 3-fold in the coming century. There's not much we can do about that in New Jersey.

But we can study the relative contribution of the different sources to different environmental media in New Jersey. Our colleagues in the office of Science and

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Research have conducted some of these studies and have documented some of the local sources of mercury. Indeed the new rules recently adopted by DEP to Control Mercury Emissions, at least from incinerators, is a clear demonstration of the direct link between research and policy.

In addition to research on sources, we need to investigate how human exposure occurs. Some of this research is already underway to establish the potential for exposure to pregnant women. This is a high priority since fetal development is the most sensitive target for mercury.

I think we also need to better understand the impact of mercury (and other contaminants) on New Jersey's ecosystems, both natural and man-altered. This has been a major part of my recent research in the area of ecological risk assessment. Studying the distribution and effects of mercury on aquatic and terrestrial ecosystems, provides another endpoint for assessing damage, as well as indicators of degradation in environmental quality.

Part of my work has been devoted to understanding how humans are exposed to fish. I have observed and interviewed fishermen of various nationalities in Puerto Rico, New York and New Jersey. This included both sport and subsistence fishermen. I consistently find that there is a significant subset of fishermen who consume far more fish than EPA uses in its risk assessments for various chemicals including mercury.

EPA is right that its risk assessment protects most people (since most of us eat fish less than once a week), but they don't take into account people who eat fish once or even twice a day. That was the kind of population that got into trouble at Minamata, Japan.

Improved studies of human exposure are an important step in understanding environmental and ecologic health hazards.

I am a firm believer in fish advisories. They are an important way of informing the public. But they require multi-media support and repetition. My studies and those of others show that fishermen ignore advisories for a variety of reasons. Some believe that they can tell if fish or shellfish are "tainted" by their appearance and odor. Studies in risk perception and risk communication provide insights as to how to impress upon fishermen the importance of not taking or eating certain creatures.

Finally I would like to encourage DEP to continue investigating the transport of mercury compounds and other toxic metals in New Jersey's environments. The recent recognition in Scandanavia that methylmercury is transported in the atmosphere (about 1% of the total airborne mercury) was a surprise to many of us. Are there other surprises that we need to know about to understand the dynamics and impacts of mercury?

January 17, 1995

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NEW JERSEY'S UNIQUE ENVIRONMENTAL NEEDS

Michael Gochfeld 1/17/95

New Jersey is a unique state, small in size but highly populous. We are the most densely populated state in the nation, and some parts of New Jersey are among the most densely populated places on Earth. Even with the transition from a manufacturing to a service economy, New Jersey still has a higher percentage of its workforce in the manufacturing sector than any other state.

Throughout the 1980's the Eagleton-Star Ledger Poll consistently showed that the New Jerseyans surveyed ranked environmental health concerns as their number 1 public policy issue.

Because of its historical importance as an industrial center, New Jersey has the dubious distinction of leading the nation in the number of hazardous waste sites, and some of the most serious sites on the U.S. National Priorities List are in New Jersey. This is, of course, partly due to New Jersey's leadership role in discovering such sites.

I therefore dismiss the notion that New Jersey should not have stricter environmental health regulations than the nation as a whole as naive rhetoric. New Jersey must have stricter environmental regulations than anywhere else, simply because of its unique properties.

It is small wonder that New Jersey through its Departments of Environmental Protection and Health have played a leadership role nationwide. Other states, even New York and California, have looked to New Jersey as a model of how to protect the environment and human health.

Of course it hasn't always been that way. Until relatively recently New Jersey, despite its world class engineering and its pharmaceutical industry, was content to parasitize New York and Philadelphia for its biomedical research. We didn't even have a medical school until the 1950's and that one failed.

Things changed dramatically beginning in the 1970's. The development of Rutgers and UMDNJ as World Class research and training universities has occurred. Within state government DEP's Division of Science and Research and its predecessors have conducted excellent research devoted to identifying and studying environmental problems. This is an essential service which has brought to public attention many problems affecting our air, water, and food. It remains the envy of other states, and its research, both internal and externally funded, is valuable, essential, and highly regarded. In the Department of Health, the former unit of Occupational and Environmental Health (which I headed from 1978 to 1980) has worked closely with DEP to mesh public health and environmental health programs. This is how it should be, and in my view how it must be, if we are to protect our unique population in our unique environment.

I want to conclude by saying that I am extremely disquieted by rumors that funding for the Division of Science and Research (DEP) and Environmental and Occupational Health (DOH) are in jeopardy. A high priority should be given to protecting and indeed enhancing their efforts which are critical for New Jersey's public. It is much easier to dismantle a finely-tuned research machine than to build it up from scratch. To undermine these unique New Jersey resources is short-sighted at best.

MERCURY AND HEALTH

All chemical forms of mercury have long been known to be toxic to humans and other organisms.

Mercury occurs in a variety of ores, but mainly in the sulfide order known as cinnabar.

Elemental mercury extracted from the air is a familiar, dense, silvery liquid known as "quick silver".

Together the elemental mercury and the various natural (ores) and man-made (salts) of mercury are the "inorganic" varieties of mercury.

Mercury can also be attached to a variety of organic compounds. This can occur deliberately in industrial processes or naturally through the action of bacteria on inorganic mercury ions.

These organic compounds (organomercurials) are soluble in lipids and tend to bioaccumulate in organisms. That is organisms have a higher concentration of mercury than their environment. When big organisms eat littler ones they retain most of the mercury.

Thus large fish have much higher concentrations of organomercury (expressed as micrograms of mercury per gram of tissue) than smaller ones. This is called biological amplification. It explains why organisms high on the food chain (tuna fish, fish-eating birds, humans) are exposed to higher concentrations of mercury than animals lower on the food chain.

The attachment of mercury to a benzene ring resulted in Phenylmercuric Acetate (PMA) which was added to marine paint to keep barnacles from growing on boats. Such anti-fouling paints are important to ship and boat owners. Several New Jersey factories manufactured (PMA) until the mid-1970's. When the hazards of mercury and its tendency to bio-amplify in the environment became apparent, mercury was eliminated from paint. It has been replaced with an organic tin compound (tributyl tin), which may be even more toxic to aquatic ecosystems than mercury (but that is another story).

The attachment of mercury to a methyl group $\overset{\text{H}}{\text{H-C-H}}$ produces the most highly toxic mercury compound, methylmercury. This was manufactured as a fungicide and used to treat seed that was stored over the winter. When the seed was planted in the spring, the mercury entered the environment causing a variety of ecosystem consequences. It also caused major outbreaks of human poisoning when people ate mercury-treated grain instead of planting it.

So mercury can occur in both inorganic and organic forms. All forms are toxic, particularly to the nervous system.

Methylmercury is the most toxic, and it is particularly toxic to the developing nervous system which is why we are concerned about possible exposure during pregnancy.

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Whenever we deal with a toxic chemical we are concerned with several properties:

toxicity=the intrinsic property of a chemical to cause harm

hazard=is the effect that the chemical might pose to some target
(usually human health)

exposure=the circumstances under which the target actually comes in
contact with and takes up the chemical

risk=the probability that harm will actually occur

One can have a highly toxic material which poses a great potential hazard, but if no one is exposed, the risk of harm is negligible.

This is the domain of risk assessment which is an evolving field with improved understanding and changing methods. New Jersey has played a leadership role in risk assessment, and many of its scientists both in DEP's Science and Research and in academia have contributed research papers to the leading journals in the field.

We have a pretty good idea of the toxicity of mercury, what organ systems it effects, and even what doses or exposure levels cause harm.

We do not as yet have a good handle on the amount of exposure occurring in New Jersey.

Some of the findings relevant to the neurobehavioral toxicity of mercury include:

People with chronic exposure to methylmercury undergo changes and atrophy of the brain, particularly the cerebellum which controls coordination and fine movements.

Babies exposed to methylmercury during pregnancy have damage throughout the brain including the cerebral cortex. Even parts of the spinal cord as well as the centers responsible for controlling the peripheral nervous system are damaged.

All forms of mercury can cross the placenta, but methyl mercury does so faster and in larger amounts. Therefore the fetus develops a much higher brain concentration of mercury than the concentration in its mothers blood.

This disease known as congenital Minimata disease after the place in Japan where it was first recognized, is very similar to cerebral palsy, except that the children are often blind and almost always severely retarded as well as paralyzed.

Mercury compounds are also toxic to the kidney. On the kidney Organic and inorganic have the same effect, but the latter is much more potent. Renal tubular damage is apparent within 4 hours. Indeed, until about 20 years ago, mercury was used as an emergency diuretic to treat people with heart failure. It poisoned the kidney,

5X

allowing it to eliminate excess fluid.

One of the problems with methylmercury is that it is slowly excreted. Once it is in the intestine it tends to get reabsorbed back into the circulation.

6X

MERCURY EXPOSURE AND LEVELS IN PREGNANT WOMEN

For further information contact Michael Gochfeld, MD, PhD
Phone 908-932-0180 FAX 908-932-0130

Department of Environmental and Community Medicine
UMDNJ-Robert Wood Johnson Medical School and

Division of Occupational Health
Environmental and Occupational Health Sciences Institute (EOHSI)
681 Frelinghuysen Road, Piscataway, NJ 08855-1179

Mercury is widespread in the environment and the organic form known as methylmercury (MeHg) has a high level of toxicity.

The main concern for human health lies involves harm to the developing fetus resulting from maternal exposure to mercury in the months prior to and in the early months of pregnancy.

In New Jersey the most significant exposure to MeHg is through the consumption of fish.

All fish contains at least slight amounts of mercury, and a small proportion of the fish caught in New Jersey or purchased, may contain excessive amounts of mercury.

The amount of mercury in fish depends upon the species of fish, where it has lived, and its size.

Processing fish and different forms of preparation may change the concentration.

Even though most fish are safe to eat, people who eat large amounts of fish (several meals a week) may accumulate significant amounts of mercury over time.

This is particularly a problem during pregnancy.

EOHSI will be studying mercury levels in pregnant women throughout New Jersey.

Women will be recruited as volunteers through their obstetricians on their initial pre-natal visit.

A blood and hair sample will be obtained and analyzed for total mercury and methyl mercury.

A detailed dietary and health interview will take place.

Results will be provided to participating women and their doctors and will be used to design health advisories and other information and educational materials.

7X

PRELIMINARY Distribution Plan for Fish Advisory Brochure

Department of Environmental Protection (DEP)

** Master list of all department mailing lists, including all elected officials, town clerks, environmental groups, business groups, various DEP task force memberships, DEP councils and commissions, etc.

contact: Debbie Chianese, Central Services 777-4398 (rec'd list)

Office of Communications:

** Environmental groups, nature centers, school related environmental clubs, environmental education contacts, business and industry associations.

contact: Lisa Wright, Public Participation & Education 777-4322

Public Participation calendar mailing list

contact: Heatherlyn Herrick, Events/Communications 292-3770

Press contacts/daily and weekly newspapers, radio stations, etc.

contact: Amy Collings, Press Office 984-1795

Division of Fish, Game & Wildlife:

Fish and Game Digest mailing list

Outdoor Writers list

Sportsmens Associations list

Fishing license agents list

Bait and tackle shops

List of various boat shows and fishing events around the state

contact: Dave Chanda, Education & Wildlife Information 292-9450
(rec'd lists from Cathy Previtt)

Division of Parks and Forestry:

List of all State Park offices (page 40 of DEP Easy Access)

State marinas list

contact: Joanne Ruscio, Communications Coordinator 984-1423

Division of Science and Research:

Science Advisors mailing list (mostly professors)

contact in writing: Leslie McGeorge, Asst. Director DSR, CN 409

Urban Anglers EPA Fish Advisory Project: (includes health officers in and around the Newark Bay Complex, environmental groups, town clerks, park and recreation areas, etc.)

contact in writing: Kerry Kirk Pflugh, DSR, CN 409

Department of Health (DOH)

Consumer Health Services:

Statewide listing of all local and county health officers, health educators and health clinics, and other health related contacts (includes Planned Parenthood)

contact: Gary Wolf, DOH, 588-3123

also on DEP master list of mailing labels - # 0011 Health Boards

10X

Sources of Mercury Emissions

Natural

- Oceans
- Vegetation
- Volcanoes
- Rocks
- Soils
- Wildfires

Human-Related

Area

- Electric lamp breakage
- Paints use
- Laboratory use
- Dental Preparations
- Crematories
- Mobile sources
- Agricultural burning*
- Landfills*

Combustion

- Utility boilers
- Commercial / Industrial boilers
- Residential boilers
- Municipal waste incinerators
- Medical waste incinerators
- Sewage sludge incinerators
- Wood combustion

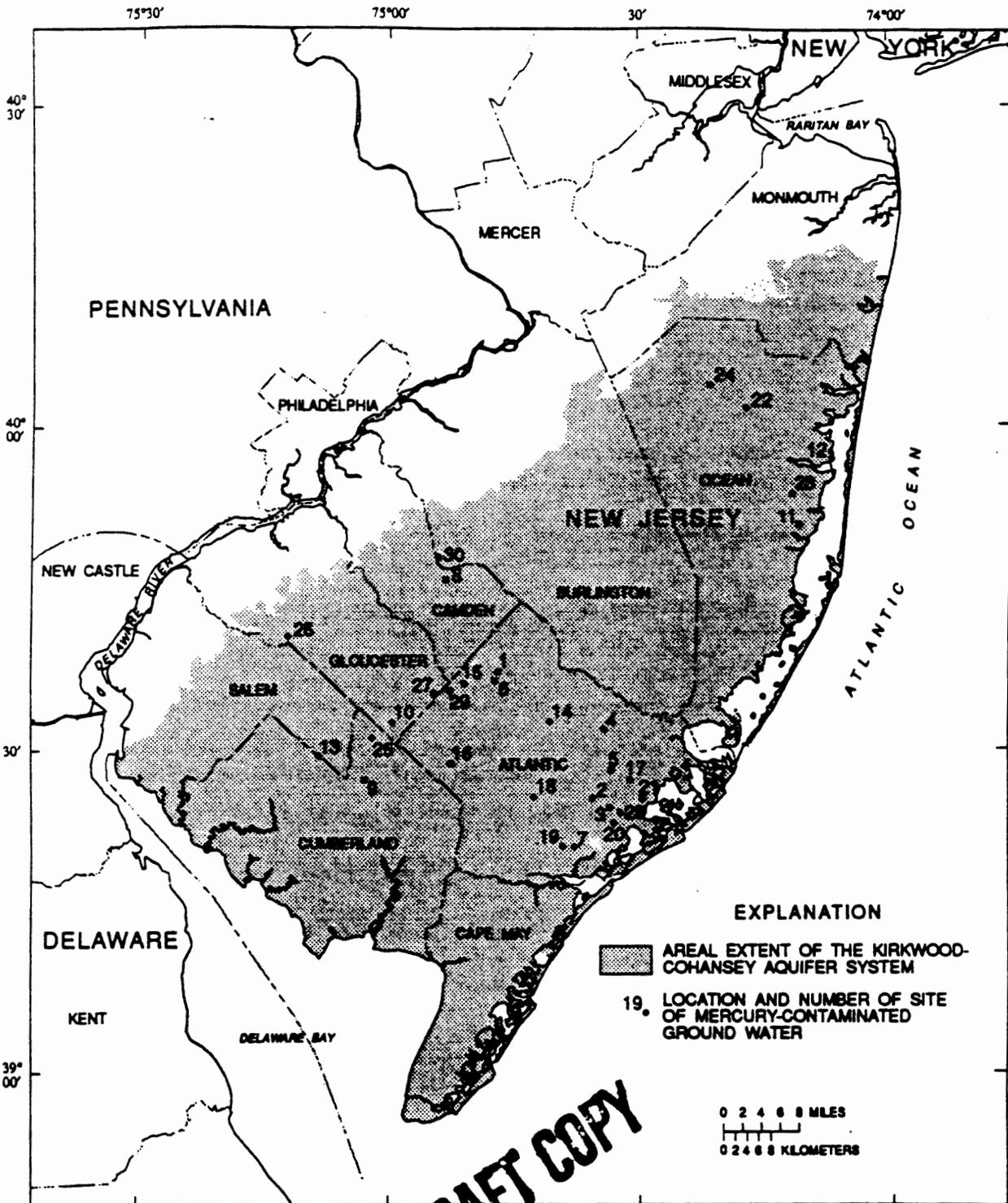
Manufacturing

- Chlor-alkali production
- Lime manufacturing
- Primary mercury production
- Battery production
- Electrical apparatus manufacturing
- Carbon black production
- Byproduct coke production
- Primary copper smelting
- Cement manufacturing
- Primary lead smelting

Miscellaneous

- Oil shale retorting
- Mercury catalysts
- Pigment production
- Explosives manufacturing
- Geothermal power plants
- Turf products

*Potential sources of mercury emissions for which there is currently no data.



Base modified from U.S. Geological Survey digital data, 1:100,000, 1983, Universal Transverse Mercator projection, zone 18

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PROVISIONAL DATA
SUBJECT TO REVISION
9+

DOH con't.

Family Health Services:

- ** Healthy Mothers/Healthy Babies Program
contact: Sandra Huneke, DOH, 292-5616
Regional Services Program, CN 364, Trenton, 08625
Well Baby Program

Regional Services Program:

- ** Maternal and Child Health Consortia, child health hospitals -
contact: Sandra Huneke, DOH, 292-5616

Health start pre-natal clinics/maternity hospitals (by county)

- ** contact: Mary Lawrence, DOH, 633-3666
Division of Family Health Services, CN 364, Trenton 08625
"Comprehensive Agency Contact List"

Department of Community Affairs (DCA)

Division on Aging:

- ** Senior citizen centers
contact: 292-3766 (rec'd list)

Department of Agriculture

contact: Linda O'Dierno, 984-6757

Other

Delaware Riverkeeper Network

contact: Maya van Rossum, Assistant Director 1-800-8-DELAWARE

- ** NY/NJ Harbor Baykeeper - American Littoral Society

contact: Andrew Willner (908) 291-0176 or 1-800-8-BAYKPR

NOTE: ** denotes that we have a paper copy of this list in the files

11X

