STATEMENT OF
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Good afternoon, Mr. Chairman and Members of the Subcommittee. I am Geoffrey Grubbs, Director of the Office of Science and Technology in the Office of Water, at the U.S. Environmental Protection Agency (EPA). I appreciate this opportunity to discuss mercury in dental amalgam and how we believe it may affect our nation's waters.

INTRODUCTION

Mercury is an element which occurs in the natural environment. Mercury persists in the environment and, under certain conditions, inorganic mercury in fresh and salt water is transformed by microorganisms into organic methylmercury. This transformation enables mercury to accumulate in the tissue of fish and other organisms that are part of the food web. While methylmercury can be found in virtually all fish and many marine mammals, relatively higher concentrations can be found at the top of the food chain in larger ocean going predatory fish.

Dental amalgam contributes a small proportion of all mercury released to the environment from human activities. Virtually all releases of dental amalgam are through municipal waste water facilities, and EPA estimates that sewage sludge nationally contains about 15 tons of mercury per year. A recent study by the American Metropolitan Sewerage Authorities (AMSA) found that dental clinics account for an average of more than 35 percent of the mercury

influent to the seven POTWs studied, more than four times the percentage contributed by the next largest source categories - human waste and hospitals.

Concentrations of mercury in water are low and of little immediate health concern. The greatest mercury exposure and potential risk exists for those persons who regularly eat fish containing elevated levels of methylmercury over long periods of time. The Centers for Disease Control (CDC) and Prevention's National Report on Human Exposure to Environmental Chemicals support the conclusion from an NRC committee review based on earlier estimates of methylmercury exposure in U.S. populations that *in utero* methylmercury exposure is low. However, approximately 8% of reproductive-aged women in the CDC study have blood mercury concentrations higher than a safe level based on EPA's reference dose (that is the level EPA considers to be safe). These elevated levels may constitute a risk to a developing child in the womb, although none of these women had blood mercury concentrations at the substantially higher levels known to present such a risk. Forty-four states, one territory and three tribes have issued fish consumption advisories for mercury-contaminated fish. Fish advisory information is not a surrogate for exposure to the general population because many people eat only commercial fish that they purchase in stores or restaurants. However, there are subpopulations who do consume fish they have caught from waters covered by fish advisories. EPA and the Food and Drug Administration are working together to develop a joint fish consumption advisory on the risks to women of childbearing age and young children from methylmercury in commercial and locally caught fish.

The Clean Air Act and the Clean Water Act (CWA) authorize EPA to limit releases of mercury to air and water. For example, the CWA requires the National Pollutant Discharge

Elimination System (NPDES) permits that specify effluent limitations where necessary to protect water quality. For municipal waste water treatment plants (i.e., Publicly Owned Treatment Works [POTWs]) that are subject to these effluent limitations, the National Pretreatment Program requires control of commercial and industrial sources of pollutants in influents.

MERCURY IN DENTAL WASTE

Dental amalgam contributes a small proportion of all mercury released to the environment from human activities. Virtually all releases of dental amalgam are through municipal waste water facilities. A recent study by the American Metropolitan Sewerage Authorities (AMSA) found that dental clinics account for an average of more than 35 percent of the mercury influent to the seven POTWs studied, more than four times the percentage contributed by the next largest source categories - human waste and hospitals. This study did not estimate the total national amount of mercury entering POTWs, only the relative loading for the POTWs studied. An American Dental Association survey indicates that in 1996, the dental industry used 31 metric tons of mercury. Amalgam for dental fillings contains about 50% mercury, with silver and other metals constituting the remaining portion.

Mercury-containing amalgam wastes may find their way to the environment in two ways. When new fillings are placed, waste amalgam material enters the solid waste stream, and waste particles from the placement process may be flushed into chairside drains. When old mercury-containing fillings are drilled out, fine particles of amalgam also may be flushed into chairside drains. The majority of the waste dental amalgam from chairside drains is removed by traps and vacuum filters. But, according to reports, 25 to 40 percent (Riversides Stewardship Alliance, 2001, “Campaigns: Mercury Free Dentists”, and Cailas, M.D., Ovsey, V.G., Mihailova, C.,

Naleway, C., Batch, H., Fan, P.L., Chou, H-N, Stone, M., Mayer, D., Ralls, S., Roddy, W.: "Physico-chemical Properties of Dental Wastewater"; Water Environment Federation 67th Annual Conference & Exposition, Chicago, IL, 1994) of the mercury-containing amalgam waste is discharged to sewer systems. Some of the waste amalgam particles that reach the sewer system settle out in the sewers and some are carried to POTWs.

The physical processes used in POTWs remove about 95% of the mercury received in waste water. The mercury removed from waste water then resides in the biosolids or sludges generated during primary and secondary treatment processes. EPA estimates that sewage sludge nationally contains about 15 tons of mercury per year. This is based on levels of mercury reported by EPA in the National Sewage Sludge Survey (55 F.R. 47210-47283, 1990) and EPA reports of POTW sludge use and disposal practices (Proposed Part 503 Standards for the Disposal of Sewage Sludge, EPA, Feb. 6, 1989). POTWs discharge about a half ton of mercury to surface waters per year nationally. Some of the mercury in sludge can return to the environment through sludge incineration.

We do not know exactly the proportion of mercury found in fish which originates from dental amalgam as compared to other mercury sources. The mercury contained in amalgam is not methylmercury and tends to stay bound in the amalgam under most environmental conditions (Arenholt-Bindslev and Larsen, “Mercury Levels and Discharge in Waste Water from Dental Clinics,” Water, Air, and Soil Pollution, Vol. 86, pp. 93-99). However, dental amalgam can break down and release mercury into the environment (MAREK, M. 1990. The Release of Mercury from Dental Amalgam: The Mechanisms and *In Vitro* Testing. J. Dent. Res. 69: 1167-

1174; other studies corroborate this finding.) The amount of mercury from dental amalgams that is methylated is not currently known.

Taking measures to prevent the dental amalgam from getting into the water in the first place, reduces the amount of dental amalgam and thus decreases mercury in waste water. The American Dental Association has identified numerous Best Management Practices for reducing mercury wastes from dental amalgam, including chairside screens and traps. Amalgam separators are also available at relatively low cost to remove fine particles of waste amalgam. A number of studies, including one conducted by EPA's Environmental Technology Verification Program, show a high degree of effectiveness of separators. Amalgam separators and other practices in dental offices can reduce the amount of mercury discharged to POTWs.

Another way to reduce the amount of amalgam entering the sewers is for dentists to use mercury-free fillings. The cost to patients of mercury-free fillings however, have been reported to be 1.5 to 8 times more than amalgam. Insurance companies may be unwilling to pay these additional costs.

The choice of dental treatment rests solely with dental professionals and their patients. EPA does not intend to second-guess these treatment decisions. Alternatives to mercury containing dental amalgams exist. As fewer mercury-containing dental amalgams are provided as treatment, they will become less of a source of mercury in the environment.

EPA ACTIONS

EPA is committed to achieving a better understanding and reduction of the public health risk to our nation's citizens with respect to mercury. EPA is working on a Mercury Action Plan to guide the Agency to an increasingly holistic and integrated approach to reducing mercury

exposure, and will include the actions discussed below. When final, this Mercury Action Plan will describe EPA's long-term goals and near-term priority actions, based on available scientific information on health and environmental impacts of mercury exposure and on the current status of EPA's program activities. In addition, the action plan's holistic perspective and approach to mercury also will be useful to other federal agencies, states, industry, academia, and the public in addressing mercury.

EPA has substantially limited emissions of mercury to the atmosphere through a Maximum Achievable Control Technology requirement under the Clean Air Act. As a result, the U.S. has cut emissions by over 90% from two of the three largest categories of sources, municipal waste combustion and medical waste incineration. Additionally, the U.S. has a goal under the Great Lakes Binational Strategy (U.S.-Canada) to reduce mercury emissions and water releases by 50% from 1990 levels and reduce use of mercury through regulatory and voluntary mercury reduction programs. EPA expects that these actions will reduce levels of mercury in air, and thus reduce the amount of mercury that eventually finds its way into rivers and lakes.

The Administration has proposed the Clear Skies legislation that would create a mandatory program to reduce power plant emissions of mercury, sulfur dioxide and nitrogen oxides by setting a national cap on each pollutant. It would cut mercury emissions by nearly 70 percent. Emissions would be cut from 1999 levels of 48 tons by a cap of 26 tons in 2010 and a cap of 15 tons in 2018.

Direct releases of mercury to water bodies are controlled through programs under the Clean Water Act, including NPDES permits issued by authorized states and EPA. AMSA estimates that six percent (253 of 4,307) of the NPDES permits issued to major POTWs include

mercury effluent limits. AMSA also estimates that ten percent (423 of 4,307) of these discharge permits have monitoring requirements.

Through the NPDES permit and the National Pretreatment Programs, EPA encourages POTWs to develop and implement pollution prevention strategies to reduce the amount of mercury received by the wastewater treatment plant. Effective mercury source reduction relies on the POTW effectively communicating to sector entities the fact that small scale individual efforts can collectively reduce the mercury loading to the environment. Forming partnerships and working with sector representatives to investigate mercury sources, explore alternatives, and assist in implementation of selected options is integral to a successful reduction strategy. For example, the Western Lake Superior Sanitary District determined that one industry and many small other sources, including dental facilities, contributed a major portion of the mercury in their wastewater. With respect to dental offices, the local POTW in Duluth, Minnesota, worked with the local dental offices to produce a manual containing BMPs on proper disposal of mercury in amalgam. Monitoring by the POTW shows that the amount of mercury discharges from dental offices has been reduced by over two-thirds.

In addition, the CWA requires EPA to develop scientific information on safe levels of pollution and for States to adopt water quality standards that protect public health and the environment. In January 2001, EPA published a new ambient water quality criterion recommendation for methylmercury which is expressed as a fish and shellfish tissue value rather than as an ambient water column value. This criterion of 0.3 parts per million (ppm) represents EPA's best scientific understanding of the level of mercury in fish tissue that will not lead to

adverse effects to the average eater of fish. States are starting to adopt new criteria in their water quality standards based on EPA's recommendation of 0.3 ppm to update their current standards.

As part of our overall goal to protect water, EPA issued a final rule in 1995 that puts in place water quality standards for the Great Lakes and their tributaries. This is the first time water quality standards took into account the effects of mercury on birds and mammals that consume contaminated fish, and serves to provide a more comprehensive level of protection for the environment.

In addition to NPDES permits and water quality standards, the CWA requires States to assess their waters to determine if they exceed water quality standards and if they do, to establish Total Maximum Daily Loads (TMDLs) for those waters. States have identified 1,097 (1998 and 2000 data) waterbodies where the levels of mercury exceed their water quality standards. States and EPA are developing TMDLs that identify the necessary reductions in mercury loadings to achieve these standards. To date, 144 are done. Some TMDLs are implemented through NPDES permits and others are designed so as to prevent increases in current mercury loadings to prevent impairments of waters.

EPA has a strategically targeted mercury research program focusing on priority areas, including transport and fate of mercury. EPA's Mercury Research Multi-Year Plan identifies as one of its two major long range goals the achievement of "an understanding of the transport and fate of mercury from release to receptor and its effects on the receptor." Resources for the implementation of the research activities in this plan total about $5.5 million annually to be spent on various areas, including transport and fate, using both Science to Achieve Results

(STAR) funds and in-house research. Between 1999 and 2005, the STAR grants program has committed approximately $13 million for atmospheric and aquatic transport and fate research.

CONCLUSION

I commend this subcommittee for conducting a hearing on this important topic. We look forward to continuing to discuss these important issues with you.

Thank you. I look forward to your questions.

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