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ON GOVERNMENT REFORM
HOUSE OF REPRESENTATIVES

STATEMENT OF

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NAVAL INSTITUTE FOR DENTAL AND BIOMEDICAL RESEARCH

(DENTAL CORPS)

BEFORE THE

SUBCOMMITTEE ON

HUMAN RIGHTS AND WELLNESS

OF THE

COMMITTEE ON GOVERNMENT REFORM

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Mr. Chairman, Honorable Representatives, ladies and gentlemen, good afternoon. Thank you for inviting us to testify before the Subcommittee on Human Rights and Wellness. I am Captain James C. Ragain, Jr, Dental Corps, US Navy, Commanding Officer of the Naval Institute for Dental and Biomedical Research (NIDBR) located at the Naval Service Training Center, Great Lakes, Illinois. Accompanying me this afternoon are Commander John C. Kuehne, Dental Corps, US Navy, Head of the Bioenvironmental Sciences Department, and Dr. Mark E. Stone, Program Manager for the NIDBR Mercury Abatement Program.

NIDBR's research related to the control of mercury emissions from dental amalgam began in 1991 as a collaboration with the American Dental Association involving the evaluation of commercial amalgam separators. NIDBR instituted a Mercury Management Program to coordinate and direct the research efforts of a number of dental researchers and equipment specialists. This program made great strides in the design and installation of wastewater pretreatment systems at several Navy dental treatment facilities. NIDBR was then designated by Navy Dentistry as the Lead Agent for development, evaluation, and guidance regarding Navy-wide installation of wastewater pretreatment systems to minimize the environmental impact of Navy Dentistry. The tasking required that pretreatment systems be able to remove mercury in order to allow all Navy dental clinics to comply with local wastewater discharge standards. NIDBR was specifically tasked to assess current compliance of Dental Treatment Facilities (DTF), in meeting local discharge standards and to develop strategies to bring all DTFs in the Navy into compliance. This includes ships, field and mobile dental units.

In FY01, NIDBR began the implementation of a multi-year program to survey and install

wastewater pretreatment systems in every Navy DTF worldwide. To date, pretreatment systems of various sizes have been successfully installed in 50% of all Navy dental clinics located within the continental United States. By the end of calendar year 2003, we expect to have completed the installation of mercury abatement systems in 95% of the Navy's US clinics. These systems meet local discharge limits, with anywhere from 95 to greater than 99% of total mercury removed from the wastewater. Previously completed wastewater characterization studies by NIDBR have enabled us to develop a pretreatment strategy that allows for the removal of mercury to extremely low levels, thus reducing mercury from grams per liter to micrograms per liter in the waste stream.

NIDBR's strategy involves the phased treatment of the dental-unit wastewater stream. Phase 1 is the removal of amalgam particulate through filtration and/or settling. Removal of particulate greater than 10 microns removes up to 95% of the total mercury in the waste stream. However, a significant amount of mercury is located in the dissolved or soluble fraction and is high enough to violate some local discharge limits. In Phase 2, the remaining dissolved mercury is driven to the ionic form by oxidation, and removed by sorbents.

This phased treatment program has proved very effective for both large and small dental treatment facilities. An additional benefit of the phased pretreatment strategy is the ability to deploy technology that can be scaled to meet variable local water treatment facilities' discharge limits.

Navy Dentistry's Mercury Abatement Program is a proactive effort intended to keep the Navy in compliance with local and overseas environmental requirements; and the successful implementation of these wastewater pretreatment systems will remove a source of mercury contamination to the environment.

Additional studies at NIDBR have attempted to measure the concentrations of various forms of mercury residing in the dental wastewater including ionic, organic and elemental mercury bound to particulate. This is an important endeavor because different mercury species have different toxicity profiles, and a meaningful assessment of mercury in dental wastewater must address the concentrations of all the different species present. Determining total mercury alone is not adequate to give a complete picture.

One of the questions you asked in your invitation to use was information on whether mercury solids methylate in sewer systems.

In 1967 Swedish researchers demonstrated that bacteria are capable of transforming inorganic mercury into methyl mercury, a more toxic and more readily absorbed form of the element. Many microorganisms, including bacteria and fungi, have been shown to possess the ability to methylate mercury.

NIDBR has been involved in the characterization of dental wastewater since 1993. We have measured total mercury and methyl mercury levels in wastewater, directly at the dental chair, from holding tanks, and from sewers both upstream and downstream from a dental treatment

facility. We found the percentage of methyl mercury relative to total mercury to be a relatively small fraction; however, preliminary composite sampling of wastewater upstream and downstream from a large dental treatment facility showed a 12-fold increase in total mercury leaving the dental clinic and a 3.6-fold increase in methyl mercury levels. One mile downstream from the clinic, the total mercury level had returned to the same as those upstream. However, the methyl mercury level remains about 3-and-half-fold higher than those upstream. The filter systems that we are installing in our dental clinics remove almost all of the total mercury prior to discharge into the waste stream.

Results of NIDBR studies underscore the importance of limiting the release of mercury into wastewater streams, as the potential exists for mercury to be transformed into more toxic species.

That concludes my prepared remarks. We are ready for any questions you might have.