OCCUPATIONAL SAFETY AND DENTAL MERCURY: COMPARING THE UNITED STATES WITH NORWAY

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Overview of the United States Occupational Safety and Health Administration (OSHA)

National standards for occupational safety are founded upon the undeniable fact that industry can kill and seriously harm workers. This concept has been tragically evidenced by a list of veritable disasters, including the development of Caisson's disease during the Brooklyn Bridge construction, the Triangle Shirtwaist Factory fire, and asbestos exposure from manufacturing.

As a result, the United States and most developed countries of the world have adopted standards for worker protection. Such standards generally state that when it is reasonable to assume a risk is present, the employer is required to take appropriate measures to protect its workers. In the United States, this effort was first officially attempted with the OSH Act, which was passed by Congress in 1970.[1]

However, the OSH Act is clearly a work in progress, which is made especially evident by the Workers' Right to Know Act of 1987.[2] This "addition" to the OSH Act became necessary because in some cases, workers were endangered without their knowledge.

In addition to the OSHA standards, many workers are compensated financially for risks by the industry. For example, truck drivers hauling trash are paid less than truckers hauling fuel, and truckers hauling fuel are paid less than those hauling explosives, etc.

At any extent, when it comes to mercury, employee exposure is strictly regulated by the 1970 Occupational Health and Safety Act and the 1987 Right to Know Act. OSHA's Hazard Communication Standard (HCS) states: "All employers with hazardous chemicals in their workplaces must have labels and safety data sheets [SDS] for their exposed workers, and train them to handle the chemicals appropriately. The training for employees must also include information on the hazards of the chemicals in their work area and the measures to be used to protect themselves."[3]

Yet, dental schools are not required to use the OSHA standards to protect students because students are not considered employees (i.e. they do not receive wages for their work). However, the instructors, janitors, assistants, and clerks in dental school facilities are covered by OSHA, although it is interesting to consider how many of them have actually been offered informed consent and appropriate training in protecting themselves from mercury.

A major issue with OSHA standards for dental mercury is that while there might be safety data sheets and training requirements, dental mercury is still being used. Additionally, the few existing OSHA standards related to dental mercury are not being enforced. What this means is that dentists, their staff, and dental students are all still being exposed to mercury, and patients are as well.

A comparison of Norway's experiences with occupational safety for dental mercury

Norway was the first country in the world to ban the use of dental amalgam mercury fillings in January 2008 when Norway's Minister of Environment and Development Erik Solheim announced: "Mercury is among the most dangerous environmental toxins. Satisfactory alternatives to mercury in products are available, and it is therefore fitting to introduce a ban."[4] Shortly after that, Sweden and Denmark took action end the widescale use of dental mercury fillings.[5] [6]

Most people are not aware that part of the impetus for the Norwegian ban can be linked to the movement against on-the-job injury from dental mercury. In 1994 dental nurse Tordis Stigen Klausen contacted the Government and the Regional Development and Directorate of Norwegian Labour Inspection (similar to the US's OSHA) to bring the issue of dental mercury exposure to their attention. At first, they ignored the problem, and so did the Norwegian Labour and Welfare Service (NAV) when Klausen contacted them in 1995. Yet, by 2005, Klausen was joined by a group of dental nurses who took the initiative and also contacted the Norwegian Labour and Welfare Service (NAV), explaining cases of on-the-job injury, birth abnormalities, and in some cases, even death.

Public perception shifted in favor of Tordis Stigen Klausen and the other dental workers when *NRK Brennpunkt*, a Norwegian documentary program, aired their story on national television in 2005.[7] The program featured a few of the nurses and discussed their health issues. They also interviewed an agency leader who denied that there could be any such problem with mercury in well-regulated dental offices. It was suggested that the female dental workers were merely looking for a handout and were not seriously impaired. However, the night the program first aired, the station received over 450 phone calls from other dental nurses exposed to mercury who had experienced similar abnormal birth outcomes or neurological harm.

To test the validity of these women's claims, an arrangement was made with the University of Lund in Sweden to evaluate the group for evidence of mercury toxicity. They took on this new task, and in a very short amount of time, they determined that the vast majority of the women and some of their offspring had been injured by on-the-job dental mercury exposure. Furthermore, they established that mercury levels generated during many dental procedures, especially in preparing high copper amalgam fillings, grossly exceeded the nation's occupational safety standards.

Meanwhile, the *NRK* television documentary did a follow-up story on the women in 2010 which transpired into public questioning as to how the government agency NAV dealt with the case.[8] Finally, in 2012, Tordis Stigen Klausen succeeded in having the NAV officially acknowledge her mercury-related occupational illness. A Norwegian news article by Kjersti Knudsson reporting this event noted that Gerd Bang-Johansen, chair of Norway's League of Dental Assistants, stated: "We have a huge number of cases to be dealt with in the NAV system and we are going to follow them closely. Many of these women have exactly the same symptoms as Stigen Klausen, and have worked with mercury a lot."[9]

After the state appealed the ruling in favor of the dental assistants, Norway's Supreme Court upheld the decision to officially acknowledge mercury injury as an occupational disease in the case of these women.

Former dental nurse Bertha Regine Serigstad, represented by the Norwegian Union of Municipal and General Employees, also won her case in 2013,[10] and Solveig Irene Jacobsen, who worked for a dental service on a boat in northern Norway, had her case approved in the NAV system in 2014.[11] Many other Norwegian dental workers have since followed suit.[12]

Science to support occupational safety measures for dental mercury

A plethora of scientific studies have demonstrated hazards of mercury in the dental workplace, as the following (abridged) list shows:

- Handling of dental mercury waste[13] [14] [15]
- Health risks for dental workers[16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39]
- Health risks for dental students[40] [41]
- Health risks for female dental workers[42] [43] [44] [45]
- Need for safety measures[46] [47] [48] [49] [50] [51] [52] [53]

The Future of Change for Occupation Safety in Dentistry

Each year that passes brings more evidence and data showing that mercury fillings pose risks to dental workers, patients, and the environment. Meanwhile, there is clearly a global trend to phase-down the use of mercury, as aptly evidenced in the United Nations Environment Programme's Minamata Convention on Mercury, which entered into force in 2017. Even in the United States, recent years have brought various regulations for industrial mercury.

Thus, it seems inevitable that protective measures will be taken for dental mercury over the next decade. The question is whether these changes will focus only on the environment and neglect to take into account the workers who are routinely and closely exposed to the element.

It is also essential to note that if placing dental mercury fillings is ever completely banned, mercury fillings will still be in the mouths of millions of patients. Some patients require the removal of silver amalgam fillings due to device failure and/or hypersensitivity, while others opt for the removal of silver amalgam fillings because of cosmetic purposes (white-colored fillings match the teeth better) or because they prefer to have dental fillings that do not contain mercury. However, removal of silver amalgam fillings without safety measures can potentially result in everyone in the dental room exceeding the safety limit of mercury exposure. The IAOMT encourages dental professionals to utilize measures that mitigate mercury exposures to dentists, their staff, and patients during amalgam removal. These recommendations are known as the Safe Mercury Amalgam Removal Technique (SMART) and are based on up-to-date science.

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