Dental Personnel and the "Right to Know"

Presented to the North Carolina Legislature by David C. Kennedy, D.D.S. March 30, 1990

In 1987 the “Right to Know “ act became law [i]. This law has direct application to the practice of dentistry since dentists are required by the nature of their occupation to frequently handle and dispose of materials which are considered toxic. Failure to disclose the toxicity of these materials, and inform your employees how to safely handle and correctly dispose of them, carries severe penalties.

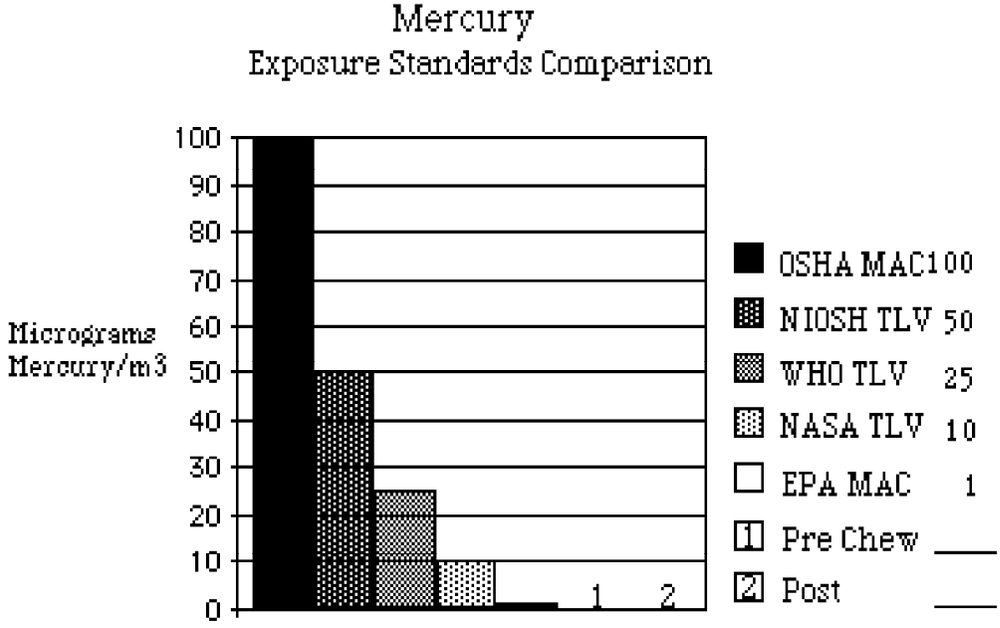
60 dentists learned of the magnitude of their liability when the EPA Super fund sought to recover almost 1/2 million dollars for the cleanup of scrap amalgam.[ii] This lawsuit was settled in favor of the EPA, however, the amount of liability was reduced by extenuating circumstances. More importantly, the ruling that scrap amalgam is a toxic material and the dentist is the manufacturer was upheld.

Toxics in the dental office are not limited to mercury. However, this article will review mercury safety and worker exposure and the applicable laws, since this is clearly a significant problem area. Such common substances such as sterilizing solutions and x-ray fixer are also on the list of hazardous materials. We are responsible for training our employees how to safely handle these materials. The law has four specific provisions. The employer is required to maintain a written hazard communication program notebook with the times and substantial nature of toxic training given employees. Secondly, it should contain a signed acknowledgement by the employees who have attended the training indicating that they understand the nature of the dangers they are exposed to in their daily duties and how they are to be protected.

The third provision requires a material safety data sheet (MSDS) for each toxic substance used. These are available from the manufacturer. They are now required to send this sheet along with new orders. Most dental supply companies will furnish these upon request free of charge.

The final requirement is that all materials included in the program be labeled with appropriate warnings.

The careless handling and disposal of mercury from dental offices is of considerable concern to environmentalists and should be to dentists as well. [iii] In response to the 1975 OSHA law, standards for the amount of mercury in the air of the work place were established[iv]. Our government has adopted a very lenient standard at 100 parts per million (ppm) maximum allowable concentration (MAC) [v]. Other countries and agencies of our own government have chosen to utilize a much lower exposure standard. (see Table 2) The National Institute for Occupational Safety and Health (NIOSH) recommended a 50 ppm time weighted average (TWA)[vi] be utilized. [vii] The EPA, whose task it is to safeguard the health of the citizens from pollution, has adopted a 1 ppm standard.[viii] As you can see, there is little agreement among the experts about how much mercury vapor it is safe to breathe. Clearly, we as employers are minimally required to keep our facilities below the 100 ppm MAC.



Some dentists have been poisoned at levels much lower that the 100 ppm level.[ix x] The offices of two dentists who were poisoned were found to be between 2 and 8 ppm.

While 100 ppm is an exposure standard for consenting adults working 8 hours with appropriate protection, the NIOSH document clearly states that women who are of child bearing age should be exposed to no more than 10 ppm and that it is not intended at all for women during pregnancy. The United States Environmental Protection Agency (EPA) is the only standard which is applicable under such circumstances. The EPA states that, "women chronically exposed to mercury vapor experience increased frequencies of menstrual disturbances and spontaneous abortions; also a high mortality rate was observed among infants born to women who displayed symptoms of mercury poisoning." In California, schools which do not conform to EPA guidelines are either decontaminated or destroyed. Levels 30 times the EPA MAC have been found in the homes of dentists posing an additional risk to the dentist and his or her family.

The current law and common sense makes it imperative for us to follow the established guidelines of the ADA in utilizing the “no touch“ technique with high volume evacuation and water spray while manipulating fillings.[xi] In addition to regularly checking the office for mercury contamination the guidelines recommend the use of a face mask while drilling, however, these recommendations do not agree with the OSHA requirement for self- protection. 3M has produced a mercury filter mask which will protect against 100 ppm mercury for about 10 minutes.[xii] It is recommended that this mask be utilized whenever fillings are manipulated including polishing, and removal by both the doctor and the assistant.

Failure to comply with OSHA Law is not new. Many businesses find it more expedient to violate the law and pay the fine than comply. The Pymm Thermometer Company of Brooklyn, New York was such a company. They repeatedly violated OSHA, paid piddling fines and disregarded their obligation to provide a clean safe work environment. After one employee suffered irreversible brain damage due to this negligent attitude the District Attorney Elizabeth Holtzman filed a criminal action against three company executives. They were charged with assault with a deadly weapon--mercury--and a jury found them guilty.[xiii]

Dental Personnel Health Risks

The average person with fillings has a much higher blood mercury level and in fact Abraham found the mercury level in the blood of people with amalgam was exactly the same as the levels which Kuntz found "at risk" of birth defects. (0.79 Nanograms / gram) Blood samples of l,555 dentists found that the mean for general dentists was 8.8 ng Hg/ml blood [xiv] This amount is slightly more than 11 times the level previously associated with stillbirths and birth defects. The evidence appears overwhelming that our profession suffers from chronic mercury intoxication.

Do women exposed to mercury vapor have a higher incidence of menstrual disturbances?

Mikhailova et al. found that 26.8% of the women working in a mercury polluted atmosphere suffered from menstrual disturbances. Marinova et al. found that 29% had hypermenorrhoea.[xv] The controls found only 0.3% with the same condition. Hypomenorrhea occurred in 15.3% of the exposed group and only 0.6% of the non-exposed group. This could mean that more than 44% of the female dental personnel working in contaminated dental offices suffer from reproductive disorders due to mercury. This is corroborated by two studies of women occupationally exposed to mercury which found that 36% to 45% of the women exposed will develop these types of disorders with in 6 month of employment and in 67% within three years of employment.[xvi] [xvii]

The most common symptoms were dysmenorrhea (painful menstruation), hypermenorrhoea, anovulation (infertility >40%) and hypomenorrhea. These symptoms are known to increase in populations also exposed to lead.[xviii] The relationship between spontaneous abortion, stillborn infants, and mercury has been confirmed.[xix]

The problems which may develop in the fetus from maternal exposure are not always evident at birth. Such delayed problems include minimal brain disorder, muscle spasms, altered electroencephalogram, dyslexia and learning disability. Exposure continues to increase if the infant is nursed since mercury is concentrated in breast milk. [xx] [xxi]

Since dental personnel are at risk is the public exposure to mercury from fillings also a problem?

In 1987 an expert committee instructed to review the safety of dental amalgam by the Swedish Socialstyrelsen (Department of Health) concluded that "from a toxicological point of view mercury is too toxic for use a filling material and dentists should use other materials as soon as a they are available. As a first step amalgam work on women that are pregnant should cease because of danger of damage to the brain of the fetus." [xxii] The Swedish Parliament has confirmed this position and has given the dentists until the end of 1991 to phase out mercury entirely. Children and women of child bearing age by general agreement are now excluded from having mercury fillings placed. Currently less than 50% of the Swedish dentist are regularly placing amalgam.[xxiii] The majority of younger dentists have complied and are now using alternative materials.

In order to more accurately evaluate the potential of amalgams to harm a fetus Drs. Vimy and Hahn designed an elegant animal experiment utilizing radioactively tagged mercury ^{203}. Dr. Vimy, a dentist, placed 12 occlusal amalgams in the molars of pregnant sheep while his surgical team implanted catheters in the mothers femoral vein, the placental sack and the femoral vein of the fetus.[xxiv] [xxv] Radioactivity measurements were utilized to determine the presence and quantity of mercury from the dental amalgam fillings in the various body tissues of the mother and fetuses. In one case twin fetuses provided the unique opportunity to compare the distribution of mercury absorbed during nursing versus interutero exposure.

1) With in 3 days mercury was found in the maternal blood, amniotic fluid, fetal blood, and maternal urine and feces.

2) By 16 days after placement the maternal mercury levels were highest in the kidney, liver, G.I. tract, and thyroid. The mercury levels in the fetus were highest in the pituitary, liver, kidney, and placental cotyledon.

3) At 33 days post placement (birth time) the most fetal tissues had higher levels of mercury that the maternal tissues. Specifically, the fetal liver, epiphysial bone, bile, bone marrow, blood, and brain.

4) During lactation there was 8 times more mercury in the milk than blood serum. This resulted in an increase in mercury in the nursed fetus.

5) 73 days post placement mercury levels in the maternal kidneys, liver, parotid glands, pancreas, pituitary glands, urine, bile, brain, and thyroid continued to rise.

Researchers concluded that mercury vapor released from dental amalgam fillings is readily absorbed in lung, gastrointestinal tract and jaw bone and progressively accumulates in maternal and fetal tissues with exposure duration. Neonatal mercury exposure from this dental material occurs via milk. They stated in their conclusions that "Our laboratory findings in this investigation are at variance with the anecdotal opinion of the dental profession, which claims that amalgam tooth fillings are safe.".

In summary the current environmental and occupational safety laws make it mandatory for all employers to inform and train their employees about toxic materials. OSHA requires that the

work place be as safe an environment as possible and that the employer periodically monitor for toxic exposure. The EPA requires proper disposal of all waste materials.

The four provisions of the "Right to Know" law require:

1) Accurate Records of Safety Training
2) Material Safety Data Sheets
3) Informed consent on file
4) Labels on all Toxic Materials

Failure to maintain a clean working environment in the past has injured both employees and employer. In this health conscious age it is imperative that risks be minimized and workers health be safeguarded at all times.

The dentist is obligated to inform patients of the risks and benefits of any treatment, however, most dentists do not mention the risk of damage to reproductive organs when they place amalgam. Some are not even aware that a risk exists. The public should be given all of the facts before they are asked to accept dental treatment.

As an added footnote the Agency for Toxic Substances and Disease Registry US PHS/CDC has recently determined that an acute exposure is the inhalation of 20 parts per billion. Acute is described as immediately hazardous to ones health.

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[i] Hazard Communication Program Federal Register/ Vol 52. No. 163 / Monday, August 24, 1987

Figure 1
Rules and Regulations
1) Written Hazard Communication Program
2) Labels and other forms of warnings
3) Material Safety Data Sheets (MSDS)
4) Informed consent of the employee

[ii] ADA News EPA, dentists settle in mercury cleanup case, 19(16):1, Aug 15, 1988

[iii] Nixon GS, Rowbotham TC: Mercury hazards associated with high speed mechanical amalgamators. Brit Dent J 131:308-11, 1971

[iv] OSHA Job Health Series: Mercury. OSHA 2234, August 1975.

[v] Maximum allowable concentration (MAC) is the level which can never be exceeded even instantaneously.

[vi] Time Weighted Average (TWA) The average air quality during the 8 hour work day would average no more than standard

[vii] National Institute for Occupational Safety and Health (NIOSH) A recommended Standard for Occupational Exposure to Inorganic Mercury. Published by NTTS. No PB-222 223, 1973

[viii] United States Environmental Protection Agency Office of Health and Environment Assessment Mercury health effects update Final Report EPA-600/8-84-019F

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[x] Nylander M: Mercury in pituitary glands of dentists. Lancet 442, February 22, 1986

[xi] A.D.A. Council on Dental Materials and Devices: Recommendations in mercury hygiene. J Amer Dent Assoc 88:39l-2, 1974

[xii] 3M Mercury filter mask #8707

[xiii] "The Nation" Pymm Thermometer Safety and Health Front cover October 23, 1989

[xiv] Battistone GC, Hefferren JJ, Miller RA, Cutright DE: Mercury: its relation to the dentist's health and dental practice characteristics. J Amer Dent Assoc 92:1182-8, 1976

[xv] Mikhailova LM et al. The influence of occupational factors on disease of the female reproductive organs. Pediatriya Akusherstvoi Ginekologiya. 33(6)56-58, 1971

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[xx] Pierce P et al. Alkyl mercury poisoning in humans. Report of an outbreak. JAMA 220:1439-1442, 1972

[xxi] Snyder RD. Congenital mercury poisoning. N Eng J Med. 18:1014-1016, 1971

[xxii] Socialstyrelsen report May 20, 1987 as reported in Svenska Dagbladet Bioprobe Vol 4 6/87 issue 3

[xxiii] Hansen Mats PhD. Presentation before International Academy of Oral Medicine and Toxicology Detroit, USA 9/89

[xxiv] Hahn LJ ; Kloiber R; Vimy MJ; Takahashi Y; Lorscheider F; Dental "silver" tooth fillings: a source of mercury exposure revealed by whole-body image scan and tissue analysis. FASEB J. 3:2641-2646; 1989

[xxv] Vimy M. Hahn LJ. Klober R Takahashi Y. Lorscheider FL. Mercury uptake in sheep fetus from dental fillings, 32nd Annual Meeting of the Canadian Federation of Biological Societies 14-17 June 1989 and 2nd Meeting of the International Society for Trace Element Research in Humans 8/89