

# Rubber Dam Reduces Mercury Exposure During Amalgam Removal

References Collated June 99

Following are some abstracted references which support the use of a rubber dam when removing amalgam. Every effort should be made to use rubber dam to protect the mouth and airways. Rubber dam may not eliminate mercury exposure but it goes a long way to reducing it.

There are some situations where a rubber dam is impossible to use, eg when an amalgam is located at the back of the back tooth or if a tooth has not fully erupted. In these situations you will rinse thoroughly after the amalgam has been removed. Thankfully these situations are rare.

## **Profile of respirable particulate produced during amalgam removal.**

Nimmo A., Werley M.S., Tansy M.F., and Martin J.S J Dent Res. 68:Abstract 334, page 223, Mar 1989.

**ABSTRACT:** Dentists frequently remove existing amalgam restorations with a high-speed handpiece utilizing water spray along with high-velocity evacuation. The purpose of this study was to evaluate the size and range of fully respirable (u) amalgam particles produced under the conditions listed above.

...These results suggest that both patient and dentist are subjected to similar particulate exposures during amalgam removal. Particle mass distribution was approximately equal across the range.

## **Particulate inhalation during the removal of amalgam restorations.**

Nimmo A, Werley MS, Martin JS, Tansy MF Department of Prosthodontics, Temple University, School of Dentistry, Philadelphia, Pa. J Prosthet Dent 1990 Feb;63(2):228-33

An aerosol that contains amalgam particles is created when a high-speed hand-piece is used to remove an existing amalgam restoration. Those particles smaller than 10 microns are considered to be fully respirable. This means that a significant percentage of the particles have the potential to travel to the terminal alveoli, where they may become lodged. Long-term exposure to fully respirable particles may compromise a person's respiratory function. Amalgam restorations were placed in the Typodont teeth of a mannequin designed to simulate the head and the respiratory tract of a patient. The amalgam restorations were removed under three experimental conditions: dry cut (control), wet cut (water spray) with high-velocity evacuation, and wet cut with high-velocity evacuation and a rubber dam. Particulate exposure was evaluated in the simulated respiratory tracts of the patient and the dentist that were equipped with ambient particle sizing samplers. Use of water spray and high-velocity evacuation significantly reduced patient exposure to particles. The use of a rubber dam, together with water spray and high-velocity evacuation, was responsible for a further significant reduction of exposure to particles when compared with water spray and high-velocity evacuation alone. The dentist, however, was exposed to moderate levels of fully respirable particles for all conditions tested. It is therefore recommended that all dental personnel wear face masks while removing existing amalgam restorations.

**Robert Gammal Special Note:**

Paper masks commonly used by dental personnel are disastrous if used for amalgam removal. Although they will stop the inhalation of most amalgam particles, these particles will adhere to the surface of the mask. The temperature of the breath will vaporise mercury from a massive surface area of amalgam particles. The end result is that the inhaled mercury vapour will far exceed that in the surrounding operatory. The solution used at Bio Compatible Dentistry is to supply the dentist and nurse with full respiratory masks and the patient with a nose piece. These masks are plastic respiratory style masks which supply pressurised sterile air (medical gasses) to the patient, nurse and dentist. The positive air flow means that almost no mercury vapour or amalgam particles are able to be inhaled.

**Mercury levels in plasma and urine after removal of all amalgam restorations: The effect of using rubber dams.**

Berglund A, Molin M Department of Dental Materials Science, Umea University, Sweden. Dent Mater 1997 Sep;13(5):297-304

OBJECTIVE: The aim of the present study was to determine whether removal of all amalgam restorations might significantly affect mercury levels in plasma and urine and whether the use of rubber dams might reduce patient exposure to mercury during amalgam removal.

SIGNIFICANCE: The study showed that dental amalgam had a statistically significant impact on the mercury levels found in plasma and urine in the patients tested, and that the use of a rubber dam during removal of all amalgam restorations significantly reduced the peak of mercury in plasma following removal.

**Systemic transfer of mercury from amalgam fillings before and after cessation of emission.** Halbach S, Kremers L, Willruth H, Mehl A, Welzl G, Wack FX, Hickel R, Greim H Institute of Toxicology, Institute of Biomathematics and Biometry, GSF-National Research Center for Environment and Health, Neuherberg, Oberschleissheim, D-85758, Germany. Environ Res 1998 May;77(2):115-23

In 29 volunteers with a low amalgam load, the number of amalgam-covered tooth surfaces and the occlusal area of the fillings were determined. Concentrations of total mercury were measured in plasma and erythrocytes as well as in urine together with the excretion rate. Absorbed daily doses were estimated from intraoral Hg emission by two separate methods. The transfer of Hg from the fillings via the oral cavity and blood to urinary excretion was evaluated according to the most representative combination of parameters. This consisted of urinary excretion (1), Hg concentration in plasma (2), absorbed dose (3), and occlusal area (4). Pairwise correlation coefficients were 0.75 for parameters 1 vs 2 and 2 vs 3 and 0.49 for parameters 3 vs 4. Within 9 days after removal of the fillings, a transient increase was observed in plasma Hg levels only. *This was reduced in those volunteers to whom a rubber dam had been applied during removal.* Peak plasma Hg was 0.6 ng/ml on average and decreased with halftimes between 5 and 13 days. A significant decrease in Hg excretion was noted not before 100 days after removal. Being relatively insensitive to dietary mercury, the determination of total mercury in plasma and of its urinary excretion rate appears, under practical aspects, most suitable for the investigation of Hg uptake from amalgam.

**Mercury concentration in blood and urine - before and after the placement of dental amalgam fillings.**

Babisch W, Kovacic S, Krause C, Roulet JF, Thron JL, Hoffmann M Institut für Wasser-, Boden- und Lufthygiene des Bundesgesundheitsamtes, Berlin. Zentralbl Hyg Umweltmed 1992 Aug;193(2):175-87

70 patients of dentist's surgery were given MOD amalgam fillings (non-gamma-2 amalgam) for molars. They were allocated for comparison to four groups defined by their treatment, i.e. the number of old and new restorations and whether a rubber dam was used. Blood and urine samples were collected at regular intervals before and during a 14-day period after treatment and tested for mercury concentration (Hg). Over the observation period the groups with the highest exposure (1-2 old restorations replaced by new ones) showed a tendency, in contrast to the less exposed groups (1 new filling with or without dam), towards increases ( $p$  less than 0.10) in group average Hg values of approx. 0.2 microgram/L (blood) and 0.3 microgram/g creatinine (urine) as acute treatment effects. The highest values recorded before and after the treatment, 3.3 micrograms/L (blood) and 16.5 micrograms/L (urine) are higher than normal but do not indicate any increase in the risk to health especially if they are not persistent.