

How Much Mercury Is Absorbed From A Typical “Silver” Amalgam

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How much mercury is absorbed from a typical “silver” amalgam is an important question that should be readily available to every dental consumer. Unfortunately the information is not readily available and it is difficult to do the evaluations in vivo (inside a real mouth) because any mercury released may be out gassed or may absorb directly into the tissues. The direct absorption of mercury into the tissues has been well documented in sheep and human studies.

In 1991 Chew et al published the results of a study that was carefully designed to determine the amount of mercury released from a 1cm² amalgam maintained in a sealed container for two years. The study concluded “that the overall mean release of mercury was 43.5 +/- 3.2 mcg/ cm² /24 hr, and the amount of mercury released remained fairly constant during the duration of the experiment (2 years).”¹

In an IAOMT supported study by Boyd Haley, PhD., reported in 2007, nine different dentists were asked to perform amalgam restorations on a standardized Plexiglas mold that produced a slightly less than 1cm² amalgam surface². These “fillings” were studied in an undisturbed water bath at room temperature for 25 days. The results demonstrated a daily release of 4-22 mcg mercury from these surfaces at a steady rate during the 25 days of observation. Furthermore, when the amalgam surface was brushed with a medium bristle toothbrush the amount of mercury released increased 5-10 fold.

Haley’s study was done in distilled water without any electrical charge and without any chewing type pressures. Undoubtedly the amount of mercury released from teeth in an acid bath would be significantly greater. The pH, or acid level, of saliva can vary from 6.0 to 7.4 (less than 7.0 is acidic) but most often saliva is on the acid side. More importantly metals will be released from their nesting site at an increased rate when there are two different metals separated by an acid bath. This is a standard battery effect that would be expected if there were dissimilar metals in the mouth such as is the case when there are mercury amalgam fillings and a gold or titanium or stainless steel cap. Mechanical pressure as occurs with gum chewing or nighttime grinding would add significantly to the amount of mercury being released.

Although the actual release of mercury would be higher in the mouth, for the argument we will use the water bath figures for mercury release, which are reported between 4 and 43.5 mcg per day for a 1cm² amalgam surface. An average amalgam surface is about 0.25 cm² (0.5cm on each side) so the average amalgam would release ¼ of the amount reported in the two studies. An average American now has about 8 amalgam fillings so the average mouth would out gas 8-87 mcg Hg per day and this would continue for many, many years.

Another way to arrive at the amount of mercury being released from an amalgam is to study the amount of mercury being excreted and compare that to the number of amalgam fillings present. This is what was done in an NIH sponsored study of 1,127 soldiers.³ These soldiers had an average of 22 amalgam surfaces and it was reported that each surface increased the amount of mercury in urine by 0.1 mcg per liter. Since 85-95% of mercury that is discharged from the body is released into the stool via the liver we could extrapolate that about 1.2 mcg is released into stool and urine per day from each amalgam surface. Since only about 20% of inhaled mercury is discharged we would have to estimate that at least 5 times the 1.2 mcg of mercury is absorbed from the amalgam surface. This number would again estimate that about 6 mcg of mercury is absorbed from each amalgam surface. That may be lower than water bath studies but the actual size of the amalgams was not determined in the military study. Since each soldier had an average of 22 amalgam surfaces we could assume that the average size was less than the 1 cm² used in the water bath studies.

It is estimated that at least 80% of the mercury out gassed would be absorbed into the body and 85-95% would be retained. Let's look at the figures for the average 70 kg American with 8 normal sized fillings who is getting exposed to 8-87 mcg mercury each day. If 80% is absorbed that would come to 6.4-70 mcg per day. That would be 0.09-1 mcg per Kg per day. The lower estimate is very close to the EPA caution of no more than 0.1 mcg/kg/day from food. The upper estimate yields ten times the EPA caution level and this is for swallowed mercury. The danger of inhaled mercury may be much greater than ingested mercury.

1. Long-term release of mercury from non-mercury releasing amalgam. Chew, et al. *Clinical Preventive Dentistry*, 1991 May-June;13(3):5-7
2. The relationship of the toxic effects of mercury to exacerbation of the medical condition classified as Alzheimer's disease. Boyd Haley. *Medical Veritas* 4 (2007) 1510-1524
3. Mercury concentrations in urine and whole blood associated with amalgam exposure in US military population. Kingman et al. *J of Dental Research* 1998;77(3):461-71