

“Dental Amalgam Fillings” is the Number One Source of Mercury in  
People

and Exposure Exceeds Government Health Standards for Inorganic  
Mercury (Vapor)

B. Windham (Ed.)

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## 1 “Dental Amalgam Fillings” is the Number One Source of Mercury in People

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Government agencies and medical studies have found that the largest source of mercury in most people who have several dental amalgam fillings is from amalgam fillings (ref 2-20, 26, 27). Exposure from fillings amounts to from 50 to 90 percent of exposure, with the average being about 80% of total exposure (5-9, 12-15, 19, 20, 26, 27). The studies found that mercury amalgams are unstable due to mercury’s low vapor pressure and galvanic action (24), leaking mercury vapor continuously into the lungs and saliva at levels exceeding health standards. The amount of mercury released by a gold alloy bridge over amalgam over a 10 year period was measured to be approx. 101 milligrams (mg) (60% of total) or 30 micrograms ( $\mu\text{g}$ ) per day (21b), and other studies have found similar results for amalgam fillings (21a, 12, 18, etc.).

Mercury exposure of most people with fillings was found to exceed government health standards and levels found to cause adverse health effects (see below).

The **tolerable daily exposure level for mercury** developed in a report for Health Canada is .014 micrograms/kilogram body weight ( $\mu\text{g}/\text{kg}$ ) or approximately 1  $\mu\text{g}/\text{day}$  for average adult (2) (**.04  $\mu\text{g}/\text{day}$  for a 6.5 pound infant or .14  $\mu\text{g}/\text{day}$  for a 22 pound infant**).

The U.S. EPA Health Standard for elemental mercury exposure (vapor) is 0.3 micrograms per cubic meter of air (1). The U.S. ATSDR health standard (MRL) for mercury vapor is 0.2  $\mu\text{g}/\text{m}^3$  of air, and the MRL for methyl mercury is 0.3  $\mu\text{g}/\text{kg}$  body weight/day (4). For the average adult breathing 20  $\text{m}^3$  of air per day, this amounts to an exposure of 4 or 6  $\mu\text{g}/\text{day}$  for the 2 elemental mercury standards. For an **infant** breathing 4  $\text{m}^3$  of air per day, this would be **0.8 to 1.2  $\mu\text{g}/\text{day}$**  and for a child breathing 8  $\text{m}^3$  per day of air this would be 1.6 to 2.4  $\mu\text{g}/\text{day}$ .

The EPA health guideline for methyl mercury is 0.1  $\mu\text{g}/\text{kg}$  body weight per day or 6  $\mu\text{g}$  to 8  $\mu\text{g}$  per day for the average adult (1). This corresponds to a level of 1  $\mu\text{g}/\text{gram}$  in hair which is the EPA reference level for mercury hair test. (this amounts to **0.3  $\mu\text{g}/\text{day}$  for a 6.6 pound infant** and 1 microgram per day for a 22 pound child)

The range of mercury exposure levels found in people with amalgam fillings by the World Health Organization Scientific Panel on Mercury was 3 to 70 micrograms per day (3), with other medical studies finding up to 500  $\mu\text{g}/\text{day}$  in gum chewers or people who grind their teeth (6, 11, 16, 17, 18) or some with large numbers of fillings. The average amount absorbed was above 10  $\mu\text{g}/\text{day}$  (ref. 3-18). The average mercury exposure for a Canadian adult with amalgam fillings was found in the Health Canada study to be 9  $\mu\text{g}/\text{day}$  (2). In a large German study with 20,000 tested subjects at a University Medical Clinic, the average exposure from fillings was over 10  $\mu\text{g}/\text{day}$  and over 50% of all those with 6 or more amalgam fillings had daily exposure exceeding the EPA health guideline (6).

Note that the amount of mercury excreted in feces, as opposed to absorbed, is much higher than most of these estimates of mercury absorbed by the body. Daily excretion through feces amounted

to from 30 to 190  $\mu\text{g}$  of mercury, being more variable than other paths (7). Other studies had similar findings (9, 12, 17-19). Most with several amalgams had daily fecal excretion levels over 50  $\mu\text{g}/\text{day}$ . The reference average level of mercury in feces (dry weight) for those tested at Doctors Data Lab with amalgam fillings is .26 mg/kg, compared to the reference average level for those without amalgam fillings of .02 mg/kg (27). (13 times that of the population w/o amalgam). Other labs found similar results (27). This level of mercury gives a daily excretion of over 30 micrograms per day. There is also evidence that amalgam is also the largest source of methyl mercury in most people with amalgam, based on studies and medical lab tests of those who have amalgam replaced (26, 27, 12). Mercury vapor and inorganic mercury have been documented to be methylated to methyl mercury by mouth and intestinal bacteria, along with candida albicans and other methyl donors (28), so that even people who don't eat fish but do have several amalgam fillings have high levels of methyl mercury in saliva and blood.

Studies have consistently found modern high copper non gamma-two amalgams have greater release of mercury vapor than conventional silver amalgams (21-23, 25). Recent studies have concluded that because of the high mercury release levels of modern amalgams, mercury poisoning from amalgam fillings is widespread throughout the population (17, 22, 18, 6). Due to such widespread high exposures the average person with several amalgam fillings has approx. 10 times higher mercury exposure than those without amalgam (1b), and excretes approx. 30 micrograms into the sewer each day, making dental amalgam the largest source of mercury in sewers. The high levels in sewers and sewer sludge result in amalgam being a significant source of mercury in water bodies and fish, and also a significant source of air emissions from out gassing sewer sludge and crematoria (1c).

Common levels found in persons with amalgam fillings are over 10 times the Health Canada TDE, and more than the EPA health standard for mercury vapor. Thus persons with amalgam fillings have levels of intraoral mercury vapor and body exposure levels higher than the level considered to have significant health risk.

The studies found that Total mercury intake is proportional to the number and extent of amalgam surfaces, but other factors such as chewing gum and drinking hot liquids influence the intake significantly increasing exposure as much as 500%.

A World Health Organization Scientific Panel concluded that a safe level of mercury exposure below which no adverse effects occur has never been established (3)

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