

# The Danger of Mercury\*

In August 1989, four family members from Lincoln Park, Michigan, died under mysterious circumstances. All four victims had severe tissue damage to the esophagus and lungs, which led doctors to suspect exposure to some type of caustic chemical. Subsequently, local police and fire investigators discovered a crude laboratory in the basement that was used to recover valuable silver from stolen dental amalgams. A dental amalgam is a metal alloy that a dentist uses to fill a tooth. The alloy typically contains silver, tin, copper, and zinc dissolved in liquid mercury. The mixture is placed in a cavity, where it hardens, resulting in a standard “filling.”

One of the victims worked at a manufacturing facility for amalgams and was stealing some of the products. At home in his crude lab he heated the amalgam to drive off the mercury (which vaporized at relatively low temperatures) so that he could recover the silver that was left behind. In the process, the colorless, odorless, tasteless mercury vapor entered the ductwork of the home, which was contaminated with mercury at levels 1500 times normal—levels certain to result in death to those exposed. In fact, postmortem analysis revealed extreme levels of mercury in the vital organs of all four victims. Mercury vapor was the silent killer.

The toxicity of mercury varies significantly depending on the route of entry into the body. Inhalation is the most dangerous route because mercury vapor entering the lungs quickly passes across the lung–blood barrier and into the bloodstream, where it can interfere with normal blood chemistry. One of the reactions that takes place in the blood is

the decomposition of hydrogen peroxide (a metabolic waste product) by the enzyme peroxidase:



When elemental mercury enters the bloodstream, it reacts with hydrogen peroxide in the presence of peroxidase to produce mercury(II) oxide and water:



If this conversion to mercury(II) occurs within vital tissues, the mercury(II) cation can denature proteins, inhibit enzyme activity, and disrupt cell membranes. Death often results from respiratory or kidney failure.

If mercury is so toxic, how can it be used in dental fillings? Surprisingly, unlike elemental mercury in the vapor form, mercury bound as a solid in a dental amalgam presents little, if any, risk. Because the mercury is not mobile, even in the harsh environment of the human mouth, the American Dental Association has determined it to be a minimal health risk to dental patients. Even if a filling loosens and is accidentally swallowed, it is passed through the digestive system and excreted before it can pose any risk. The mercury that the four victims in this story were exposed to resulted from heating the amalgam in a smelting furnace, thus vaporizing the mercury and exposing the occupants of the house to the most hazardous route of entry—inhalation.

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