



Investigating
Mercury
TOXICITY



Occasionally patients may present to primary care expressing concern about mercury toxicity, or requesting testing following their own research. Although there are many potential sources of exposure to mercury and its compounds, most patients can be reassured that they are at low risk of mercury toxicity. The exception to this is the exposure of the developing foetal brain to organic mercury.

Sources and risks of mercury exposure

Mercury exists in three different forms:¹

- **Elemental mercury** (also known as quicksilver) – a silvery, shiny, volatile liquid, which emits a colourless, odourless vapour at room temperature
- **Inorganic mercury** – compounds formed when elemental mercury combines with other elements such as sulphur, chlorine or oxygen to create mercury salts
- **Organic mercury** – compounds that are formed when elemental mercury combines with carbon, such as methyl mercury

The adverse health effects of mercury exposure depend on its chemical form (elemental, inorganic or organic), the route of exposure (inhalation, ingestion or skin absorption), and the level of exposure. Vapour from liquid elemental mercury and methyl mercury are both more easily absorbed than inorganic mercury salts and are therefore more toxic.

Potential sources of exposure to mercury²

Elemental mercury:

- Inhalation and skin absorption when handling liquid mercury, e.g. broken thermometers, sphygmomanometers, fluorescent light bulbs
- Amalgam dental fillings
- Environmental exposure, e.g. air contamination from burning coal and industrial waste
- Release from soil in geothermally active areas (low levels in New Zealand)

Inorganic mercury salts:

- Non-prescription calcium supplements
- Some complementary medicines
- Topical agents such as bleaching creams to remove freckles
- Some fungicides
- Red colouring in some tattoos

Organic mercury salts:

- Fish (methyl mercury)

Amalgam dental fillings

Dental amalgam fillings contribute only a minor amount to the total mercury levels in the body, and do not cause a significant increase in blood mercury level. There is no good evidence that amalgam fillings cause mercury toxicity.⁴

The American Dental Association (ADA) states that amalgam is a safe material with no sound scientific evidence supporting a link between amalgam fillings and systemic diseases or chronic illness. The U.S Food and Drug administration group (FDA) concludes that amalgam fillings do not significantly contribute to mercury-related toxicity. The FDA found that in adults and children aged six years and over, who have fifteen or more amalgam surfaces, mercury exposure was far below the lowest levels associated with harm.⁵ In addition the FDA does not recommend that amalgam fillings are removed or replaced. Removing sound amalgam fillings results in unnecessary loss of healthy tooth structure, and results in exposure to mercury vapour released during the removal process.

Although amalgam fillings are considered safe, research to develop new filling materials is ongoing.



Mercury in fish

Fish is by far the biggest source of exposure to organic mercury, in the form of methyl mercury. Organic mercury is passed along the food chain from smaller fish to larger predator fish, e.g. swordfish, shark, tuna, which contain the highest levels of accumulated mercury. Mercury levels can also be high in trout caught from geothermal lakes. Cooking does not reduce mercury content in fish. All canned fish (including tuna, herring and mackerel) sold in New Zealand contain acceptably low levels of mercury.²

The developing foetus, infants and young children are most susceptible to mercury-related neurotoxicity that may result from consuming large amounts of fish. The New Zealand Food Safety Authority advises that pregnant women should choose fish varieties with lower mercury concentrations.³ Fish that are likely to contain the lowest levels of mercury include: farmed salmon, skipjack tuna, tarakihi, blue cod, hoki, john dory, monkfish, warehou, whitebait and flat fish (e.g. flounder), as well as mussels and pacific oysters. Small, canned fish such as sardines and mixed fish (e.g. fish portions and fish fingers) can also be eaten without restriction.

Symptoms of mercury toxicity

Low grade continuous exposure to mercury can lead to:⁶

- Inflammation of the mouth, soft gums, loose teeth, excessive salivation, metallic taste and foul breath
- Tremor (hatter's shakes), particularly when the person is being observed or is in an unfamiliar environment or job
- Mental and nervous symptoms including behavioural changes, stammering, anxiety, insomnia and loss of energy and drive

Laboratory testing of mercury

Appropriate indications for testing blood or urine mercury:⁴

- History of mercury ingestion (other than normal consumption of fish) or other exposure
- Occupational health monitoring
- Neurological symptoms suggesting occult mercury poisoning

Inappropriate reasons for requesting blood or urine mercury:⁴

- Non-specific symptoms such as memory loss, cognitive decline, depression or chronic fatigue syndrome
- The presence of amalgam fillings
- Autism spectrum disorder or Alzheimer's disease (there is no convincing evidence that mercury is linked to either of these conditions)
- Routine "screening" or an "annual check"

Blood mercury is the recommended test to diagnose mercury poisoning as most mercury is present in red blood cells. Levels are raised by recent exposure, e.g. a large seafood meal may raise blood mercury, which then declines over subsequent weeks. The half-life of organic mercury in blood after exposure is approximately seven to ten weeks and three to 15 days after vapour exposure. After inorganic mercury exposure, the half-life is three to four weeks.²

Urine testing is used to assess chronic exposure to inorganic and elemental mercury. Organic mercury exposure (i.e. through seafood ingestion) usually only has a minimal effect on urine mercury levels.

In a primary care setting, testing for mercury in other samples, e.g. hair, nails or cerebrospinal fluid, is difficult and expensive, and is not recommended.

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