



# MERCURY THERMOMETERS ARE OUT OF THE MARKET, WHY!

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**T**HERMOMETERS are one of the most used devices to measure temperature in a specific range. In day-to-day medical life, measuring body temperature is the most preliminary diagnostic activity to start a medical procedure. But gone are the days when a doctor used to remove the thermometer from the patients' mouth and carefully check the thin glittering silver-like line of mercury to read the temperature. Today, old mercury thermometers are being replaced with digital and electronic thermometers.

During the COVID-19 pandemic, infrared radiation-based thermometers were also used widely to measure the body temperature from a safe distance without touching the

body of a patient. However, the accuracy of the mercury thermometers is excellent and highly respectable in the scientific world. Besides, the mercury thermometers are cheaper than other kinds of new thermometers. What then is the reason behind the disappearance of the mercury thermometers from the market?

Mercury is the most important part of the mercury thermometers. These have a capillary tube attached with a mercury-filled bulb; upon change in temperature the mercury expands or contracts in volume. The precise expansion and contraction of volume with temperature is a property of mercury. With this mechanism, the scale can be carved on

the surface of the glass tube and the change in temperature can be read accurately. The temperature measurement is quite accurate due to the specific volume expansion coefficient of mercury.

Mercury is a useful metal in liquid state at room temperature which has applications not only in measuring temperature & pressure but also in paints, cosmetics, Compact Fluorescent Lamps (CFL), electrical circuits, dental fillings, antibacterial disinfectants and gold purification processes, etc. According to a study, approximately 5500-8900 tons of mercury is emitted or re-emitted every year into the atmosphere mainly because of human activity.

According to the World Health Organization, mercury is among the chemicals that pose grave concerns towards public health. It is a hazardous material and may cause serious health problems including threat to child development in the uterus. It may have toxic effects on immune, nervous and digestive systems. Because of very high surface tension, transmission of liquid mercury particles is very easy and likely through the atmosphere and it can reach remote locations through the atmosphere.

Although, mercury metal in inorganic form does not react with most of the acids and can't cross the blood-brain barrier and placental barrier, yet it can make metal-organic compounds of different kinds of which many are very toxic and dangerous. For example, ethylmercury is used as a preservative in vaccines and is safe but methylmercury is not safe. People get exposed to methylmercury mostly through seafood and fish. Different inorganic and organic compounds of mercury are found to have completely different properties.

In the 1950s in Japan, the world's most mysterious and dangerous poisoning cases were reported and later it was found that the reason was mercury contamination. In the Minamata city of Japan, a local chemical plant was handling mercury in a very irresponsible manner and releasing mercury waste in the Minamata bay. Mysteriously, the people of Minamata city of Japan started suffering with severe neurological disorders, ataxia, numbness, muscle weakness, and damage in vision, hearing in speech. In 1956, the reason behind the medical suffering was discovered and was historically termed as Minamata disease.

Minamata disease spread due to severe mercury contamination and the methylmercury compound was the main culprit behind it. The cats, dogs, and humans kept dying due to this disease for almost 36 years in Minamata. The local chemical company had to pay 86 million US\$ as compensation.

When, it was established that the disorders and deaths in Minamata city were due to severe mercury contamination, the governments and international monitoring bodies started taking mercury contamination seriously. In 1972, experts at the Stockholm Conference on the Human Environment observed that a student got a disability due to severe methylmercury poisoning when he was still inside the uterus before birth.

In the same year, a few United Nations member countries established the United Nations Environment Program (UNEP),

which became actively engaged in policy implementation regarding mercury poisoning. It took 29 years for the governing council of the UN to invite the UN Environment executive director to undertake the global assessment of mercury and its different compounds. It also assessed the health hazards of mercury and its compounds, control technologies and preventions, etc. In 2003, the governing council of the United Nations accepted the assessment and found sufficient evidences against severe mercury contamination.

In 2005 and 2007, a mercury programme was established with UNEP Global Mercury Partnership to combat the mercury contamination issues and to strengthen the governments of different countries. In 2009, the governing council of UNEP decided to develop a global legal binding instrument on mercury. After the establishment of the Inter-governmental Negotiating Committee (INC), several countries discussed, negotiated and developed a text of the convention after five sessions of discussion at different times and finalised the text of the convention on 19 January 2012. The governments of 140 countries agreed upon the terms of the convention at the time. The convention was named as Minamata Convention in memory of the severe devastation faced by Minamata city. The convention was adopted and opened for signatures for one year on 10 October 2013 and till 11 October 2013 the convention had been signed by 128 countries.

The Minamata Convention is an international environmental treaty that aims to protect human health and environment from anthropogenic mercury emission and its release in any form. The text of the convention has provisions related to the entire life cycle of mercury, its control, and reductions across a large range of products and processes which involve mercury in any form. This treaty also addresses the direct mining of mercury, its export and import, safe storage and disposal. It monitors the specific human activities responsible for large scale mercury pollution.

After signatures on this treaty by different countries in 2013, five years were given to the governments of respective countries to reduce and control mercury emission *via* a wide range of products containing mercury, their manufacturing and import/export. According to Minamata Convention, the wide range of products containing mercury, their manufacturing and import/export was to be altogether prohibited by 2020, except in the countries which requested an exemption from the initial five year exemption period.

Being a member of the United Nations, India signed the Minamata Convention in September 2014. India ratified the Minamata Convention in 2018 with some relaxations and deposited the instrument of ratification to become the party of this convention.

With the ratification of the Minamata Convention in India, it's our obligation to move towards mercury-free alternatives in products and devices including non-mercury technologies in manufacturing processes.

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