



## Lead Poisoning

In July 2015 lead was found in the drinking water of some housing blocks in Hong Kong. An ongoing investigation is looking for the source of this lead contamination and the investigation will also determine the extent of the problem.

### What is lead?

Lead is a metal that has been in use since before 3000 BC. It is soft and easily worked. The Romans used it for water pipes, and we get the English term 'plumbing' from the Latin name for lead: 'Plumbum'.

### Is lead poisonous?

Lead is poisonous. There is no established 'safe' level of lead – ideally one should not have any lead in one's system. Over the centuries, many humans have been poisoned with lead, but, as more knowledge becomes available, there is a concerted effort to diminish the effect of lead on the general population. Hence, lead has been removed from petrol, paint, drinking vessels, cosmetics, most hair dyes and, where possible, in building construction, especially in water pipes.

In spite of the diminished presence of lead in the modern world, it is still found among general practice patients in Hong Kong. Lead is still found in some cosmetics, hair dyes, paints, in lead crystal, and pewter, and it is a factor in general pollution. In one study, it was widely found in dust on the floors of Hong Kong schools <sup>1</sup>. In the 1960's Gurkha soldiers stationed in Hong Kong were poisoned by lead in their Chinese-made chilli powder <sup>2</sup>. It was probably added deliberately and illegally to improve the colour. Certain herbal medicines have also been found to contain lead in recent years; these include some Traditional Chinese Medicines <sup>3-5</sup> and Ayurvedic medicines <sup>6-9</sup>.

## History gives us many examples of lead poisoning

In the 19th Century, the painter Vincent Van Gogh had a habit of sucking his paint brushes. His oil paints had a high concentration of lead. He had hallucinations and was delusional, attempting to cut off his own ear. Lead poisoning may have been responsible for these psychiatric symptoms.

The water in ancient Rome flowed through lead lined conduits and pipes and many Romans suffered lead poisoning as a consequence. Lead poisoning from water pipes was a worldwide problem as late as the 1960's, when copper replaced lead in plumbing.

Unfortunately, however, there are still times where copper is mixed with lead to make a cheaper material and the mix or alloy is used in water pipes. Joining pipes together can also be a problem. Solder for water pipes should be made mainly of tin, but lead is cheaper than tin and easier to use, so high-lead solder may be used, illegally, to join water pipes to cut costs.



Van Gogh said "The sadness will last forever". Was his sadness a direct result of excess lead?

## How do I ensure my drinking water is lead-free?

Boiling does not remove heavy metals, including lead. In fact boiling will concentrate heavy metals.

Certain types of water filters can remove lead effectively.

A high quality water filter is the best way to remove lead.

Initial costs of installation of a good filter can be expensive.

## Should I drink bottled water?

Hopefully your bottled water is free of lead – it should be!

Water in certain types of plastic bottles can contain phthalates and other chemicals. Phthalates interfere with hormones and are known as hormone disrupters.

Glass does not contaminate water, the only disadvantage is the weight of the glass bottles.

## Can I send my tap water to a laboratory for testing?

The Hong Kong Innovation and Technology Commission website has recommendations for private laboratories testing water, food, medicines and any other substances.

See: Hong Kong Accreditation Service: [www.hkas.gov.hk](http://www.hkas.gov.hk)

## Will lead in my tap water contaminate washed, boiled or steamed food?

Lead in your water will contaminate washed and boiled food but not steamed food. However the amount of lead will be minimal - it is important to wash fruit and vegetables of dirt and pesticides.

## What are the effects of lead?

Lead is damaging to many body systems. In children it can effect growth and development and result in behavioural and learning difficulties, mainly through the effect of lead on the nervous system, brain and red blood cells. In adults it also affects mainly the nervous system, brain and red blood cells. Memory loss is one of the many consequences. Lead is a very damaging poison, often accumulating slowly, and it may not become apparent until much damage is already done.

Symptoms of lead poisoning include: fatigue; difficulty sleeping; irritability; headaches; aggressive behaviour; constipation; fast heart rate; abdominal pain and memory loss. Loss of previous developmental skills in children can be a consequence of lead toxicity.

## How are lead levels measured?

The diagnosis of lead accumulation in a human is quite difficult. Industry uses blood levels of lead to determine the degree of poisoning. The [testing of blood](#) is useful, but it determines only recent poisoning, or acute levels of lead intoxication. However, blood levels do not necessarily indicate the total body burden of lead and are not adequate measures of past exposure.

If an individual has been exposed to small amounts of lead on a daily basis over a number of years, then they may not be found to have significant blood levels of lead; yet the total amount of lead in their bodies, stored in bones and soft tissue may be very significant. Drinking lead contaminated water over a period of years is exactly what

made people unwell in past centuries, albeit they had higher lead exposures from 100% lead pipes.

It is worthwhile measuring blood lead levels in the Hong Kong scenario, but it may also be useful to have a [Zinc Protoporphyrin \(ZPP\) test](#) as well. This blood test can indicate lead toxicity by measuring abnormalities in the red blood cells and can be done at the same time as taking blood for a lead level. The level of ZPP reflects lead absorption over the preceding 3 to 4 months and therefore is a better indicator of the body lead burden.

A standard [blood test](#) may show lead damage with abnormal microscopic appearance (called basophilic stippling) of the red cells.

Individuals who are found to have lead present in their blood in a significant amount, or who have an abnormal [zinc protoporphyrin test](#), or basophilic stippling, should have further testing. Tests are required for kidney function in particular.

To test the total amount of lead in the body is more difficult. Testing for chronic lead load is based mostly on testing urine after treatment to dislodge the lead from its hiding places in body tissue. This form of testing uses chelating agents to dislodge lead before measurements are taken. These tests are available in USA, Australia and UK, on behalf of Hong Kong laboratories. The testing of hair, (hairmineralysis), is a simpler test, but there is much controversy on the reliability of this method of testing, in spite of considerable data on this test over many years.

It has been said in the Hong Kong press that the lead concentration would drop by half after 30 days if affected residents switched to clean drinking water. This is true of the blood lead level, but these individuals may still have large amounts of lead stored in their bodies. This stored lead is a long term threat to health.

### **Is breast feeding safe?**

For breast feeding mothers with high lead levels there is less concern. Lead levels in breast milk is usually significantly lower than the level in the mother's blood, and as the blood lead level in a breast feeding mother decreases as she drinks clean water, it is likely that the amount of lead in her breast milk will decrease even further. Therefore breast feeding should continue in most cases.

The lead level of a mother during her pregnancy may be a bigger problem, because babies absorb toxic metals, including lead, from their mothers, during pregnancy.

### Testing for Lead

Blood tests for lead levels and the zinc protoporphyrin (ZPP) test are available at [marina medical centre](#).

We also have recent experience of water testing using Hong Kong private Hong Kong Laboratories.

### Reference

1. Tong, S.T. and K.C. Lam, Are nursery schools and kindergartens safe for our kids? The Hong Kong study. *Sci Total Environ*, 1998. 216(3): p. 217-25.
2. Power, J.G., et al., Lead poisoning in Gurkha soldiers in Hong Kong. *Br Med J*, 1969. 3(5666): p. 336-7.
3. Lin, W.H., et al., Lead intoxication caused by traditional Chinese herbal medicine. *Am J Med*, 2012. 125(1): p. e7-8.
4. Lin, G.Z., et al., Childhood lead poisoning associated with traditional Chinese medicine: a case report and the subsequent lead source inquiry. *Clin Chim Acta*, 2012. 413(13-14): p. 1156-9.
5. Chan, H., et al., Lead poisoning from ingestion of Chinese herbal medicine. *Clin Toxicol*, 1977. 10(3): p. 273-81.
6. Pierce, J.M., C.A. Estrada, and R.E. Mathews, Jr., Buyers beware: lead poisoning due to Ayurvedic medicine. *J Gen Intern Med*, 2012. 27(10): p. 1384-6.
7. Gunturu, K.S., et al., Ayurvedic herbal medicine and lead poisoning. *J Hematol Oncol*, 2011. 4: p. 51.
8. Kales, S.N. and R.B. Saper, Ayurvedic lead poisoning: an under-recognized, international problem. *Indian J Med Sci*, 2009. 63(9): p. 379-81.
9. Prpic-Majic, D., et al., Lead poisoning associated with the use of Ayurvedic metal- mineral tonics. *J Toxicol Clin Toxicol*, 1996. 34(4): p. 417-23.
10. Zhu, M., et al., Maternal Low-Level Lead Exposure and Fetal Growth. *Environmental Health Perspectives*. 10/2010; 118(10):1471-5.

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