

The importance of clean water.

Review by David Whyte

Water makes up over 80% of our body, which is logical as we cry liquid, liquid sits in our mouth, and we pass liquid in the toilet and when we cut ourselves we bleed liquid.

Enzyme activity and other metabolic process are designed to work at a particular concentration. This concentration is effected by how much water is in the body. Too much water the process gets diluted and happens sub-optimally. Not enough water then the process become cramped and occurs sub-optimally. .

The best way to determine hydration status is to check urine colour (guys you have no excuse here). If urine colour is yellowish, you are dehydrated (this why you should drink fluid upon waking up). If urine is colour less you have the correct amount of water in your body. The most noticeable side effect of dehydration is drowsiness. This because the metabolic reactions are happening slower you cannot produce enough energy etc to keep body running well. Therefore if you are feeling sleepy in mid afternoon, or at a function, drinking water will probably restore the perky feeling. If not the bladder pressure and associated body movement will later on!

It is common knowledge that a clean water supply is essential to good health. Fortunately we live in a western nation so the risk of common water born diseases is small. However in New Zealand the water quality is very poor in a lot of areas. A complete study of the New Zealand town water supply was undertaken¹. The study sampled and analysed the water coming out of household taps in urban all around New Zealand. They discovered that the following chemicals and compounds exceeded safe levels. These unsafe levels were mostly randomly/evenly distributed around New Zealand unless otherwise stated.

- **Unsafe high levels of antimony, cadmium, copper** (especially in acidic water), lead and nickel was found in approximately 860 000 peoples water supply (1/3 of New Zealanders).
 - Antimony is a suspected human carcinogen²
 - Cadmium in low doses can produce coughing, headaches, and vomiting. With long-term dosing cadmium is stored in the liver, kidneys, or replaces calcium in bones. The replacement of calcium with cadmium leads to a painful osteoporoses type illness.³

¹ Davies et al. A Report on the Chemical Quality of New Zealand's Community Drinking Water Supplies, Ministry of Health, 2001.

² <http://www.switzerland.k12.in.us/watershed/metals.html>

³ Ibid

- Long-term exposure to copper can produce liver and kidney damage. Young children are especially sensitive to copper exposure.⁴
- Long-term exposure to nickel can cause decreased body weight, heart liver damage, and skin irritation⁵.
- **Unsafe lead levels effect 612 000 people.** Lead intake damages the nervous system by interfering with the body's production of neurotransmitters that are necessary for proper brain functioning and can cause:
 - Birth defects, low birth weight and miscarriage.
 - Hyperactivity attention deficit disorder (ADHD).
 - Lowered IQ.
 - Behavioural problems.
 - Alzheimer's disease⁶.
 Lead is also stored in the bones and teeth; therefore it can continue to affect the body after the lead intake has stopped.
- **Unsafe arsenic levels effect 285 000 people.** This is mainly in the Waikato and Central Plateau areas as the volcanic soil has high concentrations of arsenic. Long-term exposure to arsenic via drinking-water causes:
 - Cancer of the skin, lungs, urinary bladder, and kidney.
 - Skin changes such as pigmentation changes and thickening (hyperkeratosis).
 - Some studies have reported hypertensive and cardiovascular disease, diabetes and reproductive effects⁷.
- **Residual chemicals from the disinfection process** were found at unsafe level for 424 000 people. These chemicals included:
 - Choral hydrate.
 - Chlorate.
 - Di chloro acetic acid.
 - Tri chloro acetic acid.
 - Halo acetic acids.
 - Tri halo methanes.

The study found even more water supplies that were just below the health risk level of chemical contamination. These water supplies could very easily rise above the acceptable limit. These chemicals are designed to destroy any living organism. When

⁴ <http://www.gemgrp.com/Contaminants/14.pdf>

⁵ <http://www.switzerland.k12.in.us/watershed/metals.html>

⁶ http://www.hometest.com/lead/about_lead.htm

⁷ <http://www.who.int/inf-fs/en/fact210.html>

you drink them they degrade and destroy your body cells, this is why they are carcinogenic i.e. they cause cancers.

- **Unsafe nitrate levels** were found in water supplies effected 100 000 people. Nitrates in water are formed by decaying plant matter and run off from farms. As this study only looked at town supplies there would be a large number of rural water supplies that would have contaminated water. Nitrates are generally tasteless; this is why northwestern Christchurch water looks and tastes clean but has excess nitrate content. Nitrates are dangerous because they decrease the ability to carry oxygen, this can result in brain damage and blue baby's syndrome⁸. Babies and unborn babies are most susceptible to nitrate contamination.

Cleaning up your water; the two options.

1) Filtration. Filters use carbon to screen out the particles and chemicals. Activated carbon is carbon that has been treated to increase the number of small holes in the carbon. Therefore the water will flow through more carbon, and be cleaner. The problems with carbon-based filters are:

- **Pore size.** Some carbon filters only removed the large components. This is because small pores in the carbon can be easily blocked. Serious carbon filters will have at least two layers of carbon, both a small and large pore size. Amway uses who use a three-carbon type system, with each layer removing smaller components. This is the reason that the Amway water treatment system can removed nitrates which are very small.
- **Breeding bacteria.** Carbon screens out the bacteria, this leave the bacteria caught in the filter. The carbon can then be perfect place for these bugs to breed. If the filter is not regular replaced, or the filter has only one screening size, the bugs will migrate through the carbon and be concentrated up into your drinking water. So cheap carbon based filters may remove the chlorine but increase your bug count.

2) Distillation. Distillers work on the principle of boiling water and collecting the "steam" and condensing it back into liquid. These work very well at removing things that have a lower boiling point than water, or don't boil at all, like heavy metals. However they have the following sever problems:

- **Taste.** As the water has been boiled and condensed, it looses all its entrapped gases. This makes the water taste gross. Some systems then run the water through a simple carbon filter, however this can quickly become a breeding ground for bacteria, and you get lots bugs back in the water⁹.

⁸ http://www.hometest.com/Water/water_quality.htm

⁹ Johnston, P. PhD Graduate in Water purification by Electric Voltage. Personal communication 2002.

- **Non-removal of chemicals.** Chemicals that have a lower boiling temperature than water boil before the water and are collected into the drinking water. This includes chemicals such as petroleum products, some pesticides and other chemicals. Atrazine, an organochlorine pesticide, interferes with the hormone system of mammals and is a possible human carcinogen. Atrazine has been found in water supplies in New Zealand, both ground water and rainwater collections¹⁰. This means that a water distiller would not remove it.

¹⁰ Unknown, Carcinogenic pesticides can travel via rain. Soil & Health September/October 1999. Condensed from Rachel's Environment & Health Weekly <http://www.rachel.org>.