Water quality

What's in our water?

Science allows us to detect the substances that exist right before our very eyes, but that we can't see with the naked eye. By using science we can discover things that are in our air, food and water, and in our houses, schools and workplaces that might not be so healthy for us.

By learning about these things we can't see, we can learn more about how to avoid breathing, drinking or eating them without knowing it. We can also learn about ways to stop these things from getting into our air, water or food and make sure the Earth is a cleaner and better place to live in.

Why is it important to know what's in water, and how can I tell what's in it?

Water in adequate quantity and safe quality is essential for human survival. Population growth and economic development put tremendous pressure on limited freshwater resources. The availability and safety of water resources is threatened by climate change.

The spread of disease through the consumption of contaminated water is a huge global problem. By using technology we can detect things in water that aren't supposed to be there, and work to make water supplies safer. Sometimes these things can be referred to as impurities or contaminants, depending on what they are and the effect they have on the environment or on human health.

Many instruments can test the levels of contaminants or substances in water, air, soil, food and so on. One such instrument is an electrical conductivity (EC) meter.

What does an EC meter do?

An EC meter measures the electrical conductivity in a solution. When you use an EC meter, an electric current flows between two metal plates (electrodes) in the water sample to measure how readily the current flows between the plates. The more dissolved salt there is in the water, the better the water will conduct electricity.

How much salt should there be in water, and how do I know it's safe to drink?

The amount of total dissolved solids in water (TDS) is used to determine the salinity of drinking water, and is measured in mg/L or parts per million (ppm).

According to the Australian Drinking Water Guidelines, TDS in drinking water should not exceed 500 ppm, although water with a TDS content of up to 1000 ppm is acceptable to many people.

In 2008, SA Health estimated that the TDS in South Australian water supplies were usually less than 100 ppm in rainwater; 250–400 ppm in metropolitan tap supplies; and often 1000 ppm in bores. EC meter readings are translated to ppm in the table below.

Water in adequate quantity and safe quality is essential for human survival

Salinity (measured in ppm) and impact on water usability

EC reading range	ppm range	Usefulness of water
0–800	0–500	Good drinking water for humans (provided there is no organic pollution and not too much suspended clay material)
800–2,300	500–1,500	Can be consumed by humans, although most would prefer water in the lower half of this range if possible
2,300–10,000	1,500–6,000	Not recommended for human consumption, although water up to 3000 mS/cm (1,800 ppm) could be drunk if nothing else was available
10,000 and above	6,000 and above	Not suitable for human consumption or irrigation

Fruit, vegetables and flowers salinity tolerance levels

	0–800 EC 0–500 ppm	800–2,300 EC 500–1,500 ppm	2,300–5,500 EC 1,500–3,500 ppm
Watering advice	*Avoid wetting leaves on hot, dry days*	*Avoid light, frequent watering and wetting leaves during daytime*	*Avoid wetting leaves; adequate leaching necessary*
Fruit	Passionfruit, strawberry, grapefruit, apricot, peach, orange, lemon, plum	Mulberry, apple, pear, raspberry, quince	Olive, fig, canteloupe
Vegetables	Lettuce, green beans/peas, carrot, celery, onion, radish, sweetcorn, potatoes	Cabbage, cauliflower, broccoli, broad beans, tomato, sweet potato	Spinach, asparagus
Flowers	Violet, primula, dahlia, begonia, azalea, camellia, magnolia, fuschia	Rose, gladiolus, aster, geranium, zinnia	chrysanthemum, bamboo, carnation, hibiscus, oleander

Australian states' water hardness levels (ppm)

City	ppm range
Perth	29–226
Adelaide	134–148
Brisbane	100
Sydney	39.4–60.1
Canberra	40
Hobart	5.8–34.4
Darwin	31
Melbourne	10–26

Hard water in Australia

Water with a high mineral content is referred to as being 'hard', and requires more soap and synthetic detergents for home laundry and washing. Hardness is caused by compounds of calcium and magnesium, and by a variety of other compounds. Generally, water with 0–60 ppm as calcium carbonate is classified as soft; 61–120 ppm as moderately hard; 121–180 ppm as hard; and more than 180 ppm as very hard.

Analysis of water hardness in major Australian cities by the Australian Water Association shows a range from very soft (Melbourne) to very hard (Adelaide). Total hardness levels of calcium carbonate in ppm are shown the table on the left.

How can I help reduce water salinity or hardness?

Unfortunately, salinity is controlled mostly by the environment, as are calcium and magnesium levels. However, this doesn't mean you can't contribute to the improvement of our natural water resources. By reducing the level of contaminants and pollutants that enter our water resources we can help to restore the natural balance of the environment. Steps you can take at home to care for our natural water resources include:

- Treat catchments with respect – always follow the advice on such signs and do not pollute these areas.
- Never put chemicals and solvents down the drain or toilet. Take them to the proper recycling locations or disposal depots, or contact your council.
- Keep runoff and stormwater clean. Never litter, as things thrown onto the street often end up in stormwater.
- Keep your plumbing in good repair. Leaky taps and pipes are a major source of wasted water, so it pays to keep them working well.
- Use less water around the house and in the shower – it means lower water and energy bills (where hot water use is reduced).
- Where possible, install appliances such as efficient shower heads and taps, dual flush toilets and front-loading washing machines.
- Install a rainwater tank; wash the car on the lawn; and clean paths and driveways by sweeping them, never by hosing them down.

The role of CRC CARE

CRC CARE research involves air, soil and water. The research linked with water focuses on inorganic contaminants such as arsenic, lead, cadmium and aluminium, and hydrocarbons such as diesel, petroleum and solvents. CRC CARE is also involved in the assessment and remediation of polluted waters, and the prevention of future contamination.

References

Hard water: http://water.usgs.gov/owq/hardness-alkalinity.html
Water salinity tables: http://www.redbackdrilling.com.au/Water_quality_guidelines.htm
Australian Drinking Water Guidelines and SA Health: http://www.health.sa.gov.au/pehs/PDF-files/ph-factsheet-water-salinity.pdf
Water care advice: http://www.nhmrc.gov.au/_files_nhmrc/file/publications/synopses/eh33.pdf
General water information: http://www.searo.who.int/en/Section23/Section1000_15448.htm
Australian Water Association: http://www.awa.asn.au/ as noted in http://en.wikipedia.org/wiki/Hard_Water

Please note that calculations for EC meter reading conversions to ppm can vary from one EC meter manufacturer to another. Refer to individual meter handbooks at all times for conversion accuracy.

Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE)

University of South Australia
Mawson Lakes
SA 5095 Australia

P.O. Box 486
Salisbury South
SA 5106 Australia

Tel: +61 (0) 8 8302 5038
Fax: +61 (0) 8 8302 3124
Email: admin@crccare.com
Web: www.crccare.com

CRC CARE is a partnership of organisations providing research, technologies and knowledge in assessing, preventing and remediating contamination of soil, water and air.

Established and supported under the Australian Government's Cooperative Research Centres Programme

08/10