LEADING THE WAY

WE NEED A NATIONALLY CONSISTENT WAY OF MEASURING LEAD AND OTHER METALS IN DRINKING WATER SUPPLIES. PAUL SKELTON REPORTS.

Construction of the new Perth Children's Hospital began in 2012.

Over the next four years the project, overseen by John Holland Group, went rather well.

Then in May 2016, lead was discovered in the drinking water at levels well above the Australian Drinking Water Guidelines (ADWG).

Despite several attempted remedies – such as flushing, filtration and phosphate treatments – a test in June 2017 showed an overall 74% compliance rate with the ADWG value for lead. The minimum compliance rate required by the ADWG is 95%.

The fallout has been nothing if not spectacular.

'Lead fear' swept the state, regularly gracing the cover of local tabloids and leading the news bulletins. The people of Western Australia have had even more conversations about lead than they did when the state became the first in Australia to remove the element from petrol in January 2000.

And this is fair enough: excessive exposure to lead can result in a wide gamut of ailments – physical and mental.

But in the case of the Perth Children's Hospital (PCH), are people in the West justified in their concerns, or are they howling at nothing?

WHEN STANDARDS FAIL

Many factors can contribute to the variability of lead in water concentration test results:

- materials used in a plumbing system;
- system age and complexity;
- usage patterns;
- flow rates;
- stagnation areas;
- introduced chemicals; and,
- water quality fluctuations (pH).

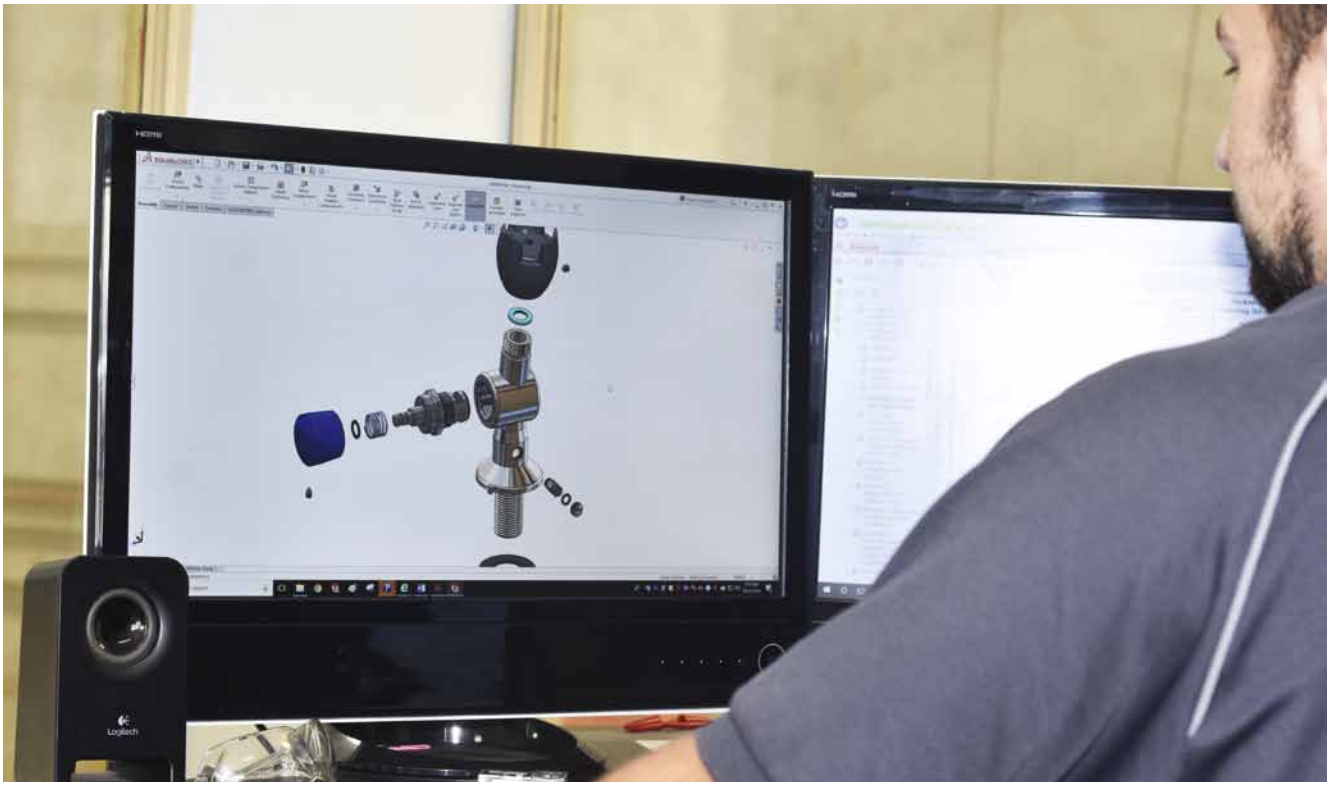
Additional factors include sampling and testing methodologies, specifically the flushing and/or stagnation periods prescribed in the tests, and the volume of water extracts tested.

Chris Galvin is the managing director of Galvin Engineering. He is joining the push for government to rectify in-field water testing practices across the country.

"From the research I've done, the Australian Standard applicable to testing in the field is vague on exactly what a person undertaking water testing would need to do in a residential or commercial situation," Chris says.

The Standard is AS/NZS 5667.5:1998 *Water quality – Sampling – Guidance on sampling of drinking water and water used for food and beverage processing*.

"It's not very prescriptive. Basically, anyone can test water – perhaps misunderstanding the broad



Galvin Engineering has a new range of stainless steel drinking bubbler called GalvinClear, which is lead free.

guidelines in the Standard – then say the test complies with Australian Standards."

Chris has identified two primary areas of contention – sample size and stagnation period.

"If you take a very small sample of water from a tap and surrounding fittings, and the water has been sitting there for ages, it will probably have a higher reading of lead and other metals due to prolonged contact.

"My concern about current testing practices is that people take a very small sample, often 80ml, then they multiply the result by 12.5 to get the figure for a litre.

"Well, it doesn't work that way. If you took a 1L sample, it would give you a very different reading. You'd get the first 80ml with a higher reading, and the other 920ml would be from further down the line.

"How long the water has been stagnant is an important consideration. If people come in first thing in the morning, the water has been sitting all night, so the test will produce the highest reading possible for that location."

Chris says that such vagueness makes current testing practice open to interpretation and debate.

"My concern about current testing practices is that people take a very small sample, often 80ml, then they multiply the result by 12.5.

"You also need to remember that the ADWG of 0.01mg/L is modelled on World Health Organisation recommendations on how many milligrams of lead per litre is OK in the water supply. This number is based on a 13kg child drinking an average of 1L a day - young children, infants and pregnant women are the highest risk groups." (Note: the WHO assessment is based on the fact that 20% of total lead intake is attributable to water consumption with the other 80% coming from food, dirt and dust.)

"The ADWG is based around health considerations and the total amount of lead you can safely consume in a day. Will you be going to the same tap first thing in the morning and drinking your total 2L for the day in one hit?"

AS/NZS 5667.5:1998 provides useful information regarding water testing, but it does leave a lot of variables up to the individual testing facility. This means that different results could be generated from the same site.

For example, when testing a distribution system, clause 4.1.4 recommends that samples be collected at distinct locations in the system and from the ends of the distribution system.

Samples should be collected after a flushing time of two to three minutes, but sometimes as long as 30 minutes.

When looking specifically at a consumer's taps, clause 4.1.5 states: *"The flushing time depends on the sampling purpose; if the effects of material on water quality are being*

investigated then the initial draw-off should be sampled. For most other purposes, a flushing time of two to three minutes is sufficient to establish equilibrium conditions."

Although this is useful, it does not specify how long the stagnation period should be before an initial draw-off sample is taken. Also, the volume of water to be collected is not specified.

Clause 7.1 just states: *"The volume of the sample to be collected depends on the number and types of analyses to be performed."*

Concentrations of metals in water vary depending on contact time, and the measured levels may be more concentrated or diluted depending on the water sample extract volume. Results at the one point may vary substantially depending on who is performing the test.

For PCH, initial testing involved a combination of first-draw extracts of 100ml and two-minute flush extracts of 100ml.

Second-round testing used a total extract of 250ml (two 125ml extracts averaged), taken after 30-minute stagnation periods.

These tests were conducted in accordance with a site-specific method that was approved by the Chief Health Officer (CHO) of Western Australia, and is loosely based on the approach taken by Health Canada.

OH, CANADA!

The method adopted by the CHO at the hospital is in part based on the Health Canada method known as 30MS Sampling.

Health Canada is the government department responsible for national public health. Historically, its lead testing regime uses two different testing approaches to cater for the size and complexity of systems.

For dwellings, it recommends:

- random daytime testing, which includes 1L extracts without prior flushing or prescribed stagnation period; or,
- 30MS sampling which includes a system flush followed by a 30-minute stagnation period then collection of two litres (two one-litre extracts).

For schools and large buildings it recommends random daytime testing, without a stagnation period and without prior flushing, using two 125ml samples (total of 250ml) and the results averaged.

In the CHO's Report on *Perth Children's Hospital Potable Water,* the primary conclusions of the 30MS sampling included:

- The source of the lead in the water is from brass fittings that have undergone a process of dezincification.
- Many of these brass fittings are located in approximately 1,200 thermostatic mixing valve (TMV) assembly boxes, located within a metre or two of drinking water outlets.
- Phosphate treatment has been partially but not sufficiently effective in reducing lead levels.

It was recommended that the Department of Health:

1. Remove all TMV assembly boxes linked to drinking water outlets at PCH.
2. Select the best replacement option, with consideration given to the types of brass fittings in each TMV assembly box, their susceptibility to dezincification hence leaching of lead, and relevant Standards and costs.
3. Carefully design, install and commission new TMV assembly boxes to avoid recurrence of the problem.
4. Inspect and test a greater number of brass fittings in the floor level distribution mains, and the outlets without TMV assembly boxes, to determine their rate of dezincification.
5. Continue current flushing and phosphate treatment programs.
6. Consider removing all temporary filters from the water distribution system.
7. Organise repeat CHO-approved water testing after installation of new TMV assembly boxes.
8. Continue to develop an overall water quality management plan for PCH, and a hazard analysis and critical control point plan that manages the risk associated with lead.
9. Ensure that the governance and management framework is fit for purpose, for the next stage of this complex project.

That all seems fairly straightforward, but here's the rub: the methods used for in-field water testing vary dramatically. It's possible that some of the testing techniques at the PCH may not be good enough for generating accurate data on metal levels in water.

Further, in-field methods differ

MPGA FRONTS PCH INQUIRY

After more than 12 months of the Master Plumbers & Gasfitters Association of WA maintaining the lead contamination issue at the new Perth Children's Hospital was due to faulty or non-compliant products, the State Government is paying attention.

MPGA executive director Murray Thomas was called before the Parliamentary Inquiry into issues at the hospital this week to present the Association's views on the causes of the issues and how they could be overcome now and prevented in the future.

"As the Association has maintained since the issues first came to light, this is symptomatic of a long-term and widespread failure to effectively regulate the supply of fittings," Murray says.

"There are compliance controls in place, through the Australian Watermark Scheme, dictating products that can be used by plumbers and defining manufacturing standards.

"But there is no legislation preventing point-of-sale supply of non-compliant products or enough controls to ensure imported materials continue to meet the required standards.

"At the same time, there are not enough plumbing inspectors in Western Australia to monitor what's being used. For public projects, and particularly health facilities, the MPGA has always recommended mandatory testing and inspection."

WA currently has nine full-time plumbing inspectors, employed by the Building Commission, to service the entire State. By contrast, Queensland employs nearly 300 inspectors at local and state government levels.

Murray advised the inquiry that a combination of effective point-of-sale legislation combined with mandatory inspection of large plumbing projects would remedy such issues from occurring again.

substantially from the end-of-line testing prescribed in the AS/NZS 4020:2005 *Testing of products for use in contact with drinking water.*

This Standard uses a total volume of 2L comprising eight extracts of 250ml, with the first extract coming after a 16-hour stagnation period. The remaining seven extracts are to be drawn after 30-minute stagnation periods.

EMBRACING CHANGE

Chris says some water testing in the field is creating public concern about high levels of lead in drinking water.

"On the other hand, there are lots of questions from certain experts in WA about whether there really is an issue. Therefore, further consideration is required to determine whether public concerns are justified."

If the objective of water testing in the field is to monitor for typical community exposure to total metal (typically lead), to determine whether there are concerns related to effects on human health, then the sampling and testing protocols should represent the average or typical exposure to lead in drinking water for a population in the water supply zone.

Galvin Clear operates automatically when you place your finger on it.

Apart from examining different testing methods, it would be advantageous to look at the testing stipulated for manufacturers of plumbing products.

"Standards bodies, government health and building authorities, and industry groups need to come together to develop a standardised method of in-field water sampling and testing across all states and territories."

Chris says testing with long stagnation times is used for specific purposes – for example, identifying specific sources of lead signals or assessing the effect of treatment regimes. It may not be the most appropriate method for determining average daily intakes of lead.

Metal concentrations will vary depending on the water's contact time with other materials. Any methodology needs to stipulate flushing and/or stagnation periods, and this will depend on the typical usage of water in a

particular style of building.

"Also, the test volume should be specified. To ensure the testing is robust in indicating daily doses of lead, the volume needs to relate to the consumption of typical users.

"Extract volumes tend to favour one litre for residential applications and at least 250ml (an average glass of water) for commercial applications. Smaller volumes may be more useful for specific testing purposes – but not necessarily the best for lead exposure testing.

"New methods could be built on the practices in place internationally, and from the detailed methodology set out in AS/NZS 4020. This Standard is already used for potable water by Australian manufacturers of plumbing products, as a prerequisite for WaterMark certification.

End-of-line fittings, which are defined in clause 3.6 as: *"Any product, or part of a product, installed within 250ml draw-off of a drinking water delivery point. Note: Products typically include taps, tap components, fittings, flexible hoses, drink dispensers, boiling water dispensers, drinking fountains, water treatment appliances, hose-connection vacuum breakers, ball valves and flow-control valves."*

Extraction of metals is covered under clause 6.7, and maximum allowable concentrations of metals are detailed in Table 2. These limits are taken from the ADWG.

The maximum level for lead (Pb) is shown as 0.01mg/l.

Under clause 6.7.1, products in general are tested for metal extraction in accordance with Appendices H to J. This clause states: *"The amounts of the specified metals in the first and/or seventh extracts shall not exceed the limits given in Table 2."*

An additional Appendix I is referenced in clause 6.7.2 for end-of-line fittings, covering all the different extraction procedures for end-of-line fittings, including metal extraction testing.

The Galvin Clear Ezy-Drink Horizontal Drinking Bubbler Tap.

"Ultimately though, people are just over it, but they're also fearful," Chris says.

"Australia could benefit from a more detailed and standardised approach to in-field sampling and measuring of metals in drinking water.

"A standardised methodology would mean more consistency and reliability in lead level results. This approach may need to vary depending on the type of building being assessed, and it should reflect typical usage patterns of the inhabitants."

Chris is now working with a number of different plumbing industry associations and testing organisations in lobbying government to change the Standard for in-field water testing so that it is more prescriptive.

"At the moment you can go to 10 testing laboratories, ask how testing water in the field is done, and get 10 different answers."

LEADER OF THE PACK

Beyond working with Standards, Galvin Engineering has a new range of stainless steel drinking bubbler called GalvinClear, which is lead free.

Chris says the company's traditional DR brass drinking bubblers are 100% safe for potable water.

"They carry the WaterMark logo, have passed all testing in accordance with AS/NZS 4020, and use high quality

ALDI TAPS ACCUSED OF CONTAINING 'DANGEROUS' LEVELS OF LEAD

A kitchen tap sold by ALDI to an estimated 12,000 customers has been found to contain dangerous levels of lead, according to testing undertaken by the Queensland Building and Construction Commission (QBCC) .

The tests conducted on the Easy Home spiral mixer kitchen tap have shown it produces as much as 21 times the maximum allowable amount of the poisonous metal.

The findings have forced ALDI to release earlier test results that found the tap to be safe.

The QBCC first raised concerns about the tap on 10 July 2017. But the tap had initially passed tests that showed it complied with the applicable Australian Standards before being sold. ALDI later commissioned further testing and has criticised the QBCC's investigation as unsatisfactory.

"Our initial test results show that there is a cause for concern, and that the tapware may cause lead contamination of drinking water," QBCC Commissioner Brett Bassett says.

"The tapware in question is the 'Spiral Spring Mixer Tap' (EASY HOME brand, model number NI183ESCRT-AUD), and it's believed that more than 3,000 units have been sold in Queensland."

Note: this product was sold nationally and not just in Queensland.

"If you've purchased the tapware, and have not yet had it installed, the QBCC recommends not doing so until further details can be confirmed," Brett says.

Experts are warning consumers against using water from the questionable taps for drinking or cooking, especially the first few litres of hot water it produces if the tap had not been used in a while.

Tom Daunt is the chief executive of ALDI Australia.

"At ALDI, we are committed to providing our customers with safe products of the highest quality. For this reason, I was alarmed by the claims suggesting that the Spiral Spring Mixer Tap, sold as a Special Buy on 10 June this year, may contaminate drinking water," he says.

"I can assure you that as soon as this matter was brought to ALDI's attention, we initiated a priority investigation. Our teams have worked tirelessly with authorities and independent testing laboratories to confirm that the tests conducted prior to sale were accurate, and the product is safe.

"We are disappointed that so many ALDI customers were provided information that generated such unnecessary concern and inconvenience. The QBCC's prematurely published statements were based on tests that were not conducted in accordance with the Australian Standard."

ALDI and the QBCC have since agreed to partner on a 'definitive round of testing' to which the Australian Competition and Consumer Commission (ACCC) will be keeping 'a close watch'.

ALDI sold the tap to an estimated 12,000 households nationally between June 2016 and June 2017.

approved materials and components.

"But we have released a new range of bubblers constructed from 316 stainless steel to give consumers a choice.

"Think of it this way: some people will pay more for organic vegetables. There's nothing wrong with vegetables from the supermarket, it's just that some people choose to buy organic because they see it as a healthier option.

"With Galvin Clear, we're offering the same kind of choice to people who looking for a lead-free tap alternative. It is all part of our commitment to produce quality taps and fixtures that support the health, well-being and safety of our community."

Of course, Galvin will continue to sell its brass range.

"As far as installation is concerned, the process is very similar. The traditional features of our brass range are still there. We still use a bacteria and UV resistant rubber compound

The Galvin Engineering Board. From left to right - Paul Galvin, Jim Crockett and Chris Galvin.

on the mouth guard, which is there to protect children's teeth.

"It's also got the usual flow adjustment in the base of the unit, and it comes with different ways of operating – push-button taps, spring-loaded taps and others."

One of those others is the Ezy-Drink Galvin Clear stainless steel piezo electronic drinking bubbler tap. Available in mains or battery-powered options, the bubbler is operated via a piezo button.

It operates automatically when you place your finger on it. No pressure is required, which makes it ideal for small children in daycare, or for arthritis sufferers.

Perhaps the biggest benefit is that the bubbler can be set to operate on its own at different intervals.

If the tap is not being used it will flush stagnant water, so any lead build-up from the plumbing system will be reduced – an extremely useful feature during weekends or holidays. This may also assist in minimising the growth of bacteria such as Legionella.

Galvin Engineering
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