**Could the next “Flint, Michigan” disaster be in your city?**

Article by Dr Colin Hayes, a Director at YOULEARNWATER LTD, July 2016

*Much has been written about the lead in drinking water “disaster” in Flint, Michigan. To save money, the municipality switched their water supply source to a local river and omitted to dose the corrosion inhibitor that had been added to the previous supply from Detroit, resulting in elevated lead at the tap. This article concludes that water safety planning, allied to appropriate sampling and investigative techniques will go a long way to averting a similar “disaster” in Canada.*

Robert Haller, Executive Director at CWWA was right to point out (1) that aging infrastructure does not in itself pose a threat of contaminated water. Minimising lead in drinking water is a particularly complex and challenging topic, requires a lot of “joined up” thinking and a holistic approach, the extent of which must be realised. In short, it needs specialist knowledge. In the very recent article (2) “Lessons from the Failures in Flint Michigan USA”, Maura Allaire argues for “more specific protocols for sampling (that) can limit over-sampling and better enforce first draw sampling for lead and copper.” She also remarked that regional EPA offices consider random sampling of tap water quality. The Final Report of the Flint Water Advisory Task Force, published in March 2016 (3) recommended the clarification of the sampling protocol specified by the US Lead and Copper Rule (LCR) and that sampling protocols should ensure that “lead sampling will capture the worst-case lead levels in the highest risk homes, as the LCR intends.” Whereas the debate has correctly highlighted poor management in Flint, it has not yet grasped several fundamental issues.

Superficially, attempting to determine the worst case for lead in drinking water in high priority homes and taking action if the 90th percentile concentration from the survey exceeds the action level of 15 µg/l appears to be a stringent mechanism for minimising exposure from lead in drinking water. However, there are fundamental weaknesses and frequent misunderstandings, of relevance to determining the true extent of the Flint problem:

* The homes that are sampled vary from survey to survey because home-owners soon tire of taking samples and different homes must be used. Lead concentrations vary greatly from home to home, particularly due to differences in their pipe-work. In consequence, survey results can vary by up to five-fold when comparing 90th percentile concentrations (based on case examples), even when treatment conditions are the same.
* First draw samples mostly miss the highest lead concentrations that relate to the water that has stood in the lead service line. Case studies using sequential sampling after stagnation show that peak lead concentrations typically occur in the 4th to 6th litre samples. It may be concluded that the LCR mostly misses the problem.
* The action level of 15 µg/l is a trigger for corrective action and is based on a survey’s 90th percentile result. It is NOT a health related standard. Far too often, lead concentrations that have exceeded the action level have been taken to infer a health problem. This is particularly absurd because people rarely ingest worst case water – it goes down the toilet, sink or shower as people attend to personal hygiene before drawing water for drinking or cooking.

Health Canada’s 2009 Guidelines on Corrosion Control (4) adopted the LCR as the preferred approach for assessing control needs, albeit with some differences. The Alberta Demonstration Project clearly demonstrated its weaknesses (5).

In the debate after the Flint episode, there has been little or no mention of risk assessment and management techniques, that is Drinking Water Safety Plans, as advocated by the World Health Organization since 2004. DWSPs assess risks to drinking water from “source to tap”, require multi-disciplinary assessment and must include consideration of water quality issues within premises. They require knowledge. DWSPs have been a regulatory requirement in the UK since 2010, are expected to become part of a revised Drinking Water Directive in Europe and have been made a requirement for much of the Province of Alberta.

Within a DWSP framework, sampling for lead in drinking water must be specific to circumstances if it is to be fit-for-purpose:

* Random first draw sampling across a water supply system will indicate the general extent of problems in a manner that reflects consumption.
* Sequential sampling (up to 20x1 litre samples) after a stagnation period can investigate the potential extent of problems at a home – if the home is repeatedly sampled it provides a measure of the success or otherwise of treatment change.
* Split-flow composite sampling at an individual home can provide a measure of average lead concentrations ingested over a period (typically a week) to inform health impact investigations.

Also within a DWSP framework, it makes sense to deploy techniques other than sampling, examples being laboratory corrosion tests, field test rigs and compliance modelling. All of these can provide valuable information.

If we now look back to Flint, adequate knowledge allied to risk assessment must surely have forestalled the lead in drinking water “disaster”. Looking forward, water supply systems in Canada need to embrace DWSPs (if they haven’t already) and ensure that they have sufficient knowledge over a range of specialist topics, including corrosion control treatment. A specialist on-line training course on minimising lead in drinking water is available from [www.youlearnwater.com](http://www.youlearnwater.com)

Learn more at <http://www.youlearnwater.com/products/minimizing-lead-in-drinking-water>

References

1. Water Haller: Walkerton & Flint are related ….. but not to infrastructure. CWWA e-Bulletin, May 26, 2016.
2. Lessons from the failures in Flint Michigan USA. The Source, IWA, June 10, 2016.
3. Flint Water Advisory Task Force – Final Report, March 2016. [www.michigan.gov](http://www.michigan.gov)
4. Health Canada 2009. Guidance on controlling corrosion in drinking water distribution systems. Health Canada, Ottawa.
5. Colin R Hayes, Nick Croft, Edith Phillips, Steve Craik and Michael Schock, 2016. An evaluation of sampling methods and supporting techniques for tackling lead in drinking water in Alberta Province. Journal of Water Supply: Research and Technology – AQUA. doi: 10.2166/aqua.2016.117

About the Author: Dr Colin Hayes has worked on the lead in drinking water problem for over 35 years, as practitioner, consultant and researcher. He has published numerous journal papers and books on the topic and undertaken projects in Canada and the US in addition to the UK, Ireland and Portugal. E-mail: [colinhayes@youlearnwater.com](mailto:colinhayes@youlearnwater.com)