COMMENTARY

Walkerton and North Battleford – Key Lessons for Public Health Professionals

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Since May of 2000, drinking water safety has achieved unprecedented publicity in Canada, yet we need to assure that we are all informed and not misled by media coverage. By now, public health practitioners in Canada must know, or at least may believe they know, the story of the Walkerton tragedy. Fewer may be aware of the details of the North Battleford outbreak of April 2001.†

What lessons should public health professionals derive from the findings of the major public inquiries into these Canadian outbreaks taken together with literature on other outbreaks in the developed world? First, the time-honoured framework for drinking water safety, the multi-barrier approach, is more relevant today than ever before. This approach, despite its diverse interpretation over time, offers the most effective framework for achieving drinking water safety. The Walkerton Inquiry Part 2 Report adopted it as the basis for developing a strategy for safe water. In addition to ensuring an effective regulatory process and a new commitment to total quality management, the multiple barrier approach was described as involving at least five main elements:

- Source protection to keep the raw water as clean as possible to reduce the risk of contamination breaching the drinking water system;
- Treatment, often involving more than one process, to remove or inactivate contaminants;
- Distribution system security to protect against intrusion of contaminants and disinfectant residual use to assure delivery of safe water to consumers;
- Monitoring programs to control treatment processes and detect contamination;
- Responses to adverse conditions that are well conceived, thorough and effective.

Multiple barriers are cost-effective because a risk reduction vs. cost curve for a single barrier is normally steepest (risk reduced per unit of cost) for the initial risk reduction, but will inevitably flatten out as we approach negligible risk. By placing suitably selected barriers in series to capture the steep risk reduction at lower cost for each barrier, a much lower cumulative risk can be achieved than by investing the same amount in a single barrier. How low we choose to push risk reduction is a choice that society must make by deciding how much we are willing to pay. For the purposes of this discussion, we will assume that Canadians do not expect to become ill or to die from drinking their tap water, so we should be committed to reducing risk to levels that are too small to worry about.5

The folly of placing our confidence entirely in a single barrier should be evident from exploring the Walkerton and North Battleford outbreaks. Although each involved interactions of many events and failures at more than one barrier, some aspects of these two outbreaks are revealing. Walkerton was a shallow groundwater supply that was supposed to be disinfected, but which failed to receive chlorination adequate to deal with pathogen contamination from cattle manure following heavy rains in May 2000. This failure occurred, in part, because the operators believed that the groundwater supply was a “safe” source and that chlorination was merely an unnecessary requirement that led to consumer complaints about taste. The operators’ faith in the safety of water from the shallow (5 to 8 m) aquifer at the infamous well #5 was woefully misplaced. In particular, a hydrogeologist’s report for the commissioning of this well, more than 20 years before the outbreak, confirmed that it was subject to surface contamination, required disinfection and recommended source protection that was never provided.

North Battleford, in contrast, relied on a river water source (the North Saskatchewan River) that is subject to human and animal waste contamination and extreme turbidity (up to 1700 NTU) so that conventional treatment (coagulation, filtration and disinfection) is mandatory. But the total faith in this treatment at North Battleford was just as misguided as the total faith in the safety of source water at Walkerton. Poor performance of the community’s sewage treatment plant located upstream of the raw water intake for the drinking water plant had been tolerated as if the latter was failure proof. Excessive coliform levels in raw intake water had been noted dating back to 1963, and fecal coliform concentrations were reported as high as 150,000 per 100 mL in March 1993. When treatment processes for turbidity removal were allowed to become sub-optimal following process maintenance in late March 2001, the outbreak ensued in April.

The media seized on the documented misdeeds of the inadequately trained operators at Walkerton. A functional multiple barrier approach applied with effective regulatory oversight would not have allowed their misdeeds to end in tragedy. In particular, Justice O’Connor found that effective implementation of continuous chlorine residual monitoring (an investment of ~$8,000), in accordance with policies for groundwater under the influence of surface contamination, would have prevented the Walkerton outbreak.

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* 7 fatalities, 27 cases of serious kidney disease – haemolytic uremic syndrome with a median victim age of 4 years, and over 2,300 cases of gastrointestinal illness attributed to exposure to Escherichia coli O157: H7 and Campylobacter jejuni contaminated drinking water.
† 5,800 to 7,100 affected by gastrointestinal illness attributed to Cryptosporidium parvum.
total quality management from source to tap was proposed as the framework for accreditation. This is a bold step forward for Ontario that will demand commitment and support from all interested parties, including public health professionals. Once implemented and functional, a transparent system that will hold responsible parties accountable for assuring safe water will vastly reduce the opportunities for complacency, incompetence, neglect or tunnel vision to cause disaster.

The total estimated cost for achieving safety is remarkably affordable for the proposed improvements arising from all 121 recommendations in the Parts 1 and 2 Walkerton Inquiry reports. Although some media reported a headline-grabbing total cost to Ontario of $800 million, the Part 2 report estimated an annual average cost of between $7 and $19 per Ontario household.* The upper figure of $19 would be insufficient to finance a household trip to the movies once a year, while the lower figure of $7 would even fail to buy the popcorn and soft drinks. Our society must confront the complacency and low value we have been placing on safe drinking water.

Overall, a multiplicity of failures occurred in Walkerton and in North Battleford, not just the few that continually grabbed headlines. The challenge for improving drinking water system safety is to reform a pervasive culture of complacency that had been evident among too many key players. We must replace complacency with a culture of personal responsibility and vigilance. Perhaps requiring all parties involved in the delivery of drinking water to read Chapter 2 of the Walkerton Inquiry Part 1 report, which describes the impact of this tragedy on the community, might promote the necessary sense of personal responsibility.

REFERENCES

5. Hrudey SE, Krewski D. Is there a safe level of exposure to a carcinogen? Environ Science and Technology 1995;29(8):70A-75A.

* These estimates were based upon covering all ongoing costs plus amortizing the one-time costs over 10 years at 7%.

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