

Converting hindsight into foresight



Dr Steve Hrudehy is a professor emeritus at the Faculty of Medicine & Dentistry, University of Alberta, Canada. He prepared an 'evidence' paper for Water New Zealand's submission to the Government Inquiry into Havelock North Drinking Water. This is a précis of his work by **Alan Titchall**.

Dr Steve Hrudehy has been engaged in environmental health sciences research and practice for 46 years. From 1999 to 2002, he worked with the Australian National Health and Medical Research Council expert working group to develop a Framework for the Management of Drinking Water Quality to restructure the Australian Drinking Water Guidelines (ADWG) towards a preventive risk management approach. He also served on the Research Advisory Panel to the Canadian Walkerton Inquiry from 2000 to 2002. This inquiry was conducted into a drinking water outbreak in Ontario, Canada's largest and wealthiest province, that caused seven fatalities and over 2300 cases of illness because livestock manure carrying *E. coli* O157:H7 and *Campylobacter* spp. contaminated a groundwater supply.

After the completion of the inquiry Hrudehy and his wife, a microbiological technologist and technical writer, expanded on the report to publish a book of case studies of drinking water outbreaks. This 500-page book published in 2004 by International Water Association Publishing provides analyses of over 70 reported drinking water outbreaks in 15 affluent countries (including New Zealand) over the previous 30 years.

Hrudehy's Havelock North evidence is framed according to six well-established guiding principles for ensuring safe drinking water adopted by the ADWG and is based on a review of international experience that includes 38 outbreaks of serious drinking waterborne disease occurring in 13 affluent countries, including one in New Zealand, that resulted in a total of 77 fatalities in nine fatal outbreaks and caused over 460,000 cases of gastrointestinal illness in the 38 outbreaks considered.

"All these outbreaks were preventable if the threat posed by microbial pathogens in drinking water had been recognised and suitable preventive measures had been implemented and consistently maintained," he says.

The first and by far the most important principle of the ADWG he says is: "The greatest risks to consumers of drinking water are pathogenic microorganisms. Protection

of water sources and treatment is of paramount importance and must never be compromised."

However, an initial review of evidence from Part 1 of the Havelock North Inquiry clearly indicates that those responsible for the safety of the Havelock North drinking water supply and hence the health of the community's consumers apparently had not embraced any of these guiding principles for ensuring safe drinking water, he says.

"In particular, there was remarkable urgency demonstrated in ceasing chlorination after the minimum time allowed for attaining clear results after the 2015 *E. coli* contamination incident, yet there was no apparent urgency in obtaining results for an investigation to explain what had caused the microbiological contamination in the first place.

"Protection of water sources and treatment is of paramount importance and must never be compromised."

"This circumstance makes it difficult to avoid a conclusion that chlorination was seen as a greater concern than microbial contamination. If chlorination is regarded as untenable for consumers, for whatever reasons, then water purveyors and public health officials are obliged to require investment in alternative disinfection technologies with all of the attendant costs, treatment and reticulation system maintenance obligations that may be associated with those technologies.

"The Havelock North outbreak was severe in its consequences, but the vulnerability that allowed it to occur could have resulted in an even more severe outcome. In particular, if livestock faecal contamination had included the pathogen *E. coli* O157:H7, the pathogenic strain of *E. coli* that was involved in the fatal Walkerton outbreak and in fatal outbreaks in Cabool, USA, Saitama, Japan and Washington County, USA, fatalities and severe illness among young children could have occurred in Havelock North."

Drinking water contamination events causing human illness are inevitably complex, he adds. “But the root causes are remarkably common and simple – risk assessment needs to be tiered with global common cause issues understood first before greater detail on contributory causal factors is pursued and elaborated. “While detail is ultimately important, the complexity arising from site specific details must not be allowed to interfere with achieving a thorough understanding of whether the overriding principles are being respected.

“Ultimately, providing safe drinking water is an exercise in risk management. The Walkerton Inquiry into the fatal outbreak in Ontario, Canada in May 2000 described some essential characteristics of risk management as:

- Being preventive rather than reactive.
- Distinguishing greater risks from lesser ones and dealing first with the former.
- Taking time to learn from experience.
- Investing resources in risk management that are proportional to the danger posed.

“International best practice for achieving risk management has been developed around the water safety plan approach. That approach, which is intended to be inherently preventive, can only be as effective as the care and commitment invested in preparing and continuously updating it allows. A water safety plan must be conscientiously developed and truly owned by those who must use it, not by an external third party. If a water safety plan is not owned by those running the water system it may become just another document taking up space on an office shelf.

“Systemic problems that are evident in many of the international outbreaks reviewed, and are certainly evident in Havelock North and likely elsewhere in New Zealand, are the resource limitations and inadequate capabilities of small water purveyors. Although providing drinking water of adequate quality can often be comparatively routine, provision of high quality, safe drinking water 24 hours a day, seven days a week, 365 days a year is a challenging interdisciplinary responsibility.

“Ensuring safe drinking water in the face of the pervasive challenge posed by microbial pathogens and the countless ways that pathogen contamination can occur is a daunting technical challenge.

“Allowing a fragmented system of drinking water supply by many small jurisdictions is a common problem worldwide that inevitably contributes to vulnerability for contamination.

“Some jurisdictions including England and the states of South Australia, Victoria and Western Australia have addressed this risk by creating larger, capable, regional or statewide water authorities to provide the critical mass of expertise for ensuring safe drinking water. Such measures are politically difficult to implement, but they can be remarkably effective.

“Ultimately, a drinking water purveyor can only be relied upon to consistently provide safe drinking water if those responsible for delivering public drinking water take personal

ownership of the considerable public health responsibility that providing drinking water entails.

“There should be no room for complacency among those who must accept this responsibility.

“In closing, the common theme across all of the international outbreak evidence is one of complacency. Our affluent societies have known for many decades how to prevent outbreaks yet we continue to allow them to happen by failing to do what we know needs to be done.

“In this sense, an analogy may be drawn with recurring outbreaks of communicable diseases like measles and mumps that occur because of a failure to maintain adequate immunization. These circumstances reveal the inevitable tension between individual rights and societal benefit. In the case of drinking water, individual biases about water disinfection and treatment should not be allowed to endanger innocent consumers, especially when such biases are based on urban myths and are not founded on authentic public health evidence.”

Risk management

Dr Hrudehy advises risk management requires sensible decision-making in the face of uncertainty.

“After incidents happen it is often difficult to obtain conclusive evidence about the specific details causing the failure.

“Critical decisions need to be made in real time facing uncertainty, so that sensible, defensible precaution in decision-making is necessary.

“Reactive measures, such as boil water advisories, can only limit but not normally prevent public health consequences and often to a very limited degree; risk management must be focused on being preventive.

“Treated water monitoring for contaminants is mainly a reactive measure unless it includes effective early warning indicators that lead to system improvements.”

In summing up the Havelock North outbreak Dr Hrudehy says overview consideration of the evidence from Part 1 of the NZ inquiry appears to indicate that those responsible for the safety of the Havelock North drinking water supply, and hence the health of the community’s consumers, failed to embrace any of the well-established guiding principles for ensuring safe drinking water.

“While knowledge of these principles in the form presented depends on being familiar with the Australian Drinking Water Guidelines, the underlying experience from which these principles were derived is engrained in good practice, worldwide.

“Failure to reflect any of these fundamental approaches in the management of the Havelock North drinking water system is profoundly troubling.”

In his paper Dr Hrudehy details a number of international outbreaks in affluent nations over the past 40 years that are relevant to this country. They provide evidence for guiding principles for ensuring the safety our water supplies. **WNZ**

- You can read the full paper here: www.waternz.org.nz