Fatal Disease Outbreak from Contaminated Drinking Water in Walkerton, Canada

Steve E. Hrudey
School of Public Health
University of Alberta
Edmonton, AB, T6G 2G3
Canada

Summary

In May 2000, a moderately prosperous town of almost 5,000 people in Canada’s richest province (Ontario) experienced an outbreak of waterborne disease that killed 7 people and caused serious illness in many others. The contamination was ultimately traced to a source that had been identified 22 years earlier as a risk. The operators of the system were oblivious to this danger and the regulators responsible for safe drinking water largely overlooked the problems that existed. This case study documents the sequence of events and provides an opportunity to reflect on the responsibility that drinking water professionals carry to assure the safety of drinking water they provide to the public.

Keywords: drinking water, safety, death, pathogens, disinfection

Context and Logistics

Learning Objectives

Through this case study, students will:
1. learn that water supply professionals carry a grave responsibility to protect the health of the public served, and failure to discharge that responsibility can have fatal consequences;
2. understand the importance of the multiple barrier concept for providing safe drinking water;
3. understand the relevance of process monitoring (in this case chlorine residual) in assuring the performance of the disinfection barrier; and
4. recognize that failures of systems often involve human failings meaning that training, supervision and validation are critically important for assuring system function.
Accommodating Course(s) and Level

- senior undergraduate environmental engineering or science courses
- graduate drinking water course

Prerequisite Course(s)

- environmental or public health microbiology
- water treatment course

Type of Activity

- This case study is best conducted in a form that allows for class discussion of student observations and ideas to maximize personal uptake of the lessons in professional responsibility. Small group discussion would be best.

Level of Effort by Instructor

- One 50 minute class should be sufficient to allow students to read the Introduction and Case Study, then engage in discussion of as many questions as time allows.
- Web sites are provided for considerable background documentation. Instructors may use these materials to expand the level of detail according to their interests.
- A faculty member unfamiliar with this topic might require 2 to 4 hours to understand this write-up, including consultation of the supporting websites

Level of Effort by Individual Student

- One 50 minute class period to read the case study and discuss the issues, plus 1 hour to write the essay suggested below.

Suggested Assessment Methods

- Evaluate for the professional responsibility lessons learned by asking students to write a one-page essay on who was responsible and what measures are needed to prevent a re-occurrence.
Introduction

Walkerton, a community of 4800 residents located about 175 km northwest of Toronto, Ontario, Canada, experienced serious drinking water contamination in May 2000. This case study is based on evidence entered at the public inquiry (O’Connor 2002a) called to determine the causes. The case study is presented, for formatting purposes only, as being from the perspective of a hypothetical investigator for the Ontario Office of Emergency Response. The investigator arrives in Walkerton on Monday May 22, one day after a boil water advisory is called and the day that the first victim dies. Although the investigator is hypothetical, the facts are drawn from the Walkerton Inquiry (the Inquiry), a $9 million public inquiry into this disaster called by the Ontario Attorney General (O’Connor 2002a). The following is presented as if it was being gathered in real time by interviewing the parties and observing the subsequent events and investigations as they unfold but is occasionally punctuated with facts from the Inquiry.

Case Study

Walkerton was served by three wells in May of 2000, identified as Wells 5, 6 and 7. Well 5 was located on the southwest edge of the town, bordering adjacent farmland. It was drilled in 1978 to a depth of 15 m with 2.5 m of overburden and protective casing pipe to 5 m depth (O’Connor, 2002a). The well was completed in fractured limestone with the water-producing zones ranging from 5.5 to 7.4 m depth and it provided a capacity of 1.8 ML/d that was able to deliver ~56% of the community water demand. Well 5 water was to be chlorinated with hypochlorite solution to achieve a chlorine residual of 0.5 mg/L for 15 minutes.

Well 6 was located 3 km west of Walkerton in rural countryside and was drilled in 1982 to a depth of 72 m with 6.1 m of overburden and protective casing to 12.5 m depth (O’Connor, 2002a). An assessment after the outbreak determined that Well 6 operated from seven producing zones with approximately half the water coming from a depth of 19.2 m. This supply was judged to be hydraulically connected to surface water in an adjacent wetland and a nearby private pond. Well 6 was disinfected by a gas chlorinator and provided a nominal capacity of 1.5 ML/d that was able to deliver 42 to 52% of the community water demand (O’Connor, 2002a).

Well 7, located approximately 300 m northwest of Well 6, was drilled in 1987 to a depth of 76.2 m with 6.1 m of overburden and protective casing to 13.7 m depth (O’Connor, 2002a). An assessment following the outbreak
determined that Well 7 operated from three producing zones at depths greater than 45 m with half the water produced from below 72 m. A hydraulic connection between Well 6 and Well 7 was also discovered. Well 7 was also disinfected by a gas chlorinator and provided a nominal capacity of 4.4 ML/d that was able to deliver 125 to 140% of the community water demand (O’Connor, 2002a).

From May 8 to May 12, Walkerton experienced ~134 mm of rainfall, with 70 mm falling on May 12. This was unusually heavy, but not record, precipitation. Such rainfall over a 5-day period was estimated by Environment Canada to happen approximately once in 60 years (on average) for this region in May. The rainfall of May 12, which was estimated by hydraulic modeling to have occurred mainly between 6 PM and midnight, produced flooding in the Walkerton area.

Stan Koebel, the general manager of the Walkerton Public Utilities Commission (PUC), was responsible for managing the overall operation of the drinking water supply and the electrical power utility. From May 5 to May 14, he was away from Walkerton, in part to attend an Ontario Water Works Association meeting. He had left instructions with his brother Frank, the foreman for the Walkerton PUC, to replace a non-functioning chlorinator on Well 7. From May 3 to May 9, Well 7 was providing the town with unchlorinated water in contravention of the applicable provincial water treatment requirements.

From May 9 to 15, the water supply was switched to Wells 5 and 6. Well 5 was the primary source during this period, with Well 6 cycling on and off, except for a period from 10:45 PM on May 12 until 2:15 PM on May 13 when Well 5 was shut down. Testimony at the Inquiry offered no direct explanation about this temporary shutdown of Well 5. No one admitted to turning Well 5 off and the supervisory control and data acquisition (SCADA) system was set to keep Well 5 pumping. Flooding was observed near Well 5 on the evening of May 12 because of the heavy rainfall that night, but why or how Well 5 was shut down for this period remains unknown.

On May 13 at 2:15 PM, Well 5 resumed pumping. That afternoon, according to the daily operating sheets, foreman Frank Koebel performed the routine daily checks on pumping flow rates and chlorine usage, and measured the chlorine residual on the water entering the distribution system. He recorded a daily chlorine residual measurement of 0.75 mg/L for Well 5 treated water on May 13 and again for May 14 and 15. Testimony at the Inquiry indicated that these chlorine residual measurements were never made and that all the operating sheet entries were fictitious. They were typically entered as either 0.5 mg/L or 0.75 mg/L for every day of the month.
On Monday, May 15, Stan Koebel returned and early in the morning turned on Well 7, presumably believing that his instruction to install the new chlorinator had been followed. When he learned a few hours later that it had not, he continued to allow Well 7 to pump into the Walkerton system, without chlorination, until Saturday, May 20. Well 5 was shut off at 1:15 PM on May 15, making the unchlorinated Well 7 supply the only source of water for Walkerton during the week of May 15.

PUC employees routinely collected water samples for bacteriological testing on Mondays. Samples of raw and treated water were to be collected from Well 7 that day along with two samples from the distribution system. Although samples labeled Well 7 raw and Well 7 treated were submitted for bacteriological analyses, the Inquiry concluded that these samples were not taken at Well 7 and were more likely to be representative of Well 5. Stan Koebel testified that PUC employees, including Allen Buckle, who sampled in this case, sometimes collected their samples at the PUC shop, located nearby and immediately downstream from Well 5, rather than traveling to the more distant wells (~3km away) or distribution system sample locations.

During this period, a new water main was being installed (the Highway 9 project). The contractor and consultant for this project asked Stan Koebel if they could submit their water samples from this project to the laboratory being used by the Walkerton PUC for bacteriological testing. Stan Koebel agreed and included three samples from two hydrants for the Highway 9 project. On May 1, the PUC began using a new laboratory for bacteriological testing, a lab the PUC had previously used only for chemical analyses.

The first set of samples submitted to the new laboratory was taken on May 1, but was improperly submitted with inadequate sample volumes for the analyses requested and discrepancies between the written documentation and numbers of samples sent. No samples were submitted by the PUC for May 8. The May 15 PUC samples repeated the problems with inadequate sample volumes and discrepancies in the paperwork.

Early on the morning of Wednesday, May 17, the lab phoned Stan Koebel to advise him that all of the water main construction project samples taken May 15 were positive for E. coli and total coliforms, and that the distribution system samples were also contaminated. Because these tests indicated only the presence or absence of indicator bacteria, it was not possible to estimate the numbers of indicator bacteria in each sample. Only the sample labeled Well 7 treated was analyzed by the membrane filtration method. The latter procedure would normally allow a bacterial count to be determined, but in this case the sample was so contaminated that it
produced an overgrown plate with bacterial colonies too numerous to count (both total coliforms and E. coli > 200 / 100 mL). The Inquiry concluded that this sample was most likely mislabeled and was more likely representative of the water from Well 5 entering the distribution system.

The new laboratory was not familiar with the “expectations” (not requirements) to report adverse microbial results to either the Ministry of Environment (MOE) or the responsible Medical Officer of Health (MOH). Accordingly, this lab reported these adverse sample results only to Stan Koebel. In turn, he advised the consultant for the Highway 9 project contractor that their samples had failed so they would need to re-chlorinate, flush and re-sample to complete the project.

On Thursday, May 18, the first signs of illness were becoming evident in the healthcare system. Two children, a seven-year-old and a nine-year-old, were admitted to the hospital in Owen Sound, 65 km from Walkerton. The first child had bloody diarrhea and the second developed bloody diarrhea that evening. The attending pediatrician, Dr. Kristen Hallett, noted that both children were from Walkerton and attended the Mother Theresa school. Bloody diarrhea is a notable symptom for serious gastrointestinal infection, particularly infection with E. coli O157:H7. Accordingly, Dr. Hallett submitted stool samples from these children to evaluate that diagnosis. By May 18, at least 20 students were absent from the Mother Theresa school.

By Friday, May 19, the outbreak was evident at many levels. Twenty-five children were now absent from the Mother Theresa school and 8 children from the Walkerton public school were sent home suffering from stomach pain, diarrhea and nausea. Three residents of the Maple Court Villa retirement home and several residents of the BruceLea Haven long-term care facility developed diarrhea, two with bloody diarrhea. A Walkerton physician had examined 12 or 13 patients suffering from diarrhea. Dr. Hallett first notified the Bruce-Grey-Owen Sound Health Unit, the responsible public health agency for Walkerton with its main office in Owen Sound, of the emerging problems on May 19. She expressed concerns to Health Unit staff that Walkerton residents were telling her something was “going on” in Walkerton, and the receptionist from the Mother Theresa school advised that the parent of one student stated that something was wrong with the town’s water supply.

An administrator at the Mother Theresa school called James Schmidt, the public health inspector at the Walkerton office of the Health Unit, to report the 25 children absent. She noted that some were from Walkerton, others from adjacent rural areas, and that the ill students were from different grades and classrooms. She suspected the town’s water supply. In contrast,
the Health Unit officials suspected a food-borne basis for the outbreak, by far the most common cause of such diseases. Nonetheless, James Schmidt placed a call to Stan Koebel in the early afternoon. By the time he called, the chlorinator had been installed on Well 7 so that it was supplying chlorinated water to Walkerton’s distribution system. According to James Schmidt, he asked whether anything was wrong with Walkerton’s water and Stan Koebel advised him that “everything’s okay” (J. Schmidt, Inquiry Transcript of Evidence, Dec. 15, 2000, p. 172). By then, Stan Koebel had been faxed the adverse microbial results from the Highway 9 project, the distribution system and the sample labeled Well 7 treated two days earlier.

Later that afternoon, David Patterson, an administrator of the Health Unit based in Owen Sound, called Stan Koebel to advise him of public concerns about the water. Patterson asked whether anything unusual had happened in the water system. Stan Koebel mentioned that there was water main construction underway near the Mother Theresa school, but made no mention of the adverse bacteriological results or of operating Well 7 from May 3 to 9 and from May 15 to 19 without a chlorinator.

The Inquiry concluded that Stan Koebel’s lack of candor seriously hampered the Health Unit’s early investigation of and response to the outbreak. Because patients had bloody diarrhea, health officials suspected the outbreak was caused by E. coli O157:H7, but this pathogen is most commonly associated with food-borne outbreaks. At that time, Health Unit personnel were not aware that any outbreaks of this disease had occurred in a chlorinated drinking water system. (Earlier waterborne outbreaks of E. coli O157:H7 — Cabool, Missouri; Alpine, Wyoming; and Washington County, New York — involved unchlorinated drinking water – Hrudey and Hrudey 2004). Stan Koebel’s reassurances about the water’s safety kept the Health Unit staff pursuing a food-borne cause. However, the emerging outbreak, with cases distributed across a wide geographic region and across the population from very young and very old was making any food-borne explanation increasingly improbable.

Suspensions about the safety of the water were spreading in the community. The BruceLea Haven nursing home, where a number of patients had become ill, began to boil water. Some citizens, including Robert MacKay, an employee of the Walkerton PUC, also began to boil their water on Friday, May 19. After his conversations with health officials that afternoon, in which he reassured them about the water, Stan Koebel increased the chlorination level at Well 7. He also began to flush the distribution system through a hydrant near the Mother Theresa school and subsequently at other hydrants throughout the system until May 22.
By Saturday, May 20, on a holiday long weekend, the outbreak was straining the Walkerton hospital with more than 120 calls from concerned residents, more than half of whom complained of bloody diarrhea. After the Owen Sound hospital determined that a stool sample from one of the children admitted on May 18 was presumptive positive for E. coli O157:H7, the health unit notified other hospitals in the region because this pathogen may cause hemolytic uremic syndrome (HUS). This was important because anti-diarrheal medication or antibiotics can worsen the condition of patients infected with this pathogen, so emergency staff had to avoid dispensing such medication.

David Patterson asked James Schmidt to contact Stan Koebel again to determine the current chlorine residual levels in the water and to receive reassurance that the water system would be monitored over the holiday weekend. Koebel assured Schmidt that there were measurable levels of chlorine residual in the distribution system, leading health officials to believe that the water system was secure.

Early on Saturday afternoon, David Patterson contacted Dr. Murray McQuigge, the local Medical Officer of Health who was out of town during the onset of the outbreak, to advise him of the emerging outbreak. By that time, several people in Walkerton were reporting bloody diarrhea and ten stool samples had been submitted for pathogen confirmation. Dr. McQuigge advised that any further cases diagnosed with E. coli O157:H7 should be interviewed for more details, and he returned that evening to Owen Sound.

David Patterson called Stan Koebel to advise him that a local radio station was reporting that Walkerton water should not be consumed. Patterson wanted Koebel to call the radio station to correct this report and reassure the public about the safety of the Walkerton water supply, but Koebel was apparently reluctant to comply with this request. Patterson asked again whether anything unusual had occurred in the water system and Koebel again failed to report the adverse results from the May 15 samples or that Well 7 had been operating with no chlorination.

Robert MacKay, who had been on sick leave from the PUC, began to suspect something was wrong with Walkerton’s water. He had learned from Frank Koebel that the samples from the Highway 9 project had failed testing. MacKay phoned the Spills Action Centre (SAC) of the MOE anonymously to report his concerns and provide a contact number at the PUC for the MOE to call about the Walkerton water system. In the early afternoon of Saturday, May 20, Christopher Johnston, the MOE employee who received MacKay’s anonymous call, phoned Stan Koebel to find out if there were problems with the system. Johnston understood from this conversation with Stan Koebel that
any problems with bacteriological results had been limited to the Highway 9 mains replacement project some weeks earlier, but that chlorine residual levels were satisfactory as of May 19. MacKay, now experiencing diarrhea himself, placed another call to the MOE number that evening to find out what was being done. MacKay was advised that Stan Koebel had been contacted, but that MacKay’s concern about drinking water safety was really a matter for the Ministry of Health. This feedback from the MOE was wrong: the MOE was designated as the lead agency for drinking water regulation in Ontario. MacKay was provided with a phone number for the wrong regional health office, eventually leading him to call back to the SAC. This time, the MOE SAC staff person agreed to contact the nearest MOE office, in Owen Sound, with a request to look into the matter.

The outbreak continued to expand. By Sunday, May 21, there were more than 140 calls to the Walkerton hospital and two more patients admitted to the Owen Sound hospital. A local radio station interviewed Dr. McQuigge on Sunday morning and subsequently reported on the noon news that Dr. McQuigge believed that drinking water contamination was an unlikely source of this outbreak. At about that time, the Health Unit was advised that the first presumptive *E. coli* O157:H7 had been confirmed and that another patient sample, presumptive for *E. coli* O157:H7, was being tested for confirmation. David Patterson and Dr. McQuigge conferred with their staff about these results and decided to issue a boil water advisory at 1:30 PM on Sunday, May 21. The notice, hastily drafted by David Patterson, read as follows:

*The Bruce-Grey-Owen Sound Health Unit is advising residents in the Town of Walkerton to boil their drinking water or use bottled water until further notice. The water should be boiled for five minutes prior to consumption. This recommendation is being made due to a significant increase in cases of diarrhea in this community over the past several days.*

*Although the Walkerton PUC is not aware of any problems with their water system, this advisory is being issued by the Bruce-Grey-Owen Sound Health Unit as a precaution until more information is known about the illness and the status of the water supply.*

*Anybody with bloody diarrhea should contact his or her doctor or the local hospital.*

This notice was provided only to the local AM and FM radio stations; additional publicity by the television station or by direct door-to-door notification was not pursued. According to the report subsequently prepared on the outbreak with the assistance of Health Canada (BGOSHU, 2000), a community survey showed that only 44% of respondents were aware that the
Health Unit had issued a boil water advisory on May 21 and only 34% heard the announcement on the radio. In retrospect, Health Unit personnel acknowledged that the community could have been more effectively notified. However, given Stan Koebel’s consistent reassurance about the safety of the Walkerton water system, the Health Unit’s caution in attributing the outbreak to the local drinking water at this emerging stage of the outbreak is understandable.

After issuing the boil water advisory, Dr. McQuigge notified the MOE SAC that there was an E. coli outbreak in Walkerton. In exchange, the SAC advised Dr. McQuigge about the anonymous calls about adverse results for the Walkerton water system. The Health Unit updated the MOE SAC that there were now 2 confirmed cases of E. coli O157:H7 and 50 cases of bloody diarrhea. The MOE called Stan Koebel to discuss the situation; Koebel again failed to report the adverse samples from May 15 (reported to him on May 17). During his Inquiry testimony, Stan Koebel responded to a question about whether he had deliberately avoided disclosing these results during his conversation with MOE personnel by answering: “I guess that’s basically the truth and I was waiting on the Ministry of the Environment to call from the Owen Sound office with further confirmation” (S. Koebel, Inquiry. Transcript of Evidence, December 20, 2000, p. 108).

The Health Unit established a strategic outbreak team to deal with the emergency. Local public institutions were to be notified about the boil water advisory, but the BruceLea Haven nursing home and the Maple Court Villa retirement home were inadvertently missed. The Walkerton hospital had been reassured about the safety of the water until that afternoon and had not taken any measures to address water safety. In fact, hospital staff had been advising those caring for patients with diarrhea to provide ample fluids to maintain patient hydration, advice that caused many ill patients to be further exposed to contaminated Walkerton tapwater.

Once notified of the problems, the hospital was forced to find an alternative, safe water and ice supply, shut off its public fountains, and discard any food prepared or washed with Walkerton tap water. By that evening, the Health Unit had notified provincial health officials of the outbreak and requested the assistance of major hospitals in London and Toronto in treating Walkerton residents and the assistance of Health Canada in conducting an epidemiological investigation.

By Monday, May 22, the Health Unit had received reports of 90 to 100 cases of E. coli infection. Phillip Bye, the regional MOE official in Owen Sound, who had been notified the previous evening about the outbreak, did not initiate a MOE investigation, even after being advised about the large
number of cases of E. coli infection and that the Health Unit suspected the Walkerton water system. Only after being contacted later that day by Dr. McQuigge, who stressed the urgency of the situation, did the regional MOE initiate an investigation by sending environmental officer James Earl to Walkerton to meet first with the Health Unit before meeting Stan Koebel. The Health Unit advised Earl about the “alarming” number of illnesses and said that Health Unit investigations failed to reveal any plausible food-borne cause, making the water system highly suspect. David Patterson asked Earl to obtain any microbiological test results from the PUC for the previous two weeks. Earl was also informed of the anonymous call, and he surmised that intentional contamination might be possible. When Earl interviewed Stan Koebel and asked about any unusual events of the previous two weeks, Koebel did not tell him about the adverse bacteriological results for May 15 or the operation of Well 7 without a chlorinator. However, Koebel provided Earl with a number of documents, including the May 17 report (results for May 15).

James Earl returned to Owen Sound and reviewed these documents that evening. Although Earl noted the result showing high E. coli numbers for the water system, he did not report this alarming evidence to his supervisor, Phillip Bye or the Health Unit at that time. James Earl apparently believed that the boil water advisory eliminated any urgency concerning the revelation about adverse microbial results for Walkerton’s drinking water supply.

In the meantime, the Health Unit began to plot an epidemic curve that revealed an apparent peak of disease onset for May 17, suggesting a most likely date of contamination between May 12 and 14. They also plotted the residence locations for those who were infected. This plot revealed that cases were distributed all across the area served by the Walkerton water distribution system. By that evening, the Health Unit was convinced this was a waterborne outbreak, even though they had not yet been provided with the adverse results for May 15.

On Monday, May 22, the first victim of the outbreak, a 66-year-old woman, died. Subsequently, a 2 year old child who visited Walkerton on Mother’s Day (May 14) and consumed only one glass of water, died on Tuesday, May 23. Ultimately 5 more deaths, 27 cases (median age of 4) of HUS, a life-threatening kidney condition that may subsequently require kidney transplantation and 2,300 cases of gastrointestinal illness were attributed to consuming Walkerton water. Stool cultures confirmed exposure to Escherichia coli O157:H7, Campylobacter jejuni and other enteric pathogens.
Well 5 was providing drinking water to Walkerton during the period of most likely contamination (May 12 to 14) according to the SCADA system. Well 5 was located close to two farms posing a water contamination risk from manure (Figure 1). The original hydrogeology report for Well 5, written in 1978, recognized the risk of contamination from nearby farms, finding that fecal coliforms appeared after 24 hours during pump testing (O’Connor, 2002a).

![Figure 1. Location of Walkerton Well 5 near farms to south and west (adapted from original photo taken for the Walkerton Inquiry by Constable Marc Bolduc, RCMP, used with permission).](image)

As illness emerged in the community, the Koebel brothers remained convinced that water was not to blame and they continued to drink the water. In the past, they had often consumed Well 5 water before chlorination because they did not recognize the danger of pathogen contamination.

The MOE disinfection requirement for 0.5 mg/L chlorine residual for 15 minutes would have provided a CT value of 7.5 mg/L-min. That CT value is more than 150 times greater than literature CT values of 0.03-0.05 mg-min/L for 99% inactivation of E. coli O157:H7 and more than 80 times greater than a CT value of 0.067 to 0.090 mg-min/L for 99.99% inactivation of E. coli (Hoff & Akin, 1986; Kaneko, 1998).

Questions

1. Prepare a timeline of events and indicate the opportunities for intervention that could have prevented or reduced the scope of the outbreak.
2. What field, treatment facility and hydrogeological investigations would you undertake to determine the physical causes of this outbreak? See Hrudey and Hrudey 2004 pp.110-113 or Grey Bruce Health Unit Investigative Report located at: http://www.publichealthgreybruce.on.ca/_private/Water/SPWater.htm

3. To prove Well 5 as the ultimate source, what other possible sources of contamination should be investigated and eliminated?

4. What information from the epidemiological investigation of this outbreak would be useful for determining the cause? (See Hrudey and Hrudey 2004 pp.113-117 or Grey Bruce Health Unit Investigative Report located at: http://www.publichealthgreybruce.on.ca/_private/Water/SPWater.htm

5. What molecular biological typing options might be pursued to gather confirmatory evidence about the source(s) of water contamination? See Hrudey and Hrudey 2004 pp.115-117 or Grey Bruce Health Unit Investigative Report located at: http://www.publichealthgreybruce.on.ca/_private/Water/SPWater.htm

6. What actions should the operators of this facility have taken that could have prevented this outbreak? See Hrudey & Walker 2005 located at: http://www.awwa.org/communications/opflow/2005/June/

7. What actions should the regulator have taken to have prevented this outbreak? See O’Connor 2002b Chap 3 (pp 72-79) located at: http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/part2/Chapter_3.pdf

8. What are the critical features of a drinking water safety program needed to prevent these kinds of failures? See the following references:

**Analysis**

Summary of the timeline of events should provide perspective on the opportunities for intervention that could have prevented or substantially reduced the scope of this outbreak (Hrudey and Walker 2005). Although the simple interpretation that was evident in media coverage of this tragedy
placed the blame primarily on the Koebel brothers (the operators), the Walkerton Inquiry determined that they were not solely responsible, nor were they the only ones who could have prevented the outbreak. The largest portion of the inquiry report into what went wrong in Walkerton (O’Connor 2002a) was directed at the failings of the Ontario MOE who were the designated regulator in this case. The operators were not properly trained and they had no idea that Well 5 was at risk from contamination or that contamination of any of the Walkerton wells could pose life-threatening illness to their fellow residents. Overall, the regulatory system for Walkerton failed at many levels with the result that drinking water was allowed to become unsafe and the tragedy occurred.

The Walkerton case study provides a strong argument for the multiple barrier concept for assuring safe drinking water. Because outbreaks of disease caused by drinking water remain comparatively rare in North America, particularly in contrast with the developing world, complacency about the dangers of waterborne pathogens has become common. Yet, the source of waterborne disease in the form of microbial pathogens is an ever present risk because these pathogens are found in human fecal waste and in fecal wastes from livestock, pets or wildlife, making any drinking water source at risk of contamination before or after treatment.

Learning Assessment

Students may be evaluated for the professional responsibility lessons learned by asking them to write a 1 page essay to describe who they think should be held responsible for the Walkerton tragedy and if they were the ultimate decision-maker, what would they change about the regulatory system to assure safe drinking water for the future.

References Cited

Hrudey, S.E. and R. Walker. 2005. Walkerton – 5 years later. Tragedy could have been prevented. Opflow. 31(6): 1, 4-7.

