IT'S ONLY WATER -SO WHAT'S THE RISK?

Clean and Safe Drinking Water Workshop Gander, NL March, 2011

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OUTLINE

 Overview Contamination Threats – **Microbial/Chemical** Guidelines, Standards... Managing Risk Risk Perception/Communication Summary

OVERVIEW

The 3 dangers;
 Too little (fresh) water
 Too much water
 Contaminated water

Fresh water only accounts for about 3% of the planet's water but supports all life outside the seas Of that 3% not all water is suitable for human consumption and it is not evenly distributed

Physiological need; Dehydration is potentially deadly Also short term effects on body such as brain function impairment, increased susceptibility to illness such as flu... – Daily requirement varies with climate The human body can survive for weeks without food but rarely lasts for more than a week without water

Sanitation

- Public sanitation and with it the flushing lavatory — has been voted the greatest medical breakthrough since 1840.
 - Sewage disposal and clean water supplies, among other aspects of sanitation, were chosen over 15 key medical advances named in an international poll by the *British Medical Journal (BMJ)*.

The Times January 19, 2007



Hurry up! 2.4 billion people want to use the toilet.

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Threat of fire & impact on firefighting



 Impact on food production and commerce in general

Drought in Saskatchewan in the Great Depression



 Catastrophic climate events

 When hurricanes come, be they Hazel to Ontario, Katrina to the Gulf of Mexico, or Igor to Newfoundland, it's water, not wind, that often brings the most death and damage.



Calgary sewer overflow during flood



Drowning Lifetime odds of drowning in your bathtub are about 1/11,000.*



* U.S. Statistics 2001

Overindulgence

– " A new review of three deaths of US military recruits highlights the dangers of drinking too much water... diluting the concentration of salt in the tissues... can induce swelling of the brain... limit to 12 quarts per day."

Reuters, 2002

Can carry infectious disease

 "Pathogens pose the greatest and most tangible risk to drinking water safety, making pathogen removal and disinfection the paramount concern."

Hrudey, 2004

Waterborne illness can be brought on by a single exposure.

- Infectious disease may result from the presence of bacteria, viruses and protozoa
 - Examples;
 - E. coli 0157:H7
 - Norovirus
 - Giardia \rightarrow
 - Cryptosporidium



Pathogen sources include humans, animals and birds
The threat is everywhere!

- Gastrointestinal infection due to fecal contamination is the primary concern regarding the potential presence of pathogens in drinking water
 - Symptoms can include diarrhea, vomiting, nausea, headache, fever...
 - After exposure, it may just be a matter of hours but could be over a week before symptoms appear
 - Symptoms may disappear within 12 hrs. but may also last for weeks
 - Complications can lead to long term effects and even death!

• The E. coli results your lab sent you are <u>old data</u>

"Making decisions with old data

- Water was unsafe yesterday and maybe even before then so a boil water advisory is being issued today
- Hope you are feeling well!

 The water may or may not be safe today but you won't know for sure until tomorrow"

Will Robertson, 2000

We need to take a preventative approach

 "Population health surveillance is insensitive and is likely blind to low-level endemic disease and all but the largest outbreaks."

Hrudey, 2004

 Endemic disease refers to the ongoing 'background' occurrence of illness in a population over time in contrast to the short peaks of disease associated with point source outbreaks.

The absence of detectable outbreaks must not lead to complacency!

Can contain harmful chemicals....

- Potential for risk is much more site specific than for pathogens
- Focus is mainly on health effects due to long term consumption but important exceptions exist;
 - Acute events such as spills
 - Nitrate/nitrite
 - Lead

- A great deal of uncertainty exists concerning the health effects of long term exposure to most regulated chemicals at low levels
 - A precautionary approach is taken
 - For non-threshold carcinogens, we generally accept that a risk of 1 additional cancer per 1/100 000 to 1/1 000 000, from lifetime exposure at the guideline/standard level is acceptable
 - We'll never know whether we got the calculated risk right

• The bottom line;

 Control of pathogen risk must <u>never</u> be compromised in favour of controlling risk from chemicals such as disinfection byproducts (DBPs)

Who?
What?
When?
Where?
Why?

• Who?

- Health Canada plays a lead role in providing and reviewing the latest relevant science
- The Committee on Drinking Water which includes representatives from each province, territory and the federal government develops guideline documents
- All stakeholders have an opportunity to comment before the guideline is finalized

• What?

 It must be detected in many Canadian drinking water supplies

- There must be evidence of potential adverse health effects at the levels found
- Feasibility is considered
- Maximum Acceptable Concentrations (MACs) are developed

• When?

- Guidelines are always open for review

- Based on new research or data on occurrence, health effects, analytical methods, treatment technology
- Priority lists are always under revision

 "Guidance" documents can be developed for specific drinking water issues

• Where?

 Used at the federal level for determining drinking water quality in areas of federal jurisdiction

 Provinces/territories use the guidelines when setting their own enforceable standards

 Meeting the guidelines themselves is voluntary because substances of concern vary between regions

• Why?

 The guidelines set a science based foundation for determining "acceptable" risk on a regional basis

 Provinces and territories have ultimate jurisdiction and responsibility

- Identification
- Assessment
- Managing and controlling

A hazard is;

A biological, chemical, physical or radiological agent that has the potential to cause harm. Examples;

Drinking water contaminated with e. coli O 157:H7

• Exceedance of a chemical standard

Low/no pressure for fire fighting

A hazardous event is;

An incident or situation that can lead to the presence of a hazard (what can happen and how).

Examples;

Depressurized water main in contact with sewage
 Chemical spill into source water

Broken water main resulting in loss of service

 A simple risk definition: The likelihood of a hazardous event occurring and exposing populations to a specific hazard as well as the magnitude of the harm and/or consequences which may result from such exposure.

 While we may not be able to manage, and even identify, all possible risks, we need a logical approach;

Understand the workings of your system

Identify potential hazards/hazardous events
 Rank and prioritize subsequent risks

Identify and list your system's vulnerabilities to specific hazards and hazardous events and list all that could be of potential concern
 Consider

 Sourcewater

- Treatment
- Distribution

Don't ignore potential hazards or hazardous events just because they have never happened before - Moose were not native to Newfoundland, however there are now over 700 moose/vehicle collisions per year (risk is about 1/700 persons!) Cryptosporidium next?

MANAGING RISKS Assign a <u>likelihood</u> score for each listed item

Description	Likelihood of Hazardous Event Occurring	Rating
Rare	May occur in exceptional circumstances, and has not occurred in past	1
Unlikely	Could occur at some time, historically has occurred less than once every five or 10 years	2
Possible	Has occurred or may occur once or more per year	3
Likely	Has occurred or may occur on a monthly to quarterly basis	4
Very likely	One or more occurrences on a monthly or more frequent basis	5

MANAGING RISKS Assign a <u>consequence</u> score for listed items

Description	<u>Consequence</u> of Hazardous Event Occurring	Rating
Insignificant	Insignificant impact, little public exposure, little or no health risk	1
Minor	Limited public exposure, minor health risk	2
Moderate	Minor public exposure, health impact on small part of the population	3
Major	Large part of population at risk	4
Catastrophic	Major impact for large part of the population, complete failure of systems	5

MANAGING RISKS Calculate a total score

 Detectability is sometimes used as well as <u>likelihood</u> and <u>consequence</u> in the ranking of risks

RANK = LIKELIHOOD + CONSEQUENCE (+ DETECTABILITY)

 Prioritize risk management planning based on rank

CONTROLLING RISKS

For each significant risk;

- Identify critical control points
 - Where can intervention prevent health risk?
- Identify critical limits
 - If exceeded, action must be taken
- Monitor critical control points
 - To ensure that control has been maintained
- Determine corrective actions to be taken if critical limits are exceeded
 - Have an intervention plan

CONTROLLING RISKS

 Have an emergency response plan!

 Document processes for emergency response and recovery
 Define roles and responsibilities
 Develop a communication protocol and an <u>up</u> to date list of emergency contacts
 Train staff & test the plan

- Reality vs. Perception
- We want our customers to complain!
- Dealing with customer inquiries

The reality;

– "While it is not possible to utterly remove all risk from a water system, the ... overall goal is to ensure that Ontario's drinking water systems deliver water with a level of risk so negligible that a reasonable and informed person would feel safe drinking the water."

Part Two Report of the Walkerton Inquiry

The perception;

 Water gives life. When someone is charged with providing it, absolute safety must be ensured. Any amount of risk cannot be tolerated.

• Uninformed but perhaps reasonable person?



Why We Fear the Things We Shouldn't – and Put Ourselves in Greater Danger

Dan Gardner

 Following 9/11, people stopped flying even though statistics indicated that the most dangerous part of a typical commercial flight is the drive to the airport.

 It was calculated that the number of Americans killed in car crashes in one year, as the direct result of the switch from planes to cars, was 1595 (6 times higher than the number of plane passengers killed on board the doomed 9/11 flights)!

- Following a major earthquake, stress forces in the earth's crust
 have been released, and although there may be aftershocks the chances of another "big one" in
 - the near future are diminished
- However, sales of insurance peak soon after the last "big one" but decrease as the risk actually increases



Some factors influencing perception;

- Risk to children
- Man made rather than natural
- Voluntary vs. involuntary risk
- Rare but spectacular events draw attention away from more mundane but realistic risks
- Trust in institutions
- That 1 in a million could be me

Aesthetic problems often result in safety concerns

American Water Works Association



Drinking Water Surveillance We Need Our Customers to Complain



For years public health departments have been using public feedback to detect health crises. This practice is called syndromic surveillance and is the means by which the population is monitored for behavioral patterns (e.g., purchase of overthe-counter medications, absenteeism from work or school, visits to doctors' offices or emergency

by Andrew J. Wheiton and Margaret F. Cooney

In the aftermath of Sept. 11, 2001, many water system managers would have liked to install in their distribution systems a single device that would detect every imaginable contaminant. Unfortunately, that silver bullet does not exist. Instead, drinking water surveillance is primarily attained through a combination of detection devices and water quality monitoring measures. These early warning systems can alert utilities to contamination events and allow system operators to act quickly if water quality is compromised. But, sometimes, customers may be the first ones to notice that something is wrong with the water, which means utility response to customer complaints may be even more important now than in the past.

rooms) or nonspecific symptoms of disease (e.g., diarrhea, vomiting, difficulty breathing, skin rashes). If the frequency of reported signs and symptoms of disease increases above a background (or normal) threshold, public health officials take a closer look.

- Customer inquiries provide an opportunity for utilities to inform and reassure customers.
- Customer complaints provide an opportunity for utilities to identify and correct problems in the system before customer confidence is lost.
 - Every inquiry and complaint should be considered seriously and investigated – this could be your first indication of a hazardous event!

- Why would your customers trust you if you ignore them?
 - In Milwaukee, Wis., in 1993, residents persistently reported various taste, odour and colour complaints;
 - The *Cryptosporidium* outbreak was recognized 2 weeks later (over 400 000 ill)
 - The information provided by customers was not scrutinized at the time but health officials later realized how useful it could have been

What do they really want to know?
 Will it hurt me or my family?
 What can I do to protect myself or my family?
 What is important for me to know?

These may not be the actual words they use but you should be prepared to answer the above questions

• What should we say?

- Empathize and be open, don't criticize.
 - Listen, acknowledge the concern
- Emphasize your utilities commitment as well as the specific steps taken to ensure that risk is controlled
- Explain the role of other stakeholders and where to get further information
- Empower the customer to make their own "wise" decision based on facts that you provide.
- Spend a bit of time with the customer!

RISK – PERCEPTION TO REALITY



SUMMARY

Water gives life but it can also take it

- Our greatest concern regarding drinking water is the potential presence of pathogenic organisms
- Risk needs to be understood and managed on a system specific basis
- Perceptions of risk may seem less important than actual risks but perceptions can lead to increased risk

THANK YOU !



QUESTIONS?