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# Clean & Safe Drinking Water Workshop

Gander, Newfoundland  
March 27, 2001



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# THM Potential and Newfoundland Water Supplies - Implementing Best Management Practices



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Newfoundland and Labrador



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**WHY IS THIS A CONCERN?**

- Disinfection versus THM production.
- Humic and fulvic acids in local water.
- The “Walkerton Disaster”.
- Oh no - a carcinogen in my water!
- Where is Erin Brockovich (THM v. Cr <sup>+6</sup>)?

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# LIFETIME CANCER RISK:

(Jorgenson, 1985 – 70 kg body weight, 1.5L/day water)

**THMs (**

$10^{-5}$	56 – 300
$10^{-6}$	5.6 – 30
$10^{-7}$	0.56 - 30

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## LESSONS FROM BEFORE:

(no need to repeat that here)

- Why do we need disinfection?
- DBPs (Disinfection By-Products).
- Health effects of DBPs and THMs.
- How THMs and formed?
- How are THMs reduced or removed?

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## HEALTH CANADA WEB SITE:

Health Canada's evidence indicates that the benefits of chlorinating our drinking water – which yields a reduced incidence of water borne diseases such as cholera and typhoid – are much greater than the risks of health effects of THMs. So, yes, people should continue to chlorinate their drinking water.

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Many supplies are even less than 50 è 10!ô4†%# 9• Ž° Àô

Some supplies peak in the summer period

- Surface water supplies yield more THMs
- Heavy chlorination yields higher THMs

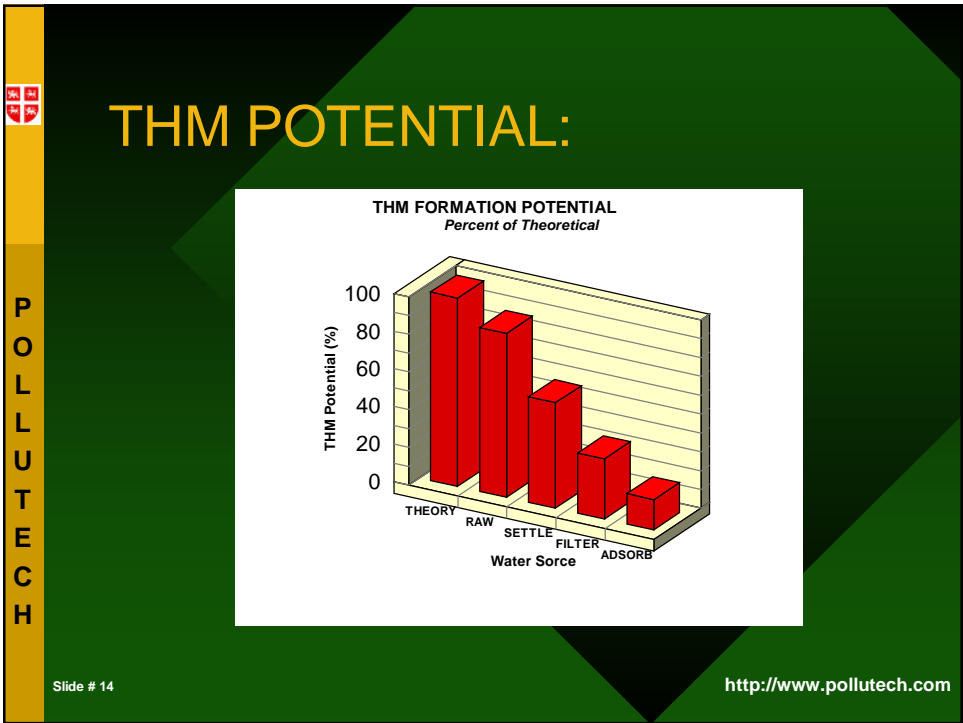
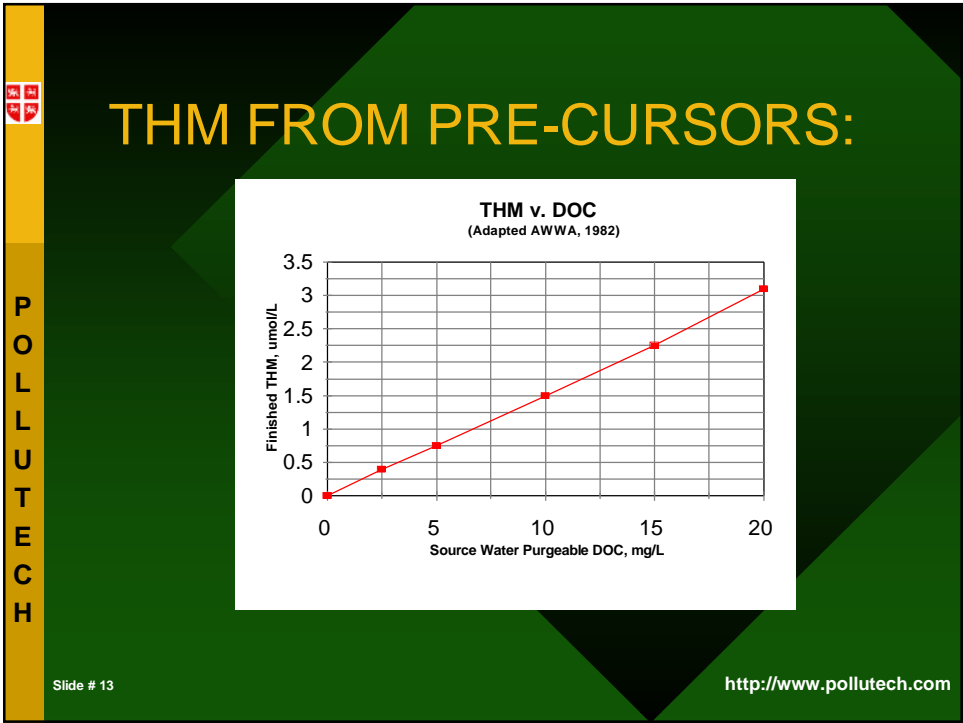
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**HISTORIC WATER QUALITY:**  
(TESTING COMPLETED BY POLLUTECH)

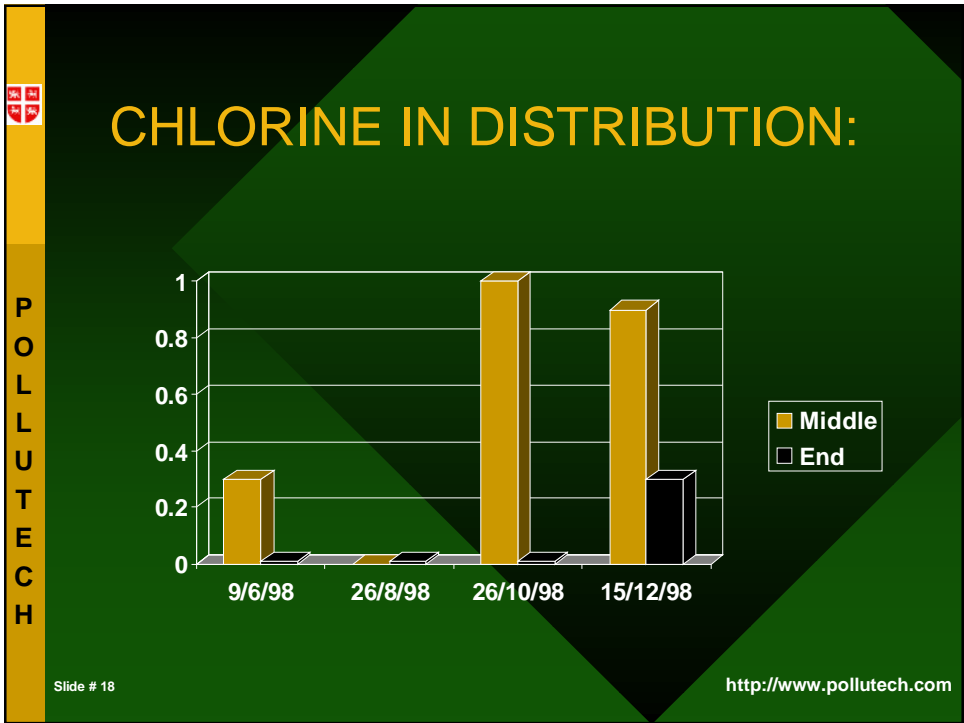
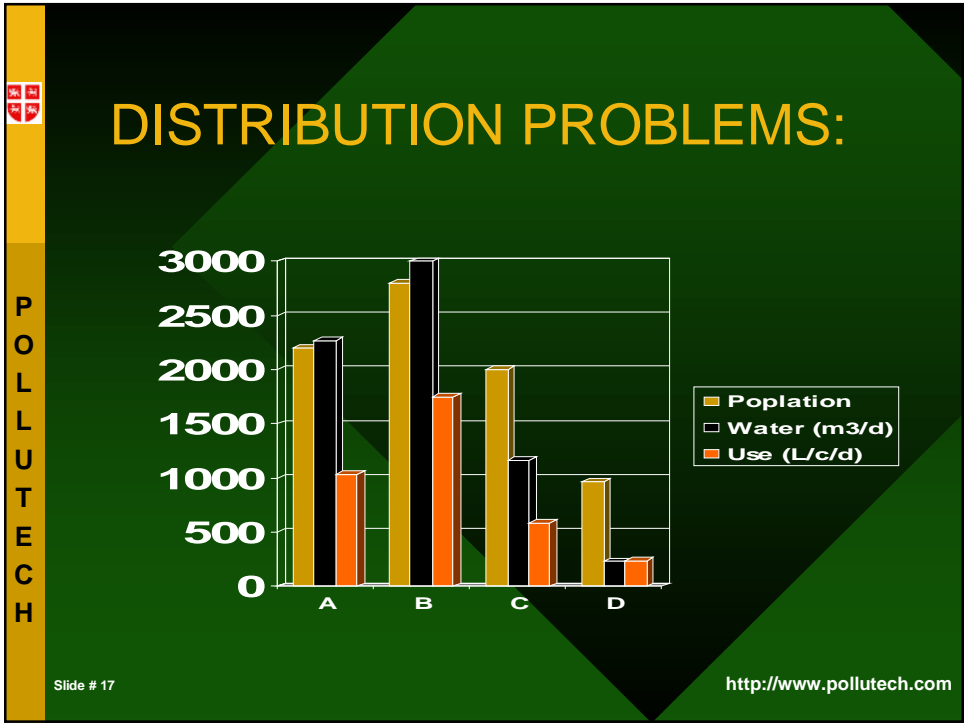
TOWN	pH	Colour	Fe (mg/L)	Mn (mg/L)
Community A	5.0	52	0.36	0.02
Community B	4.2	-	0.39	0.005
Community C	5.2	40	0.14	0.005
Community D	6.5	21	0.01	0.01
Community E	5.7	46	0.01	0.02
Standard	6.5 - 8.5	15	0.30	0.05

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**HISTORIC CORROSION:**  
(TESTING COMPLETED BY POLLUTECH)

Location	pH	Fe (mg/L)	Cu (mg/L)
Intake	6.6	0.21	0.01
Hydrant	5.9	2.50	0.03
Cold Water	4.2	0.39	1.15
Hot Water	4.7	0.30	2.40

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**IMPLICATIONS OF STUDY:**

- THMs are forming in the system
- Rapid loss of chlorine in system
- Chlorine residual is depleted at end
- Water quality guidelines not met for either THMs or Chlorine Residual

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**ALTERNATIVE DISINFECTANTS:**  
(Fleming et al, January 2001)

Process	Bacteria Virus	Cysts	Residual	Organic	Inorganic
NaOCl	Very Good	Fair	Good	High	Medium
Cl <sub>2</sub> + NH <sub>4</sub> <sup>+</sup>	Fair	Very Poor	Excellent	Medium	No
ClO <sub>2</sub>	Very Good	Very Good	Fair	Low	High
Ozone	Excellent	Excellent	No	Low	Medium
UV	Good	Under Study	No	No	No

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# EUROPEAN STANDARDS:

(Hydes, January 1999)

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	TTHM (	Chlorine (mg/L)
Austria	30	0.3 – 0.5
Belgium	100	0.2
Denmark	10 – 15	-
Germany	10	n/a
Ireland	100	0.2 – 0.5
Italy	30	-
Luxembourg	50	<0.25
Sweden	50	-
United Kingdom	100	-

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## DO YOU HAVE A PLAN?



Don't let the water get the best of you!


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## THE MANAGEMENT PLAN: (STEP 1)

- Define the current system (physical and chemical).
- Establish the THM and chlorine levels.
- Identify the interaction of THM and  $\text{Cl}_2$ .
- Test the water and system for chlorine decay rates.

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## THE MANAGEMENT PLAN: (STEP 2)

- Evaluate pre-cursor treatment alternatives.
- Consider alternate disinfectants.
- Complete a “Value Engineering” study.
- Make a “reasonable” decision.

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## THE “NOT TO DO” LIST:

- Don’t panic, base your decision on good testing and reasonable decisions.
- Don’t listen to “fear mongers”, read the “peer reviewed” literature.
- Don’t run out and buy a treatment system until you know what you need.
- Remember “What is the use of a treatment system that is affordable yet ineffective, or one that is effective and not affordable”?

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 **IT IS YOUR CHOICE:**

Do you find sometimes that you are just “following the flock”? Now is the time to take the lead, so find out all the details and make a rationale decision.



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 **SAMPLING AND ANALYSIS:**

- **Chemical**
  - metals, ions, corrosive characteristics
- **Biological**
  - bacteria, cysts, viruses
- **Physical**
  - flow, corrosion potential, leakage, retention

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## BENCH SCALE TESTING:

- Presence of organically bound metals.
- Influence of pH on water chemistry.
- Adjustment of alkalinity (corrosion control)
- Evaluation of alternative coagulants, filtration.
- Consideration of alternative oxidants.
- Interaction of all parameters on water quality.

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## PILOT SCALE TESTING:

- Confirm bench scale test results.
- Evaluate seasonal variation.
- Decide on most appropriate process.
- Demonstrate water quality achievable.
- Train plant operations and maintenance.
- Obtain public acceptance and confidence.

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## FULL SCALE OPTIMIZATION:

- Investigate an existing system.
- Evaluate alternatives (corrosion, pre-cursors, disinfectants).
- Understand the “real chlorine decay”.
- Identify system “hot spots” or “upgrade needs”.
- Demonstrate what can be technically and financially achievable.

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## ONLY IN NEWFOUNDLAND?

- Northern Ontario
- New Brunswick
- Northern Quebec
- Central Europe
- Central USA
- Almost anywhere!



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## WHAT TOMORROW WILL BRING:

- New technologies
- Better risk studies
- Improved distribution
- Scientific research
- Communication (Web)
- Community Understanding




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## WORKING AS A TEAM:

- International
- Federal
- Provincial
- Municipal
- Private
- Research Facilities



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**FURTHER INFORMATION:**

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*Thank  
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