



Pilot Project

Evaluation of Bacteriological Testing of Potable Water Using Colilert and Colisure Presence and Absence Method

by Vincent Tam, P. Eng.

Objective

This pilot study was established to determine whether the Colilert or Colisure methods (presence/absence screening) would be acceptable to health authorities for the purpose of reporting the bacteriological quality of treated water.

Background

In the Northwest Territories, the Department of Health & Social Services (H&SS), under the *Public Health Act*, and the *Public Water Supply Regulations*, is the authority having jurisdiction for public water supplies.

Under the regulations, bacteriological testing is to be performed monthly in communities under 1,000 in population. Inspections carried out by environmental health officers revealed that some communities did not always comply with the *Public Health Act*. This was largely due to difficulties in transporting samples within 24 hours from the communities without scheduled air service to an accredited laboratory or hospital for bacteriological testings. 1

In August 1998, HQ Public Works & Services (PW&S) and H&SS discussed practical alternatives (such as Colisure² and Colilert) to the current laboratory bacteriological testing. Colisure is being used in the United States and some isolated communities in southern Canada with support from Health & Welfare Canada. Due to lack of operational

experiences with either Colisure and Colilert, HSS and PW&S discussed the possibility of establishing a pilot project to evaluate the two alternatives, and to determine if they could be used in lieu of the present testing procedures.

On October 2, 1998 H&SS, MACA and PW&S met and agreed to establish a (3) month pilot project in the Ft. Simpson area. The communities³ selected were Nahanni Butte, Jean Marie River, Trout Lake and Wrigley.

Procedures

PW&S, having the operating responsibility for the four selected community water supply systems, took the lead role in this project.

The personnel designated to oversee the pilot project were selected from PW&S staff in Ft. Simpson, with technical support and training provided by Technical Services, PW&S, and Environmental Health staff.

Water samples were collected monthly from each community at various sampling locations. The basic sampling locations were as follows :

Two from the truckfill station, one from the water truck, and one from a randomly selected building. The second sample from the truckfill station was to be used as a control and would be tested in Stanton Regional Hospital to verify the results using the Colilert and Colisure presence/absence screening.

1 Samples must be tested within 24 hours after they are collected to ensure accurate results.

2 Colisure and Colilert are USEPA approved methods for detecting and confirming coliforms and E. coli in water.

3 Nahanni Butte, Wrigley, Trout Lake and Jean Marie River water supply systems are currently being operated and maintained by PW&S.



NTWWA Newsletter

Board of Directors:

President -- Robert Phillips CIPHI(C)
Yellowknife
Vice President – Normand Prevost
Fort Simpson
Secretary Treasurer – Richard Cook, Yellowknife

Ted Karanka, Fort Simpson
Siva Sutendra, Yellowknife
Derek Chubb, Ekati
Brian Horne, P. Eng., Ottawa

The NTWWA Newsletter is written three times per year. Letters to the Editor may be edited and condensed. Authors are acknowledged with their contribution. Publication deadlines are: January 15, June 15, and September 15.

Office

NTWWA Water and Waste Association
#5 4807 49th Street
Yellowknife, NT
X1A 3T5
Fax: 403 873 4058
WebPage www.fsc.ca/ntwwa

Advertising Rates:

Full Page - \$300
Half Page - \$150
Quarter Page - \$75
Business Card - \$40

Consultants and Contractors

The pilot study was set up inside the central steam plant in Ft. Simpson. The equipment included an incubator with temperature control, Colilert and Colisure reagents and disposable sample bottles.

The sample bottles were sealed plastic bottles dosed with premeasured preservative.

The two methods were evaluated based on the following criteria :

- Ø Simple to use
- Ø Accuracy of P/A screening
- Ø Ease of interpreting results

Based on the manufacturer's information, the major differences between the two screening methods are :

Parameter	Colilert	Colisure
Incubation Time (hr)	24-28	28-48
Prewarming	Not required	To 20°C
Colour comparator for total coliform	Yes	No

Quality Assurance

Due to the difficulty in transporting the quality control kit for Colisure and Colilert into Canada, H&SS agrees that, as an alternative, duplicate samples can be forwarded to the Stanton Regional Hospital to verify the presence and absence screening method at pre-determined intervals.

Results Summary

Wrigley : May 1, 1999 – July 22, 1999

Source	Total no. of samples	Colilert		Colisure		Stanton Regional Hospital	
		Total Coliform	E-Coli	Total Coliform	E-Coli	Total Coliform/100mL	Faecal Coliform/100mL
Truckfill	4	A4	A				
	4			A	A		
Water Truck	2	A	A				
	1	P5	P				
	2			A	A		
	1			P	P		
	1					<1	<1
School	1	A	A				
	1			A	A		
	1					<1	<1
Band Office	2	A	A				
	1			A	A		
	1					<1	<1
Nursing Station	1	A	A				
	1			A	A		
Hotel	1	A	A				
	1			A	A		
	2					<1	<1

4 A = absence
5 P = presence

Jean Marie River : April 16, 1999 – July 12, 1999

Source	Total no. of samples	Colilert		Colisure		Stanton Regional Hospital	
		Total Coliform	E-Coli	Total Coliform	E-Coli	Total Coliform/100mL	Faecal Coliform/100mL
School	3	A	A				
	3			A	A		
Community Centre	1	A	A				
	1			A	A		
Water Truck	16	P	P				
	5	A	A				
	3			A	A		
	1					<1	<1
Nursing Station	2	A	A				
	1			A	A		
Band Office	1	A	A				
	1					<1	<1
Truckfill	4	A	A				
	3			A	A		

Trout Lake : May 6, 1999 – July 22, 1999

Source	Total no. of samples	Colilert		Colisure		Stanton Regional Hospital	
		Total Coliform	E-Coli	Total Coliform	E-Coli	Total Coliform/100mL	Faecal Coliform/100mL
Truckfill	4	A	A				
	3			A	A		
	17			P	A		
Water Truck	5	A	A				
	2			A	A		
Nursing Station	2	A	A				
	2			A	A		
	1					<1	<1
School	1	A	A				
	1			A	A		
	3					<1	<1

Nahanni Butte : May 11, 1999 – June 3, 1999

6 Sample collected has no residual chlorine. Sample showed absence of total coliform and E-coli after resampling with free residual chlorine of 0.2ppm.

7 Information on free residual chlorine is not available.

Source	Total no. of samples	Colilert		Colisure		Stanton Regional Hospital	
		Total Coliform	E-Coli	Total Coliform	E-Coli	Total Coliform/100mL	Faecal Coliform/100mL
Truckfill	2	A	A				
	2			A	A		
Water Truck	2	A	A				
	2			A	A		
Nursing Station	2	A	A				
	2			A	A		
Hotel	2					<1	<1

Interpretation of Results

1. Wrigley

- Of the 23 samples using Colisure and Colilert methods, only 2 samples (from the water truck) were reported positive for total coliform and E-coli. The presence of total coliform bacteria was most likely due to either sampling errors or inadequate free residual chlorine. The water truck was resampled and the results indicated no presence of faecal contamination.
- The four samples forwarded to Stanton Regional Hospital for verification indicated no faecal contamination.

2. Nahanni Butte

- Of the 13 samples using Colisure and Colilert methods, none was reported positive for total coliform and E-coli.
- The one sample forwarded to Stanton Regional Hospital for verification indicated no faecal contamination.

3. Trout Lake

- Of the 23 samples using Colisure and Colilert methods, none was reported positive for total coliform and E-coli.
- The two samples forwarded to Stanton Regional Hospital for verification indicated no faecal contamination.

4. Jean Marie River

- Of the 28 samples using Colisure and Colilert methods, only one sample (from the water truck & with 0 ppm of free residual chlorine) was

reported positive for total coliform and E-coli. The water truck was resampled after dosing the water with 0.2 ppm of free residual chlorine. The result showed absence of total coliform and E-coli bacteria.

- The two samples forwarded to Stanton Regional Hospital for verification indicated no faecal contamination.

Conclusions

Both Colisure and Colilert P/A screening methods have proven to be reliable and met the objectives of this pilot project:

1. Easy to use
 - Do not require special skill or cumbersome procedures.
2. Accuracy of test
 - Colisure and Colilert P/A screening results demonstrate consistency with the current testing procedures.
3. Ease of interpreting results
 - Both Colisure and Colilert methods use changes in colour and the fluorescence property of the indicator if tested positive.
 - Results from both methods are very easy to interpret.

Colisure and Colilert P/A methods for total coliform and E-coli screening have been accepted in May of 2000 by H&SS as alternates for reporting bacteriological quality of drinking water as required by current act and regulations.

Conference/AGM Announcement

Celebrating Our Diversity!

Come to Yellowknife, NT for our Conference and Annual General Meeting, November 18 and 19, 2000!

The Conference Hotel will be the Yellowknife Inn (1 800 661 0580 toll free). There's a block of rooms reserved for the NTWWA so get your reservations made early.

Your assistance in planning this event will be appreciated.

Please pre-register by completing the pre-registration form found at the back of this newsletter.

Send no money at this time. You can but you don't need to. Instead, please bring a cheque or money order with you. We appreciate not having to invoice you.

The Conference fee is \$240.00, and for that we'll include two lunches, a dinner, your 2000 NTWWA Membership, and the GST as well. But if you *pre-register before October 15, 2000*, we'll charge you only \$200.00 for the whole package. How 'bout that! Only \$200 bucks to attend a premier northern conference on municipal works and engineering, offered to you in a unique Northern community.

There will be a Trade Show held in conjunction with the conference which will showcase the latest technology and tricks of the trade. Anyone interested in obtaining a booth contact Scott Smith at 780-985-3636 ph or fax at 780-985-2466 or email at s.smith@urecon.com.

A tour of the Yellowknife's water and sanitation facilities is planned for November 17th. Planned stops include: the Water Treatment and Distribution Facilities, and the Solid Waste Management Site. Each of these facilities will be described in detail at the conference so you'll really be able to appreciate the tour (and the presentations!) Please sign up early for the tours as space may be limited.

It is your responsibility to make your own travel and accommodation arrangements

Wanted! Volunteers to Help Organize the Conference

Think the last couple of conferences were pretty good? Well, they were -- but only through the considerable efforts of our Conference Committee and the Host Community. Think you can make it even better? I bet you can. Volunteer your considerable (but under appreciated) talents to help organize this year's conference. We'll make sure you feel appreciated and there's lots to do. To find out just how much we need you, contact Richard Cook, Conference Chair, 403 920 2287 (phone); **403 873 3324 (fax)**; or email rcook@eba.ca

Celebrating Our Diversity!

Call for Papers and Presentations

Our 2000 conference theme is “Celebrating Our Diversity”. Authors are invited to provide a 25 word outline of proposed papers or presentations. The requested date for submissions is September 1, 2000. After that, count on someone to phone and nag you. Please send your outline to Richard Cook, Conference Chair, (403) 920 2287 (phone); **(403) 873 3324 (fax)**; or email rcook@eba.ca

Introduction to Water and Sanitation: An Environmental Operator Training Program

Providing Water and Sanitation Services for your community ...

Your NTWWA Training, Education, and Certification Committee is pleased to offer the training program, “**Introduction to Water and Sanitation**”. It will be held in conjunction with the conference and AGM so you can attend both, potentially at a cost *savings* to your training budget. The dates for this training are **November 14 to 17, 2000**. Topics include: basic chlorination and water delivery, lagoon sewage treatment, solid waste management, and safety. A special case study will be presented on the events at Walkerton, and what we may learn from this tragedy. The cost of this training is \$295.00, including GST.

This training is specifically designed for water and sanitation operators, foremen, or managers in small communities who operate pumphouses, sewage lagoons and/or solid waste management facilities.

Following the training, people will be able to challenge either or both of the certification exams, “Small Water Systems”, or “Small Wastewater Systems – Lagoons”. Each exam can lead to certification under the NTWWA’s Voluntary Operator Certification Program. The cost for writing for each exam is \$50.00. Read more about certification on the webpage www.fsc.ca/ntwwa

Contact Siva Sutendra, P. Eng., Chair TEC Committee at (867) 392-6900 (phone), (867) 392-6312 (fax) or email siva_sutendra@gov.nt.ca for more information. Also, *please* complete the training registration form at the back of this newsletter and fax it to Siva

Refresher Course in Water Treatment Plant Operations *An Environmental Operator Training Program*

Safe water for your community ...

Your NTWWA Training, Education, and Certification Committee is pleased to offer the training program, “**Refresher Course in Water Treatment Plant Operations**” to be held in conjunction with the conference and AGM so you can attend both, potentially at a cost *savings* to your training budget.

The dates for this training are **November 20 to 23, 2000**. Topics include: basic chlorination and water delivery, water treatment chemistry, applied water treatment mathematics, and safety. Elements will be taken from the both the Class I and the Class II training programs.

Also, a special case study will be presented on the events at Walkerton, and how we may learn from this tragedy. The cost of this training is \$295.00 including GST.

This training is specifically designed for water and sanitation operators, foremen, or managers in small communities who operate pumphouses, sewage lagoons and/or solid waste management facilities.

Following the training, people will be able to challenge one of the certification exams, “Class I Water Treatment Operations”, or “Class 2 Water Treatment Operations”. Either exam can lead to certification under the NTWWA’s Voluntary Operator Certification Program. The cost writing for each exam is \$100.00. Read more about certification on the webpage www.fsc.ca/ntwwa

Contact Siva Sutendra, P. Eng., Chair TEC Committee at (867) 392-6900 phone, (867) 392-6312 fax or email siva_sutendra@gov.nt.ca for more information. Also, *please* complete the training registration form at the back of this newsletter and fax it to Siva.



TO: ALL CWWA MEMBERS

The purpose of this memo is to advise you of the status of the Priority Substances Assessment Program, administered jointly with Health Canada.

Twenty-five substances were named to the second Priority Substance List (PSL2) in December of 1995. The assessments of these substances are currently being carried out.

In addition to extensive internal and external scientific reviews and approval by the Environment Canada/Health Canada CEPA Management Committee, each assessment report is released for a 60-day public comment period. Environment Canada and Health Canada seek comments on the scientific and technical aspects of the reports. The comments are considered, and the reports revised as necessary, including a final decision as to whether or not the substances are "toxic" under CEPA 1999, Section 64.

The draft assessment report for the substance ammonia has been completed and was released for public comment on May 13, 2000. The report proposed that ammonia be found "toxic" under CEPA 1999, Section 64.

The report is available on the internet at :
www.ec.gc.ca/cceb1/eng/public/index_e.html .

If you would like to receive copies of the draft assessment report or if you have any questions or concerns, please contact:

Karen Mailhiot
Chemicals Evaluation Division
Environment Canada
Ottawa, Ontario K1A 0H3
phone: (819) 953-0385
fax:(819) 953-4936
e-mail: Karen.Mailhiot@ec.gc.ca

The Latest on the Bioavailability of Aluminum from Alum Treated Drinking Water

Ron Kent, P. Eng., Ferguson Simek Clark

Considerable concern was raised when Australian researchers, Walton *et. al.* (1995) reported significant uptake into rat brains of aluminum from drinking water treated with aluminum salt (alum). Several epidemiological studies at the time associated aluminum in drinking water with the incidence of Alzheimer's disease, despite the fact that water provides a minor proportion of the intake compared to other dietary sources (food).

While the scientific community questioned the validity of the scientific methodology that led to those conclusions, health departments worldwide scrambled to assimilate the information for fear that it was correct. In Canada, the issue was hotly debated within Health Canada and at the Federal/Provincial Subcommittee on Drinking Water. Health Canada

even went so far as to announce they planned to regulate aluminum.

In the end, Health Canada agreed not to regulate aluminum in drinking water, to advise operational guidelines for water treatment plants, and to recommend that flocculation and sedimentation should not be compromised.

Thank goodness that cooler heads prevailed.

We now live in the Information Revolution. We can collect, massage, and distribute information at the speed of light. Our ability to understand that information is at a somewhat slower pace. Recently published in the November 1999 Journal of the American Water Works Association (JAWWA)

was another report by another Australian based research team. Stauber *et. al.* (1999) now report that, based on a study of 29 healthy volunteers, only one or two percent of the daily intake of aluminum came from aluminum treated water. Of that, only 0.3 to 0.4 percent of the aluminum in the water was absorbed by the body.

This is the same percentage as is absorbed from food. The team estimated that drinking 1.6 litres per day of aluminum treated water containing 140 µg/l Al would contribute only 0.4 to 1.1 percent of the lifetime body burden of Al.

In summary, if aluminum is a significant factor in Alzheimer's Disease, aluminum treated water should not be considered to be a contributing factor. These results, however, do not invalidate the 1998 Operational Guidance Value proposed by Health Canada for water treatment plants which states:

There is no consistent, convincing evidence that aluminum in drinking water causes adverse health effects in humans, and aluminum does not affect the acceptance of drinking water by consumers or interfere with practices for supplying good water.

Therefore, a health-based guideline or aesthetic objective has not been established for aluminum in drinking water.

In recognition of advancing research into the health effects of aluminum, and in an exercise of

the precautionary principle, water treatment plants using aluminum-based coagulants should optimize their operations to reduce residual aluminum levels in treated water to the lowest extent possible.

For plants using aluminum-based coagulants, operational guidance values of less than 100 µg/L total aluminum for conventional treatment plants and less than 200 µg/L total aluminum for other types of treatment systems (e.g., direct or in-line filtration plants, lime softening plants) are recommended. These values are based on a 12-month running average of monthly samples.

Any attempt to minimize aluminum residuals must not compromise the effectiveness of disinfection processes (i.e., microbiological quality) or interfere with the removal of disinfection by-product precursors.

At the time of the Walton *et. al.* (1995) paper, your NTWWA challenged operators of small systems providing aluminum treated water to meet an operational guideline of 300 µg/l total residual aluminum in their product. We suggested that if you were above the 300 µg/l value some thing else was wrong.

Health Canada has bettered that challenge now. Are you able to meet that challenge?

Editor's Notes

Watching Over Your Shoulder

You never can be sure, can you? You operate in good faith, obtain all the necessary permits and certificates, and still they get you.

The City of Kingston was recently convicted and fined \$120,000 under the Fisheries Act, for a landfill site that had been closed 25 years; a landfill site for which they had a Certificate of Approval from the Ontario Ministry of Environment (MOE). The fine, of course is only part of the cost to the municipality. Also, the municipality's engineer received a personal conviction and received a suspended sentence. These convictions are being appealed.

The charges were laid under the Fisheries Act because one only has to prove that a substance is deleterious (toxic) to fish or fish habitat, and that it MAY enter water frequented by fish. This is an important difference, as most provincial legislation requires proof that the substance did kill fish, or cause impairment.

Once the prosecution has established that these two conditions are met (normally a pretty easy task), the burden of proof now shifts to the defense. In order to protect themselves, the defense must prove to the

court the material is not toxic (an impossible task since it seems everything is potentially deleterious to fish) or that it exercised due diligence to prevent the release of the substance. Compliance with an MOE certificate of approval was not enough to protect Kingston from conviction, just as compliance with a Water Licence was not enough to prevent Iqaluit from being convicted in albeit different circumstances.

Do communities in the North need to be concerned?

Yes. The Fisheries Act provides for fine sharing; a mechanism that allows a private citizen to both lay charges and to share in the fine. In this case, the citizen will receive \$60,000. While it is not the case in Canada as yet, some US environmental organizations support themselves through court cases.

This means that any citizen could lay charges for any community's waste management practices that produce an effluent that does not meet the general conditions of the Fisheries Act, i.e. is not deleterious. Who knows when this potentially lucrative source of revenue will be tapped?

So what is due diligence, really?

When it comes to environmental matters, which are important and high profile concerns in our society, communities need to know:

- θ *what are our environmental responsibilities?*
- and
- θ *what do we have to do to meet those responsibilities?*

Community Councils must properly delegate environmental responsibilities to competent people who must report back so that the Council will know that the matter has been resolved.

A community's environmental duties can be summarized as follows:

- θ **The duty of care** requires Council and Administration to become informed about the background facts and circumstances before acting on a particular matter.

- θ In the environmental area, this means that an environmental management system must be put in place, which mandates the protection of the environment by preventing unlawful discharges and also provides regular, timely and uniform reporting of issues, trends and concerns.
- θ To comply with environmental laws and thus avoid corporate and personal liability, directors must take reasonable care to prevent discharges to the natural environment. The Supreme Court of Canada has said that this standard of reasonable care or "**due diligence**" means: (i) establishing a proper system to prevent contravention; and (ii) taking reasonable steps to ensure effective operation of the system.
- θ It is important that an effective environmental system has, in fact, been implemented and that there is follow-up by management to ensure that problems are corrected. Management should furnish periodic (usually quarterly or semi-annual) reports to the Council and Administration on the operation of the system. Such reports typically focus on potential or actual non-compliance.
- θ Attention to environmental concerns can improve matters, but it also creates a risk of increased liability if problems are not addressed despite directors being aware of them. Clear assignment of environmental responsibilities and effective follow-up will minimize this risk.

What does this mean? Council and Administrators should be insisting upon regular reports from the environmental coordinator, or from each plant or facility. These reports should, at a minimum, discuss areas of significant concern, including non-compliance. It is important that there be follow up reports indicating compliance. While a paper trail can be used to convict you, the lack of a paper trail is even worse.

Typical matters to be addressed include:

- θ administration and organization of environmental matters
- θ environmental standards to be met
- θ emergency response
- θ employees' environmental awareness and training
- θ potential or actual charges, cleanup orders or civil actions