News Release

Contact: Julie Roney  
(502) 564-3410

DRINKING WATER NOTICES NO REASON FOR CONSUMER CONCERN
They reflect careful government standards for water purity

FRANKFORT, Ky. (May 9, 2005) – If you received a notice from your water company about “disinfectant byproducts” in your drinking water, you’re not alone. Thousands of Kentuckians are receiving the notices, which were required under standards set by the U.S. Environmental Protection Agency (EPA).

Recently, many water systems in the state were required to notify customers that maximum contaminant levels (MCLs) for certain disinfectant byproducts (DBPs) had been exceeded. The notices, intended as advisories, included language about potential health effects from consuming water with elevated levels of these substances.

The notifications used specific language and a format dictated by EPA, causing confusion among some consumers.

What it’s all about

To be made safe for drinking, water is disinfected during treatment. Without disinfection, bacteria, viruses and microbes would cause disease and possibly death. Dysentery, cholera and typhoid fever once were constant threats. Public health officials say chlorine treatment of drinking water is one of the most significant public health achievements of the past century.

However, disinfectants such as chlorine, chloramine, chlorine dioxide, ozone and bromine can react with substances that occur naturally in water at its source, such as decaying leaves or other organic matter. The reaction creates DBPs such as trihalomethanes (THMs) or haloacetic acids (HAAs). The EPA determined that long-term exposure to DBPs was potentially cancer-causing and thus set maximum contaminant levels (MCLs) for water systems to meet. The standards were set cautiously and conservatively.

The MCL for THMs was set in 1970 and revised in 1998; the new rule also added monitoring for HAAs. The new rules became effective for all surface and groundwater systems on Jan. 1, 2004, regardless of population size. Water systems are required to monitor for THMs and HAAs every three months. At the end of 2004, quarterly monitoring was
averaged and compared with the MCL. If the running annual average showed the level to be over that set by EPA, a water system was to examine its treatment techniques to get into compliance. It also was to notify the public of its monitoring results. Those averages and notifications became available in March.

Eight percent of large water systems – systems that served more than 10,000 people and treated surface water – were out of compliance in 2004, down from 37 percent in 2002. Most are taking further steps to control THM and HAA.

Smaller surface water systems and all groundwater systems began to comply with lower limits in 2004. As this was the first time that these smaller surface water systems monitored for THMs and HAAs, some had not changed their treatment processes enough to lower these levels and thus were out of compliance at the end of 2004. Of the approximately 208 groundwater systems and 103 small surface water systems, none of the groundwater systems exceeded the new MCL and 25 percent of the surface water systems did exceed them. That 25 percent was required to notify the public for the first time about this new monitoring. Those small surface water systems are now examining their treatment processes and preparing to make the changes necessary to return to compliance.

The health effects of DBPs are unclear. Some studies have shown no problems. Others have indicated a slightly higher incidence of bladder and colon cancer in areas where drinking water has been chlorinated. Though the science is uncertain, EPA has taken precautions by establishing MCLs. To experience health effects from water with elevated DBP levels, a person would have to drink two liters daily for 70 years of water containing elevated levels of these substances. Risks from not disinfecting are immediate, however.

For information about DBPs, contact the Drinking Water Hotline, 1-800-426-4791, or see these Web sites:
http://www.epa.gov/safewater/hfacts.html. Click on Disinfection Byproducts.
http://www.epa.gov/safewater/pws/pn/handbook.pdf. This site contains the handbook that tells how water systems are to notify their customers and exactly what language they must use.


**What’s being done and what consumers can do**

Water systems, with assistance from DOW when needed, will be adjusting treatment processes. Customers of water systems that sent notices need not switch to bottled water. THMs dissipate readily from water. THMS and HAAs both are removed when water is heated, such as for making coffee or tea.

For cold drinking water, or in making beverages with cold water, allowing the water container to sit uncovered at room temperature for several hours before refrigeration will allow much of the THM concentration to dissipate.

People with special health needs or concerns should contact their physicians for additional precautions.
Drinking Water Warning Notice Worries Superior Residents

Water Supply Doesn’t Meet Treatment Requirements

SUPERIOR, Colo. -- Residents in Superior are concerned about their drinking water after they received a warning notice with their bills.

The notice said the water supply did not meet treatment requirements.

The state health department said the water is safe to drink. The Health Department said the water is not contaminated but did have elevated levels of organic carbon.

They said the drinking water contains material produced by decaying vegetation, microorganisms and soil erosion, and that caused the levels of organic carbon to reach 2.3 milligrams-per-liter, which is above the standard of 2.0 milligrams-per-liter.

The notice told residents that the elevated levels of organic carbon is not an emergency. It also said if residents have specific health concerns they should contact a physician.

"We drink tap water. We don't drink water from the fridge or bottled water," said Superior resident Erin Gonzales.

Gonzales said she can't help but be concerned because the notice was difficult to understand.

"I don't feel the notice was a good explanation for those who don't work for a water company and have an understanding of what those terms are," said Gonzales.
She said she is also concerned because the violation occurred Sept. 14, but residents didn't receive notice until Nov. 10.

"I would feel better if we had a better idea of what symptoms would be if something significant was happening," said Gonzales.

7NEWS contacted public works officials in Superior and they directed us to their contractor, Eco Resources. Eco Resources then directed 7NEWS to the state health department.

The health department said people are not being asked to boil their water or buy bottled water. Government regulations require a notification to be sent to residents when treatment levels or certain solids in the water are above normal. So, even though the water is safe to drink, the health department said the notices are part of the process.
SUPERIOR, Colo. -- Residents in Superior are concerned about their drinking water after they received a warning notice with their bills.

The notice said the water supply did not meet treatment requirements.

The state health department said the water is safe to drink. The Health Department said the water is not contaminated but did have elevated levels of organic carbon.

They said the drinking water contains material produced by decaying vegetation, microorganisms and soil erosion, which caused the levels of organic carbon to reach 2.3 milligrams-per-liter, which is above the standard of 2.0 milligrams-per-liter.

The notice told residents that the elevated levels of organic carbon is not an emergency. It also said if residents have specific health concerns they should contact a physician.

"We drink tap water. We don't drink water from the fridge or bottled water," said Superior resident Erin Gonzales.

Gonzales said she can't help but be concerned because the notice was difficult to understand.

"I don't feel the notice was a good explanation for those who don't work for a water company and have an understanding of what those terms are," said Gonzales.
She said she is also concerned because the violation occurred Sept. 14, but residents didn't receive notice until Nov. 10.

"I would feel better if we had a better idea of what symptoms would be if something significant happened," said Gonzales.

7NEWS contacted public works officials in Superior and they directed us to their contractor, Eco Resources. Eco Resources then directed 7NEWS to the state health department.

The health department said people are not being asked to boil their water or buy bottled water. Government regulations require a notification to be sent to residents when treatment levels or certain solids in the water are above normal. So, even though the water is safe to drink, the health department said the notices are part of the process.
MEMORANDUM

TO: Tom Curtis, American Water Works Association
    Mike Keegan, National Rural Water Association
    Jim Taft, Association of State Drinking Water Administrators

FROM: Jack L. Daniel, Administrator
        Environmental Health Services Section
        Department of Health and Human Services
        Regulation and Licensure

DATE: September 9, 2005

SUBJECT: Total Coliform Rule

It is my understanding that EPA plans to revisit the Total Coliform Rule for the purpose
of inserting a distribution component (backflow) as a result of Stage 2 FACA agreement
in principle.

It is also my understanding that EPA is willing to discuss a change to the maximum
contaminant level component of the rule.

In the recent past, I have discussed with all three of you the need to make the finding of
E. Coli a violation of the rule and not the finding of total coliform a violation of the rule.

The use of total coliform for rule violation purposes is causing this nation a lot of money
needlessly and is misleading to the American public. Collaboratively, this is an
opportunity to put credibility into the Total Coliform Rule and improve the confidence of
this nation's public water consumers.

Enclosed please find an article entitled, “The Public Health Significance of Bacterial
Indicators in Drinking Water” as background information supporting this request for
action and unity on this matter.

If you have any questions concerning this issue, please feel free to contact me at
402/471-0510.

JLD/jem

Enclosure
At 07:01 PM 12/23/2008 -0500, Barr.Pamela@epamail.epa.gov wrote:

> This email is in reply to your December 15th email (attached below)
> suggesting a direct rule to implement changes to the current public
> notice requirements of the Total Coliform Rule ITCR).
>
> EPA greatly appreciates the efforts of all the members of the Total
> Coliform Rule/Distribution Advisory Committee (the Committee). All
> members of the Committee signed the Agreement in Principle (AIP) in
> September 2008 that provides recommendations on revisions to the TCR and
> on information and research needed to better understand water quality
> issues in water distribution systems. The members signed the AIP as
> representatives of various stakeholder organizations. NRWA was very
> effectively represented on the Committee by David Baird and Paul
> Whittemore. In addition, you personally attended many of the Committee
> meetings, and we recognize the time and effort it took to do so.
>
> Different Committee members had different provisions they were most
> interested in seeing changed or added to a revised TCR. From the
> beginning of the Committee's deliberations, there was an agreement that
> each organization that was represented on the Committee would be
> agreeing to any recommended revisions to the TCR "when taken as a
> whole". The Committee developed ten criteria for a revised TCR and
> considered them throughout the deliberations. Section 3.0 of the AIP
> outlines those ten criteria and states that the Committee's
> recommendations meet these criteria "when taken as a whole".
>
> EPA, as one of the signatories to the AIP, also agreed to "publish a
> proposed rule in the Federal Register that, to the maximum extent
> consistent with the Agency's legal obligations, has the same substance
> and effect as the elements of the AIP" (section 2.0 #3 of the AIP).
> EPA intends to follow through on this commitment by developing a
> proposed rule for public comment that reflects all the recommended
> changes to the TCR included in the AIP.
>
> EPA will be holding a stakeholder meeting in early Spring to inform our
> efforts in developing a proposed rule, as recommended by the AIP. We
> hope that NRWA and all the organizations represented on the Committee
> will be able to attend this meeting. We'll be providing more details at
> a later time.
>
> Warm wishes for happy holidays,
> Pam
> Pamela S. Barr
> Director, Standards and Risk Management Division
> Office of Groundwater and Drinking Water, Room 2331A EPA East
> U.S. Environmental Protection Agency
> 1200 Pennsylvania Ave., Washington, DC 20460
> phone: 564-3752 fax: 564-3758
> barr.pamela@epa.gov
---Original Message-----
>From: Mike Keegan [mailto:keegan@ruralwater.org]
>Sent: Monday, December 15, 2008 2:17 PM
>To: rotert.kenneth@epa.gov; Ney.Denise@epamail.epa.gov;
>jlaitly@omb.eop.gov; James_A_Laity@omb.eop.gov
>CC: kevin.bromberg@sba.gov; thomas@ruralwater.org;
>rotert.kenneth@epa.gov; dbaird@milford-de.gov; pjwhittemore@comcast.net;
>Wu, Mae; jkeesecker@fwwatch.org; Andrew_D_Hanson@omb.eop.gov
>Subject: current public notice requirements of total coliform violations
>under the current rule
>
>Denise, Ken, and Jim -- thank you for your consideration of assistance
to small and rural communities. After some initial research, it seems
>that EPA adoption of a direct rule to change the current public notice
>requirements of total coliform violations under the current rule could
>be the most effective method of modifying this provision in current
>rule, in concert with the TCR Agreement in Principle, that would allow
>for the public to expeditiously realize this improvement in public
>health policy.
>
>We would be grateful for your consideration of this request. We are
>quite flexible in any consideration of any alternatives that can achieve
>our principle of immediate enhancement of the current TCR public notice
>requirements.
>
>We will be discussing this proposal with our partners at the Natural
>Resource Defense Council and Food and Water Watch to attempt to
demonstrate some initial consensus on the effort.
>
>Thank you,
>Mike Keegan, Analyst
>National Rural Water Association
>Washington, DC
>[t] 202-294-4785
>[f] 866-385-3160
>keegan@ruralwater.org
THE PUBLIC HEALTH SIGNIFICANCE OF BACTERIAL INDICATORS IN DRINKING WATER

Martin J. Allen, AWWA Research Foundation
Stephen C. Edberg, Yale University

INTRODUCTION

In the United States, Canada, and many other countries, bacteriological indicators are employed to assess if drinking water is free of infectious organisms. The World Health Organization's Guidelines for Drinking-water Quality (1) states that it is impractical to monitor drinking water for every possible microbial pathogen, and that a more logical approach is the detection of organisms normally present in the feces of humans and other warm-blooded animals.

Since the late 1800s, public health scientists have looked for the optimal indicator for drinking water which could be used routinely to assess if drinking water is safe to drink. This indicator should provide a true assessment of the probability of pathogens in drinking water, be relatively inexpensive and easy to assay, and provide definitive results in the shortest period of time.

Three indicator groups are currently used for monitoring drinking water. Unfortunately, the lack of a fundamental understanding on the public health significance of the indicator groups among users and public health agencies has resulted in regulations that rely on the continued use of less-specific indicators, which frequently results in inappropriate public health advisories to consumers.

INDICATOR GROUPS

Coliform Group

As early as 1905, public health scientists recommended (2) the organism Bacterium coli, i.e., Escherichia coli, as the preferred indicator of fecal contamination since this organism was universally present at high numbers in both human and animal feces. Unfortunately there was no method that specifically enumerated this species at that time. For this reason, the coliform group, also called "total coliforms," was developed as the surrogate for E. coli.

The coliform group comprises genera that satisfy a functional definition, i.e., they utilize lactose to produce acid and gas, or possess the enzyme β-D-galactosidase.
which is capable of using a chromogenic galactopyranoside substrate for growth. The genera that satisfy the definition are:

- **Klebsiella** - may be found in feces and ubiquitous in the environment
- **Escherichia** - always found in human and other animal feces
- **Enterobacter** - may be found in feces and ubiquitous in the environment
- **Citrobacter** - found in environmental sources
- **Serratia** - found in environmental sources

It is important to understand that four of these genera are widely found in the environment (source waters, vegetation, soils), are not associated with fecal contamination, and do not pose nor necessarily indicate a health risk. Numerous studies (3, 4, 5) have documented that **Enterobacter** and **Klebsiella** frequently colonize the interior surfaces of water mains and storage tanks (often called "regrowth"), growing in biofilms when conditions are favorable, i.e., nutrients, warm temperatures, low disinfectant concentrations, long residence times, etc.

As the biofilm grows, there is intermittent shedding that can result in more extensive colonization of the distribution system. Obviously, if this situation occurs, a large number of water samples could be coliform positive, triggering non-compliance with certain regulations, and in many instances, needless public advisories for consumers to boil their drinking water. This situation is not uncommon in North America with several hundred water utilities annually encountering regrowth problems. In these situations, the usefulness of the coliform test is lost until the regrowth/colonization situation is controlled.

Unfortunately, existing regulations compel water utilities to advise tens of thousands of consumers that their drinking water may be unsafe, even though the causative bacteria neither pose nor indicate a health risk.

**Fecal (Thermotolerant) Coliforms**

Since coliforms other than *E. coli* are widespread in the environment, the fecal coliform test or "elevated temperature" test was developed in 1904 to screen for *E. coli*. The selection of the term "fecal" as the name of this method was in retrospect, a poor choice, since this implied that all fecal coliforms originated from feces. In theory, the 44.5°C incubation temperature inhibits the growth of non-thermotolerant coliforms other than *E. coli*. *Citrobacter* and *Enterobacter* are most often eliminated by the elevated temperature, but a significant percentage of **Klebsiella** are thermotolerant. Capelinas and Kanarek (6) reported that 15 percent of *K. pneumoniae* are thermotolerant, and Edberg et al. (7) reported similar findings shown below.
TABLE 1. Fecal Coliform Thermotolerance Methods: Species Isolated from Water

<table>
<thead>
<tr>
<th>Species</th>
<th>Percent of all species identified</th>
<th>EC broth</th>
<th>Light Blue</th>
<th>m-FC plate</th>
<th>Dark Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Escherichia coli</em></td>
<td></td>
<td>81</td>
<td>64</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
<td></td>
<td>9</td>
<td>13</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><em>Klebsiella oxytoca</em></td>
<td></td>
<td>8</td>
<td>18</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><em>Enterobacter cloacae</em></td>
<td></td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Citrobacter diversus</em></td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Source: AWWA Research Foundation Comparison of the Colilert Method and Standard Fecal Coliform Methods, 1994. 90647

The fecal coliform test must be performed under exacting temperature standards. Incubation temperatures must be rigidly controlled since even minor excursions as small as 0.2°C will produce erroneous data. Also, large populations of heterotrophic bacteria interfere with both liquid (MPN) and membrane methods. More alarming is the fact that many strains of *E. coli* are unable to ferment lactose or are not thermotolerant (8), resulting in a false-negative reaction.

Since the current U.S. and Canadian regulations/guidelines allow the use of the fecal coliform method, many water utilities are using a method that enumerates non-fecal *Klebsiella* and actually inhibits the growth of fecal-associated *E. coli*. For these reasons, the fecal coliform method for compliance should be reevaluated.

While a significant percentage of *Klebsiella* isolates grow at 44.5°C (fecal coliform positive), this genus does not pose a health risk (9). In an extensive review entitled “Waterborne Klebsiella and Human Diseases,” I.B.R. Duncan concluded that “...Klebsiella in water supplies should therefore not be considered a hazard to human health.” Other studies have isolated *Klebsiella*, *Enterobacter*, and *Citrobacter* in large numbers from sapwood of a variety of trees, concluding that these organisms are indigenous to the wood (10).

This lack of specificity for accurately differentiating between fecal and nonfecal sources of these genera compromises the value of the fecal coliform method for assessing drinking water quality.
Escherichia coli

Starting in the late 1980s, a number of studies (11, 12, 13, 14) reported the successful use of defined substrate media to selectively enumerate E. coli. This medium contained 4-methylumbelliferyl-α-D-glucuronide (MUG) that can only be metabolized by the unique constitutive enzyme, α-glucuronidase, found in at least 95 percent of E. coli. After extensive national field trials (11, 12, 13, 14), the U.S. Environmental Protection Agency approved the MUG-based methods for regulatory compliance. The 19th edition of Standard Methods for the Examination of Water and Wastewater includes the chromogenic (defined) substrate method for E. coli.

There are several reasons for choosing E. coli as the principal bacterial indicator in drinking water, wastewater, recreational waters, and shellfish waters. Research has shown that E. coli are universally present in the feces of warm-blooded animals at densities of \(10^6\) to \(10^7\) per gram, and comprise nearly 95 percent of the coliforms in feces (see Tables 2 and 3). Based on this data, it can be concluded that E. coli would always be present in any fecal contamination event, unlike Klebsiella, Enterobacter, and Citrobacter which may be present, but at much lower densities.

**TABLE 2 Relative Number of Fecal and Non-fecal Types of Coliform Bacteria in Various Substances**

<table>
<thead>
<tr>
<th>Sources</th>
<th>No. of Strains Observed</th>
<th>Percentage of Strains of Aerobacter (Enterobacter) aerogenes type</th>
<th>Percentage of Strains of E. coli type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human feces</td>
<td>2554</td>
<td>5.9</td>
<td>54.1</td>
</tr>
<tr>
<td>Animal feces</td>
<td>1832</td>
<td>7.4</td>
<td>92.6</td>
</tr>
<tr>
<td>Water</td>
<td>2137</td>
<td>35.2</td>
<td>64.8</td>
</tr>
<tr>
<td>Milk</td>
<td>1382</td>
<td>43.1</td>
<td>56.9</td>
</tr>
<tr>
<td>Grain</td>
<td>288</td>
<td>81.7</td>
<td>13.3</td>
</tr>
<tr>
<td>Soil</td>
<td>853</td>
<td>88.1</td>
<td>11.9</td>
</tr>
</tbody>
</table>

Source: Iowa State College Engineering Experiment Station Bulletin, 62 (1921), p. 79.
TABLE 3. Percentage of Genera of Coliforms in Human and Animal Feces

<table>
<thead>
<tr>
<th>Animal (# examined)</th>
<th>E. coli</th>
<th>Klebsiella spp</th>
<th>Enterobacter/ Citrobacter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken (11)</td>
<td>90</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Cow (15)</td>
<td>99.9</td>
<td>--</td>
<td>0.1</td>
</tr>
<tr>
<td>Sheep (10)</td>
<td>97</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>Goat (8)</td>
<td>92</td>
<td>8</td>
<td>--</td>
</tr>
<tr>
<td>Pig (15)</td>
<td>83.5</td>
<td>6.8</td>
<td>9.7</td>
</tr>
<tr>
<td>Dog (7)</td>
<td>91</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Cat (7)</td>
<td>100</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Horse (3)</td>
<td>100</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Human (26)</td>
<td>96.8</td>
<td>1.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Average %</td>
<td>94.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


PUBLIC HEALTH DECISIONS

By understanding which genera the indicator systems enumerate, better and quicker public health decisions can be made in confidence. By using the most specific indicator, water utilities will know when there is truly a public health problem, and consumers will not be unnecessarily alarmed.

It is inappropriate to consider public advisories based on total or fecal coliforms unless E. coli has been identified. On the other hand, the presence of E. coli should trigger immediate public notification if repeat samples are positive for this organism, regardless of the densities found. Other studies have shown that presence/absence data, rather than numbers of bacteria per sample volume, is a more valid approach for water quality monitoring to assess health risk.

The ramifications of advising the consumer to boil water are very onerous, and such advice must be fully warranted as a real and immediate health risk. The ramifications include countless consumer inquiries to the water utility and health agencies, calls to the 911 switchboard that interfere with more urgent emergencies, exhausted supplies of bottled water, purchasing of point-of-use water treatment devices, and hardships affecting dental, medical, and food services. Any public advisory should be weighed in the light of the disruptive consequences that result from this action.

Although it is now possible to assay for the definitive indicator of fecal contamination, E. coli, many regulatory/health agencies and water analysts continue to use the traditional, but less specific coliform and fecal coliform groups. In reality, the use of MUG-based methods to detect E. coli provides the
drinking water community and consumers with an analytical tool that signals real and recent contamination. Regulatory agencies need to examine their current policies and regulations that pre-date the development of E. coli specific (MUG-based) methods and are based on the less specific coliform and fecal coliform indicator systems.

RECOMMENDATIONS

Based on the availability and confidence of MUG-based methods to provide more timely and specific information on the microbiological quality of drinking water, the following recommendations should be considered:

1. Water utilities should use the coliform group to monitor for treatment efficiencies and for general water quality within distribution and storage systems.

2. Fecal coliform method is not recommended for monitoring of fecal contamination.

3. E. coli should be the principal indicator used to monitor for fecal contamination.

4. MUG-based tests should be used exclusively for the rapid analysis of E. coli.

5. Public advisories should only be made when E. coli has been found.

6. Regulations that specify acceptable percentages of total coliform-positive samples should be reconsidered.

7. Regulations that reference coliform densities may not be appropriate.

8. Regulations that call for public advisories based on coliforms or fecal coliforms may not be appropriate.

9. Water utilities with chronic or seasonal coliform positive samples should determine the reasons and take appropriate actions to correct this problem.

CONCLUSIONS

The drinking water community, including the regulatory and health agencies, is responsible for ensuring that consumers are provided with pathogen-free drinking water. This responsibility implies the use of the best monitoring methods for assessing water quality. Regulations and policies that restrict the use of MUG-based bacteriological methods, use the less specific indicators (coliforms, fecal coliforms), or specify acceptable percentages of positive samples/coliform densities compromise the ability to carry out this responsibility.

As water treatment practices change to minimize the formation of disinfection by-products, greater numbers of coliforms and fecal coliforms may be found in drinking water. This does not imply a higher probability that pathogens may be present. Unless current regulations are changed to reflect the use of these new
bacteriological methods, the drinking water community and consumers will witness the issuance of more health advisories that are not science-based and erode consumer confidence.

REFERENCES


15. Iowa State College Engineering Experiment Station, Bulletin 62 (1921), pg. 79.

The views expressed are those of the authors and do not necessarily reflect those of the AWWA Research Foundation.

(Presented at International Conference - “Coliforms and *E. coli*: Problem or Solution?” Royal Society of Chemistry, University of Leeds, UK, September 24-27, 1995.)