Hi Nicole, monochloramine can kill viruses, if the contact time is sufficiently long. Typically this contact time, enough to achieve some target reduction in infectious virus, will be much longer than needed for free chlorine. In general terms, chlorine contact times are measured in minutes; monochloramine contact times are in hours. The effectiveness of monochloramine is affected by other water chemistry characteristics and by the specific target virus. Hope this helps...Mark
### Document Log Item

#### Ex. 5 -- Deliberative Process Privilege

**Addressing**

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danielle Tillman/DC/USEPA/US</td>
<td>Nicole Shao/DC/USEPA/US@EPA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CC</th>
<th>BCC</th>
</tr>
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<tbody>
<tr>
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</table>

**Description**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloramines - MN comments</td>
<td>05/09/2008 02:20 PM</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th># of Attachments</th>
<th>Total Bytes</th>
<th>NPM</th>
<th>Contributor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>36,180</td>
<td></td>
<td>Nicole Shao</td>
</tr>
</tbody>
</table>

**Comments**

- Clear Category
- Non-responsive

---

**Document Body**

Nicole,

Here are Mike's comments reformatted:

![ Chloramine message maps_MN comments.doc ]

And here's the website with the NOM definition I mentioned:


Let me know if there's something else I can do.

Danielle
Question 1
S.I. 3.1. To improve clarity, we recommend slightly rewording: “EPA regulates the amount of chloramines in the water utility system.” This text, similar to what is currently in the document, avoids using the phrase, “found in the drinking water,” which would be inaccurate.

(N- I left out the comment about NOM)

Question 4
S.I. 3.3. We recommend replacing “in initial treatment of water” with “as a primary disinfectant,” here and similarly throughout the document.

Question 5
S.I. 3.3 We recommend rewording as follows: “Disinfection decisions are made by each water utility based on the quality of the source water and differ with each utility.”

Question 6
S.I. 3.3. As noted for question 4, we recommend replacing “in initial treatment of water” with “as a primary disinfectant” here.

Question 7

(N- Left out the comment about abbreviations since you already have it in)

Question 8
(N- There’s a comment here about using 6 instead of six. I don’t think I’d make that comment, but I wanted to let you know in case you feel differently.)

Question 9
K.M. 1. We suggest deleting “some” before “byproducts.”

(N- Left out the question about message map 7)

Question 12
S.I. 1.1. We suggest that the phrase “for drinking water” is not necessary and could be deleted.

Question 13
S.I. 1.1. We recommend clarifying or at least defining the term “primacy agencies.” This term may not be familiar to the audience.
S.I. 3.2. "...uses conferences" seems awkward, and we suggest rewording. For example, "EPA attends professional meetings to explain regulations and understand the concerns of states and utilities."

(N- I’m not overwhelmed by the suggestion I came up with in the comment for 3.2 above. You may want to see if you can do better.)

**Question 14**
K.M. 2. We recommend slightly rewording: "There is little direct research on the health effects when humans are exposed exposure to chloramine."

(Left out comment on 18 since that’s been reworked)

**Question 19**
S.I. 3.3. We recommend adding "Academic institutions" to "water industry groups" at the start of this sentence.

**Question 25**
K.M. 3. To avoid "drinking" incorrectly understood as a verb here, we recommend inserting "exposure": "Contact your doctor if you think you have a respiratory problem related to exposure to drinking water."

**Question 26**
S.I. 2.1 and 2.2. We suggest switching the order of these two to make the S.I. consistent with what happens chronologically.

**Question 28**
S.I. 1.2 and 2.3. Consider switching the placement of these two messages.
I was about to send comments to Crystal when this good news from Trish came in. I've attached what I've done, but it would be great if you could edit as necessary. I think you could strengthen some of the comments since you know more about the issues and the previous discussions. Let me know if you need me to try to play with my version of the file to get the initials right - I have the comments coming from "dct" now.

Thank you very much for working late to make sure that I was as prepared as possible for today - it definitely was a big help as I tried to do the review! I hope you had fun with your dad!

Danielle
We did not end-up sending our comments on maps 1-10 to Dr. Covello today. We will continue to work on them tomorrow.

Susan Shaw/DC/USEPA/US

Subject Re: Comments from Dr. Covello: 1st 10 maps

I'm just beginning to look at the attached revisions. I have problems with the statements implying effectiveness of chloramine to inactivate viruses and other statements on the use of chloramine as a disinfectant. I'll get back with specific comments. Chloramine is not used as a primary disinfectant because it is not effective in inactivating viruses.

Susan
Crystal Rodgers-Jenkins/DC/USEPA/US

Dear all,

Attached is the revised chloramine message maps based on our discussion with Covello on yesterday.

I have also incorporated comments from Rose Kyprianou, Trish Hall (although Trish please review - I could not decipher some of your comments), and Nicole Shao (e.g., definition for NOM). Also, Jeanne Briskin and Pam Barr provided comments on an earlier version of the message maps - although Covello's version was significantly changed, I have made my best attempt to incorporate comments from Jeanne and Pam.
Next steps: SRRB review and send to Track by COB today.

Our general comments back to Covello are as follow:

- Chloramines is plural
- Monochloramine is singular
- EPA writers use the active voice (is there a technical "message map" reason for using passive voice?)
- The word "disinfection" should precede "byproducts" where appropriate
- The terms "natural organic matter" should replace phrases like "natural materials in water such as leaves" throughout the message maps
- The terms "harmful organisms" should replace the term "germs" in the supporting information sections of the message maps

[attachment "Expert review compare first 10 version 3.doc" deleted by Danielle Tillman/DC/USEPA/US]

************************************************

Crystal C. Rodgers-Jenkins
Microbiologist
202.564.5275 tel
202.564.3767 fax
rodgers-jenkins.crystal@epa.gov

Mailing Address:
US Environmental Protection Agency
1201 Pennsylvania Avenue, NW
Mail Code - 4607M
Washington, DC 20460

Patricia Hall/DC/USEPA/US

06/23/2008 08:56 AM

To Patricia Hall/DC/USEPA/US@EPA
cc Crystal Rodgers-Jenkins/DC/USEPA/US@EPA, Jeanne Ellis/DC/USEPA/US@EPA, Jerry Ellis/DC/USEPA/US@EPA, Nicole Shao/DC/USEPA/US@EPA, Rose Kyprianou/DC/USEPA/US@EPA, Susan Shaw/DC/USEPA/US@EPA

Subject Re: Comments from Dr. Covello: 1st 10 maps

I used the wrong file for the comparison. Here is the new and improved version:

[attachment "Expert review compare first 10 version 2.doc" deleted by Danielle Tillman/DC/USEPA/US]

Patricia Hall/DC/USEPA/US

06/23/2008 08:31 AM

To Crystal Rodgers-Jenkins/DC/USEPA/US@EPA, Jerry Ellis/DC/USEPA/US@EPA, Jeanne Ellis/DC/USEPA/US@EPA, Nicole Shao/DC/USEPA/US@EPA, Susan Shaw/DC/USEPA/US@EPA, Rose Kyprianou/DC/USEPA/US@EPA
I've compared these to the most recent version of our maps:

[attachment "Expert review compare first 10.doc" deleted by Patricia Hall/DC/USEPA/US]

Patricia Hall/DC/USEPA/US


cc

Subject Comments from Dr. Covello: 1st 10 maps

Attached are the first set of comments from Dr. Covello. I suggest that we keep the 11:30 meeting today. We can discuss our major issues with him and perhaps these first few maps.

See Christine's note below regarding the comments...

[attachment "a.Chloramine Message Maps.First 10 rev..doc" deleted by Patricia Hall/DC/USEPA/US]

--- Forwarded by Patricia Hall/DC/USEPA/US on 06/23/2008 08:18 AM ---

Christine Brittle
<do-not-reply@thetrackgroup.updatelog.com>

To Patricia Hall/DC/USEPA/US@EPA

cc

Subject [The Track Group] Re: Meeting with Dr. Covello

--- Reply ABOVE THIS LINE to post a comment to the project ---

Company: The Track Group
Project: 497 - Risk Communications on Water Disinfectants
Link: https://thetrackgroup.updatelog.com/C18992225

Christine Brittle said:

Good morning,

Attached are the first ten message maps with Dr. Covello's changes. He did not use track changes, so you will want to
compare them with the previous version to see his suggestions. (He had also mentioned to me that he wanted to re-order them, so I'm not sure if this version is in the same order or not--I didn't check yet because I wanted to get these posted ASAP).

He would like to keep a meeting with us today if possible. I suggest we keep the 11:30 time, but everyone please confirm that.

Here is the note he sent me:
"I have attached a set of revised maps. These are the first ten maps. This should give us something to talk about during our conference call today. I will be meeting with my colleagues today to finalize the remaining maps. Assuming you are in agreement with the revised first ten maps, I should be able to send you the complete set today."

Thanks,
Christine

---There is 1 file for this comment:
Download it here: https://thetrackgroup.updatelog.com/C18992225
a.Chloramine Message Maps.First 10 rev..doc

Read the original message, view this comment, and download attachments at:
https://thetrackgroup.updatelog.com/C18992225

You can always check the Overview for the latest project activity:
https://thetrackgroup.updatelog.com/projects/1556568/project/log
### BASIC INFORMATION ABOUT CHLORAMINES

#### 1) What are chloramines?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
<th>KEY MESSAGE 2</th>
<th>KEY MESSAGE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloramines are types of disinfectants used to treat drinking water.</td>
<td>The major types of chloramines are monochloramine, dichloramine, and trichloramine.</td>
<td>The Environmental Protection Agency regulates the safe use of chloramines.*</td>
</tr>
<tr>
<td>Supporting Information 1.1</td>
<td>Supporting Information 2.1</td>
<td>Supporting Information 3.1</td>
</tr>
<tr>
<td>Chloramines are most commonly formed when ammonia is added to chlorine to treat drinking water.</td>
<td>If chloramines are used to disinfect drinking water, monochloramine is the most common type of chloramine formed.</td>
<td>EPA requires water utilities to meet strict health standards when using chloramines to treat water.</td>
</tr>
<tr>
<td>Supporting Information 1.2</td>
<td>Supporting Information 2.2</td>
<td>Supporting Information 3.2</td>
</tr>
<tr>
<td>The most typical use of chloramines is to protect water quality as it moves through pipes.</td>
<td>Dichloramine and trichloramine are produced when treating drinking water but in much lower amounts than monochloramines.</td>
<td>EPA chloramine regulations are based on the average amount of chloramines found in a water system over time.</td>
</tr>
<tr>
<td>Supporting Information 1.3</td>
<td>Supporting Information 2.3</td>
<td>Supporting Information 3.3</td>
</tr>
<tr>
<td>Chloramines provide long lasting protection as they do not break down quickly in water pipes.</td>
<td>Trichloramines are typically associated with disinfected water used in swimming pools.</td>
<td>EPA regulates chemicals formed when chloramines react with natural organic matter** in water.</td>
</tr>
</tbody>
</table>


Deliberative draft – do not cite or distribute
2) How long has monochloramine been used as a drinking water disinfectant? How is monochloramine typically used? How many people/water utilities use monochloramine?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
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<th>KEY MESSAGE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monochloramine has been used as a drinking water disinfectant for more than 90 years.*</td>
<td>Monochloramine is generally used to disinfect drinking water as it moves through pipes.</td>
<td>More than one in five Americans use drinking water treated with monochloramines.</td>
</tr>
<tr>
<td>Supporting Information 1.1</td>
<td>Supporting Information 2.1</td>
<td>Supporting Information 3.1</td>
</tr>
<tr>
<td>Monochloramine help protect people from water borne diseases.</td>
<td>Monochloramine provides long lasting protection of water quality.</td>
<td>Monochloramine use has increased in recent years due partly to new drinking water regulations developed to limit disinfection byproducts.</td>
</tr>
<tr>
<td>Supporting Information 1.2</td>
<td>Supporting Information 2.2</td>
<td>Supporting Information 3.2</td>
</tr>
<tr>
<td>Monochloramines kills harmful bacteria and viruses.</td>
<td>Monochloramine is effective as a disinfectant because it does not break down into ineffective chemicals as quickly as chlorine.</td>
<td>New drinking water regulations set standards for utilities to regulate some of the potentially harmful disinfection byproducts that may occur in drinking water.</td>
</tr>
<tr>
<td>Supporting Information 1.3</td>
<td>Supporting Information 2.3</td>
<td>Supporting Information 3.3</td>
</tr>
<tr>
<td>Monochloramine inactivates disease-causing organisms.</td>
<td>Monochloramine may help lower levels of potentially harmful disinfection byproducts that may occur in drinking water.</td>
<td>New drinking water regulations require water utilities to reduce the amount of some of the potentially harmful disinfection byproducts that may occur in drinking water.</td>
</tr>
</tbody>
</table>

### BASIC INFORMATION ABOUT DRINKING WATER DISINFECTION

3) Why is drinking water disinfected? What is the difference between primary and secondary disinfection? How is monochloramine used in a treatment plant?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
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<th>KEY MESSAGE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking water is disinfected to protect public health.</td>
<td>Primary disinfection kills or inactivates bacteria, viruses, and other potentially harmful organisms in drinking water.</td>
<td>Secondary disinfection ensures water remains safe to drink as it moves through pipes to the consumer's homes.</td>
</tr>
<tr>
<td><strong>Supporting Information 1.1</strong> Prior to the widespread use of disinfectants, many people became ill or died because of contaminated water.*</td>
<td><strong>Supporting Information 2.1</strong> Disinfection prevents infectious diseases such as typhoid, hepatitis, and cholera***.</td>
<td><strong>Supporting Information 3.1</strong> Secondary disinfection kills harmful organisms that may get in water as it moves through pipes.</td>
</tr>
<tr>
<td><strong>Supporting Information 1.2</strong> Disinfection reduces or eliminates illnesses acquired through drinking water.</td>
<td><strong>Supporting Information 2.2</strong> Disinfection protects people from ingesting potentially harmful organisms such as protozoa.</td>
<td><strong>Supporting Information 3.2</strong> Monochloramine is commonly used as a secondary disinfectant.</td>
</tr>
<tr>
<td>Health experts believe benefits associated with disinfection heavily outweigh the risks.</td>
<td>The exact disinfection processes used varies from water utility to water utility.</td>
<td><strong>Supporting Information 3.3</strong> Monochloramine is more chemically stable than chlorine, making it useful for killing harmful organisms found in pipes (such as those causing Legionnaires' disease).***</td>
</tr>
</tbody>
</table>

**Additional Supporting Information:** Infectious diseases prevented by disinfection include typhoid, hepatitis, and cholera. Harmful organisms include bacteria, viruses, and protozoa. See message map 2 for additional history on drinking water disinfection. **See message map 17 for more information about monochloramines controlling harmful organisms.*** For more information about these diseases, see www.cdc.gov. **** For more information on Legionnaire's disease visit nlm.nih.gov/medlineplus.
4) What disinfectants are available for drinking water?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
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<th>KEY MESSAGE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Most water utilities use chlorine as a primary disinfectant because of its effectiveness in killing potentially harmful organisms.</strong></td>
<td>Water utilities often prefer monochloramine as a disinfectant because it is longer lasting than chlorine.</td>
<td>Water utilities may use ozone or UV light as primary disinfectants.</td>
</tr>
</tbody>
</table>

**Supporting Information 1.1**
Chlorine is effective in killing bacteria, viruses, and other harmful organisms in water.

**Supporting Information 2.1**
Monochloramine is effective in killing bacteria, viruses, and other harmful organisms in water, but takes longer to inactivate the organisms compared to chlorine.

**Supporting Information 3.1**
Ozone and UV light are effective in killing bacteria, viruses, and other harmful organisms in water.

**Supporting Information 1.2**
One disadvantage of chlorine is that it can react with natural organic matter present in water to form potentially harmful disinfection byproducts.

**Supporting Information 2.2**
One disadvantage of monochloramine is that it can react with natural organic matter present in water to form potentially harmful disinfection byproducts.

**Supporting Information 3.2**
One disadvantage of ozone, UV light, and chlorine dioxide is that they quickly lose their effectiveness as water travels through pipes.

**Supporting Information 1.3**
Water utilities must often use chlorine several times during treatment because it loses its effectiveness over time.

**Supporting Information 2.3**
Monochloramine is more chemically stable than chlorine, which makes it longer lasting.

**Supporting Information 3.3**

*Additional Supporting Information: See message map 3 for a discussion of primary and secondary disinfectants. See message maps 5 and 6 for a specific discussion of chlorine and monochloramine as a primary and secondary disinfectant.*

**Natural organic matter is a complex mixture of compounds formed as a result of the breakdown of animal and plant material in the environment; source:**

Deliberative draft – do not cite or distribute
5) How effective is monochloramine vs. chlorine as a primary disinfectant?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Monochloramine is not a very effective primary disinfectant.</td>
<td>Chlorine is a very effective primary disinfectant.</td>
<td>In rare cases, monochloramine is used as a primary disinfectant.</td>
</tr>
<tr>
<td>Supporting Information 1.1</td>
<td>Supporting Information 2.1</td>
<td>Supporting Information 3.1</td>
</tr>
<tr>
<td>Monochloramine is not as effective as chlorine at killing potentially harmful organisms.</td>
<td>Chlorine is a very effective at killing harmful organisms.</td>
<td>Monochloramine can be used as a primary disinfectant if it is allowed to interact with water for a long time.</td>
</tr>
<tr>
<td>Supporting Information 1.2</td>
<td>Supporting Information 2.2</td>
<td>Supporting Information 3.2</td>
</tr>
<tr>
<td>Monochloramine takes longer than chlorine to kill harmful organisms.</td>
<td>Chlorine kills harmful organisms quickly.</td>
<td>When used as a primary disinfectant, its effectiveness is increased by combining it with other disinfectants.</td>
</tr>
<tr>
<td>Supporting Information 1.3</td>
<td>Supporting Information 2.3</td>
<td>Supporting Information 3.3</td>
</tr>
<tr>
<td>Because it is longer lasting than chlorine, monochloramine is often used as a secondary disinfectant.</td>
<td>Chlorine is the most frequently used primary disinfectant of drinking water.</td>
<td>The choice of which combination of disinfectants to use varies from water utility to water utility.</td>
</tr>
</tbody>
</table>

Additional Supporting Information: See message map 3 for a discussion of primary and secondary disinfectants.
6) How effective is monochloramine vs. chlorine as a secondary disinfectant?

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Both chlorine and monochloramine are effective secondary disinfectants.</td>
<td>Monochloramine has several advantages over chlorine as a secondary disinfectant.</td>
<td>The choice of which secondary disinfectant to use varies from water utility to water utility.</td>
</tr>
<tr>
<td>Supporting Information 1.1</td>
<td>Supporting Information 2.1</td>
<td>Supporting Information 3.1</td>
</tr>
<tr>
<td>Both chlorine and monochloramine kill harmful organisms as water travels through pipes.</td>
<td>Monochloramine typically produces fewer potentially harmful regulated disinfection byproducts than chlorine.</td>
<td>Regulatory agencies and water utilities work together in selecting the most effective disinfectants.</td>
</tr>
<tr>
<td>Supporting Information 1.2</td>
<td>Supporting Information 2.2</td>
<td>Supporting Information 3.2</td>
</tr>
<tr>
<td>Both chlorine and monochloramine produce disinfection byproducts, some of which are harmful to human health.</td>
<td>Monochloramine is longer lasting than chlorine offering disinfection throughout pipes.</td>
<td>Regulatory agencies and water utilities balance several factors in deciding which disinfectant to use.</td>
</tr>
<tr>
<td>Supporting Information 1.3</td>
<td>Supporting Information 2.3</td>
<td>Supporting Information 3.3</td>
</tr>
<tr>
<td>Health experts believe the benefits associated with chlorine or monochloramine heavily outweigh the risks of disinfection.</td>
<td>Monochloramine is more chemically stable than chlorine, making it useful for killing harmful organisms found in pipes (such as those causing Legionnaires' disease).*</td>
<td>Chlorine and monochloramine are the most commonly used secondary disinfectants by water utilities.</td>
</tr>
</tbody>
</table>

Additional Supporting Information: See message map 3 for a discussion of primary and secondary disinfectants. See message maps 17 & 18 for advantages and disadvantages in monochloramine use. *For more information on Legionnaire's disease visit nlm.nih.gov/medlineplus.
7) Why are disinfection byproducts a public health concern?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
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<th>KEY MESSAGE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research indicates byproducts of water disinfection have the potential to be harmful.</td>
<td>Assessments of the risks of water disinfection are often highly uncertain.</td>
<td>The Environmental Protection Agency considers risk and uncertainty in drafting regulations about water disinfection.</td>
</tr>
</tbody>
</table>

**Supporting Information 1.1**
Some research indicates byproducts of water disinfection are linked to increases in cancer incidence, including bladder cancer.

**Supporting Information 2.1**
Scientists from many organizations conduct research on the effects of water disinfection byproducts.

**Supporting Information 3.1**
Regulators weigh the public health benefits of disinfection against the uncertain risks of the harmful disinfection byproducts.

**Supporting Information 1.2**
Some research indicates byproducts of water disinfection can be linked to liver, kidney, central nervous system problems, and reproductive effects.

**Supporting Information 2.2**
Research results are often contradictory; some studies show links to adverse effects and others do not.

**Supporting Information 3.2**
EPA sets limits for disinfection byproducts (DBPs) believed to indicate potential threats to public health.

**Supporting Information 1.3**
Some research indicates byproducts of water disinfection can be linked to anemia.

**Supporting Information 2.3**
Regulatory documents describe the uncertainties in risk assessments of water disinfection byproducts.

**Supporting Information 3.3**
EPA and other organizations continue to conduct research on water disinfection byproducts.

*Additional Supporting Information:* For more information on anemia and disinfection byproducts, visit [http://www.epa.gov/owcd/hfacts.html](http://www.epa.gov/owcd/hfacts.html).

**EPA has enforceable regulations to limit occurrence of disinfection byproducts in drinking water, for a group of four total trihalomethanes (THMs) (chloroform, BDCM, DBCM, and bromoform), a group of five haloacetic acids (HAAs) (MCA, DCA, TCA, MBA, and DBA), and the individual byproducts chlorite and bromate. The maximum contaminant levels for these disinfection byproducts are: THMs (0.080 mg/L), HAAs (0.060 mg/L), chlorite (1.0 mg/L), bromate (0.010 mg/L). See Stage 2 Disinfection Byproducts Rule (71 FR 386, January 4, 2006) for more information on disinfection byproducts and discussion of uncertainties. [http://www.epa.gov/fedrgstr/EPA-WATER/2006/January/Day-04/w03.pdf](http://www.epa.gov/fedrgstr/EPA-WATER/2006/January/Day-04/w03.pdf).*

Deliberative draft – do not cite or distribute
8) How does EPA regulate disinfection byproducts (DBPs)?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
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<th>KEY MESSAGE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPA sets limits for disinfection byproducts (DBPs) believed to indicate potential threats to public health.</td>
<td>Water utilities must test water regularly to make sure disinfection byproducts are within EPA limits.</td>
<td>EPA conducts research to better understand disinfection byproducts in drinking water.</td>
</tr>
<tr>
<td>Supporting Information 1.1 Disinfectants react with natural organic matter** to produce many disinfection byproducts, not all of which are of health concern.</td>
<td>Supporting Information 2.1 The choice of which disinfectant to use varies from water utility to water utility.</td>
<td>Supporting Information 3.1 EPA scientists coordinate their research on disinfection byproducts with scientists from many organizations.</td>
</tr>
<tr>
<td>Supporting Information 1.2 Disinfection byproducts formed by chlorine can be different than those formed by other disinfectants.</td>
<td>Supporting Information 2.2 EPA recently strengthened regulatory limits for particular disinfection byproducts.</td>
<td>Supporting Information 3.2 Scientific studies are focused on identifying disinfection byproducts that may need to be regulated.</td>
</tr>
<tr>
<td>Supporting Information 1.3 Disinfection byproducts that occur in large amounts can be used as indicators of the presence of other disinfection byproducts.</td>
<td>Supporting Information 2.3 New EPA drinking water regulations require water utilities to reduce the amount of particular disinfection byproducts.</td>
<td>Supporting Information 3.3 EPA scientists and decision makers review regulations of disinfection byproducts every six years to determine if they need to be revised because of new information.**</td>
</tr>
</tbody>
</table>

Additional Supporting Information: *EPA has enforceable regulations to limit the occurrence of disinfection byproducts in drinking water for a group of four total trihalomethane (THMs) (chloroform, BDCM, DBCM, and bromoform), a group of five haloacetic acids (HAAs) (MCA, DCA, TCA, MBA, and DBA), and the individual byproducts chlorite and bromate. The maximum contaminant levels for these disinfection byproducts are: THMs (0.080 mg/L), HAAs (0.060 mg/L), chlorite (1.0 mg/L), bromate (0.010 mg/L). See Stage 2 Disinfection Byproducts Rule (71 FR 388, January 4, 2006) for more information on disinfection byproducts and discussion of epidemiological data on chlorinated water exposure and cancer, http://www.epa.gov/ledgstr/EPA-WATER/2006/January/Day-04/w03.pdf. **Natural organic matter is a complex mixture of compounds formed as a result of the breakdown of animal and plant material in the environment; source: http://www.waqs.org/templates/id_templates/layout_633184.aspx?ObjectID=661579. ***See the Contaminant Candidate List online at http://www.epa.gov/OGWIDW/ccl/ccl3.html for contaminants EPA proposes to review. EPA scientists review regulations of disinfection byproducts every six years.

Deliberative draft – do not cite or distribute
9) How do the kinds and amounts of disinfection byproducts formed by monochloramine compare to those formed by chlorine?

<table>
<thead>
<tr>
<th>KEY MESSAGE 1</th>
<th>KEY MESSAGE 2</th>
<th>KEY MESSAGE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water treated with chlorine and monochloramine contain different types and amounts of disinfection byproducts.</td>
<td>Compared to chlorine, water treated with monochloramine contains lower amounts of regulated disinfection byproducts.</td>
<td>Compared to chlorine, water treated with monochloramine may contain higher concentrations of unregulated disinfection byproducts.**</td>
</tr>
</tbody>
</table>

**Examples of these unregulated disinfection byproducts include nitrosamines (including nitrosodimethylamine, NDMA), iodo-trihalomethanes, and iodo-acids. See message map 7 for additional detail on disinfection byproducts.

Additionaling Supporting Information: TTHM and HAA5 are the regulated byproduct groups that form at lower concentrations with monochloramine.

Supporting Information 1.1
Compared to chlorine, water treated with monochloramine contains fewer regulated disinfection byproducts linked to human health problems.

Supporting Information 2.1
Compared to chlorine, water treated with monochloramine contains lower concentrations of the two major types of regulated disinfection byproducts.

Supporting Information 3.1
Scientists are currently studying the amounts and types of unregulated disinfection byproducts in water treated with monochloramine.

Supporting Information 1.2
Compared to chlorine, water disinfected with monochloramine contains fewere regulated disinfection byproducts linked to health problems such as bladder cancer.

Supporting Information 2.2
Compared to chlorine, water disinfected with monochloramine may contain higher concentrations of unregulated disinfection byproducts.

Supporting Information 3.2
Compared to chlorine, water treated with monochloramine may contain higher concentrations of unregulated disinfection byproducts.

Supporting Information 1.3
Compared to chlorine, water treated with monochloramine contains fewer disinfection byproducts identified as possible indicators of human health problems.

Supporting Information 2.3
Compared to chlorine, water disinfected with monochloramine contains fewer regulated disinfection byproducts linked to health problems.

Supporting Information 3.3
EPA scientists continuously review new data related to the health effects of unregulated disinfection byproducts.

Comment [o22]: Very similar to S.I. 2.2 - is this OK?
### 10) Why are water utilities switching to monochloramine?

<table>
<thead>
<tr>
<th><strong>KEY MESSAGE 1</strong></th>
<th><strong>KEY MESSAGE 2</strong></th>
<th><strong>KEY MESSAGE 3</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>New EPA regulations require reduced levels of regulated disinfection byproducts.</td>
<td>Water treated with monochloramine contains reduced levels of regulated disinfection byproducts.*</td>
<td>Many water utilities have switched to monochloramine to meet the revised EPA regulations.</td>
</tr>
</tbody>
</table>

**Supporting Information 1.1**
Water utilities are required to comply with EPA’s revised regulations.

**Supporting Information 2.1**
Monochloramine produces less regulated disinfection byproducts because it is less reactive than chlorine with natural organic matter.*

**Supporting Information 3.1**
Many water utilities have already replaced chlorine with monochloramine. For many utilities, use of monochloramine is the simplest way to comply.**

**Supporting Information 1.2**
Water utilities are studying changes needed to comply with revised EPA regulations.

**Supporting Information 2.2**
Water utilities switching from chlorine to monochloramine report fewer concerns about taste.

**Supporting Information 3.2**
EPA does not require systems to switch to using monochloramine.

**Supporting Information 1.3**
To meet the new regulations, many utilities have decided they need to replace chlorine with another disinfectant.

**Supporting Information 2.3**
Utilities switching from chlorine to monochloramine report fewer concerns about odor.

**Supporting Information 3.3**
Regulators and water utilities are working together to decide how best to meet the revised regulations.

---

**Additional Supporting Information:**
*Natural organic matter is a complex mixture of compounds formed as a result of the breakdown of animal and plant material in the environment; source: http://www.iwahq.org/templates/id_templates/layout_633184.aspx?ObjectID=661579.*

**See message map 11 for additional ways utilities could comply.**

---

Deliberative draft – do not cite or distribute
Nicole,

I think Jeanne's e-mail looks fine. I did notice that she included the 6th grade/12th grade description. I don't recall what agreement you all reached on that for the Q&A cover sheet, but it's okay with me if she wants to use it here. She also seems to have a few minor typos that I've noted. If she does leave in the paragraph about the information sessions, you probably should add something in your e-mail about communication points of contact. Based on your conversation with Melissa, could you put a sentence or two about this into your e-mail?

As I mentioned before, a lot of the information is redundant with your draft e-mail, although you put your own twist in your message which is helpful. I suggest that we cut some of your text (e.g., the info about Covello and perhaps the paragraph starting, "It is our hope") to save people time.

Let me know if you'd like to discuss anything.

Danielle
Danielle,

My e-mail is supposed to be in addition to hers. She is supposed to send hers to me and then I am supposed to forward her message on with my message on top to the ORD workgroup. Let me know if you have any comments on Jeanne’s e-mail. I plan to send her the text from my e-mail and any comments we might have on her e-mail by COB today.

Thanks,

Nicole

Nicole Shao
US EPA, ORD-Office of Science Policy
1200 Pennsylvania Avenue, NW (8104R)
Washington, DC 20460
(202) 564-6779

Hi, Nicole. I just finished commenting on the draft... 03/16/2009 10:45:56 AM

Hi, Nicole.

I just finished commenting on the draft e-mail you sent to me this earlier morning and then I saw this. So I’m wondering, would Jeanne’s message be in addition to yours or are you thinking it would replace part of yours? Based on a quick glance, they seem to cover much of the same ground.

Danielle

[attachment "draft chloramines message maps e-mail_dct.doc" deleted by Nicole Shao/DC/USEPA/US]

Fw: Comments on draft transmittal email

Fw: Comments on draft transmittal email

Nicole Shao to Danielle Tillman 03/16/2009 10:28 AM

Danielle,

Attached below is Jeanne’s e-mail. Please let me know if you have any comments or suggestions. I plan to look at this in greater detail after I send out the request for the CCL 3 FAR notice review to the ORD workgroup.
Hello,

We're getting ready to "go live" with the new chloramine message maps. The target date is Wednesday 3/18, to coincide with this week's ASDWA meeting.

Attached is a draft internal transmittal email. The idea would be that we (SRMD) would send this to the regional branch chiefs and Nicole (for ORD). Then Nicole would forward this to all the relevant ORD contacts with an invitation to participate in an informational session on how to use the message maps. We also would like to encourage the regions and key offices to designate key points of contact for inquiries, and to clarify with staff who may speak on the record regarding which information.

Based on our recent conversations, I believe that Nicole is investigating ORD's possible interest in this type of informational session. Jane, do you think this type of session would be helpful for you and the other regional contacts? I had understood that you all were planning to hold a meeting with your states on this as well.

I'd appreciate your input on the draft transmittal email, as well as on the concept of an informational session. We'll need to finalize the email in the next day so we can run it by management here.

We're continuing to work on the external transmittal email.

Thanks

Jeanne

[attachment "internal email transmittal 031309.doc" deleted by Danielle Tillman/DC/USEPA/US]
The Office of Water, along with input from the Office of Research and Development (ORD) and the EPA regions, has created detailed questions and answers (Q&As) in response to public concerns and frequently asked questions about use of chloramine as a secondary disinfectant in drinking water. The goal of these Q&As is to provide a consistent message to the public about the benefits and risks of monochloramine while at the same time stressing the necessity of adequate pathogen control to assure protection of public health. The website to view the Chloramine Q&As is: http://www.epa.gov/safewater/disinfection/chloramine.

We are releasing these Q&As in order to assist EPA regions, state environmental and public health offices, and water suppliers to respond to public concerns in a consistent, clear, and cohesive manner. The Q&As were designed using a specific risk communication format (message maps) aimed at targeting the general public. Each question is answered by 3 key responses, written at approximately a 6th grade level. Each key response is supported by three more detailed pieces of information at approximately a 12th grade level. There is an Additional Supporting Information section in the footnotes that includes links to documents and resources that provide additional technical information. For more information on message maps, see http://www.epa.gov/NHSRC/news/news040207.html.

We worked closely together, and with a highly qualified risk communication expert, Dr. Vince Covello, to develop specific language that is both understandable and accurate. To the extent that all relevant responses to public inquiries use the language in the Q&As, we will achieve our goal of consistency, accuracy and understandability. Dr. Covello recommends that to better meet this goal, that we all adhere closely to the wording in the Q&As rather than attempt to rephrase the responses. Sometimes subtle word changes are perceived (rightly or wrongly) as conveying different information than the specific text provided.

We plan to hold an information session in the near future to answer any questions you may have about this new risk communication tool and how best to use it when speaking with the public or the media. In the meantime, offices may want to consider identifying a key point of contact and establishing a communications approach so that if anyone in your group receives questions, there is a clear understanding of who is authorized to respond to inquiries of different sorts.

We very much appreciate the input of many technical experts in ORD who worked closely with us to assure that the simple language we required is also accurate and up to date. Thanks also to the representatives of the Regions who helped us make sure that the very technical information we needed to convey is understandable and responds to the questions they frequently receive.

We hope you find these Q&As helpful and timely, and look forward to discussing with you how to best communicate about chloramines in drinking water.
Hi, Nicole.

I agree that it would be preferable to have the ORD message sent separately.

And, I think you probably could ask to have until the following Monday if you needed it. But I'd rather have you switch your compressed day than work over the weekend, if switching wouldn't inconvenience you. Do you have plans already for the 9th? Let me know if you'd like to discuss.

Danielle

Nicole Shao/DC/USEPA/US

Nicole Shao/DC/USEPA/US
04/21/2008 04:56 PM

To Danielle Tillman/DC/USEPA/US@EPA

cc

Subject: Fw: draft email requesting chloramine messages review

Danielle,
I need to get back to Rose by tomorrow morning. I think I would prefer if ORD was sent the message separately, rather than saying ORD feedback should go through me and non-ORD feedback should go through Crystal Rodgers-Jenkins. Do you agree?

The timeline poses some difficulty for me and I am interested in hearing your input. Rose wants the ORD folks to have until COB May 6th (2 weeks) to submit their comments to me. After that she was planning on giving me a couple of days to consolidate the comments. I already have several plans for the end of that week that are now coming into question, I had signed up for an AWWA Webcast (2 hours) on 5/7, I took annual leave on 5/8 to volunteer at the MD/DE Water Festival in Delaware, and I am supposed to be compressed on 5/9. What is your recommendation for the best way to work around this? I am not sure how extensive the comments will be. Do you want me to cancel the training, volunteer activity, or switch my compressed day?

Do you think it would be reasonable for me to ask to have until Monday 4/12? If I did this, I could work on it on the weekend. I am interested in hearing your ideas on how to best proceed.

Thanks,
Nicole

Nicole Shao
US EPA, ORD-Office of Science Policy
1200 Pennsylvania Avenue, NW (8104R)
Washington, DC 20460
(202) 564-6779
----- Forwarded by Nicole Shao/DC/USEPA/US on 04/21/2008 04:38 PM -----

Hi Nicole and Danielle,

Below is the email that I drafted that I will send with the most recent chloramine message maps asking for further input from ORD and other workshop participants. Please note that I will be sending this email to others that attended the workshop, so even though the email is geared towards ORD review, it will include others, such as regional folks. If you’d prefer to have an ORD only message, let me know and we can change this easily enough.

Please let me know if you have any suggestions or edits to the draft email below.

As it now stands, I hope to get the new draft of the chloramine messages tomorrow, so I could send this email out as soon as Tues afternoon (I'll change the date in the email depending on when I send it). Nicole said she will follow this email with one to ORD colleagues with additional instructions from her. I will give ORD a 2-week review, and then Nicole a few extra days beyond that, as she needs, to combine the comments into one consolidated set of comments. I will be starting a new job next Monday, so correspondence at that point will be to my colleague Crystal Rodgers-Jenkins, who will take over this project.

Thank you for working on this with us and for facilitating this review.

Rose
To: bathija.ambika@epa.gov, Page.Angelad@epa.gov, Russo.Bill@epa.gov, atkins.blake@epa.gov, kiselica.bruce@epa.gov, mintz.bruce@epa.gov, laley.cara@epa.gov, christine@uncommoninsights.com, impellitteri.christopher@epa.gov, rodgers-jenkins.crystal@epagov, lytle.darren@epagov, brune.doug@epagov, doyle.elizabeth@epagov, hubbard.hanriet@epagov, ernst.hiba@epagov, Downing.jane@epagov, Simmons.Jane@epagov, deason.ken@epagov, forrest.kesha@epagov, donahue.lisa@epagov, lfb9@cdc.gov, lavay.maggie@epagov, rodgers.mark@epagov, mshimkin@trackg.com, Mindrup.Mary@epagov, mcclelland.mauleen@epagov, eloivitz.michael@epagov, lowy.michael@epagov, Wright.Michael@epagov, narotsky.michael@epagov, wurtz.monica@epagov, ashbolt.nick@epagov, Shao.Nicole@epagov, barr.pamela@epagov, fair.pat@epagov, oshida.phil@epagov, pegram.rex@epagov, lieberman.richard@epagov, rogers.rick@epagov, burns.robert@epagov, kyprianou.rose@epagov, haught.roy@epagov, bahrman.sarah@epagov, shereen@trackg.com, Comerford.Sherri@epagov, Hunter.sid@epagov, regli.stig@epagov, richardsonsusan@epagov, shaw.susan@epagov, tanya@riverbyte.com, speth.thomas@epagov, grubbs.thomas@epagov, deangelo.anthony@epagov, hall.patricia@epagov, blank.valerie@epagov, blette.veronica@epagov, guilarbon.yu-ting@epagov, bain.zeno@epagov, Bruce Macler/R9/USEPA/US

Subject: Chloramine risk communication - revised and simplified messages

Dear Colleague,

We received many comments on the draft chloramine risk communication message maps that are being developed as a result of the Jan 30 workshop held by our office to exchange information on chloramine-related issues. Thank you for your thoughtful input! Your comments were incorporated as best we could, while also making some other important changes to the messages which I talk about below. I have also collected all the comments together for our office to use as reference in future activities around these issues.

You are receiving another email from me for a couple reasons. First, we had comments from Regions and from the risk communication experts that the messages needed to be much more simple. We also heard that folks would like to see how their comments were taken and what the messages look like if there are substantial changes. We have changed the messages quite a bit, and they are much simpler, so my office would like to share these with you again.

Our hope is that these message maps will serve as communication tools for fact sheets, Q&A, and brochures that we may develop. We also hope that Regions, ORD Labs, and HQ will be comfortable using these message maps when needing to communicate to the public in this area. As such, we request another review by you of these message maps, and if you see a problem with how we state an answer, please let us know. The text is much simplified, down to a 6th grade level. We hope it makes reading these through a second time much easier and quicker, but please be forgiving of this important change and focus in on if what we are saying conceptually is correct and appropriate coming from EPA.

As a reminder, the messages are in a message map format. This means that there are three main key messages in response to each question, and supporting information for these key messages is listed below in an outline format.

We would like feedback in 2 weeks -- by COB Tues., May 6. Please note: Our office would like ORD feedback to go through Nicole Shao in OSP who will be consolidating responses. Non-ORD feedback should be sent to my colleague Crystal Rodgers-Jenkins, who is taking over this project. I will be joining EPA's Office of Pesticides (in FEAO) for a new job. It has been a pleasure to work with you, and do not hesitate to contact me if you have questions (my email remains the same).
Thank you,

Rose

Please consider this draft document internal:
[insert doc: revised, simplified message maps]

**************************************************************
end of message
**************************************************************

----------------------------------------------
Rose Kyprianou
EPA/Office of Water/Ground Water and Drinking Water
Standards and Risk Management Division
Phone: (202)-564-6325
Fax: (202)-564-3767
Office: 2209Q, Mail code: 4607M
Good find! You could reframe the question, and let them know that you found a possible study that addresses this. For example,

OW wants us to confirm that there are laboratory studies in rats that show monochloramine is metabolized and excreted in the urine. They don't want us to spend a lot of time on this but simply want to know if any studies come to mind that confirm this statement. They do not want us to spend a lot of time on this. One potentially relevant study I found is:


If you have reason to believe that this study isn’t appropriate and/or you want to suggest another study that confirms (or refutes) the statement above, please let me know.

If we do not know the answer to this question, OW will contact OST for their input.

Nicole Shao/DC/USEPA/US

Nicole Shao/DC/USEPA/US
04/15/2008 01:12 PM
To Danielle Tillman/DC/USEPA/US@EPA
cc
Subject Monochloramine Rat Study
Danielle,

I was looking up something else on chloramines online and I think I stumbled on the rat study OW was inquiring about. This WHO document mentions the study whereby monochloramine was metabolized to the chloride ion by rats and excreted mainly in the urine and to a lesser extent in the faeces. Do we still need to ask the ORD workgroup if they have any thoughts on this? The original draft question I was planning on asking them is below.

p. 4, Section 4, Kinetics and Metabolism in Laboratory Animals and Humans. The last sentence in the 2nd paragraph references the study on the rats.


[attachment "monochloramine[1].pdf" deleted by Danielle Tillman/DC/USEPA/US]

2) p. 27, Question 26, Supporting Information 2.2, Comment RK9. OW wants us to confirm that there are laboratory studies in rats that show monochloramine is metabolized and excreted in the urine. They simply want to know if any studies come to mind that confirm this statement. They do not want us to spend a lot of time on this. If we do not know the answer to this question, OW will contact OST for their input.

Thanks,
Nicole

Nicole Shao
US EPA, ORD-Office of Science Policy
1200 Pennsylvania Avenue, NW (8104R)
Washington, DC 20460
(202) 564-6779
Document Log Item

<table>
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<th>Ex. 5 -- Deliberative Process Privilege</th>
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</tr>
<tr>
<td>To</td>
<td>Nicole Shao/DC/USEPA/US@EPA</td>
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Ex. 5 -- Deliberative Process Privilege

Body

**Document Body**

Nicole,

Just a few minor things - mostly typos I happened to notice.

[Replacement file]

[Replacement file]

For the water chemistry/quality/properties issue, can you just suggest to OW that they might want to double check that elsewhere and leave it to them? I know we definitely don't want you spending still more time on this!

Thanks,
Danielle

Nicole Shao

Danielle, I tried to clarify/shorten the two section... 01/15/2009 10:49:10 AM

From: Nicole Shao/DC/USEPA/US
To: Danielle Tillman/DC/USEPA/US@EPA
Date: 01/15/2009 10:49 AM
Subject: Revised Question 19 and 27

Danielle,
I tried to clarify/shorten the two sections where OW had comments yesterday. I tried to stay away from using the term water chemistry or water quality and instead included water properties. However, water quality is already used many other times on the document with various definitions (in some cases quality refers to good/bad, in some cases it refers to the properties of water (taste, odor, etc.). Not sure what do about it, except perhaps just let it go.

When you have a chance, let me know if you are okay with these revisions. After I hear back from you, I will send them to Audrey and NRMRL for final approval.

[attachment "suggested revisions for question 19.doc" deleted by Danielle Tillman/DC/USEPA/US]
[attachment "suggested revisions for 27.doc" deleted by Danielle Tillman/DC/USEPA/US]

Thanks,
Nicole

Nicole Shao
US EPA, ORD-Office of Science Policy
1200 Pennsylvania Avenue, NW (8104R)
Washington, DC 20460
(202) 564-6779
27) Does monochloramine change water properties? Does monochloramine use contribute to the release of lead or other contaminants into drinking water?

Water properties can be changed by many factors, including the use of monochloramine.

- The chemical, physical, and biological properties of water may be changed by many factors.
- Levels of lead or other contaminants in water may change due to changes in water properties from monochloramine use.
- Biofilm activity, including nitrification and the resulting nitrite and nitrate formation in water may change due to changes in water properties from monochloramine use.

Water utilities typically monitor for problems caused by changes in water properties from monochloramine use.

- The presence of natural organic matter in water may change the water properties.
- Water utilities monitor for changes in water properties at water treatment facilities.
- Water utilities typically monitor for changes in water properties as the water moves through pipes.

Water utilities may need to adjust their treatment processes for problems caused by changes in water properties from monochloramine use.

- Water utilities may need to adjust their treatment processes to reduce levels of lead or other regulated contaminants to meet EPA regulations.
- Water utilities may need to adjust their treatment processes to reduce biofilm activity, including nitrification and the resulting nitrite and nitrate formation.
- EPA provides guidance for water utilities on problems that can arise from changes in water properties.

Additional Supporting Information:

1. Examples of chemical properties include pH and alkalinity, examples of physical properties include taste and odor, and examples of biological properties include biofilm formation and nitrification. See footnote 3 below for more information on biofilms and nitrification. Factors that may influence water properties include temperature, rainfall, weather conditions, and the use of disinfectants, including monochloramine.

2. Changes in water properties can occur when disinfectants such as monochloramine are added to water. These changes can make water more corrosive which may lead to pipe corrosion and increased levels of lead or other contaminants in the water. However, utilities can test water for corrosiveness and make changes to the water treatment process to address this problem (see footnote 5 below).

3. High levels of nitrate/nitrite can be especially harmful to infants; additional health effect information can be found at [http://www.epa.gov/owd/contaminants/dw_contaminants/nitrates.html](http://www.epa.gov/owd/contaminants/dw_contaminants/nitrates.html). The ammonia which is added to the water to make monochloramine, or which naturally occurs in some waters, can be converted by naturally occurring bacteria to form nitrates and nitrites, which are contaminants regulated by EPA at the treatment plant. Excessive nitrate/nitrite (due to nitrification) in the distribution system can also cause bacterial regrowth. For more information about nitrification see: [http://www.epa.gov/safewater/disinfection/tcr/pdfs/whitewater_tcr_nitrification.pdf](http://www.epa.gov/safewater/disinfection/tcr/pdfs/whitewater_tcr_nitrification.pdf). For more information about biofilm see question 2 or: [http://www.epa.gov/safewater/disinfection/tcr/pdfs/whitewater_tcr_biofilms.pdf](http://www.epa.gov/safewater/disinfection/tcr/pdfs/whitewater_tcr_biofilms.pdf). Nitrate/nitrite
control is discussed in EPA's simultaneous compliance manual which can be found at:
http://www.epa.gov/OGWDW/disinfection/stage2/pdfs/guide_st2_pws_simultaneous-
compliance.pdf. Other guidance is available through the American Water Works Association
(http://www.awwa.org) and the American Water Works Research Foundation
(http://www.awwarf.org).

4. Natural organic material is a complex mixture of compounds formed as a result of the
breakdown of animal and plant material in the environment; Source:

5. EPA guidance to utilities on addressing corrosion issues is available at:
19) What is EPA's current focus regarding chloramines research? What other ongoing research is EPA aware of?

The current focus of EPA chloramines research is on disinfectant effectiveness, disinfectant effects on water properties, and disinfection byproduct formation.

- Evaluating the effectiveness of disinfectants, including monochloramine, is a focus for EPA's chloramines research.
- Research is targeted at understanding the various effects that may be caused by disinfectant use.
- EPA supports research on evaluating potential treatment technologies that can reduce effects sometimes caused by disinfectant use.

Results from past and ongoing research indicate monochloramine use at regulated levels is a safe means for disinfecting drinking water.

- Several large cities such as Denver and Philadelphia have used monochloramine successfully as part of their water treatment process for decades.
- Research shows that monochloramine produces fewer potentially harmful disinfection byproducts than chlorine.
- EPA reviews and considers new research results as they become available.

Many organizations support research on the safety of monochloramine use.

- Academic institutions and water industry groups conduct research on monochloramine use.
- CDC has investigated community concerns related to monochloramine use.
- EPA will continue to work with other organizations on research related to the safe use of monochloramine.

Additional Supporting Information:

2. Research includes studying the effectiveness of chloramines at controlling potentially harmful organisms under different source water and treatment options. For more information on potentially harmful organisms.
3. Efforts include improving the understanding of the various effects that may be caused by the use of disinfectant(s) or mixed disinfectants on water properties, such as the formation of disinfection byproducts, the release of contaminants including lead into water, and biofilm activity, including nitrification and the resulting nitrate and nitrite formation. See question 37 for additional information on contaminant release, biofilms, and nitrification.
4. Compared to chlorine, water treated with monochloramine may contain different unregulated disinfection byproducts than chlorinated water. There are few studies on health effects of unregulated disinfection byproducts. For example, TTHMs and HAAs (see question 6 for more information) typically occur at higher levels than other known and unknown disinfection byproducts. The presence of TTHMs and HAAs is representative of the occurrence of many other chlorinated disinfection byproducts; thus, a reduction in TTHMs and HAAs generally indicates a reduction of other types of disinfectant byproducts. Information on one unregulated byproduct associated with chloramination, NDMA, can be found at http://www.epa.gov/iic/download/contaminantfocus/epa542f07008.pdf Also see question 9 and 23.
5. See the Contaminant Candidate List online at http://www.epa.gov/OGWDW/ccc3.html for contaminants EPA proposes to review. EPA scientists review regulations of disinfection byproducts every six years. (http://epa.gov/safewater/revol.html). EPA is currently monitoring for several unregulated disinfectant byproducts (NDEA, NDMA, NDPA, NPYR). More information can be found at http://www.epa.gov/safewater/uicmr/index.html
6. American Water Works Association Research Foundation (AwwaRF) is an example of a group that conducts water industry research. Information on AwwaRF projects can be found at http://www.awwrf.org/.

Nicole- Sorry I have been out and not had time to respond. At this point I am in total agreement with the comments of Mike and Jonathan. Looking at the bullet below- you could include iron release as well. This really opens up other questions such as the release of trace contaminants. You could say "research on the release of contaminants such as lead from distribution system materials and...". Secondly, nitrification is specific- but could it be opened to biofilm activity or would this be a stretch? For example could you say "...and biofilm activity including nitrification, and the resulting subsequent secondary issues such as nitrite and nitrate formation, that....". The bullet could read:

- EPA supports research on the release of contaminants such as lead from distribution system materials and biofilm activity including nitrification, and subsequent secondary issues such as nitrite and nitrate formation, that can occur when disinfectants such as monochloramine are used.

The wording can probably improved upon. Darren

You could add, and have nothing new to add. Darren Lytle, PhD, PE
Environmental Engineer
U.S. Environmental Protection Agency
26 W. Martin Luther King Dr.
Cincinnati, Ohio 45268
Hi Nicole

I agree with Mike's suggested changes. I also think we should add some language that includes nitrification research, because nitrification causes other water quality issues besides nitrite/nitrate. I suggest the following additions (highlighted in red):

The current focus of EPA monochloramine research is on disinfectant byproduct formation as well as how disinfectants affect water chemistry and quality.

- EPA supports research on lead release and nitrification including the resulting nitrite and nitrate formation that can occur when disinfectants such as monochloramine are used.

Perhaps this needs to be further wordsmithed, but somewhere we should include "nitrification".

Happy Holidays
Jonathan

Nicole Shao

Jonathan and Darren, Mike Schock suggested t... 12/22/2008 03:29:11 PM
Document Log Item

From: Darren Lytle/CI/USEPA/US
To: Michael Schock/CI/USEPA/US

CC: Audrey Levine/DC/USEPA/US@EPA, Jonathan Pressman/CI/USEPA/US@EPA, Nicole Shao/DC/USEPA/US@EPA

Re: Please Review Quickly and Respond Today - Revised Message Maps 19 and 21

Revised Message Maps 19 and 21

About message maps, however questions 19 and 21 are not about chloramine health effects.

Clear Category Non-responsive

Ex. 5 -- Deliberative Process Privilege

Body

Document Body

Nicole- I have nothing to add beyond Mike’s suggestions- thanks, Darren

Darren Lytle, PhD, PE
Environmental Engineer
U.S. Environmental Protection Agency
26 W. Martin Luther King Dr.
Cincinnati, Ohio 45268

phone (513) 569-7432
fax (513) 569-7892

Michael Schock Nicole; Here are my comments. See red below. 01/15/2009 03:02:26 PM

From: Michael Schock/CI/USEPA/US
To: Nicole Shao/DC/USEPA/US
Cc: Audrey Levine/DC/USEPA/US@EPA, Darren Lytle/CI/USEPA/US@EPA, Jonathan Pressman/CI/USEPA/US@EPA
Date: 01/15/2009 03:02 PM
Subject: Re: Please Review Quickly and Respond Today - Revised Message Maps 19 and 21

Nicole;
Here are my comments. See red below.

Nicole Shao  Audrey, Mike, Jonathan, and Darren, I met with... 01/15/2009 01:22:54 PM

From: Nicole Shao/DC/USEPA/US
To: Audrey Levine/DC/USEPA/US@EPA, Michael Schock/CI/USEPA/US@EPA, Jonathan Pressman/CI/USEPA/US@EPA, Darren Lytle/CI/USEPA/US@EPA
Date: 01/15/2009 01:22 PM
Subject: Please Review Quickly and Respond Today - Revised Message Maps 19 and 21

Audrey, Mike, Jonathan, and Darren,

I met with OW yesterday and for the most part they were okay with incorporating our "major" comments. They did however ask me to go back and shorten Question 19, message 1 and revise Question 27.

- Adding "other contaminants" in addition to lead OK
- Discussing biofilm activity and nitrification (instead of just saying nitrate and nitrite)
I think your change is very good, providing the mention of nitrite and nitrate specifically stays in the way you have it.

- Not using either "water chemistry" or "water quality" but instead "water properties"
"Water properties" means specific things in physics and chemistry (such as viscosity, density, surface tension, etc. mainly physical properties), and the use here is improper. Water chemistry means something different and correct in this context. However, for this audience I can live with it.

Take a look at what I have done and let me know if you are okay with these two final draft messages. Are you able to "live with" this text? I think they are a decent compromise. Anyhow, OW is trying to wrap this activity up and wants any final comments from me on these two questions by tomorrow.

[attachment "suggested revisions for question 19.doc" deleted by Michael Schock/CI/USEPA/US]
[attachment "suggested revisions for 27.doc" deleted by Michael Schock/CI/USEPA/US]

For reference, here are the previous versions Audrey and I worked on that OW wanted us to change:

[attachment "19 previous 14jan09.doc" deleted by Michael Schock/CI/USEPA/US] [attachment "27 previous 14jan09.doc" deleted by Michael Schock/CI/USEPA/US]

Thanks,
Nicole

Nicole Shao
US EPA, ORD-Office of Science Policy
1200 Pennsylvania Avenue, NW (B104R)
Washington, DC 20460
From: Nicole Shao/DC/USEPA/US@EPA
To: Audrey Levine/DC/USEPA/US@EPA, Michael Schock/CI/USEPA/US@EPA, Jonathan Pressman/CI/USEPA/US@EPA, Darren Lytle/CI/USEPA/US@EPA
Date: 01/15/2009 01:22:54 PM
Subject: Please Review Quickly and Respond Today - Revised Message Maps 19 and 21

Audrey, Mike, Jonathan, and Darren,

I met with OW yesterday and for the most part they were okay with incorporating our "major" comments. They did however ask me to go back and shorten Question 19, message 1 and revise Question 27.

In a nutshell, the changes are:
- Making the bullets shorter for Question 19.
- Adding "other contaminants" in addition to lead.

Nicole Shao
Audrey, Mike, Jonathan, and Darren, I met with...
01/15/2009 01:22:54 PM
Discussing biofilm activity and nitrification (instead of just saying nitrate and nitrite)
- Not using either "water chemistry" or "water quality" but instead "water properties"

Take a look at what I have done and let me know if you are okay with these two final draft messages. Are you able to "live with" this text? I think they are a decent compromise. Anyhow, OW is trying to wrap this activity up and wants any final comments from me on these two questions by tomorrow.

[attachment "suggested revisions for question 19.doc" deleted by Jonathan Pressman/CI/USEPA/US]
[attachment "suggested revisions for 27.doc" deleted by Jonathan Pressman/CI/USEPA/US]

For reference, here are the previous versions Audrey and I worked on that OW wanted us to change:

[attachment "19 previous 14jan09.doc" deleted by Jonathan Pressman/CI/USEPA/US] [attachment "27 previous 14jan09.doc" deleted by Jonathan Pressman/CI/USEPA/US]

Thanks,
Nicole

Nicole Shao
US EPA, ORD-Office of Science Policy
1200 Pennsylvania Avenue, NW (8104R)
Washington, DC 20460
(202) 564-6779
Hi Nicole

I agree with Mike's suggested changes. I also think we should add some language that includes nitrification research, because nitrification causes other water quality issues besides nitrite/nitrate. I suggest the following additions (highlighted in red):

*The current focus of EPA monochloramine research is on disinfectant byproduct formation as well as how disinfectants affect water chemistry and quality.*

- EPA supports research on lead release and nitrification including the resulting nitrite and nitrate formation that can occur when disinfectants such as monochloramine are used.

Perhaps this needs to be further wordsmithed, but somewhere we should include "nitrification".

Happy Holidays
Jonathan

---

Nicole Shao

Jonathan and Darren, Mike Schock suggested t... 12/22/2008 03:29:11 PM

From: Nicole Shao/DC/USEPA/US
To: Jonathan Pressman/CI/USEPA/US@EPA, Darren Lytle/CI/USEPA/US@EPA
Cc: Michael Schock/CI/USEPA/US@EPA, Patricia Erickson/CI/USEPA/US@EPA
Date: 12/22/2008 03:29 PM
Jonathan and Darren,

Mike Schock suggested that I contact you to take a quick look at some sentences OGWDW is planning on including in Question 19 of the Chloramines Message Maps. Question 19 is, "What is EPA's current focus regarding chloramines research? What other ongoing research is EPA aware of?"

Mike was saying that he thought the two of you might have additional details you might possibly want to see added regarding the nitrification and ammonia removal by biological filtration research that you two are working on. The bullets below (and Mike's proposed suggestions) are very broad in nature and thus seem to at least generally encompass the research that is being conducted, so I don't think too many changes are necessary. However, if you have additional text you would like to see added to the bullets below, please let me know.

Currently, Question 19, Message 1 reads:

The current focus of EPA monochloramine research is on disinfectant byproduct formation as well as how disinfectants affect water chemistry.

- EPA supports research on the unregulated disinfection byproducts formed in drinking water.
- EPA supports research on lead release and nitrate formation that can occur when disinfectants such as monochloramine are used.
- Natural organic matter removal technologies, that can reduce byproduct formation, are a priority for future EPA supported research.

Mike is suggesting the following changes to bullets 2 and 3.
- EPA supports research on lead release, nitrite, and nitrate formation that can occur when disinfectants such as monochloramine are used.
- Natural organic matter removal technologies, that can reduce byproduct formation, are of high interest for future EPA supported research.

Are you okay with Mike's proposed changes? Do you have any additional comments on this message? Are there any additional sentences you would like to see added?

Thanks,
Nicole

Nicole Shao
US EPA, ORD-Office of Science Policy
1200 Pennsylvania Avenue, NW (8104R)
Washington, DC 20460
(202) 564-6779
Hi Rose and Susan, here is my presentation. I just completed it; I hope I've hit the mark here. Thanks...Mark
Mark, 

I am organizing the workshop on chloramine risk communication and heard you will be joining us. I look forward to your participation and presentation! Below is a message about presentations that I sent to presenters yesterday. It also explains a bit of background and purpose for the workshop. Attached is the agenda and list of public question topics we plan to address either at this meeting or afterwards in our follow-up activities. Please let me know if you have any questions. Susan Shaw (shaw.susan@epa.gov; 202-564-5284) in my branch is also available to speak with you (and has more of a microbial background).

I will be forwarding two more emails to you:
(1) The email to register for this workshop. Please sign up so you receive the actual webinar invite. During this registration, you also have a chance to identify areas of expertise on the topics we will discuss. This will help the contractors to understand the mix of people present as they facilitate the workshop and also who they may contact as they develop key messages to public questions after the workshop is over.
(2) Today we will be conducting a test of the webinar at 1pm EST. I will send you an invitation to that webinar. Feel free to join if you are interested. We will be testing it to be sure that it works, to give presenters a chance to see how they will be able to use it when presenting, and to get feedback about useful instructions to send to attendees next week. If you are not able to attend, I will send out a summary of how we will conduct the webinar to help you with presenting.

Thanks for your involvement with this workshop,

Rose

Rose Kyprianou
EPA/Office of Water/Ground Water and Drinking Water Standards and Risk Management Division
Phone: (202)-564-6325
Fax: (202)-564-3767
Hello Presenters for the Chloramine Risk Communication workshop,

We are delighted to have you join us and present at the upcoming Jan 30 workshop! I would like to pass on a few reminders and logistics for you to keep in mind. First and foremost, since a good number of people will not be attending in person, we will be sending the presentations out to all attendees Tuesday Jan 29. We have set a deadline of the end of Mon Jan 28 (COB) for submitting presentations to us so that we may do this. Please email them to me directly and let me know if this poses any problem to you.

Reminders:
-- please number your slides
-- please recognize and respect the time allotted for your presentation; we look forward to a lively discussion and will ask that attendees hold their questions and comments to the discussion period in order to help you stay on schedule
-- you need to be registered for the webinar to receive the webinar invite (the actual web link for the conference), so please respond to the email that our contractor should have sent you inviting you to attend the workshop (Jan 10, from Shereen Kandll - Track Group) by clicking on the link and registering; notify me if you have not received this invite
-- Please be sure to register for the workshop, even if you will be attending in person. At the registration site, the contractors are asking for people to mark the issues that they have expertise in, so that they may work with them as they draft key messages after the Jan 30 meeting.

Background:
The purpose of the workshop is to receive input for messages we will develop for Agency use when communicating with the public on the topics listed in the agenda (most recent agenda is attached). Your role is to set up and give context for discussion of specific questions we have identified from the public. You will see relevant questions listed after each presentation. Discussion will focus on what attendees think is most important to be conveyed in messages that will be used in communicating with the public. We've contracted out to some risk communication specialists who will then work with us to draft the messages.

If you would like to discuss the meeting with our facilitators prior to the 30th, they would be more than happy to speak with you. We have two talented facilitators who will be leading us on Jan 30; feel free to contact either one (Christine Brittle - christine@uncommoninsights.com, 703-254-6515) (Tanya Hilteary - tanya@riverbyte.com, 703-476-5679). And feel free to contact Trish Hall (hall.patricia@epa.gov; 202-564-5263) or myself (contact info below) in OGWDW with any other questions or concerns.

Thank you for your participation!

Rose
Rose Kyprianou
EPA/Office of Water/Ground Water and Drinking Water
Standards and Risk Management Division
Phone: (202)-564-6325
Fax: (202)-564-3767
Office: 2209Q, Mail code: 4607M
Chloramine vs chlorine as a disinfectant
- Chloramine is not as strong a disinfectant compared to chlorine
- Longer contact times are required when using chloramine
- Commonly used as a secondary disinfectant
- Produces a more stable residual able to last longer in a distribution system
- More effective in penetrating biofilm matrices

Biofilms in DW Distribution Systems
- A community of microorganisms attached to a surface, held together with extracellular polymers.
- Microbial composition of DW biofilms determined by:
  - Surface type (copper, PVC, cement, iron, rubber, etc)
  - Chemical conditions (nutrient availability, pH, etc)
  - Physical conditions (flow velocity, abrupt changes in flow, temperature, etc)
**Formation of Biofilm**

- Attachment
- Colonization
- Growth
- Direction of fluid flow
- Planktonic cells
- Sedentary cells
- Surface

---

**Biofilms in DW Distribution Systems**

- Microorganisms present include:
  - Heterotrophic bacteria (HPC); many unculturable and unknown to us.
  - Pseudomonads, amoebe, fungi, actinomycoids bacteria
  - Human pathogens possible
  - Passively present (stuck in biofilm matrix; viruses/some protozoa)
  - Others able to colonize and grow
    - Mycobacterium, Legionella

---

**Biofilms and chloramines**

- Chloramines more effective in reducing both HPC levels in bulk water phase and coliform regrowth in biofilms.
- Presence of elevated ammonia leads to nitrification
- Nitrifying conditions can lead to:
  - Instability of chloramine residual
  - Presence of nitrates
  - More biofilm
**Chloramination as a security factor**

- Free chlorine's high reactivity rate makes it useful in oxidizing introduced chemical and microbial contaminants,
- and free chlorine residual has been proposed as a "sentinel" compound in DW DS,
- Chloramine's slower rate of reactivity with organic compounds allows for a more stable residual, which produces a more consistent and long range disinfectant in the DS,
- but this also makes chloramine less useful as a "sentinel" for detecting intentionally-introduced contaminants.

---

**Chloramination and prevention of eye infections**

- Acanthamoeba
  - is the causative agent of Acanthamoeba keratitis;
  - occurs naturally in water, soil;
  - is present in DW biofilms where it feeds on bacteria;
  - exists in both a motile (amoeba) and cyst forms;
  - cysts are more resistant to disinfectants than motile forms.

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[Diagram of Acanthamoeba and CDC logo]
Chloramination and prevention of eye infections

- Using contact lens is a risk factor for Acanthamoeba keratitis
  - Potential factors relating to this risk include how the lens are cleaned, the water used in the cleaning process, wearing lens while showering or swimming, use of soft lens
  - An epi study in Chicago area noted an uneven distribution of cases geographically, suggesting that homes further out on OS with lower CI residuals have greater risk

Chloramination and prevention of eye infections

- Few studies on chloramine inactivation of Acanthamoeba
- Thomas et al. 2004
  - Chloramine had no significant effect on Acanthamoeba in bulk water or biofilm communities
  - No other disinfectant tested (chlorine, chlorine dioxide, ozone) was effective against Acanthamoeba in biofilms