We’ve learned from survey data that opinions from Medical and Public Health Professionals matter most.
WateReuse Members have asked for support in this regard.

May 17, 2016

Guy Carpenter
President
WateReuse Association
1199 North Fairfax Street, Suite 410
Alexandria, VA 22314

Dear Mr. Carpenter:

Research consistently shows that the public wants to hear from medical professionals and scientists regarding the safety and quality of purified water. In fact, providing information about safety, quality, and the treatment process to respondents was the single most important factor in increasing support for potable reuse in the research conducted for WWRF 13-62. We are writing you to request that the WateReuse Association commit its resources and influence to obtain support for potable reuse from leading national medical associations, health researchers and scientists. We believe this is one of the most important actions you can take for all of your members. You have the stature and reach to accomplish what most of your members cannot: access to these associations, researchers and scientists for purposes of obtaining letters or resolutions of support for this important drinking water source.

Orange County Water District’s Groundwater Replenishment System is widely recognized as the model for purified water projects, especially with regard to its public outreach program. Their early medical and science support included an environmental epidemiologist from the Centers for Disease Control and Prevention, a researcher from the Center for Water and Health at Johns Hopkins University and a former director of the Center for Risk Sciences & Public Health, to name a few. It would be very helpful for WateReuse to seek support from individuals prominent in the medical or science field and such groups as the American Medical Association, the National Medical Association — the oldest African American medical association, the National Hispanic Medical Association, leading medical schools such as Johns Hopkins University, Columbia University, Stanford University and others, and associations representing politicians and nurses.

Your members pursuing potable reuse projects are "doing the work" of informing community members about the importance of this new, local water supply. But they need your help in breaking through to state or local medical schools, public health associations, nurses, doctors, hospitals and others in the health community who are busy with the daily demands of this important profession. For example, physicians at a recent presentation to a medical association in San Diego wanted to know what scientists and medical associations thought about purified water before they would take a position on the local potable reuse project. Your assistance can help provide these answers and increase local support.

Sincerely,

Hallas Razak
Director of Public Utilities
City of San Diego

Mike Markus
General Manager
Orange County Water District

John Ballwieser
President/Chief Executive Officer
El Paso Water Utilities

Rick Nagel
General Manager
West Basin Municipal Water District

Norma Cassone
Interim Chief Executive Officer
Santa Clara Valley Water District
Talking about Water to a Skeptical Public
Topics

- Water Availability & Scarcity
- The Safety of Drinking Water
- Resilience & Reliability
- Risk & Perception
- Potable Reuse
  - Treatment Technologies
  - Other Risk Mitigating Practices
- Q/A
Water Availability and Scarcity
We forget that the water cycle and the life cycle are one.

— Jacques Yves Cousteau —
Water covers 70% of the earth’s surface, but…

Source: USGS, 2012
Water stress is increasing, particularly where populations are high

The Public Doesn’t Pay Much Attention to Water Until Something Bad Happens
The Safety of Drinking Water
Water Supplies

- Surface Water
  - “Fresh”
  - Stormwater
  - Brackish
  - Ocean
  - Contaminated

- Groundwater
  - “Fresh”
  - Under the Influence of Surface Water
  - Brackish
  - Contaminated

- Reclaimed or Recycled Water
# Potential Contaminants

<table>
<thead>
<tr>
<th><strong>Acute</strong></th>
<th><strong>Chronic</strong></th>
<th><strong>Aesthetic</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Nitrate</td>
<td>- Volatile organic chemicals (VOCs)</td>
<td>- Taste</td>
</tr>
<tr>
<td>- Pathogens</td>
<td>- Inorganic chemicals (IOCs)</td>
<td>- Odor</td>
</tr>
<tr>
<td></td>
<td>- Parasites</td>
<td>- Color</td>
</tr>
<tr>
<td></td>
<td>- Bacteria</td>
<td>- Total dissolved solids</td>
</tr>
<tr>
<td></td>
<td>- Viruses</td>
<td></td>
</tr>
</tbody>
</table>
Water Quality Standards are based upon acceptable risk of exposure

• EPA uses default exposure assumptions that are based on national data in its recommended Human Health Criteria:
  • A drinking water intake of 2 liters per day
  • An average body weight of 70 kg
  • Over 70 years

• Pathogens: 1/10,000 risk of infection
• Chemicals: 1/10,000 to 1/1,000,000 risk of effect
  • Cancer
  • Nervous disorders
  • Organ damage
  • Teratogen
So, depending upon the source and potential contaminants, we treat the water to reduce the risk of infection or effect

- Safe Drinking Water Act is supported by updates and rules
- Operators of treatment plants have to be certified based upon size of treatment plant, complexity of treatment technologies, and population served
- A disinfectant residual is typically maintained within the piping system
- Safety is demonstrated through regular laboratory testing
- Industry involves engineers, chemists, microbiologists, and public health officials
Resilience and Reliability
Sole & Limited Source Communities are Scrambling to Increase Reliability – Creates conflict
Most large community water systems have moved to a portfolio approach to water resources.
Risk & Perception
The general public has difficulty with the concept of relative concentrations and risk

- There is a concern that “presence” in any amount is a problem
- Adverse health effects are presumed if anything can be detected.
- There is no “zero” of anything… including risk.

“Not everything that counts can be counted, and not everything that can be counted counts.”

-Albert Einstein
As scientists, we have to remind ourselves that feelings AND facts matter

... there can also be strong, spiritual references and connectedness to water, particularly among native people groups.
Risk Perception Summary

- We are sometimes irrational and react to our perception of risk rather than to the risk itself.
- **We are generally more accepting of risks that:**
  - We voluntarily expose ourselves to - as opposed to those over which we have no control
  - Are natural - as opposed to human made
  - Are familiar - as opposed to unfamiliar
  - Are well-defined - as opposed to uncertain
  - We have good understanding of - as opposed to our fear of the unknown
Pharmaceutically Active Compounds

THE VIAGRA IN THE WATER MAKES ME WANT TO SWIM UPSTREAM, BUT THE PROZAC IS MAKING ME TOO TIRED.
### Amount of Water to Meet Acceptable Daily Intake (for Humans) - Pharmaceuticals

<table>
<thead>
<tr>
<th></th>
<th>ADI-DWEL</th>
<th>Maximum Water Conc.</th>
<th>Amount of water to meet ADI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>µg/L</td>
<td>µg/L</td>
<td>Finished 8 oz Glasses/d</td>
</tr>
<tr>
<td>Atenolol</td>
<td>70</td>
<td>0.026</td>
<td>22,800</td>
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<tr>
<td>Carbamazepine</td>
<td>12</td>
<td>0.018</td>
<td>5,500</td>
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<tr>
<td>Diazepam</td>
<td>35</td>
<td>0.00033</td>
<td>890,000</td>
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<tr>
<td>Prozac</td>
<td>Flutoxetin</td>
<td>0.00082</td>
<td>360,000</td>
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<tr>
<td>Gemfibrozil</td>
<td>45</td>
<td>0.0021</td>
<td>180,000</td>
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<tr>
<td>Meprobamate</td>
<td>260</td>
<td>0.043</td>
<td>51,000</td>
</tr>
<tr>
<td>Phenytin</td>
<td>6.8</td>
<td>0.032</td>
<td>1,800</td>
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<tr>
<td>Risperidone</td>
<td>0.49</td>
<td>0.00034</td>
<td>12,000</td>
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<tr>
<td>Sulfamethoxazole</td>
<td>18,000</td>
<td>0.0030</td>
<td>51,000,000</td>
</tr>
<tr>
<td>Triclosan</td>
<td>2,600</td>
<td>0.0012</td>
<td>19,000,000</td>
</tr>
</tbody>
</table>

Credit: Shane Snyder, University of Arizona
Contagion mentality: Once contaminated, always contaminated
Stigmatization

• Our capacity to absorb factual information is blocked by negative associations of “dirty” water

• The negative associations (based on FEAR rather than FACT!) scare us!
What’s the Solution?

Engineering technology and science can remove the chemicals and micro-organisms in water...

... and negative associations and fears can be reframed by creating a better understanding of water.
The Hydrologic (Water) Cycle with Human Influence

Graphic credit: www.healthywaterways.org
Potable Reuse

Significantly increases resiliency and reliability
Non-Potable Reuse

Source: AWWA Potable Reuse 101
A Key Element of Potable Reuse is the ATWF

Indirect

Direct (with engineered storage)

Surface water or groundwater supply

Wastewater treatment facility

Community

Drinking water treatment facility

Advanced water treatment facility

Additional treatment in an Advanced Water Treatment Facility (AWTF)
Advanced Water Treatment Facility removes pathogens and chemicals to make drinking water

1. Ultrafiltration
   Membranes remove bacteria, protozoan and some trace pathogen.

2. Reverse Osmosis
   Membranes remove salt, organics, trace pollutants and remaining pathogens.

3. Disinfection/Advanced Oxidation
   Removes trace pollutants and pathogens.

4. Meets all drinking water standards
In addition to effective treatment technologies, other Risk Mitigating Practices are used

• Supported by pilot and full scale testing

• Multiple barrier approach, with lots of built in conservatism
  • Based upon hazard analysis and critical control points (HACCP)

• Trained operators

• Checklists

• Real-time water quality monitoring

• Source control
Questions?

Guy Carpenter  
Past-President  
WateReuse Association  
gcarpenter@carollo.com