A Primer on EPA’s New Beach Water Quality Criteria

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BACKGROUND

• EPA adopted new beach water quality criteria November 26, 2012

• You asked for a briefing about the biggest changes contained in the new criteria
  – These are federal recommendations
  – California must determine which parts to adopt

• I gave a similar briefing to the California Beach Water Quality Workgroup
  – I will also share their thoughts on what California should adopt
MAJOR CHANGES

• New beach management thresholds
  – There are now three values instead of two
  – The conceptual approach to thresholds has changed
  – Increased consistency between freshwater and saltwater criteria

• Allows use of rapid QPCR-based methods

• Allows use of predictive models for health warnings

• Allows use of quantitative microbial risk assessment (QMRA) for developing site-specific objectives

• Opens the door to use of alternative indicators
THREE THRESHOLDS

• **Geometric mean (35 cfu/100 ml)**
  – Same value as we are presently using
  – The allowable number of illnesses (on which it is based) changes, but that is in the weeds

• **Statistical threshold value (130 cfu/100ml)**
  – A new concept

• **Beach action value (70 cfu/100 ml)**
  – A new concept

• **Eliminates the single sample maximum criteria (104 cfu/100 ml)**
BEACH ACTION VALUE

• EPA differentiates water quality criteria from beach health warnings
  – Water quality criteria are intended for discharge permit requirements and for determination of impaired water bodies

• The Beach Action Value is not regulatory
  – Provides single sample guidance for when beach health warnings should be issued
  – EPA refers to it as “a conservative, precautionary tool for making beach notification decisions”

• It is lower than the value we have been using for that purpose
  – 70 vs. 104
  – Would lead to more beach advisories, if adopted
STATISTICAL THRESHOLD VALUE

• A new regulatory value
  – Intended to supplement the geometric mean with a frequency of exceedance component

• Value not to be exceeded by more than 10 percent of the samples taken in a month
  – Does not explicitly provide for a seasonal adjustment

• It replaces the single sample maximum and would result in fewer 303(d) listings
  – Some Regional Boards presently use no more than 4% of samples above 104
  – This would be no more than 10% of samples above 130
**RISK LEVEL**

- **New criteria identifies two possible risk levels**
  - 32 illnesses per thousand or 36 illnesses per thousand

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Illness Rate: 36 per 1,000</th>
<th>OR</th>
<th>Illness Rate: 32 per 1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GM</td>
<td>STV</td>
<td>GM</td>
</tr>
<tr>
<td>Enterococci – marine and fresh</td>
<td>35</td>
<td>130</td>
<td>30</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>E. coli</em> – fresh</td>
<td>126</td>
<td>410</td>
<td>100</td>
</tr>
</tbody>
</table>

- **Provides no guidance on which of these States should adopt**
  - 36 illnesses per thousand equivalent to present allowable illness rate
**BWQWG REACTION**

- **There were aspects they liked**
  - Consistency between fresh and salt water
  - Separation of warnings from criteria
  - An opportunity to eliminate *E. coli* and fecal coliform measurements

- **But mostly they weren’t favorable to switching**
  - Changes would create confusion
  - The underlying science was based on non-representative beaches

- **Were also concerned that it would add to inconsistency across States**
  - Only some States would adopt new standards
  - They didn’t understand the different risk levels, which they felt would add to inconsistency
USE OF RAPID METHODS

- **EPA is allowing use of QPCR, with caveats**
  - “not currently suggested for NPDES permitting or effluent-related monitoring purposes because this method may not reflect the efficacy of WWTP disinfection”
  - “EPA has limited experience with its performance across a broad range of environmental conditions”
  - “EPA encourages a site-specific analysis of the method’s performance prior to use”

- **The methods we have been using in California are slightly different than the EPA method**
  - EPA recognizes the technology is evolving rapidly and their published method is already dated
  - Has opened the door to use of alternative methods, but hasn’t laid out clear rules for method substitution

- **EPA has not yet issued implementation guidance**
  - Due out later this year
SOME IMPLEMENTATION ISSUES

• **Standard reference material**
  – What type will be used?
  – Where will you obtain it from?

• **Training**
  – Who is going to provide training?
  – How many locations will training be held?

• **No mention of financial assistance or incentives for adoption of new methods**
  – Have already eliminated traditional beach monitoring support funds
  – Sequestration won’t help

• **QA and laboratory certification**
Everyone liked the concept of rapid methods
- Particularly when it could be applied to a subset of beaches most in need of rapid methods

Most expressed concern that EPA needs to provide implementation guidance and start-up funds

Also concerned it would add inconsistency to monitoring systems
- Methods are still evolving
- The process for establishing site-specific thresholds for new methods is vague
STATISTICAL MODELS

• EPA has opened the door to use of models for health warnings
  – Some States are already doing it
  – The new criteria provides approval and guidance

• Recognizes several categories of predictive models
  – Statistical regression models
  – Rainfall-based notifications
  – Decision trees
  – Deterministic models

• Mostly technical guidance about how to do it well, rather than a recommendation or criteria
• Interesting, but not compelling

• Noted that we are already using models for health warnings
  – Imperial Beach: Based on flow from Tijuana River
  – Rain-related warnings

• Stanford/Heal the Bay currently doing a project to investigate whether models work at California beaches
  – Group wants to hear results from that project before opining on likelihood of expanded use of models
One of the biggest complaints about previous criteria is that they are applied equally, regardless of fecal source.

States are presently permitted to conduct epidemiological studies to derive site-specific objectives.

EPA will now allow QMRA for site-specific objectives:
- Less expensive, but scientifically less mature than epidemiology
- EPA is presently developing QMRA guidance
HOW DOES QMRA WORK?

• **Identify fecal sources**
  - Sanitary survey
  - Source ID methods
  - Stop if there is more than ~15% human contribution

• **Quantify pathogen loads from each source**
  - Eight pathogens account for >97% of non-foodborne illness in the US

<table>
<thead>
<tr>
<th>Pathogen</th>
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<tbody>
<tr>
<td>Norovirus</td>
<td><em>Giardia lamblia</em></td>
</tr>
<tr>
<td>Rotavirus</td>
<td><em>Campylobacter</em> spp.</td>
</tr>
<tr>
<td>Adenovirus</td>
<td><em>Salmonella enterica</em></td>
</tr>
<tr>
<td><em>Cryptosporidium</em> spp.</td>
<td><em>E. coli</em> O57:H7</td>
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BWQWG REACTION

• This topic engendered the most discussion

• People were generally favorable
  – Recognize that some beaches have non-human sources

• But they were also cautious
  – Were concerned about relaxing standards based on inadequate evidence

• EPA has not yet produced guidance
  – EPA is enthusiastic to partner with us on case studies
ALTERNATIVE INDICATORS

• “EPA anticipates that scientific advancements will provide new technologies for enumerating fecal pathogens or FIB”
  – “As new or alternative indicator and/or enumeration method combinations are developed, states may want to consider using them to develop alternative criteria”

• Opens the door to both new methods and new indicators

• “If a state adopts WQS using alternative indicator/method combinations, EPA will review those standards to determine whether such standards are scientifically defensible and protective of the primary contact recreation use”
  – “A robust relationship need not be established between EPA’s recommendation and alternative indicators for the whole range of indicator densities”
  – “It is important that a consistent and predictable relationship exist between the enumeration methods and an established indicator/health relationship in the range of the recommended criteria”
BWQWG REACTION

• No reaction, as they didn’t see adoption of new indicators as likely to happen in the foreseeable future
  – They were glad to see flexibility for adopting new enterococcus measurements as they evolve
• **New beach management thresholds**
  - This is a policy issue and our involvement will be minimal

• **QPCR-based methods**
  - We continue working on the method refinement (a portable field unit)
  - We will continue to conduct training for our member agencies

• **Use of models for health warnings**
  - Serving on advisory committee for the Stanford/Heal the Bay project

• **Quantitative microbial risk assessment**
  - Our main focus is developing case studies that will help lead to guidance

• **Opens the door to use of alternative indicators**
  - We will soon publish a paper that comments on efficacy of 30 alternatives
  - None were found to improve on *Enterococcus*