Past as Prologue: The Safe Drinking Water Act at 40

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Presented at the Spring Conference, CA NV Section AWWA
Anaheim, California
March 25, 2014
Objectives

• The purposes of this presentation are to:
  – Review how we got to 1974 and the SDWA
  – Chart the real progress of the SDWA in improving water quality and public health protection
  – Discuss two prologues that we are faced with based on our two pasts
Outline

• Introduction and Objectives
• Germs, Disease and Death
• Early Drinking Water Regulations
• Run Up to Passage of the SDWA
• Progress Made Under the SDWA
• SDWA: Mid-Life Crisis
• Two Prologues
Outline

• Introduction and Objectives
• Germs, Disease and Death
Jump Into Your Favorite Time Machine and Join Me in 1890
Germs, Disease and Death

- In 1890s and early 1900s, waterborne diseases and deaths were facts of life in the U.S.
- Rivers became more polluted in the U.S. as urbanization and industrialization exploded
- Public health movement to remove “filth” from cities encouraged sewer construction
Germs, Disease and Death (cont.)

- Water distribution systems created an efficient means of delivering contaminated drinking water to the public.
- High death rates for a variety of diseases (later proved to be waterborne) were accepted as facts of urban life.

- The Sewer Pipe, Water Pipe Death Spiral
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Common Cup--1912

• Today, it’s hard to imagine how hard it was to adopt the 1st federal drinking water reg
Early Federal Drinking Water Regulations

- 1912—common cup
- 1914—bacteria limits (apply only interstate)
- 1925—addition of limits for inorganic and physical constituents
- 1942 and 1946—revised standards for a variety of parameters
1962 U.S. Public Health Service Standards

- Applied only to interstate carriers—about 700 utilities
- Adopted by reference by many states
- Voluntary compliance by many utilities
- Set standards for bacteria, metals, other inorganics, physical parameters and a few organics
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1974--The Drinking Water World was Shaken
1974--Drinking Water Events

- Three Consumer Reports articles criticize DW safety
- 36 organic chemicals identified in New Orleans tap water at part-per-billion levels
- Epidemiological study in New Orleans area—higher cancer risks allegedly in cities served by Mississippi River water
- CBS 60 Minutes: “Caution, Drinking Water May be Dangerous for Your Health”
1974 (cont.)

- Trihalomethane articles published by Bellar and Lichtenberg of USEPA and J.J. Rook from the Netherlands
- SDWA signed by President Ford on December 16, 1974.
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One Way to Look at the “Success” of the SDWA

Source: Roberson 2003

2001 Arsenic Rule
2001 Filter Backwash Recycling Rule
2006 GWR, Final LT2 and Stage 2 DBPR
2007-2008 RTCR negotiations
2010 proposed RTCR —final December 2012
## Progress in Filtration

<table>
<thead>
<tr>
<th>Cities</th>
<th>1974</th>
<th>2014/Beyond</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>Unfiltered</td>
<td>Croton Filt</td>
</tr>
<tr>
<td>San Fran</td>
<td>Unfiltered</td>
<td>UV, Unfilt</td>
</tr>
<tr>
<td>LA</td>
<td>Unfiltered</td>
<td>Direct Filt</td>
</tr>
<tr>
<td>Seattle</td>
<td>Unfiltered</td>
<td>Tolt Filt</td>
</tr>
<tr>
<td>Portland</td>
<td>Unfiltered</td>
<td>Unfiltered</td>
</tr>
</tbody>
</table>
Los Angeles Aqueduct Filtration Plant—LAAFP

• Completed 1986; $146 million
• World’s largest ozone-direct filtration facility: 600 mgd
• Preozonation combined with 13 gpm/ft² filtration rate
## Progress in Disinfection

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<tr>
<td>New York</td>
<td>Cl2</td>
<td>UV, Cl2</td>
</tr>
<tr>
<td>San Fran</td>
<td>Cl2</td>
<td>UV, O3, CLM</td>
</tr>
<tr>
<td>LA</td>
<td>Cl2</td>
<td>O3, UV, CLM</td>
</tr>
<tr>
<td>MWDSC</td>
<td>Cl2</td>
<td>O3, Perox, CLM</td>
</tr>
<tr>
<td>Seattle</td>
<td>Cl2</td>
<td>UV, O3, Cl2</td>
</tr>
<tr>
<td>Portland</td>
<td>Cl2, CLM</td>
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Microbial Drivers for Disinfection Changes

1908: Bacteria
1960s: Virus
1989: Giardia
2012: Cryptosporidium

Disinfection Methods:
- Cl₂/NH₂Cl
- O₃
- UV
Los Angeles, California

Los Angeles Aqueduct Filtration Plant

Ozone → Flocculation → Direct Filtration

Chlorine

Phase 1: 2014
- 650 mgd
- 600 mgd

Ammonia

Phase 2: 2019
- 600 mgd
- UV

LA Reservoir

Distribution System
## Progress Covering Reservoirs

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<tbody>
<tr>
<td>MWDSC</td>
<td>4 Uncov</td>
<td>4 Covered</td>
</tr>
<tr>
<td>MWRA</td>
<td>All Uncov</td>
<td>180 MG Cover</td>
</tr>
<tr>
<td>LADWP</td>
<td>All Uncov</td>
<td>Bird Balls/Treat</td>
</tr>
<tr>
<td>Seattle</td>
<td>8 Uncov</td>
<td>8 Covered</td>
</tr>
<tr>
<td>Syracuse</td>
<td>2 Uncov</td>
<td>2 UV Treat</td>
</tr>
<tr>
<td>Portland</td>
<td>5 Uncov</td>
<td>2020 Compliance</td>
</tr>
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Bird Balls and Covered Reservoirs
Progress in DBP Reduction

Substantial progress even by 1997

Statistics for Treatment Plant Effluents

- Median: NORS 41, ICR 28 (32% Reduction)
- P90: NORS 150, ICR 60 (60% Reduction)
MWDSC Ozone/PEROXONE

• Proposed in mid 1980s
• Implementation
  – Henry J. Mills WTP, 220 mgd: 2003
  – Joseph P. Jensen WTP, 750 mgd: 2005
  – Robert A. Skinner WTP, 630 mgd: 2010
  – F.E. Weymouth WTP, 520 mgd: 2016+

Collectively, these applications comprise the largest installation of ozone and PEROXONE in the world
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What Alternatives Can Result from a Mid-Life Crisis?

- Irresponsible Action
  - Flashy
  - Lots of media attention
  - Short term thrills
  - Really expensive

- Responsible Action
  - Reliable
  - Gets the job done
  - Sustainable for the future
Latest Regulatory Update Under the SDWA

- Perchlorate
- Hexavalent chromium
- cVOCs

- Regulate rocket fuel where there is no problem?
- Regulate Cr6 because of a movie?
- Seriously? Regulate a bunch of VOCs together? Seriously?
Projecting SDWA Regulatory Activity

- Draft the 4th, 6th or 30th Contaminant Candidate List (CCL30)???
- EPA perform 4th, 6th or 10th Regulatory Determination???
- Are we improving public health or killing a lot of trees (or silicon chips)
This is what the SDWA is not protecting us from

- Deaths from *Naegleria fowleri*
- Deaths from *Legionella pneumophila*
- Chemical spills that wipe out a system
SDWA is not protecting consumers from spills of chemicals we never heard of before
West Virginia Chemical Spill
January 9, 2014

- 4-Methylcyclohexane methanol (MCHM)
- Licorice odor
- Toxicity largely unknown, but data suggests low
- Safe limit: CDC and USEPA set 1 ppm—no one in Charleston believed it
- Licorice odor persisted
- OTC for experts = <0.15 ppb
Which Past Should the SDWA Follow Into the Future

**Past #1**
- Continue to regulate individual compounds at lower and lower concentrations until we get to the molecular level

**Past #2**
- Find guidance from our past that actually protects public health and does not bankrupt cities
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Prologue #1: Regulate to the Molecular Level

- California PHG for As and Cr\textsubscript{6} at 4 and 20 ppt, respectively
- Calif notification level for NDMA at 10 ppt
- PPCPs occur at parts-per-trillion

Mad Environmental Chemist
The Poster Child for ppt--Pharmaceuticals and Personal Care Products (PPCPs)

- Drugs of all kinds: ibuprofen to codeine
- Triclosan—antibacterial component in hundreds of consumer products
- Cosmetics
- Fire retardants used in clothing
- Caffeine
- Estrogen-like compounds cause feminization of fish
Prologue #2

- Regulate bugs that are actually killing people or making them ill
- Preserve the ability to use existing disinfectants under existing regulations
- Do not regulate NDMA for which drinking water is only 0.02% of the total daily oral intake for humans
Which Leads To:

• The Safe Drinking Water Act Amendments of 2016
Summary and Conclusions

• In the past 40 years, SDWA has resulted in a huge improvement in DW quality and safety
• The SDWA at 40 is having a mid-life crisis; must choose between two Prologues
• Prologue 1: Chase the last molecule of the last organic compound or metal
• Prologue 2: Continue supporting reasonable regulations that actually protect public health
  – Regulate pathogens that are killing people