Control of Infectious Diseases in Drinking Water

Morgan State University
Baltimore, MD
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U.S. Army Center for Health Promotion and Preventive Medicine
Water Supply Management Program
**Report Documentation Page**

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Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std Z39-18
Overview

• Introduction

• Pathogen Control
  – Source
  – Treatment
  – Distribution
  – Regulation
  – Water System Security

• Army Experience

• Wrap-up
Introduction

• The U.S. Army Center for Health Promotion and Preventive Medicine

• Water Supply Management Program
Introduction
Introduction
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Introduction

- Cholera outbreak Dec 2000
  - Ebeye Island
  - 103 defined cholera cases
  - 6 deaths
  - U.S. Army water system suspected
Introduction

- Suspected mode of transmission
- Underlying causes of outbreak
- Outbreak termination

- Drink mixes may protect against cholera

- Reference:
Pathogen Control

• Source Protection
• Treatment
  – Filtration
  – Disinfection
• Distribution Protection
• Regulatory Drivers
• Water System Security
Pathogen Control – Source

• Surface Water
  – Access control
  – Contaminant inventory
  – Wastewater discharge regulations
  – Intake location

• Groundwater
  – Well construction
  – Contaminant inventory
  – Delineate well recharge area
Pathogen Control - Treatment

- Physical Removal
  - Chemical coagulation, flocculation, sedimentation, and **filtration**
- Inactivation/Destruction
  - **Disinfection**

**LIFE**: Filtration and disinfection of drinking water is “probably the most significant public health advance of the millenium”
Pathogen Control - Treatment
Pathogen Control - Treatment

- Coagulation

Source: www.mastrrr.com
Pathogen Control - Treatment

• Flocculation

Pathogen Control - Treatment

• Sedimentation
Pathogen Control - Treatment

- Filtration
  - Slow rate
  - Rapid rate
  - Membrane
Pathogen Control - Treatment

- Disinfection
  - Chlorination
  - Chloramination
  - Chlorine dioxide
  - Ozone
  - Ultraviolet irradiation (UV)
Pathogen Control - Treatment
Pathogen Control - Distribution

- Backflow/backsiphonage protection
Pathogen Control - Distribution

- Storage tank O&M
- Flushing
Pathogen Control - Regulations

• Source protection
  – Source Water Assessment & Protection Program (SWAPP)
  – Wellhead Protection Program (WHPP)
  – Sole Source Aquifer Program (SSA)
Pathogen Control - Regulations

- Treatment & distribution
  - Total Coliform Rule (TCR)
    - Fecal contamination
  - Surface Water Treatment Rule (SWTR)
    - Giardia, Legionella, viruses
  - Interim Enhanced SWTR/Long-term 1 Enhanced SWTR (LT1ESWTR)
    - Cryptosporidium
  - LT2ESWTR
    - Cryptosporidium
Pathogen Control - Security

• Intentional biological contamination
• Distribution system vulnerability
  – Hydrants
  – Residences
  – Storage tanks
• Contaminants of concern
  – *Anthrax bacillus*
  – Botulinum toxin
  – *Cryptosporidium*
Pathogen Control - Security

• Fort Bliss, TX DEC 2003
• Two storage tanks discovered tampered during routine annual inspections
Army Experiences

- Army water system-related contamination events
  - *Mycobacterium* in hospital water supply
  - *Legionella* in building hot water supplies
  - Norwalk virus (suspected)
  - *E. coli* contamination without increased illnesses
Wrap-Up

QUESTIONS?