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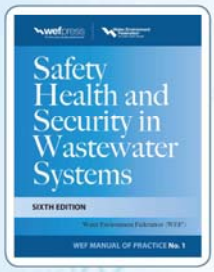

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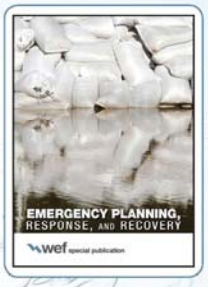

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Wastewater Worker Safety – Addressing Concerns on Ebola in Wastewater

Tuesday, November 4th, 2014

2:00 – 3:30 pm Eastern

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Wastewater Worker Safety – Addressing Concerns on Ebola in Wastewater

Welcome and Opening Remarks

Christopher Stacklin, P.E.

Chair, WEF Water Reuse Committee
Vice-Chair, WEF Government Affairs Committee, Regulatory Affairs Subcommittee
Orange County Sanitation District

WATER'S WORTH IT

CDC Guidance on Safety of Ebola and Sanitation Systems:

"Sanitary sewers may be used for the safe disposal of patient waste. Addition ... igestion, compos ... gned to inactiva ... mental Infection ... 14, CDC

"For equ ... he United States s ... aerobic digestio ... inactivate infectiou ... on, Transport, Testing, and Submission for Persons Under Investigation for Ebola Virus Disease in the United States, October 6, 2014, CDC

"Sanitary sewers may be used for the safe disposal of patient waste."

WATER'S WORTH IT

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Recap of Recent Meetings

10/07/2014

Ebola Facts for Wastewater Personnel

- Wastewater/Water Stakeholders
- EPA

10/16/2014

Water Sector Ebola Wastewater Update

- Wastewater/Water Stakeholders
- EPA + CDC

10/30/2014

Ebola To Wastewater: Invited Discussion Research Needs

- Wastewater/Water Stakeholders
- EPA + CDC

WATER'S WORTH IT

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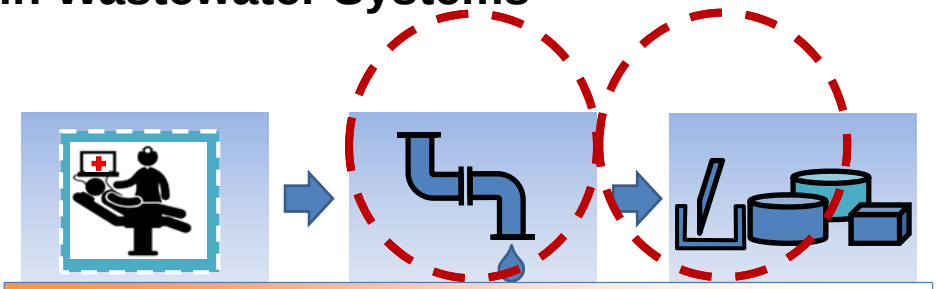
Potential Pathways for Ebola Exposure in Wastewater Systems



Public and Environment

WATER'S WORTH IT

Water Environment Federation

Wastewater Worker Safety – Addressing Concerns on Ebola in Wastewater

Moderator

Tim Williams

Senior Director of Government Affairs for the Water Environment Federation

WATER'S WORTH IT

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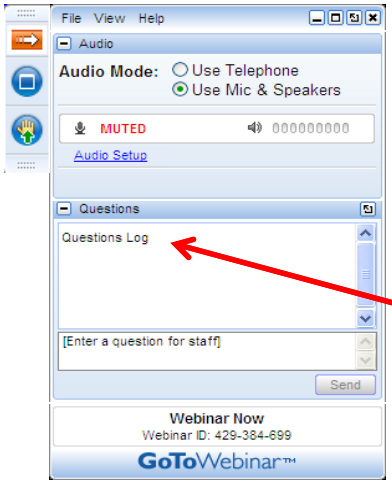
How to Participate Today



- **Audio Modes**
  - Listen using Mic & Speakers
  - Or, select "Use Telephone" and dial the conference (please remember long distance phone charges apply).
- **Submit your questions using the Questions pane.**
- **A recording will be available for replay shortly after this webcast.**

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WERF

Ebola and Sewage and Wastewater

Matthew J Arduino, MS, DrPH, FSHEA, RM (NRCM), M(ASCP)CM

Chief, Clinical and Environmental Microbiology Branch
Division of Healthcare Quality Promotion
Centers For Disease Control and Prevention

The findings and conclusions in this presentation are those of the author and do not represent the official position of the Centers for Disease Control and Prevention

National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion

Ebola

- **Family Filoviridae: enveloped single stranded negative sense RNA viruses**
- **Genera: *Cuevavirus, Ebolavirus, Marburgvirus***
- **Species: *Bundibugyo ebolavirus, Reston ebolavirus, Sudan ebolavirus, Taï Forest ebolavirus*, and *Zaire ebolavirus***

Ebola Virus Disease

- Incubation Period: 2 - 21 days
- Symptoms: fever, severe headache, muscle pain, weakness, diarrhea, vomiting, abdominal (stomach) pain, unexplained hemorrhage (bleeding or bruising)
- Transmission: only after appearance of symptoms; In US would be direct contact with patient or their blood body fluids (other potentially infectious fluids)

At Risk Population in the United States

- Healthcare workers in hospitals treating a case
- Healthcare workers returning from providing care in affected countries of West Africa

Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus

5 Is it safe for Ebola patients to use the bathroom?

Yes. Sanitary sewers may be used for the safe disposal of patient waste (WHO, 2014). Additionally, sewage handling processes in the United States are designed to inactivate infectious agents.

http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html

Recommendations From WHO, 2014

- **Waste, such as faeces, urine and vomit, and liquid waste from washing, can be disposed of in the sanitary sewer or pit latrine.**
- **No further treatment is necessary**

WHO. Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola, 2014 (http://www.who.int/csr/resources/publications/ebola/filovirus_infection_control/en/)

Microbial Resistance to Physical and Chemical Methods for Inactivation

Resistant

- Prions (eg., CJD, nvCJD)
- Bacterial Endospores (eg., Bacillus, Clostridium)
- Coccidia (eg., Cryptospridia)
- Mycobacteria
- Nonlipid or small viruses (eg., polio, Norovirus)
- Fungi
- Vegetative bacteria
- Lipid or medium sized viruses (eg. Ebola, HCV, HIV, HBV)

Susceptible

Adapted from: Rutala WA, Weber DA, Healthcare Infection Control Practices Advisory Committee. Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008 (http://www.cdc.gov/hicpac/Disinfection_Sterilization/toc.html)

Risk to Sewer and Wastewater Workers in the United States Is Low

- Only 9 cases
- One active case, in NYC
- Virus, even though 3 lab studies suggest virus can persist under certain controlled laboratory conditions
- Risk from other enveloped viruses is low

How do We Protect Sewage Workers

- **Use Appropriate PPE to protect against contact with human wastes**
  - Goggles or face shield: to protect eyes from splashes of untreated sewage
  - Face mask (e.g., surgical mask): to protect nose and mouth from splashes of human waste. If undertaking cleaning processes that generate aerosols, a NIOSH-approved N95 respirator should be used.
  - Impermeable or fluid-resistant coveralls: to keep untreated sewage off clothing
  - Waterproof gloves (such as rubber) to prevent exposure of hands to untreated sewage
  - Rubber boots: to prevent exposure of feet to untreated sewager

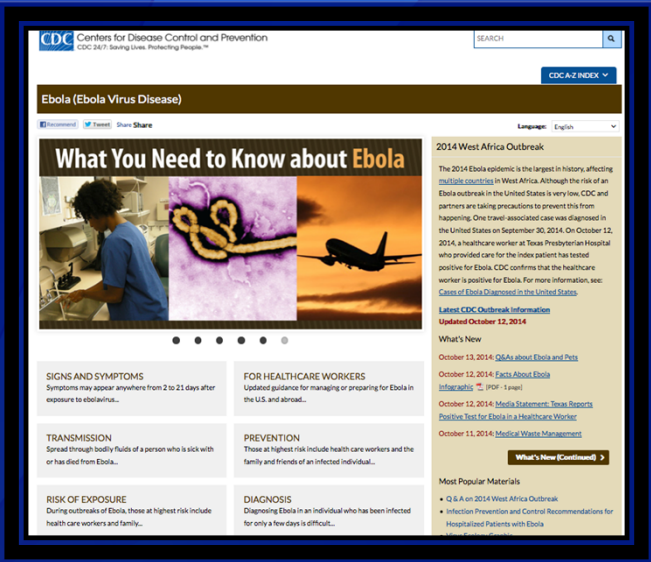
Basic Hygiene Practices

- **Wash skin with soap and water immediately after handling sewage, or any materials that have been in contact with sewage.**
- **Avoid touching face, mouth, eyes, nose, or open sores and cuts while handling sewage, or any materials that have been in contact with sewage.**
- **Wash your hands with soap and water before eating or drinking after you have handled sewage.**
- **Remove soiled work clothes and do not take home to launder. Launder clothing at work or use a uniform service.**
- **Eat in designated areas away from untreated sewage.**
- **Do not smoke or chew tobacco or gum while handling human waste or sewage, or any materials that have been in contact with sewage.**
- **Cover open sores, cuts, and wounds with clean, dry bandages.**

Treatment of Patient Wastes Prior to Discharge

- **Some utilities are requiring pre-treatment**
  - One hospital has used bleach
  - One has used a quaternary ammonium compound
- **Disinfection of waste**
  - No data on efficacy
  - Bleach may be a patient safety risk because of chemical fumes
- **Use of camping toilet with solidifier**
  - Disposal with other solid Ebola-Associated waste

Lowe JJ, et al. Nebraska Biocontainment Unit perspective on disposal of Ebola medical waste. *AJIC* 2014; Article in Press (http://www.ajicjournal.org/pb/assets/raw/Health%20Advance/journals/ymic/YMIC_3269.pdf)



http://www.cdc.gov/vhf/ebola/index.html

WERF/WEF Invited Experts Discussion on Ebola in Wastewater – *What are the Research Needs?*

November 4th, 2014

Lawrence P. Jaworski, P.E., BCEE
Interim Executive Director
Water Environment Research Foundation

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Ebola Research Needs: WERF/WEF Expert Panel

Naoko Munakata
Chair, WEF Disinfection & Public Health Committee
Sanitation Districts of Los Angeles County

Research Needs Basis: WERF/WEF Panel Discussion

Research Needs: Overview

- Efficacy of disinfectants against Ebola
- Survival of Ebola in human wastes and environmental matrices
- Transmission risk

Photo credit: CDC

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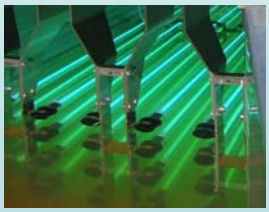
Efficacy of Disinfectants: Dose-Response Data

- Various disinfectants: chloramines, free chlorine, UV, ozone, PAA, chlorine dioxide, heat, detergents, alkali



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Efficacy of Disinfectants: Dose-Response Data

- Various disinfectants: chloramines, free chlorine, UV, ozone, PAA, chlorine dioxide, heat, detergents, alkali
- Doses relevant to multiple applications: hospitals, drinking/reuse/wastewater
- Effect of waste characteristics: solids, temperature, etc.

Ebola Survival

- Human waste
- Water/wastewater treatment
  - Sewer to reuse or receiving water
  - Source water to drinking water

Photo credit, clarifier: Annabel, Wikimedia Commons.

Additional Recommendations for Disinfectant/Survival Research

- Identify surrogates and test in parallel with Ebola
- Use culture-based methods to evaluate Ebola survival, not molecular methods

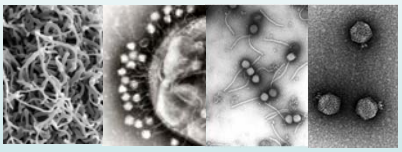


Photo credits, L-R, top-bottom: NIAID; Dr. Graham Beard; Vincent Fischetti and Raymond Schuch, The Rockefeller Institute; Sherwood Casjens and Elaine Lenk; Wikimedia Commons.

Transmission Risk

- Dose-response data on infectivity
- Characterization of risk sources
  - Virus production/shedding by patients
- Evaluating risk pathways
  - Sewers: e.g., staff, public risk from overflows
  - Aerosols: low risk or essentially zero?
  - Treatment plants
- Correlation between survival and transmission risk

Research Initiatives

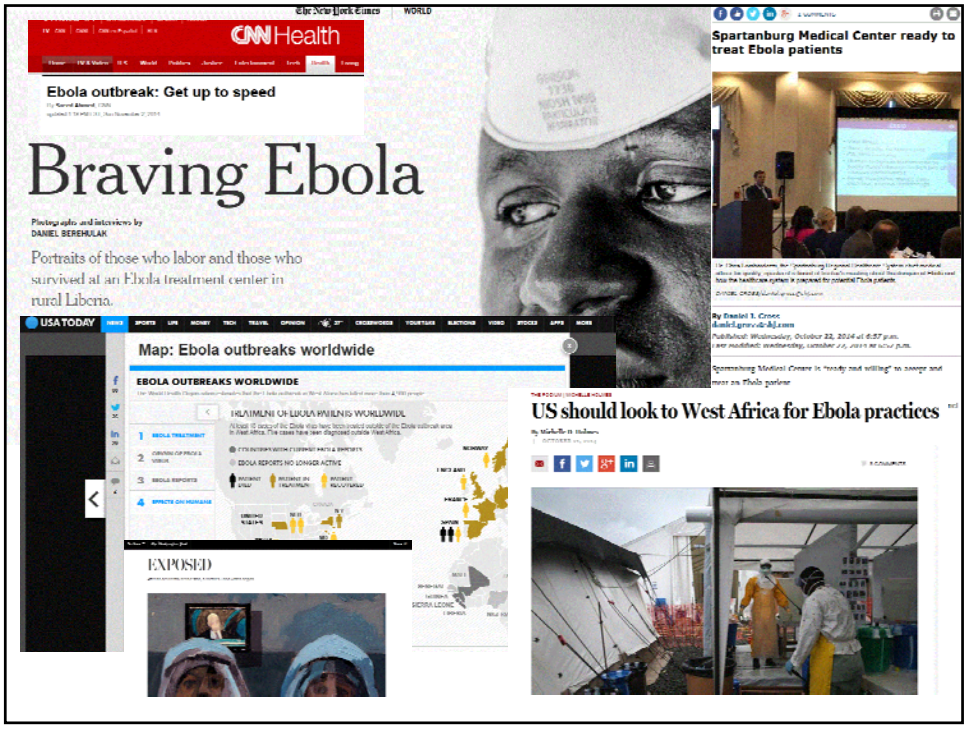
- Fort Detrick: starting research on Ebola survival in feces, urine, etc.
- RAPID program: seeking proposals to model and understand the spread of Ebola

Sanitation and Personal Protective Practices for Wastewater Personnel

Sue G. Schneider, *CEO*
John W. Westcott, *Special Projects Manager*

Spartanburg Water

Spartanburg, South Carolina



Ebola Knowledge Base

Not surprisingly, much of available information is focused to clinicians and clinical settings or to the general public. Guidance from one source sometimes conflicts with guidance from another. There is also a great deal of information of uncertain quality out there.

What do we (think we) know about Ebola?

- Lipid sheathed RNA
- ~.08 μm diameter x .97 – 14 μm length, sometimes branched
- Adapted to relatively high ionic strength environment
- Susceptible to hospital disinfectants including bleach (hypochlorite)
- Survival in fresh water on the order of minutes
- Survival on hard surfaces on the order of hours
- Survival in body fluids could be days
- No airborne transmission
- No waterborne transmission
- Direct contact transmission (including droplet transmission)
- Wastewater treatment likely inactivates Ebola as it does other pathogens
- Contact with eyes, nose, mouth, broken skin, accidental ingestion are high risk for transmission

What do we (think we) need to know about Ebola?

- Survival in raw sewage having higher ionic strength than fresh water ?
- Survival on hard surfaces covered with organic matter and biofilm ?
- Survival in body fluid contaminated debris (wipes, dressings, feminine hygiene products, etc.) that can provide shielding from environmental effects ?
- How does sewage content affect efficacy of disinfectants ?
- What are highest probability sources ? Hospitals ? Clinics ? Homes of infected persons ?

Can't wait for answers, so conservative assumptions are needed

- Utility workers in sewer collection system are potentially at risk from exposure to the Ebola virus
- Highest potential risk source would be hospital treating Ebola patients
- Contact with body fluid contaminated debris (wipes, dressings, feminine hygiene products, etc.) that can provide shielding from environmental effects /disinfection present highest risk
- Contact with hard surfaces and materials coating them also present a risk
- Risk from splash / immersion in waste water via eyes, nose, mouth, broken skin
- PPE decisions can be made based on physical characteristics of the virus, just as they can for many physical and chemical hazards.
- PPE cannot increase hazard (e.g. heat stress, loss of mobility)
- PPE selection must address other hazards as well (chemical, mechanical, electrical safety, etc.)

Hazard	PPE options
Splash to face	Goggles, face shield, enhanced face shield (seals to face and includes particulate respirator)
Hand protection	Impermeable gloves (latex, nitrile) plus mechanical protection (leather glove) or heavy butyl rubber glove. Is there a spec ?
Splash to body	Disposable Tyvek suit, Tyvek boot covers. Tyvek breathes, i.e. has openings or pores in the fabric structure
Immersion (standing water)	Coated Tyvek (Tychem QC) suit, waterproof boots (dielectric boots ?), waders
Accidental ingestion	Good hygiene practices

More questions

- Can we define risk levels based on whether or not hospitals are actually treating patients with Ebola ?
- Can we define a time of travel from the probable source as a risk boundary ?
- Do we need to change our disposal practices for materials removed from traps, pump stations, etc. ?
- Do we need a process for disinfecting equipment (e.g. pumps) removed for maintenance ?
- Do we need to disinfect PPE before employee removes it ?
- Do sewer overflows present a risk to public health from Ebola ?

Moderated Questions and Answers

Moderator
Lola Olabode, M.P.H.
Program Director for the
Water Environment Research Foundation

Closing Remarks

Thank you for attending today's webcast!

The recording will be available on both WEF and WERF's websites within 24 hours.

For any CDC Ebola training-related requests, please email eocevent100@cdc.gov.

WERF has also set-up a LinkedIn information forum on Pathogens Removal during Wastewater Treatment.