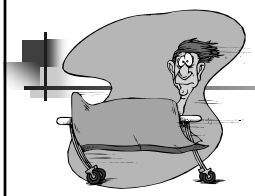
Clostridium difficile: Update



Dr. Michelle Alfa Ph.D, FCCM
Diagnostic Services of Manitoba
St. Boniface General Hospital Site

Hosted by Paul Webber
paul@webbertraining.com

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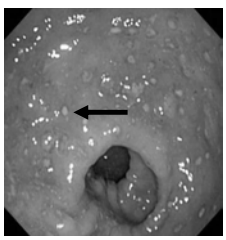
Overview:

- ***Clostridium difficile; unique characteristics***
- ***Environmental issues***
- ***Toilets, commodes and bedpans***
- ***Bedpan washers***

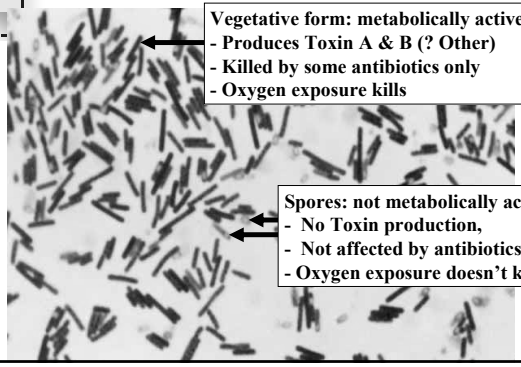
Clostridium difficile - associated diarrhea (CDAD)

Multi-hit Disease:
- Toxigenic *C.difficile*
- Imbalance in normal GI flora
- Host factors

Disease range:
- asymptomatic carriage
- diarrhea; colitis
- PMC (pseudomembranous colitis)
- Toxic Megacolon (surgical emergency)



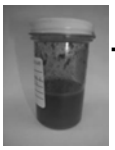
C.difficile: Vegetative vs Spore



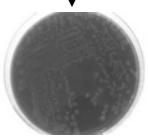
Vegetative form: metabolically active
- Produces Toxin A & B (? Other)
- Killed by some antibiotics only
- Oxygen exposure kills

Spores: not metabolically active
- No Toxin production,
- Not affected by antibiotics
- Oxygen exposure doesn't kill

Spores versus Vegetative form of *C.difficile*



Culture for *C.difficile* from Stool specimens:
Alcohol or Heat Shock:
kills all vegetative bacteria, spores survive and produce colonies on agar medium



CDMN culture of *C.difficile*

Impact of Spore characteristics

- **Alcohol hand hygiene**
  - CDC recommendations; soap and water
  - Alcohol does kill vegetative *C.difficile* but does NOT kill spores

- **Heat treatment**
  - Thermal decontamination: make item safe to handle and safe for next patient use

- **Disinfectant treatment:**
  - Often needs substantial contact time
  - Formulation (concentration) dependant

Provincial Infectious Disease Advisory Committee (PIDAC)

- Contact precautions
- Hand hygiene: soap and water
- Room cleaning (twice per day)
- If ongoing transmission→ consider hypochlorite (after routine cleaning)
- After 48 hours without diarrhea → may stop isolation precautions
- Do not perform "test of cure"

Evironmental Reservoirs of *C.difficile* Spores

- **Current guidelines (Health Canada):**
  - Clean with regular detergent
  - No need to use disinfectant
  - Emphasis on physical action
- **PIDAC (Ontario):**
  - Ongoing CDAD transmission→ consider hypochlorite use (after routine cleaning)
- **Bedpans: Thermal treatment**
  - Bedpan washers; 80°C for 1 min; ISO 15883
  - steam sterilization

Patient Room: Toilet

- **High frequency of spores in toilet environment of CDAD patients**
- Published Studies evaluating Bleach:
  1) Bleach: Has been accepted as effective intervention
  - however, 500 ppm to 1000 ppm not effective (1:10 dilution of 5% household bleach = 5000ppm)
  2) Wilcox 2005; Suboptimal conc of cleaners and disinfectants may stimulate spore production
  3) Wilcox J. Hosp Infect 2003: 1000 ppm concluded bleach effective – but data did NOT show any difference in environmental load of spores
- Lab tests: 5000 ppm bleach effective at killing *C.difficile* spores rapidly (within 1-2 minutes).
- Bleach at 5000 ppm; fumes →workplace hazard

Summary: Bleach

- Used in Quebec outbreak;
  - workplace safety issues
  - thought to be helpful
- Published Data → not convincing
- Recent study suggests CDAD outbreaks can be controlled without use of bleach
  (Tomiczek Healthcare Quarterly 2006)

Accelerated H_2O_2

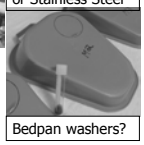
- Effective against *Clostridium difficile* spores:
  - 7% formulation; 10 minutes
- What is optimal formulation?
- Workplace safety concerns for some formulations
- Tomiczek et al in Healthcare Quarterly 2006; used AHP rather than bleach

Toilets, Commodes and Bedpans: What to do??

Sprayer; aerosol issues

C.diff – Mobile!

Bedpans: Plastic or Stainless Steel



Bedpan washers?

Bedpan Reprocessing

- Patient use:
  - Who empties and cleans bedpan?
  - Is bedpan just rinsed with water?
  - Where does the bedpan get stored?
- After CDAD patient discharged:
  - does bedpan go to CPD for reprocessing and sterilization?

Ward Bedpan washers versus "sprayer and sluice"

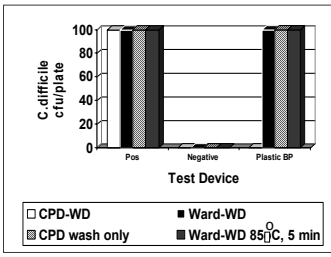
- Aerosols; sprayer and sluice major problem
- Is Bedpan wash cycle adequate to eliminate *C.difficile*?

Each site (circle) on bedpan was inoculated with ~ 1,000 to 10,000 spores in fecal material and dried O/N.

Determine residual viable spores by sampling with Rodac plate (CDMN agar)

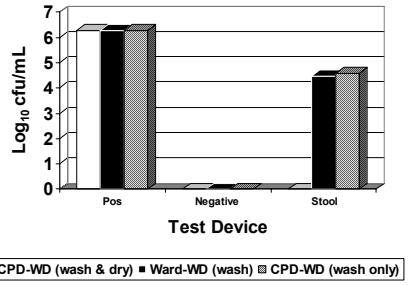
Bedpan washer efficacy data

- **Current standard: Visibly clean**
- **Rodac samples of bedpans post-cycle (plastic vs stainless steel)**

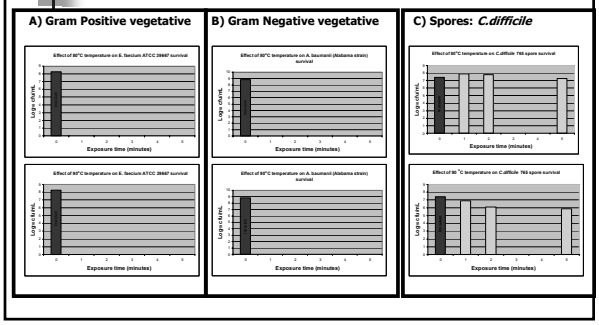


NOTE: CPD-WD Dry cycle was 116°C for 7 mins

C.difficile in stool in sealed vial exposed to Bedpan washer cycle



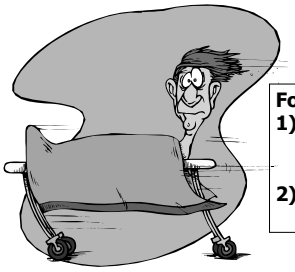
Thermal Treatment: Efficacy of spore killing



Summary:

- *C.difficile* spores: reservoir for transmission
- Bleach; rapid killing of *C.difficile* spores
  ? efficacy on wards, workplace safety issues
- AHP; need more ward data, formulation dependant, some concentrations workplace safety issues
- Bedpan washers;
  - reduces aerosols
  - ? thermal conditions re: *C.difficile* spores
  - ISO 15883 3recommends; 80°C 1 minute, manufacturer's compliant – no sporicidal claims

C.difficile in Healthcare Environment is a "Moving Target"!



Focus on:
1) "Religious" Attention to Housekeeping Cleaning Compliance
2) "Fecal Patrol"→ Bedpans, commodes, toilets

References:

1. ISO 15883-3 Washer-disinfectors; Requirements and tests for washer-disinfectors employing thermal disinfection for human waste containers. ISO 15883-3:2006 International Standards Association publishers, Geneva, Switzerland.
2. Perez et al Activity of selected oxidizing microbicides against the spores of *C.difficile*: relevance to environmental control. Am J Infect Control 2005;33:320-5.
3. Tomiczek A et al Enhancing patient ssafety through the management of *C.difficile* at Toronto East General Hospital. Healthcare Quarterly 2006;9:50-53.
4. Best Practices Document for the Management of *C.difficile* in all Health Care Settings. Provincial Infectious Diseases Advisory Committee (PIDAC) May 2006
5. Wilcox MH et al. Comparison of the effect of detergent versus hypochlorite cleaning on environmental contamination and incidence of *C.difficile* infection. J Hosp Infect 2003;54:109-114.
6. Activity of selected oxidizing microbicides against the spores of *C.difficile*: Relevance to environmental control. Am J Infect Control 2005;33:320-5.

2007 Teleclass Schedule

January
9 - *The UK Infection Prevalence Survey*, Chris Perry, UK
18 - *Personal Hygiene Measures to Prevent Influenza Transmission*, Dr. Elaine Larson, USA
25 - *Twenty First Century Plagues*, Prof. Robert Pratt, UK

February
8 - *Influenza – Of Poultry, Pets and People*, Dr. Corrie Brown, USA
15 - *Fresh Produce and Human Pathogenicity*, Prof. Keith Warriner, Canada
21 - *Infection Control in the Endoscopy Clinic*, Dr. Richard Everts, New Zealand
22 - *Best Practice for Hospital Construction Management*, Andrew Streifel, USA

March
6 - *Tuberculosis in the Modern Age*, Evonne Curran, UK
8 - *Voices of CHICA*, CHICA-Canada Board & Guests
22 - *A Year of Cleaner, Safer Care - A Worldwide Experience*, Dr. Didier Pittet, Switzerland
29 - *Environmental Control Strategies for C. diff*, Dr. Lynne Sehulster, USA

April
12 - *Who's Afraid of the CIC Exam?*, Sheila MacDonald & Sharon Krystofiak
19 - *Bacterial Resistance to Biocides in the Healthcare Environment*, Dr. Jean Yves Maillard, UK
25 - *Making IC Really Work - Managing the Human Factor*, Prof. Seto Wing Hong, China
26 - *Environmental Surveillance for Infection Control*, Andrew Streifel, USA

May
8 - *Panton-Valentine Leucocidin Producing Staph. aureus*, Brenda Dale & Adam Brown, UK
10 - *Infection Control in the Dialysis Clinic*, Dr. Charmaine Lok, Canada
17 - *Ethics of Care During a Pandemic Crisis*, Dr. Eric Wasylenko, Canada
24 - *Importance of Vaccination Among Dialysis Patients*, Dr. Matthew Arduino, USA
31 - *Evaluation and Management of Outbreaks in Nursing Homes*, Dr. Chesley Richards, USA

June
7 - *Infection Control in the Living and the Dead: The Angola Marburg Outbreak*, Dr. Adriano Duse, South Africa
20 - *Central Venous Lines and Prevention of Infection*, Dr. Steve Chambers, New Zealand

July
3 - *Implementing Innovations in Health Services*, Clare Allen, UK
26 - *CDC Guideline Review - Disinfection & Sterilization*, Dr. Bill Rutala, USA

August
9 - *Outcome Surveillance and Process Surveillance to Minimize Nosocomial Infection*, Dr. Victor Rosenthal, Argentina
22 - *ESBLs - Where Are We Now?*, Dr. Fong Chiew, New Zealand

September
20 - *Extreme Makeover: Exploring New Challenges to Our Identity in Infection Control*, Gwyneth Meyers, Canada
27 - *Ethical Issues in Infection Control*, Dr. Loreen Herwaldt, USA

October
4 - *Green Cleaning Strategies for Healthcare*, Dr. Lynne Sehulster, USA
10 - *Infection Prevention Among Refugees*, Dr. Mark Birch, Australia
18 - *Hot Issues in Hand Hygiene Improvement - The First Global Challenge*, Julie Storr, Switzerland

November
6 - *Commissioning Infection Control Strategy*, Yvonne Sawbridge, UK
8 - *Hazard Vulnerability Analysis for Infection Control*, Andrew Streifel, USA
15 - *An Approach to Outbreak Management- Using Biostats to Clobber Bugs*, Dr. Dick Zoutman, Canada
29 - *Effective Infection Control Promotion in 3-to-5 Steps*, Allen Soden, USA

December
13 - *Water Quality Issues Pertaining to Medical Device Reprocessing*, Dr. Michelle Alfa, Canada