**Overview:**

- **Clostridium difficile**
- Diseases caused
- Spore: role in transmission
- Community exposure
- Spore issues in Healthcare

**Overview:**

**Clostridium difficile**

- Asymptomatic carriage
- Disease occurs in Large bowel:
  - Asymptomatic carriage
  - Diarrhea; Colitis
  - PMC (pseudomembranous colitis)
  - Toxic megacolon
    (surgical emergency)
  - Recurrence: ~ 25% of CDAD cases

**Overview:**

- Clostridium difficile associated disease (CDAD)
- Disease of the large bowel
- Multi-hit Disease:
  - Ingestion of toxigenic *C. difficile*
  - Imbalance in normal GI flora
  - Overgrowth of toxigenic *C. difficile*
  - Host factors?
  - Recurrence: Post antibiotics
  - GI flora not re-established
  - Role of humoral/mucosal immunity?

**Overview:**

- 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

- Not all *C. difficile* strains carry genes for Toxin production

**Overview:**

- Pictures from Google Images

**Overview:**

- Approximately 5%
  (up to 20% in hospitalized adults)

**Overview:**

- Up to 50 – 70%

**Overview:**

- Pictures from Google Images

**Overview:**

- December 16, 2010

**Overview:**

- Dr. Michelle Alfa, FCCM
  - Medical Director Microbiology, DSM
  - Principal Investigator, SBRC
  - St. Boniface Hospital, Winnipeg
**Clostridium difficile** – The Sinister Spore Saga  
Dr. Michelle Alfa,  
Sponsored by 3M (www.3m.com)

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**Clostridium difficile** spores in CDAD patient stools

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**CDAD: Nosocomial & Community**

- **Manitoba:** 
  - (CDAD is Reportable)  
  - More cases of CDAD per year (2009: 700/yr)  
  - Versus:  
  - ALL other bacterial enteric pathogens combined (2009: 497/yr)  
  - CPL Website data for 2009 reportable organisms  

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**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: 80°C for 1 min and cooking do NOT kill spores  

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

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**Spore Issues in Healthcare:**  
Reservoir for nosocomial spread

- Bedpan reprocessing: Ward bedpan washer disinfectors  
- Environmental Cleaning: Bathrooms  
- Outbreaks: alternatives to bleach

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Healthcare Bedpan Sprayers

Aerosolization of fecal material major concern when bedpan sprayers used

Ward Bedpan washer/disinfectors

- Various manufacturers
- Installed on ward
- Flushes toilet paper, fecal and urine waste
- Cleans reusable bedpans, urinals etc
- Thermal disinfection
- Bedpan/urinal once processed are provided to next patient

Simulated-use Testing for C. difficile post cleaning of Bedpans

Bedpans inoculated with sterile faeces; C. difficile spores (~ 4 Log_{10}/100 µL)
Sealed vial of sterile faeces; C. difficile spores (~ 4 Log_{10}/100 µL)

Determine level of C. difficile before and after cleaning in Ward BP WD and CPD WD

Thermal killing of bacteria

A) Gram Positive vegetative
B) Gram Negative vegetative
C) Spores: C. difficile


Ward Bedpan Washer:

Routine bedpan cycle
No detergent or Routine detergent
Thermal: 85°C for 1 min

Routine bedpan cycle
Alkaline Detergent, Thermal: 85°C for 1 min

Ensure cycle validated for C. difficile

Healthcare Environmental cleaning: What are the issues?

- Role of Housekeeping: Front line in the Battle of the Bugs!
- Audit tools other than “visually clean”
- Alternative to bleach for C. difficile eradication?
**UV Marker Audits:**
Impact of Feedback on Compliance

**Summary of Key Spore Issues:**
- **CDAD:**
  - Spores in food chain (30% community acquisition)
  - Spores in healthcare environment → reservoir
- **Spore characteristics**
  - Resistant to: thermal killing [90°C for 10 min], alcohol, cleaning agents and disinfectants
- **Healthcare Spore Issues:**
  - Ward Bedpan washers: ensure validated cycle
  - Hand hygiene: ensure soap & water
  - Housekeeping: ensure cleaning compliance [audit tools]
  - Bleach alternative: OxivirTB results in significantly lower *C. difficile* spore levels in toilets of patients with CDAD

**Use of Oxivir**
_Accelerated Hydrogen Peroxide_ as a bleach alternative

**What you can’t see............ Can hurt you!**

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