

Clostridium difficile infections (CDI) surveillance in Colorado

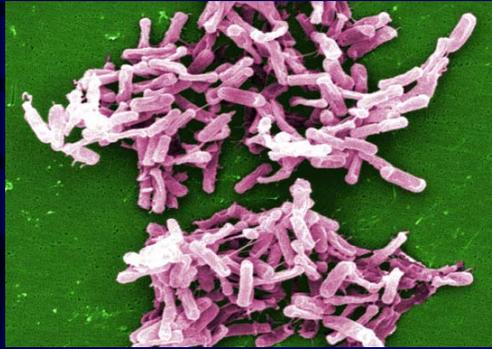
Kelly R. Kast, MSPH

Objectives

- Review changing CDI epidemiology
- Understand CDI surveillance
- Discuss prevention strategies



Clostridium difficile infections



<http://phil.cdc.gov>, image #9999

Background: *Clostridium difficile*

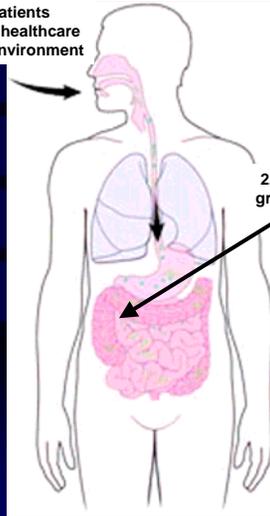


<http://phil.cdc.gov>, image #3647

- Anaerobic, spore-forming, gram positive bacillus
- Toxigenic and nontoxigenic
- Causes illness ranging from nuisance diarrhea to life-threatening colitis.

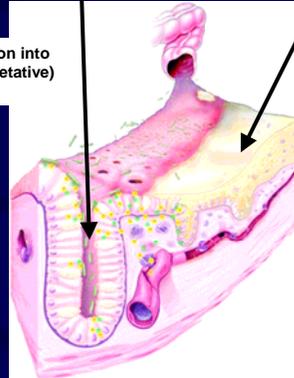
Background: Pathogenesis of CDI

1. Ingestion of spores transmitted from other patients via the hands of healthcare personnel and environment



3. Altered lower intestine flora (due to antimicrobial use) allows proliferation of *C. difficile* in colon

2. Germination into growing (vegetative) form



4. Toxin A & B Production leads to colon damage +/- pseudomembrane

Sunenshine et al. Cleve Clin J Med. 2006;73:187-97.

Changing epidemiology of CDI

- Increasing incidence
- Increasing disease severity
- Emergence of epidemic strain
- Changing populations at risk



CDI Surveillance

Disease surveillance

- is the ongoing systematic collection, analysis, and interpretation of health data ... and the application of these data to prevent and control [disease]. (CDC 1986)

CDI surveillance



EIP surveillance sites: CA, CT, CO, GA, MD, MN, NM, NY, OR, TN

- Began as part of the Emerging Infections Program in 2009
- Objectives:
 1. Detect, investigate, and monitor emerging pathogens.
 2. Integrate laboratory science and epidemiology.
 3. Enhance communication.
 4. Strengthen local, state, and federal public health infrastructures.

CDI surveillance, cont.

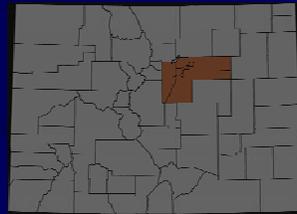
- In Colorado, active, population-based laboratory surveillance among residents Adams, Arapahoe, Denver, Douglas, and Jefferson counties



- Objectives:
 - Determine the incidence of CDI
 - Describe the epidemiology and clinical characteristics of CDI
 - Characterize *C. difficile* strains

CDI surveillance objectives

- Determine the incidence of CDI
- Describe the epidemiology and clinical characteristics of CDI
- Characterize *C. difficile* strains



Determining CDI incidence

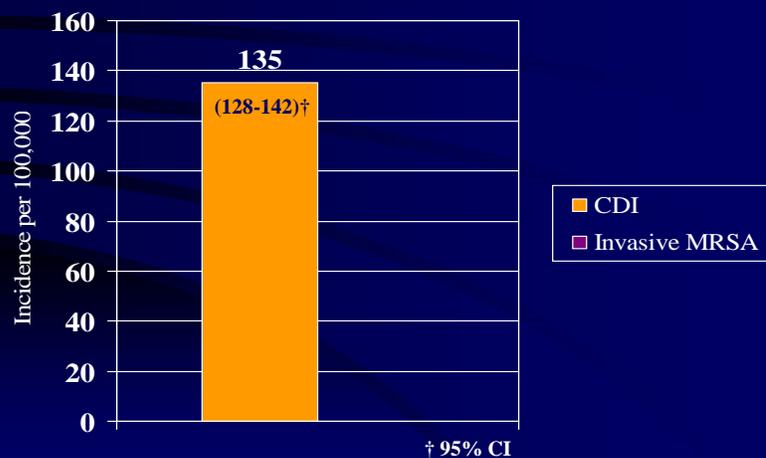
- Notifiable condition, April 2008
- Laboratory reportable
- Objective is to provide population estimates for incidence by age, sex, gender and race

CDI case definition

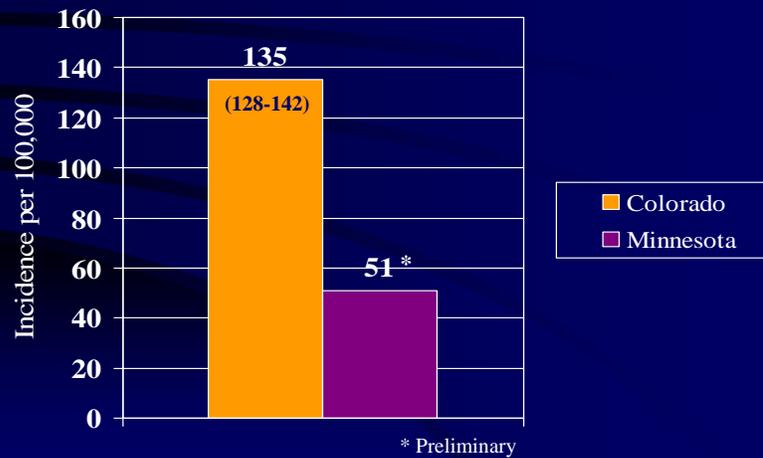
- Incident toxin-positive test
 - Incident: > 8 weeks from last positive
 - Duplicate: < 2 weeks from last positive
 - Recurrent: between 2 and 8 weeks from last positive
- Patient age > 12 months
- Resident of 5-county Denver metropolitan area (Adams, Arapahoe, Denver, Douglas and Jefferson counties)



Overall preliminary CDI incidence, CO 2009

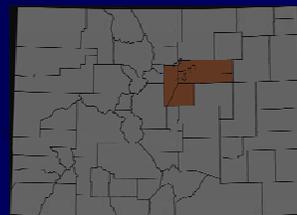


Overall preliminary CDI incidence, Colorado and Minnesota 2009



CDI surveillance objectives

- Determine the incidence of CDI
- **Describe the epidemiology and clinical characteristics of CDI**
- Characterize *C. difficile* strains



Describing the clinical characteristics

- Contact health care provider to assess severity, underlying conditions, some medications, previous overnight hospital stays, and the like
- Complete standard form
- Conduct patient interviews

Epidemiological and clinical characteristics

- Where did the patient acquire the CDI?
 - Contact with health care facilities for care
 - Procedure history
 - Visiting, volunteering, working at health care facilities
 - Children
 - Household members who had contact with a health care facility or had diarrhea
 - Animal contact (pets and other)
 - Travel
 - Food

Epidemiological and clinical characteristics - Food

- Are the *C. difficile* strains in the food chain the same as those causing human illness?
- Are there different types of retail food products associated with human subtypes?
- What is the prevalence of *C. difficile* in retail meat products?

Epidemiological and clinical characteristics - Food

- Concern that food animals may act as reservoirs for pathogenic *Clostridium difficile*
 - Songer et al. 2004
 - Field study of 253 diarrheic calves, 64 (25%) positive for *C. difficile*
 - Of 33 randomly selected isolates, 31 yielded Ribotype 078
 - Rodriguez-Palacios et al. 2007
 - Convenient sample of 60 retail meat packages
 - 12/60 (20%) positive for *C. difficile*
 - Susceptible to metronidazole: resistant to levofloxacin
 - Songer et al. 2009
 - 37/88 (42%) positive samples from retail meat packages.
 - All strains associated with human illness
- Studies highlight need for enhanced surveillance

Epidemiological and clinical characteristics - Food

- Using the FoodNet/NARMS Retail Food Surveillance sample packages of

- Chicken breasts
- Ground turkey
- Ground beef
- Pork chops



- Objectives

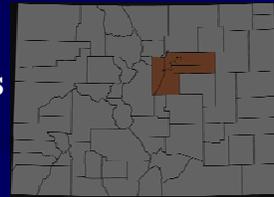
- Conduct a survey of retail meats in FoodNet sites to determine the prevalence of *C. difficile*
- Characterize the antimicrobial susceptibility and virulence properties of isolates obtained from retail meats
- Compare isolates obtained from retail meat samples with isolates from humans and food-producing animals

Epidemiological and clinical information – Risk factors

- What are other risk factors for acquiring CDI?
 - Antibiotic use
 - Acid-reducing medications
 - Laxatives
 - Anti-diarrheal drugs
 - Anti-inflammatory drugs (NSAIDS)
 - Underlying conditions
 - Race or ethnicity
 - Age

CDI surveillance objectives

- Determine the incidence of CDI
- Describe the epidemiology and clinical characteristics of CDI
- **Characterize *C. difficile* strains**



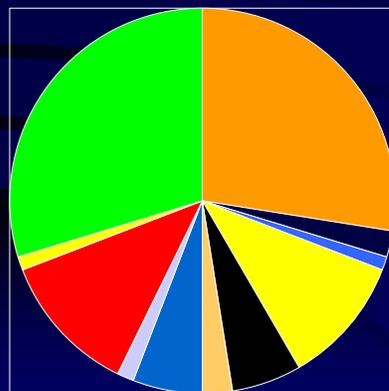
Strain characterization

- Objective is to describe microbiologic characteristics of public health relevance.

Strain characterization

- 6 participating laboratories in Colorado
- Assessing:
 - PFGE type
 - Toxinotype
 - Presence of binary toxin
 - Presence of tcdC deletion

PFGE types of 88 Colorado *C. difficile* isolates, Dec 2009 – May 2010



- NAP1
- NAP1-related
- NAP2
- NAP4
- NAP7
- NAP8
- NAP9
- NAP10
- NAP11
- NAP12
- unnamed

Prevention strategies

Based on CDI Toolkit slides developed by:

Carolyn Gould, MD MSCR

Cliff McDonald, MD, FACP

Division of Healthcare Quality Promotion

Centers for Disease Control and Prevention

http://www.cdc.gov/hai/pdfs/toolkits/CDItoolkitwhite_clearance_edits.pdf

Prevention Strategies

- **Core Strategies**
 - High levels of scientific evidence
 - Demonstrated feasibility
- **Supplemental Strategies**
 - Some scientific evidence
 - Variable levels of feasibility

Core prevention strategies

- Contact Precautions for duration of diarrhea
- Hand hygiene in compliance with CDC/WHO
- Cleaning and disinfection of equipment and environment



http://www.cdc.gov/ncidod/dhqp/id_CdiffFAQ_HCP.html
Dubberke et al. Infect Control Hosp Epidemiol 2008;29:S81-92.

Core prevention strategies, cont.

- Laboratory-based alert system for immediate notification of positive test results
- Educate about CDI: HCP, housekeeping, administration, patients, families



http://www.cdc.gov/ncidod/dhqp/id_CdiffFAQ_HCP.html
Dubberke et al. Infect Control Hosp Epidemiol 2008;29:S81-92.

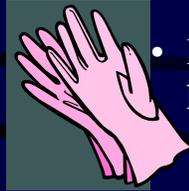
Supplemental prevention strategies

- Extend use of Contact Precautions beyond duration of diarrhea (e.g., 48 hours)
- Presumptive isolation for symptomatic patients pending confirmation of CDI
- Evaluate and optimize testing for CDI
- Implement soap and water for hand hygiene before exiting room of a patient with CDI

Supplemental Prevention Strategies: Hand Hygiene Methods

Since spores may be difficult to remove from hands even with hand washing, adherence to glove use, and Contact Precautions in general, should be emphasized for preventing *C. difficile* transmission via the hands of healthcare personnel

Supplemental prevention strategies, cont.



- Implement universal glove use on units with high CDI rates
- Use sodium hypochlorite (bleach) – containing agents for environmental cleaning
- Implement an antimicrobial stewardship program

Summary of Prevention Measures

Core Measures

- Contact Precautions for duration of illness
- Hand hygiene in compliance with CDC/WHO
- Cleaning and disinfection of equipment and environment
- Laboratory-based alert system
- CDI surveillance
- Education

Supplemental Measures

- Prolonged duration of Contact Precautions
- Presumptive isolation
- Evaluate and optimize testing
- Soap and water for HH upon exiting CDI room
- Universal glove use on units with high CDI rates
- Bleach for environmental disinfection
- Antimicrobial stewardship program

Other resources



- Educational materials: http://www.cdc.gov/ncidod/dhqp/id/Cdiff/ed_mater.html
- Additional tools available for evaluating adherence to precautions, environmental cleaning and the like.

Acknowledgements

- Reporting laboratories
- Hospital infection preventionists
- Countless outpatient and LTC providers
- PI: Wendy Bamberg, MD
- Consultant: Connie Savor Price, MD
- MPH interns: Ashley Grajczyk and Rosine Angbanzan
- Previous interns: Helen Johnston and Blessing Wazara

Discussion

Kelly R. Kast, MSPH

Kelly.kast@state.co.us

303-692-2459