

*Clostridium difficile* infections  
(CDI) surveillance in Colorado

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# Objectives

- Describe CDI and its symptoms
- Discuss why we care
- Discuss surveillance
- Understand prevention measures



# *Clostridium difficile* infections (CDI)



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

# CDI: What is *Clostridium difficile*?



[www.cdifff-support.co.uk](http://www.cdifff-support.co.uk)

- Gram positive bacillus
- Anaerobic
- Spore-forming
- Toxigenic and nontoxigenic

# CDI: What is it?

# CDI: Symptoms

## Common symptoms

- Watery diarrhea (3 or more times a day)
- Mild abdominal cramping and tenderness

## Severe symptoms

- Diarrhea 10 to 15 times/day
- Abdominal cramping and pain
- Fever
- Blood or pus in stool
- Nausea
- Dehydration
- Loss of appetite
- Weight loss

# CDI: Severe outcomes

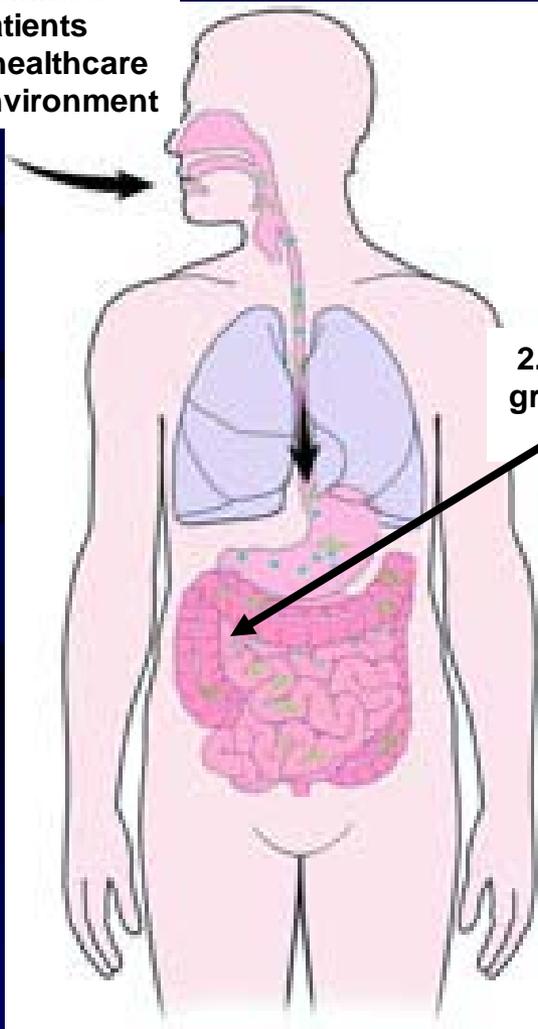
- Disease recurrence
- Inflammation of the colon  
(pseudomembranous colitis)
- Toxic megacolon
- Colectomy
- Death

# CDI: Who is at risk?

- Antibiotic use
- Acquisition of *C. difficile*
- Advanced age
- Medications that suppress the immune system
- Underlying illness
- Tube feeds

# CDI: Pathogenesis

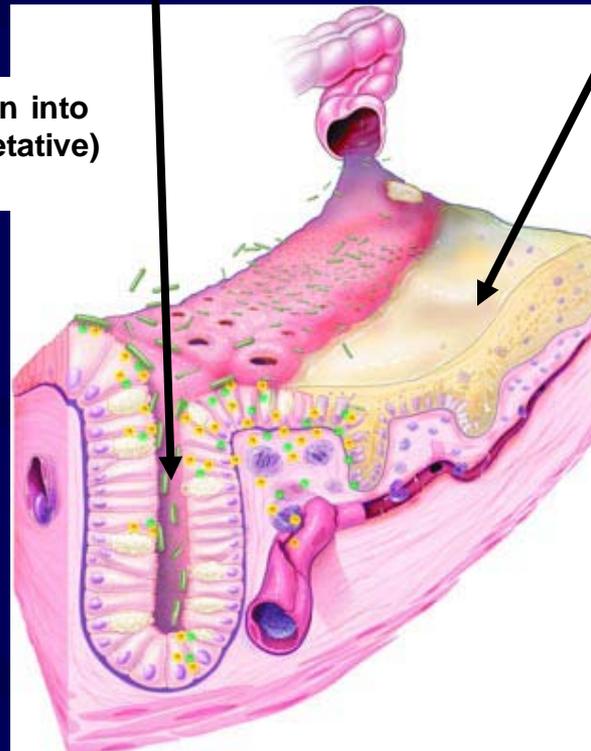
1. Ingestion of spores transmitted from other patients via the hands of healthcare personnel and environment



2. Germination into growing (vegetative) form

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

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



Why do we care?

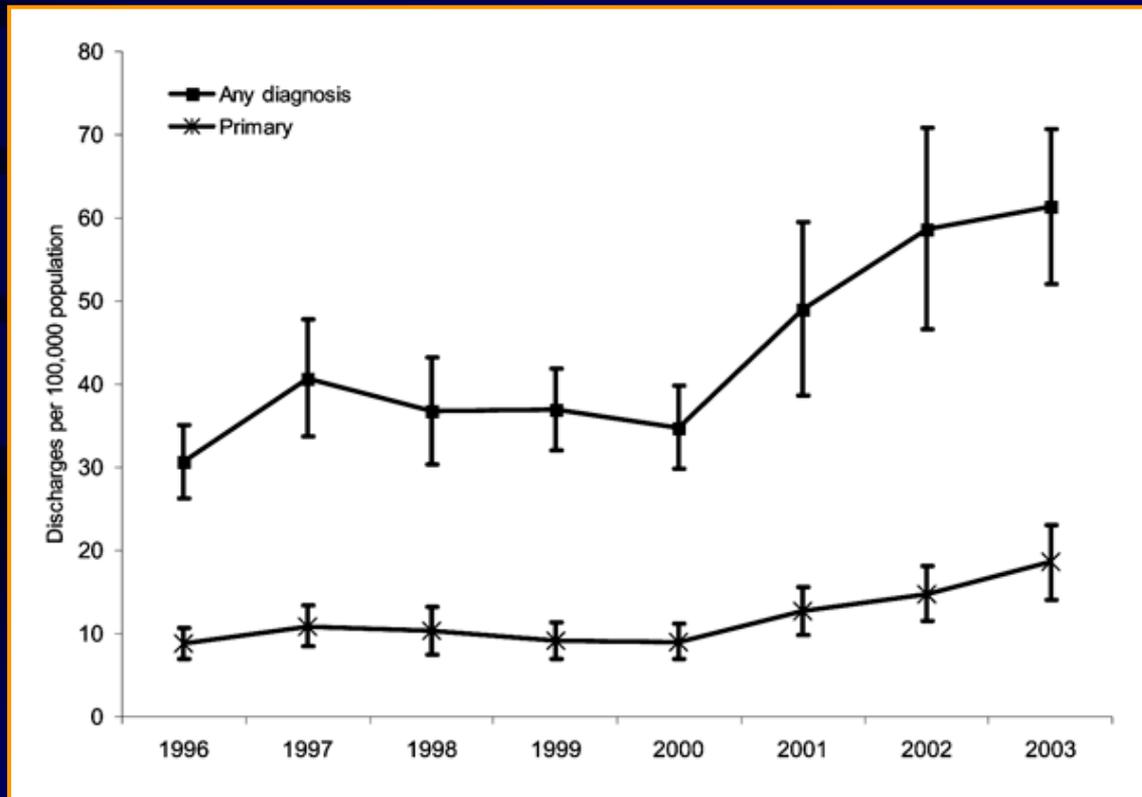
# Why do we care?

- More people getting it



# Why do we care: Increasing incidence of CDI

## *C. difficile* hospitalizations, NHDS, 1997 - 2003



McDonald LC, et al. *Emerg Infect Dis.* 2006;12:409-415

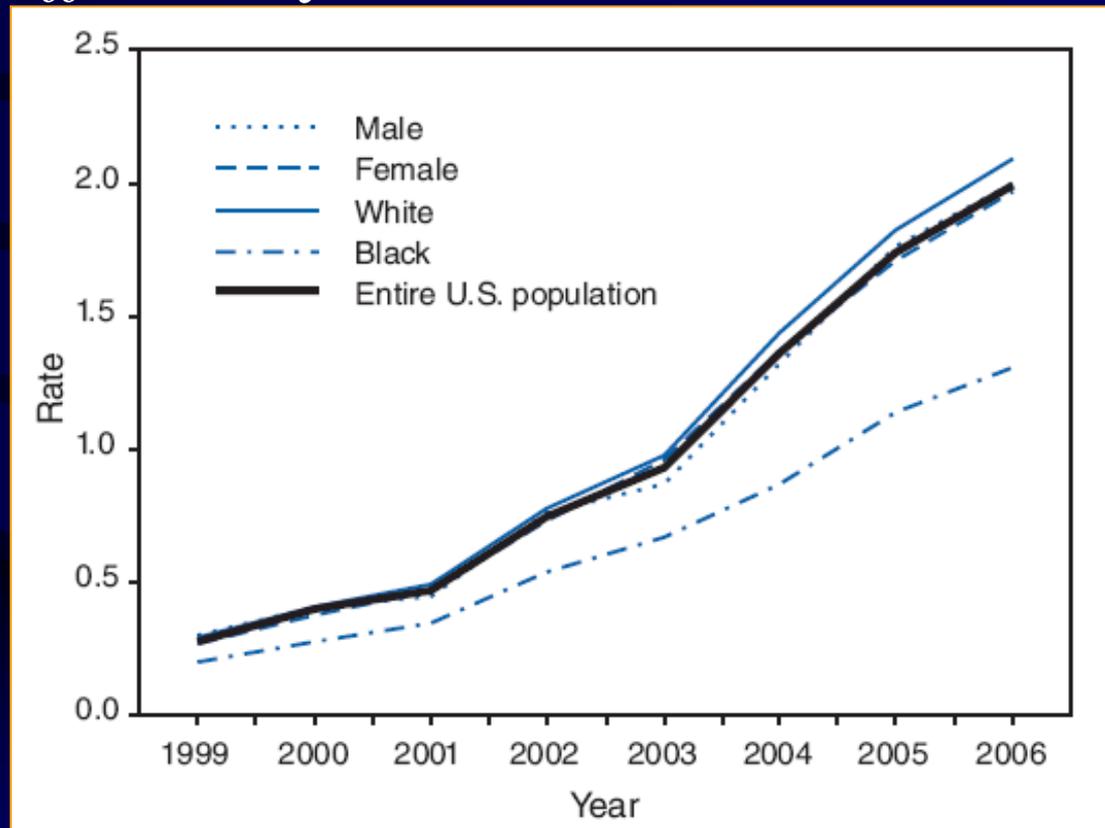
# Why do we care?

- More people getting it
- More people dying from it



# Why do we care: Increasing severity

Age-adjusted death rate per 100,000 for enterocolitis due to *C. difficile*, by race and sex, US, 1999-2006



Heron et al. Natl Vital Stat Rep 2009;57(14).  
Available at [http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57\\_14.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_14.pdf)

# Why do we care?

- More people getting it
- More people dying from it
- The bacterium is changing



[www.bbc.co.uk](http://www.bbc.co.uk)

# Why do we care?

- More people getting it
- More people dying from it
- The bacterium is changing
- Changing populations at risk



# Why do we care: Case report

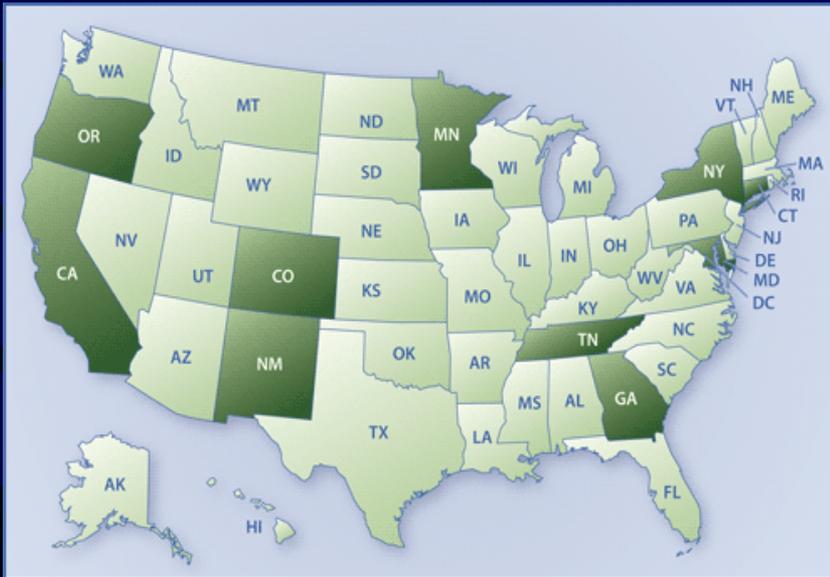
- 39 year old male
- Presents at the ER with bloody diarrhea and fever that began 2 weeks prior
- Treated in ER and released
- Risk factors – recent antibiotic use for sinus infection, no other contact with health care facility in preceding 3 months
- When we talked with patient 2 months after ER visit, diarrhea was continuing.

# 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



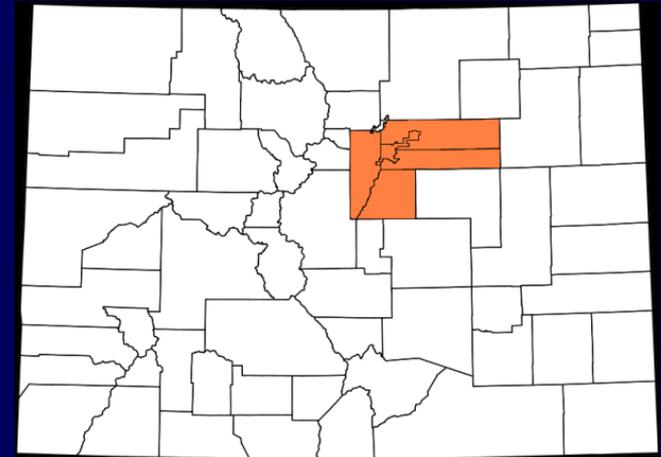
- Began as part of the Emerging Infections Program in 2009
- EIP surveillance sites: CA, CT, CO, GA, MD, MN, NM, NY, OR, TN

# CDI surveillance: Objectives

- Determine the incidence of CDI by age, sex, gender and race
- Describe the epidemiology and clinical characteristics of CDI
- Characterize *C. difficile* strains

# CDI surveillance: Identifying new cases

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



# CDI surveillance: Understanding risk factors

- 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

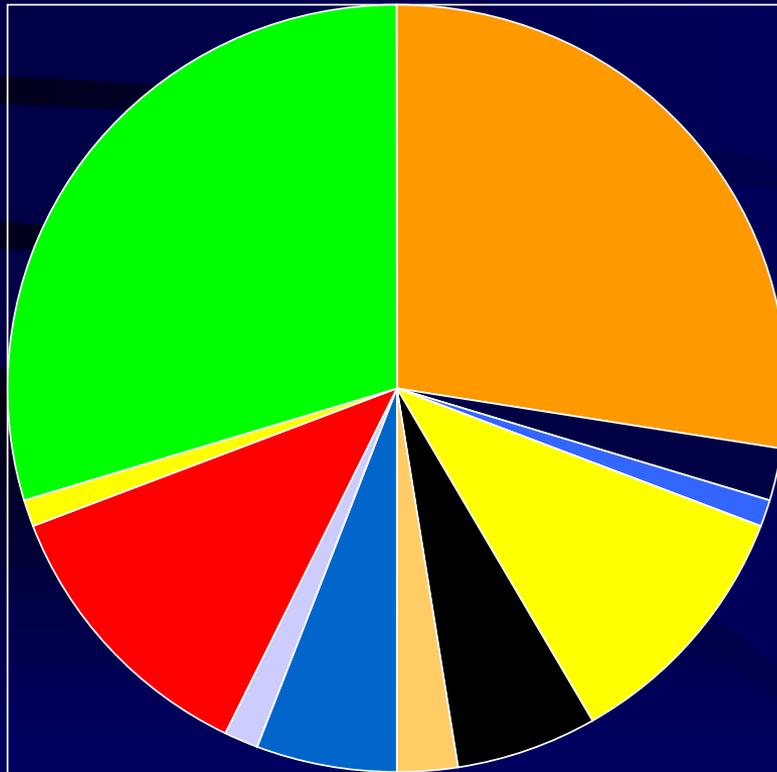
# CDI surveillance: Understanding risk factors

- 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: Strain characterization

- Objective is to describe microbiologic characteristics of public health relevance

# 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](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



# Core prevention strategies, cont.

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



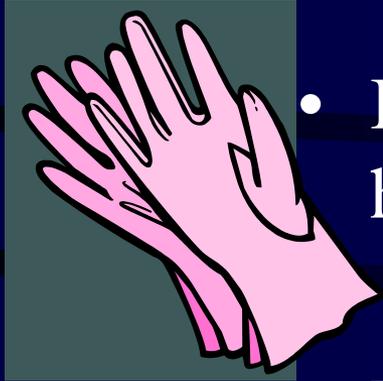
# Supplemental prevention strategies

- 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 bleach-containing agents for environmental cleaning
- Implement an antimicrobial stewardship program

# Summary of Prevention Measures

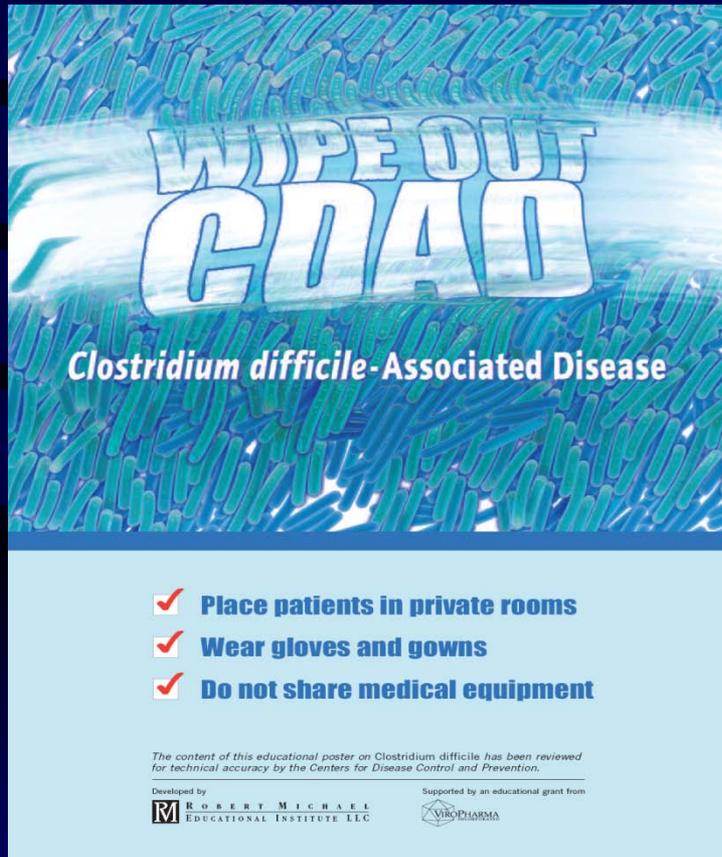
## Core Measures

- 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](http://www.cdc.gov/ncidod/dhqp/id_Cdiff_ed_mater.html)
- Contact me for additional tools:
  - Evaluating adherence to precautions,
  - Environmental cleaning
  - Patient education

# Outbreaks

- When you are seeing CDI in more residents than expected:
  - Report the outbreak to local or state public health (303-692-2700)
  - Review your adherence to core prevention strategies
  - Implement supplemental strategies
  - Ask for assistance when needed

# Acknowledgements

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

# Discussion

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303-692-2459