Fire and Feces: *Cryptosporidium parvum* Outbreak Associated with Fighting a Barn Fire — Indiana and Michigan, June 2011

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Michigan Epidemiology Conference
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- Indiana Department of Homeland Security called the Indiana State Department of Health (ISDH)
  - An Indiana fire station had substantial workforce absenteeism due to gastrointestinal illness
- ISDH contacted Michigan Department of Community Health (MDCH)
  - Reports of ill Michigan firefighters
  - Firefighters responded to a barn fire on June 6, 2011
  - One Indiana firefighter hospitalized and diagnosed with cryptosporidiosis
Cryptosporidiosis
“Crypto”

- Diarrheal disease caused by protozoan parasite, *Cryptosporidium*
- Lives in the intestine of humans and animals
- Shed in the stool
- Symptoms begin 2–10 (avg. 7) days after becoming infected
- Symptoms usually last about 1–2 weeks (range: few days–4+ weeks)
- Possible recurrence of symptoms after brief period of recovery before illness ends
Cryptosporidiosis

- **Outbreaks associated with**
  - Recreational waterparks
  - Municipal water
  - Exposure to livestock
  - Daycare settings

- **High risk populations**
  - Children under 2
  - Animal handlers
  - Travelers
  - MSM
  - HIV-infected persons

- **Complications**
  - Cholecystitis

![Cryptosporidium](http://knol.google.com/k/about-cryptosporidium#)
Outbreak Investigation

- **June 6, 2011 Barn Fire, Southern Michigan**
  - 34 firefighters: 3 Michigan, 1 Indiana fire station
  - Barn housed ~ 240 week-old calves
  - Water from local hydrant, on-site swimming pond

- **Retrospective Cohort Study**
  - Standardized telephone interviews
  - Clinical testing

- **Environmental Assessment**
  - Sampling of calves, pond water

Photo: Don Reid, Heather Jeffrey, The Daily Reporter
Retrospective Cohort Study

Case definition

- **Clinical case** = diarrhea or ≥4 other gastrointestinal symptoms within 12 days of exposure

- **Confirmed case** = clinical case with laboratory confirmation
  - *Cryptosporidium* organisms detected in stool, intestinal fluid, or tissue samples
  - Antigens in stool or intestinal fluid
  - Nucleic acid in stool, intestinal fluid, or tissue samples

- **Probable case** = clinical case with epidemiologic links but no laboratory confirmation
Retrospective Cohort Study

- **Results**
  - 33/34 (97%) firefighters interviewed
  - 2/5 positive stool samples from patients
  - 20 (61%) met the case definition
    - 3 confirmed, 17 probable
  - Median age: 33 (range: 21–58) years
  - Median exposure to illness onset: 5 (range: 2–10) days
  - Median illness duration: 4 (range 0.5–15) days
  - 9/20 (45%) sought medical care
Retrospective Cohort Study

No. of cases

Date of illness onset

- Michigan Fire Department 1
- Michigan Fire Department 2
- Michigan Fire Department 3
- Indiana Fire Department
- Confirmed Case

Barn fire

No. of cases:
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
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- 18
# Retrospective Cohort Study

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Environmental Assessment

Photo: Google Maps
Environmental Assessment
Environmental Assessment

Photos: Karen Griffith, BHSJ
Environmental Assessment

Calves = Positive for *Cryptosporidium parvum* and *Giardia duodenalis*
Environmental Assessment
Environmental Assessment

Photos: Karen Griffith, BHSJ
Swimming pond = positive for Cryptosporidium parvum and Giardia duodenalis
Summary

- **Positive Cryptosporidium Testing**
  - 3 human stool specimens
    - 1 from hospitalized patient
    - 2 from cohort study
  - 10/25 calf fecal samples
  - Swimming pond water

- **Epidemiologic Evidence**
  - Cases statistically more likely to have had direct calf contact
  - Exposure to drinking cooler water and being on the Indiana fire department were associated with illness
  - Pond water contact was not statistically significant
    - Not a question on the original questionnaire
Recommendations

- **Farm Owners**
  - Not to use the swimming pond for recreational use
  - Practice thorough hygiene to reduce fecal-oral exposures

- **Firefighters**
  - Decontaminate firefighting gear on-site
  - More thoroughly clean gear
  - Drink only bottled water and sports drinks

- **General Recommendations**
  - Practice good hygiene
    - Thorough hand washing
    - Not swimming when experiencing diarrhea
    - Minimizing contact with animal feces
  - Avoid contaminated food and water, especially when traveling
Discussion

- **Difficulty in Diagnosing Cryptosporidiosis**
  - Often an asymptomatic infection
  - Intermittently shed
  - Requires several stool samples
  - Not all hospitals have laboratory capacity
  - O&P tests may not include *Cryptosporidium* spp. testing

- **Infection Control**
  - *Cryptosporidium* is a chlorine-tolerant organism
  - Not readily inactivated by alcohol-based hand sanitizers
  - Hydrogen peroxide is more effective
  - Hand washing with soap and water
Conclusions

- Calf feces and pond water likely contributed to this first-ever reported cryptosporidiosis outbreak attributable to occupational exposure among firefighters
Acknowledgments

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  - Theresa Dearen

  - Jothikumar Narayanan
  - Amy Kahler
  - Jonathan Yoder
  - Jevon McFadden
  - Sheryl Lyss
  - Betsy Cadwell
Thank You!

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov      Web: www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
References

Extra Slides
Cryptosporidiosis

- Cryptosporidium parasites are worldwide
- Est. 748,000 cases of cryptosporidiosis occur each year in the United States
Common Symptoms

- Watery diarrhea
- Stomach cramps or pain
- Dehydration
- Nausea
- Vomiting
- Fever
- Weight loss
- General malaise
- Anorexia
Index Patient — June 15, 2011

- 21 year old male part-time firefighter
- Chief Complaint
  - Vomiting and diarrhea past 5 days
- Other Signs/Symptoms
  - Epigastric pain, weight loss
- Pertinent Medical History
  - Appendectomy 2 years previously
- Physical Exam Findings
  - Vitals within normal limits
  - Abdomen diffusely tender to palpation
Index Patient — Admission

- **Laboratory Testing**
  - Complete blood count – within normal limits
  - Liver function tests
    - Elevated aspartate transaminase (AST) 185 U/L (5–30)
    - Elevated alanine transaminase (ALT) 262 U/L (10–50)
  - Stool culture
    - Negative for *Salmonella, Shigella, Aeromonas, Pleisiomonas, Campylobacter, toxic E. Coli, Yersinia, and C. difficile*
    - Negative for antigens to *Cryptosporidium* and *Giardia*
  - Colonoscopy – terminal ileum inflammation
  - CT abdomen – mesenteric lymphadenopathy
  - Gallbladder US – unremarkable
Index Patient — Hospitalization

- **Laboratory Testing**
  - Additional stool testing
    - Positive *Clostridium difficile* Toxin A (confirmed 2x)
    - Positive antigens to *Cryptosporidium*
    - Hepatobiliary iminodiacetic acid scan (HIDA) scan – reduced gallbladder ejection fraction

- **Assessment**
  - Acalculous cholecystitis secondary to cryptosporidiosis

- **Treatment**
  - Supportive care/fluid therapy
  - Nitazoxanide for cryptosporidiosis
  - Metronidazole for C. diff colitis
  - Laproscopic cholecystectomy
Retrospective Cohort Study

No. of cases

Date of illness onset

Barn fire

Probable case
Confirmed case