Cryptosporidiosis
In the Line of Fire

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Initial Situation

- A fire occurred in Branch County in a barn housing around 240 one-week-old calves on June 6, 2011
- A malfunctioning generator started the fire, leaving the well inoperable
- Farmer rescued some calves before firefighters arrived on scene

Photo: Don Reid, Heather Jeffrey, The Daily Reporter

Firefighter Response

- 34 firefighters responded from 4 fire stations
  - Fire stations were located in Michigan (3) and Indiana (1).
- Some firefighters fought the fire
- Other firefighters rescued calves one-by-one

Photo: Karen Griffith, BHSJ

Photo: Don Reid, Heather Jeffrey, The Daily Reporter

Notification

- Twelve days after the event, a local Michigan firefighter called BHSJCHA on Saturday, June 18th
- Reported an Indiana firefighter was hospitalized & members of other responding fire departments were also ill
- On June 20th, the Indiana Department of Homeland Security notified Indiana State Department of Health (ISDH) of reported gastrointestinal illness in an Indiana fire station
  - All ill firefighters had responded to Michigan barn fire
- ISDH contacted the Michigan Department of Community Health (MDCH)

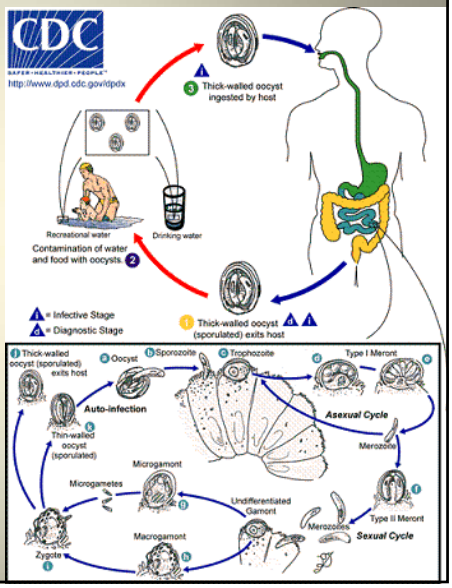
Cryptosporidiosis "Crypto"

- A diarrheal disease caused by the protozoan parasite, *Cryptosporidium*
- The parasite lives in the intestine of humans and animals and is shed in the stool
- Symptoms begin 2–10 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 ultimately ends

Photo: http://knol.google.com/k/about-cryptosporidium#

2009/2010 CDC Case Definition

- Clinical case: diarrhea (≥3 loose stools in 24h) or gastrointestinal illness (≥ 4 symptoms such as abdominal cramps, nausea, vomiting or fever) in a person within 12 days after exposure
- Confirmed case: a clinical case with *Cryptosporidium* organisms, antigen or nucleic acid detected in an appropriate specimen
- Probable case: a clinical case that lacked laboratory confirmation but was epi-linked to a confirmed case



Contributing Factors

Photo: Karen Griffith, BHSJ

- Nearby pond was the main source of water used to fight the fire & allow firefighters to cool themselves
- Local hydrant was also used as a water source

Contributing Factors

Photo: Karen Griffith, BHSJ

Photo: Don Reid, Heather Jeffrey, The Daily Reporter

- Firefighters carried or lead calves across a manure filled trench

Contributing Factors

- Firefighters wore heavy gear while working in very hot temperatures
- Food, cooler water, and bottled water were provided
  - Firefighters were unable to wash hands appropriately

Photo: Don Reid, Heather Jeffrey, The Daily Reporter

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Outbreak Location

Photo: Karen Griffith, BHSJ

Photo: Google Maps

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Outbreak Investigation (1)

- Through investigation, needed to identify additional ill individuals, assess possible risk factors, and guide implementation of control measures
- LHD worked with the individual fire departments to establish the contact list for on-scene firefighters
- LHD notified area EDs and providers to increase surveillance and testing
- LHD EH visited the farm on June 21st and were able to gather additional information on firefighter response and potential exposures

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Outbreak Investigation (2)

- A retrospective cohort study was initiated on June 22nd
  - Interview form included a question regarding other high-risk occupations, such as being a food handler, to control the potential for secondary transmission in the community
  - MDCH & LHD contacted all responding firefighters by telephone to administer the standardized questionnaire
- LHD contacted responding firefighters to request stool samples for those with recently reported gastrointestinal illness
- Environmental assessment was performed on June 27th that included sampling and testing to determine the source of the outbreak

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Media Involvement

- The LHD reported at the Board of Health meeting on June 23rd
- Media was present at both the barn fire response on June 6th and the Board of Health meeting
- Firefighters were upset that they could be identified

Articles in the Press

Quincy Barn Fire

Tuesday, June 07, 2011 6:31 a.m. EDT

QUINCY, MI (WTVB) - About 60 young calves died in a barn fire yesterday afternoon in Branch County's Quincy Township. Firefighters were able to rescue the other 180 calves that were

Firefighters sickened

Cryptosporidiosis contracted at barn fire

Photos Zoom

By Don Reid
Hillsdale Daily News
Posted Jun 27, 2011 @ 02:30 PM

Recommend Be the first of your friends to recommend this.

Quincy Township, Mich. — One f
was hospitalized and 19 others s
diarrhea after a June 6 barn fire

Business News

3 Things You Should Know About Small Business: April 18

Only 3 Cities Look Good for Home 'Flipping'

Branch-Hillsdale-St. Joseph Com
Health Agency (BHSJCHA) Healt
Steve Todd said one fireman, wh
health issues, was hospitalized a

LHD Coordination

- Investigation spanned two MI counties and went across the state border
- Coordinated with healthcare providers regarding symptom recognition, appropriate testing, and reporting
- Communication within outbreak team between two offices in the jurisdiction
  - Health alert team video conferencing kept all involved (CD+EH) for all three offices
  - Communication and video conferencing facilitates a smooth response to outbreaks
  - There was some difficulty communicating with outside partners because could only take 2 incoming calls; now there is a subscription for a phone conferencing service
- Coordination occurred between LHD and MDCH to determine who would administer questionnaires

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Coordination outside LHD

- Guidance was received from Regional Epidemiologist & MDCH in planning outbreak response and investigation
- MDCH coordinated with Indiana to obtain Indiana fire station roster and also administered the questionnaire to all Indiana firefighters
- CDC consulted on the terminal cleaning of firefighter gear and equipment
- Specimen collection and testing was coordinated with MDCH Laboratories, MSU, and CDC

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Human Specimen Testing

- Hospital lab performed antigen testing on one hospitalized fireman
- Other firefighters submitted specimens to LHD
  - Firefighters picked up specimen collection kits and dropped off specimens (total of 5 received)
  - Specimen stored in Cary-Blair, 10% formalin, PVA
  - Tests included an acid-fast stain, direct immunofluorescent stain and PCR (MDCH and CDC)

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Human Testing Concerns

- Difficulties in detecting *Cryptosporidium*:
  - Cryptosporidiosis is often an asymptomatic infection
  - Parasite is intermittently shed, requiring several stool samples
  - Not all hospitals have the laboratory capacity
  - Standard Ova and Parasite (O&P) tests may not include testing for *Cryptosporidium*

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Environmental Sampling

- Calf stool collection:
  - Twenty five samples collected in preservative free tubes tested via PCR at CDC
- Pond water sampling:
  - Two 20 L samples tested via fluorescence microscopy, PCR, & EPA Method 1623 at CDC & MSU
- Well water sampling (per request of family):
  - Two 20 L samples tested via fluorescence microscopy, PCR, & EPA Method 1623 at CDC & MSU
  - 0.2 L underwent bacterial testing at a local lab in Coldwater, MI

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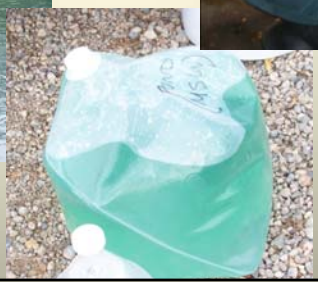
Collecting Site Samples



Photos: Karen Griffith, BHSJ

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Testing Results (1)

- Human specimens:
  - Hospitalized firefighter was antigen positive for *Cryptosporidium* spp. and was diagnosed with cryptosporidiosis-associated acute cholecystitis
  - Although immunocompetent, this individual was believed to have received an excess of the infectious dose as he fell into a manure pit while rescuing calves
  - 2/5 specimens collected at LHD were positive by PCR for *Cryptosporidium parvum*

http://www.dpd.cdc.gov/dpdx/html/imagelibrary/a-f/cryptosporidiosis/body_Cryptosporidiosis_il1.htm

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Testing Results (2)

- Calf stool samples:
  - 10/25 positive for *Cryptosporidium parvum*
  - 4/25 positive for *Giardia duodenalis*
- Pond water sampling:
  - *Cryptosporidium parvum* positive via CDC
  - *Cryptosporidium* & *Giardia* positive via MSU
- Well water sampling:
  - *Cryptosporidium & Giardia* negative via MSU & CDC
  - Non-*E. coli* bacteria (high concentrations) positive via Wastewater Treatment Laboratory, Coldwater, MI

Photos: Karen Griffith, BHSJ

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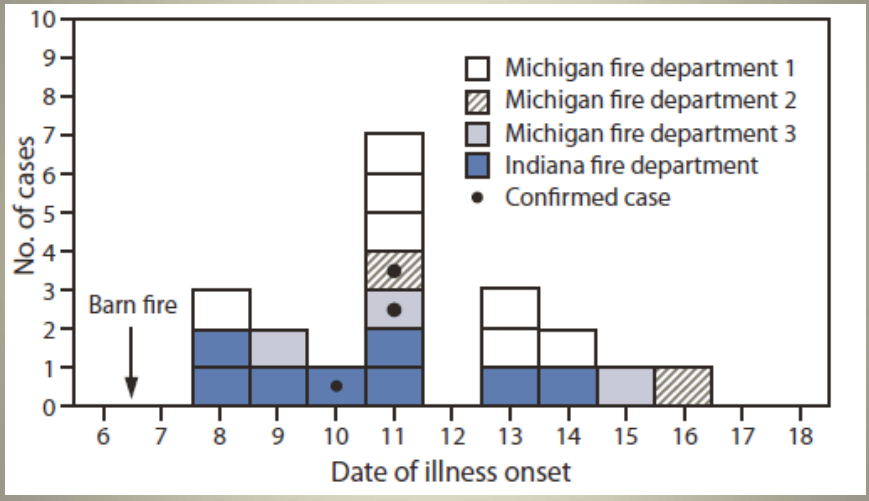
Retrospective Cohort Study Results

- Clinical case: diarrhea or gastrointestinal illness in a person within 12 days after fire response
- 33/34 firefighters completed the questionnaire
- 20/33 (61%) reported illness:
  - 3 confirmed (defined as a clinical case with *Cryptosporidium* organisms, antigen or nucleic acid detected in specimen)
  - 17 probable (a clinical case that lacked lab confirmation but was linked epidemiologically to a confirmed case)
  - Median age: 33 years (range: 21–58 years)
  - Median exposure to illness onset: 5 days (range: 2–10 days)
  - Median illness duration: 4 days (range 0.5–15 days)

Epi-Curve



Number of probable and confirmed cryptosporidiosis cases* among firefighters who responded to a barn fire, by date of illness onset and fire department — Indiana and Michigan, June 2011

Retrospective Cohort Study Results

	Exposed			Not Exposed					
Exposure	**Ill**	**Total**	**Ill (%)**	**Ill**	**Total**	**Ill (%)**	**Relative Risk**	**(95% CI)**	**p value**
Calves at farm	18	25	(72)	2	8	(25)	2.88	(1.04-12.76)	0.023
MI fire dept 1	7	11	(64)	13	22	(59)	1.08	(0.61-1.90)	1.000
MI fire dept 2	2	7	(29)	18	26	(69)	0.41	(0.12-1.37)	0.084
MI fire dept 3	3	6	(50)	17	27	(63)	0.79	(0.34-1.86)	0.659
IN fire dept	8	9	(89)	12	24	(50)	1.78	(1.12-2.82)	0.056
Drinking cooler water	13	18	(72)	5	12	(42)	1.73	(0.90-4.17)	0.100
Drinking bottled water	14	22	(64)	5	10	(50)	1.27	(0.68-2.92)	0.522
Drinking or other contact w/ pond water	5	9	(56)	1	6	(17)	3.33	(0.73-44.31)	0.182

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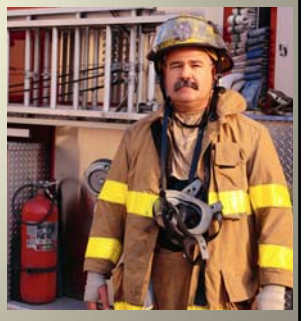
Controlling Transmission in Future Events

- LHD determined that firemen cared for their gear in their normal pattern
  - There was concern about grossly contaminated outer clothing, personal equipment, and vehicles
  - *Cryptosporidium* is a chlorine-tolerant organism that is not readily inactivated by alcohol-based hand sanitizers
- Consulted with the CDC for guidance regarding decontamination



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CDC Cleaning Recommendations

- Use soap and water to wash hands
- Clothing contaminated with feces: machine-wash and heat-dry on the highest heat setting for 30 minutes
- All non-machine washable items: clean with soap and water to remove gross fecal contamination, air-dry, and leave in the sun for at least 4 hours after drying
- For equipment that cannot be cleaned with soap and water or equipment that contacts the mouth: soak in 3% hydrogen peroxide for 20 minutes after consulting manufacturer guidelines

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Public Health Recommendations

- As a result of the epidemiologic study, laboratory reports and environmental assessment, recommendations included:
  - Farm owners:
    - Discontinue recreational swimming in the pond
    - Treat well water with chlorine; boil water for human consumption until declared safe
    - Practice hand hygiene to reduce fecal-oral exposures
  - Firefighters:
    - More thoroughly clean firefighting gear
    - Properly decontaminate firefighting equipment on-site
    - Drink only bottled water or sports drinks during response
- No additional cases associated with this exposure were reported

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Outbreak Reporting

- Reported to CDC via the National Outbreak Reporting System via the NORS 52.12 form for Waterborne Disease Transmission
  - "Both the pond water and direct animal contact are thought to have been the sources for this outbreak."

General

National Outbreak Reporting System

Waterborne Disease Transmission

This form is used to report waterborne disease outbreak investigations. This form has 6 parts, indicated by tabs at the top of each page. Part 1 asks for the minimum or basic information about the outbreak investigation. Part 2 asks for epidemiological data and clinical specimen test results. Parts 3, 4, 5 and 6 collect information about types of water exposure (treated recreational water, untreated recreational water, drinking water, and water not intended for drinking/unknown intent). Only 1 of these 4 water exposure parts should be completed for an outbreak investigation report.

CDC USE ONLY

CDC Report ID | State Report ID

Form Approved
OMB No. 0920-0004

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Outbreak Conclusions

- Calf feces and pond water likely contributed to this first-ever reported cryptosporidiosis outbreak attributable to occupational exposure among firefighters
- Firefighters, like other visitors to facilities housing livestock, are at potential risk for Cryptosporidiosis
- Investigation findings highlight the importance of public education regarding cryptosporidiosis prevention and control, in particular the importance of minimizing contact with animal feces, practicing thorough hygiene, and not drinking from untreated water sources

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MMWR Publication

Morbidity and Mortality Weekly Report

MMWR / March 9, 2012 / Vol. 61 / No. 9

Outbreak of Cryptosporidiosis Associated with a Firefighting Response — Indiana and Michigan, June 2011

On June 20, 2011, the Indiana Department of Homeland Security notified the Indiana State Department of Health (ISDH) of an Indiana fire station that reported gastrointestinal illness among a substantial percentage of their workers, causing missed workdays and one hospitalization as a result of cryptosporidiosis. All ill firefighters had responded to a barn fire in Michigan, 15 miles from the Michigan-Indiana border on June 6; responding firefighters from Michigan also had become ill. ISDH immediately contacted the Michigan Department of Community Health (MDCH) concerning this outbreak. The investigation was led by MDCH in partnership with ISDH and the Michigan local health department (LHD). Among 34 firefighters who responded to the fire, 33 were interviewed, and 20 (61%) reported gastrointestinal illness ≤12 days after

Beginning on June 22, MDCH and LHD interviewed firefighters using a standardized telephone questionnaire. Of 34 firefighters from all four fire stations, 33 (97%) completed the interview. Twenty (61%) of 33 study participants had illness meeting the probable (n = 17) or confirmed (n = 3) case definition (Figure). All patients were men; median age was 33 years (range: 21–58 years). Median time from exposure to illness onset was 5 days (range: 2–10 days). Common symptoms included diarrhea (n = 20 [100%]), abdominal cramps (n = 15 [75%]), fatigue (n = 11 [55%]), gas/bloating (n = 11 [55%]), nausea (n = 10 [50%]), and weight loss (n = 10 [50%]). Among 17 (85%) patients whose symptoms had resolved before interview, median illness duration was 4 days (range: 0.5–15 days). Nine (45%) ill firefighters sought medical care; six submitted stool

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Questions

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