A laboratory-associated outbreak of Cryptosporidiosis: biosafety intervention and corrective actions

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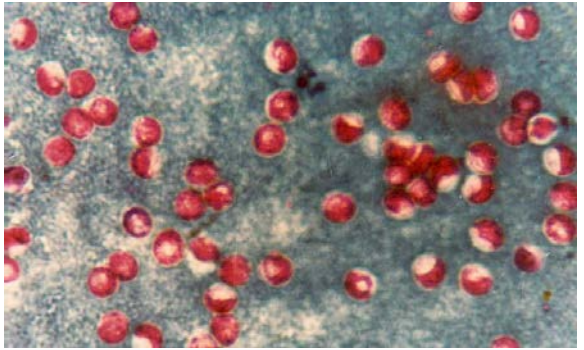
Properties of *Cryptosporidium* spp.

- Zoonotic protozoan parasites that can complete lifecycle in a single host.
- Common in many animals; transmitted by fecal / oral cycle.
- Is an occupational hazard for veterinarians and other persons with animal contact.

Cryptosporidium spp.



- Infectious stage is the oocyst.
- Infectious dose for humans:
  - 1-10 oocysts ingested.
- Oocysts are extremely resistant to chemical disinfectants.

Cryptosporidium in calves

- Over 90% of dairies in U.S. are infected; usually causes clinical disease in calves.
  - One infected calf sheds approximately 10^{10} oocysts / day.
- Most common way that veterinarians become infected.

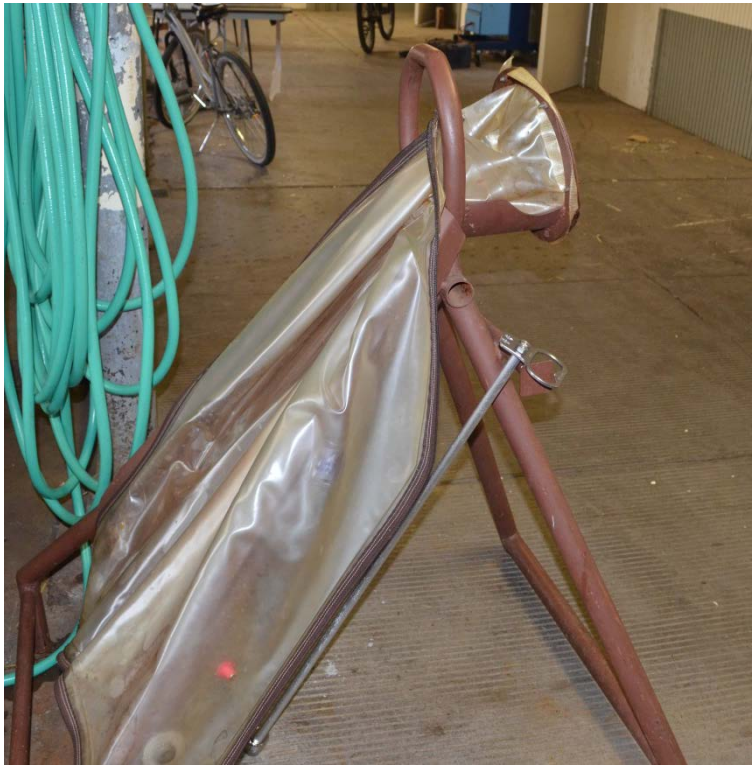
Images courtesy of Dr. Anthony Knight, Colorado State University

Outbreak Background

- Oregon State University is a Land-Grant university with significant agricultural programs and a College of Veterinary Medicine.
- Outbreak occurred among 3rd year veterinary students in 2011.

Obstetrics Laboratory

- Students practice difficult birth manipulations using euthanized dairy calves and “synthetic bovine uterus,” or “mock cow.”



Obstetrics Laboratory

- Newborn calves (1 week) obtained from two dairies, euthanized and placed in mock cow.
- Students reach into mock cow and manipulate the calves, attempt to extract them.
- Students also practice fetotomy.

Things that went wrong

- Calves obtained from both dairies were infected.
- Personal Protective Equipment (PPE) was not sufficient to prevent exposures.
  - Faculty did not enforce the use of PPE.
- Facility lacked handwashing sink.
  - Garden hose was provided.
- Students left the lab and went to another building or home wearing contaminated clothing.

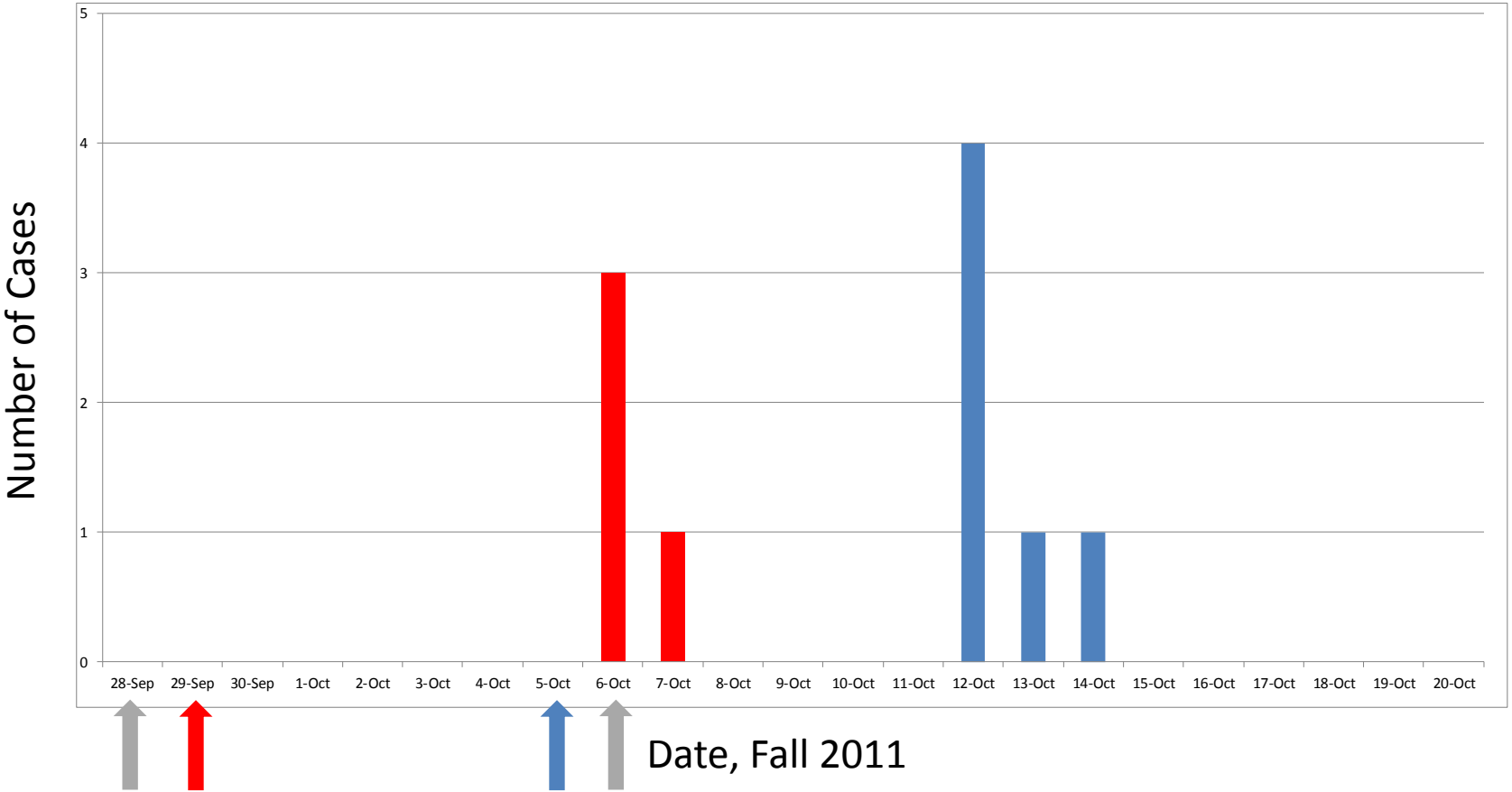
Investigation

- Benton County Public Health / OSU Biosafety collaborated on initial investigation.
  - Interviews (students, instructors), questionnaires
- State Public Health declared an outbreak, sent a team to investigate.
  - Specimen analysis, met with Dean and other members of university leadership.

Epidemiology

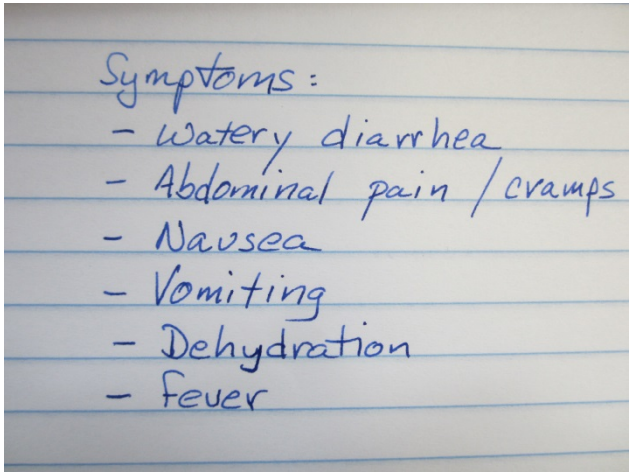
- The lab was taught in four sections, on September 28 & 29, October 5 & 6
  - Students attending 2 of the labs became ill.

Documented Cases



Illnesses

- 10 / 44* students had documented, clinical illness.
  - Some missed up to 2 weeks of classes.
- Several others are believed to have become ill also.
  - Including one household contact.



* Class size is 56; other students did not respond to interview / questionnaire request.

Other Findings

- Fluids and fecal material had splashed onto clothing, faces during the lab exercises.
- Students were not advised to wash hands.
  - Facility lacked handwashing sink, soap.
- Gloves and sleeves were available, but some students removed them and manipulated the calves with bare hands; PPE use not enforced.
- No face or head protection available.

Laboratory Findings

- Calf stool specimens were collected from one of the dairies that provided the calves.
- Species and subtype matched 4 available student specimens (testing by CDC):
  - *Cryptosporidium parvum* type IIaA15G2R1

Interventions: Administrative Support

- Systemic problem with safety procedures in the CVM; need for administration support to influence changes.
- Meetings with CVM dean and department heads to formulate a plan to improve safety for students, staff and faculty.

Interventions: First Steps

- CVM Safety Committee tasked with formulating a plan going forward.
  - Opportunity to address biosafety college – wide.
  - Specific plans were drafted.

Interventions: Class Specific

- Pre-screen animals used in lab for *Cryptosporidium*
- Move lab to more suitable location.
- Personal protective equipment:
  - Protective clothing, gloves + sleeves, face/hair protection.
  - Coveralls either disposable or laundered on-site after removal.
  - Faculty to model PPE and instruct students on proper use.
- Exit procedures / Hand Hygiene:
  - PPE to be removed inside out at exit of lab; immediate handwashing in anteroom of lab.

Previous Lab Location:
no accessible handwashing sinks

Handwashing sinks in new lab location

Students in new lab location listen to safety information prior to beginning lab in October, 2012.

Interventions: College – Wide

- Safety Policy adopted.
  - Assigns responsibility and accountability for safety
  - Mandatory safety training and annual inspections
    - Biosafety training for students in years 1, 2 and 3
  - Attire and appropriate PPE for all tasks
  - Safety SOPs for all classes; template provided
  - No food / drink policy in labs or animal areas

Conclusions

- Poor safety procedures caused the outbreak.
- 10 or more students exposed to *Cryptosporidium parvuum* during a laboratory exercise became clinically ill.
- This unfortunate incident became an opportunity to implement changes with the goal of ultimately improving the safety culture in OSU's CVM.

Acknowledgements

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College of Veterinary Medicine Safety Committee