Case-based Gaming for Foodborne Diseases

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Foodborne Diseases: Investigating Outbreaks

ANFS 230

- Course developed in 2004…continually evolving
- Required course for Food Science majors
- Meets Department (Animal Science, Pre-Vet majors) and College requirements
- General Education Natural Science course across the University

- Popular course – restricted to 30 for years, now capped at 50
  - Students across many majors and levels
  - Grown from 5 to 12 groups with game play over 2 days

- Epidemiology, Basics of Microbiology Basics, Basics of Food Science
WASHINGTON, August 3, 2011 – Cargill Meat Solutions Corporation recalling ~36 million pounds of ground turkey products that may be contaminated with a multi-drug resistant strain of *Salmonella* Heidelberg.
Course Student Learning Outcomes:

• Have an understanding of the complex processes involved in outbreak investigation and be familiar with the epidemiology and traceback techniques used to resolve an outbreak.

• Be more familiar with many of the organisms responsible for current foodborne illnesses.

• Gain an increased awareness of outbreaks of foodborne illness and be able to critically evaluate the coverage of foodborne illness by popular media.

Program Student Learning Outcomes (abbreviated):

• Develop critical thinking and reasoning skills used in developing food safety risk assessment and in evaluating the epidemiological and environmental investigations (ANFS Critical Thinking Goal, Gen Ed Goal 2).

• Develop intellectual curiosity concerning truth and bias behind contemporary media in communication of scientific principles (ANFS Communications Goal, Gen Ed Goal 6).

• Demonstrate successful and effective written and oral communication skills by writing literature reviews and investigation reports and by participating in course discussions (ANFS Communications Goal, Gen Ed Goal 1).

• Develop team-working skills and leadership in the development of a board game and in the presentation of that game (ANFS Communications Goal, Gen Ed Goal 1 & 3).
Food Related Illness and Death in the US

- 48 million cases
- 128,000 hospitalizations
- 3,000 deaths

- Majority caused by unknown agents – 38.4 million
- Are numbers meaningful?
  - Baseline data
  - Underreporting
  - mild disease
  - Scallan et al., 2011(CDC)
Outbreak Investigations

- Learn from historical and current outbreaks
- Case-based learning!
- Interactive stories that often unfold during the semester

- Intertwine Epidemiology, Surveillance, Laboratory Analysis, Traceback, Economic & Social Issues
  - Following an introduction the course is arranged based on outbreaks caused by specific microorganisms: *Clostridium botulinum*, *Salmonella*, *Listeria monocytogenes*, Shiga-toxigenic *E. coli*, Norovirus, Hepatitis A virus, Ebola, and more
Flow of an Investigation

Figure A. Sequence of events in investigating a typical outbreak of foodborne illness.
Outbreaks in North America were linked to eating Guatemalan raspberries. We conducted a study in health-care facilities and among raspberry farm workers. 126 (2.3%) of 5,552 surveillance specimens tested positive; prevalence peaked in June (6.7%). Infection was most common among children 1.5 to 9 years old and among persons with gastroenteritis. Among 182 raspberry farm workers and family members monitored from April 6 to May 29, six had been infected. In the case-control analysis, 62 (91%) of 68 persons with the illness reported drinking untreated water in the 2 weeks before illness, and their illness lasted nearly 3 weeks! Wild Boars who drank from the same water source did not have the illness.

The following clues describe an illness...

- Onset of sickness approximately 2 days after consumption of food
- Continental breakfast at hotel is the common meal shared by those affected by illness
- Employee managing breakfast claimed that eggs served were discarded only at the end of the shift
- Cut melon, honey, and jam were all served
- Three weeks after the buffet, infectious material was found on a stain in the carpet

Investigations of foodborne outbreaks naturally lend themselves to game development and game play.

The following clues describe an illness...

- There were 3 friends that died in this outbreak
- For graduation they decided to backpack through Europe in 2000
- They ate lots of culturally diverse food and were able to enter and eat in every country
- When they got back from their trip in 2001 they had enough stories for a lifetime
- The beginning of 2002 one of the friends started to act funny and passed away shortly after that
- Two months later the second friend could no longer walk and passed
Capstone-Board game development

- Final project is worth 12% of final grade
  - Group game project and presentation 10%
  - Peer evaluation 2%
- Groups of 4-6 students created early in semester, used for small in-class discussions
- Grading rubric of 9 elements
Assessment

- Used for Curricular Assessment for IFT Program and Course-Learning Outcomes (for 2 years now)

- Programmatic goal of Synthesis of Information/Critical Thinking Goal
  - 3 artifacts assessed using Inquiry and Analysis Rubric
    - Topic Selection
    - Existing Knowledge, Research, and/or Views
    - Analysis

Class Grading Rubric

Outbreak well established:

Outbreak is plausible:

Displays all players and regulatory agencies as necessary:

Surveillance:

Epidemiological investigation:
(could include descriptive epidemiology, case histories, epidemic curves, and collected samples)

Analytical epidemiology / Laboratory studies:
(could include data analysis and relative risk)

Environmental investigation:
(could include on-site investigation, hazard analysis, and collected samples)

Control and prevention:

Communication with the public:

Participation from all group members:
Games!

Games take all formats:
- Traditional board games
- Card games
- Computer-based
Most often game from perspective of the investigation, but sometimes a game is designed from the perspective of the infectious agent getting into our food supply.
All games include detailed directions that are unique to the game play
- For example- *E. colopoly* had different directions than *Monopoly*
Games often contain a great deal of student-generated original data.
Play!
Learn!
Demonstrate!
Thoughts from the students on games

- Volunteered responses to open-ended questions (n=93):
  - 49% volunteered synthesis of course material and reinforced learning
  - 46% particularly noted creativity as a favorite aspect
  - 100% indicated it was a fun/enjoyable project

“Refreshing way to review course material”

“This game helped me understand outbreak investigations better”

“My favorite part was thinking outside the box to choose a game”

“I was surprised that I was able to play the games without having to reference information slides”
What's next?
Unanswered questions

• Is learning optimized from a specific platform?
• Quantify learning through the capstone project
• Movement to computerized games?

• Measure specific learning outcomes through game development and playing.
• Add to assessment rubric using specifics related to game play.

Thank You!
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