Cleveland Museum of
NATURAL HISTORY

DISEASE DETECTIVES:

Outbreak Investigation Kit

Investigator Name:

_____

KEY STEPS

- ❒ **STEP 1:** Prepare for fieldwork
- ❒ **STEP 2:** Define the outbreak
- ❒ **STEP 3:** Verify the diagnosis
- ❒ **STEP 4:** Define and identify cases
- ❒ **STEP 5:** Collect and describe data in terms of time, place and person
- ❒ **STEP 6:** Develop hypotheses
- ❒ **STEP 7:** Evaluate hypotheses
- ❒ **STEP 8:** Refine hypotheses and carry out additional studies
- ❒ **STEP 9:** Implement control and prevention measures
- ❒ **STEP 10:** Communicate findings

Academic Content Standards

Program content includes many of the indicators incorporated in Ohio's Academic Content Standards in Science and the National Health Education Standards.

Although this program may be tailored to your individual class needs and student questions, the information routinely includes the following indicators:
Grade 7: Scientific Inquiry: 1, 3, 5, 7
Grade 8: Scientific Inquiry: 2, 3, 4
Grade 9: Scientific Inquiry: 1, 4, 6
Grade 10: Life Sciences: 27, 28; Scientific Inquiry: 4
Grade 11: Scientific Inquiry: 2, 3, 4, 5
Grade 12: Life Sciences: 12; Scientific Inquiry: 1, 2, 5
Grades 6-8: National Health Education Standards: 1.8.3, 2.8.6, 2.8.10
Grades 9-12: National Health Education Standards: 1.12.3, 2.12.6, 2.12.10

Vocabulary

agent – a substance that exerts some force or effect.
bacteria – microscopic, single-celled organisms that lack chlorophyll and nuclei.
epidemic – a widespread outbreak of an infectious disease in a specified community, often beyond what is expected, within a certain time period.
epidemiology – the study of the frequency, distribution, and behavior of a disease within a population.
exposure – to come in contact with an infectious agent in a manner that promotes transmission and the likelihood of disease.
Gram stain – a method using dyes and clearing agents that differentiates bacteria into two groups: gram-negative and gram-positive.
incubation period – the time between a when a person comes in contact with a pathogen and when they first begin to show symptoms or signs of disease.
infection – invasion of the body by pathogenic agents.
infectious – able to spread from one organism to another.
onset – time of the appearance of the first symptoms of an illness.
outbreak – a sudden occurrence of disease in two or more people during a specified period of time.
pandemic – a disease that occurs over a wide geographic area and affecting an exceptionally high proportion of people.
pathogen – a disease causing agent, such as a bacterium or virus.
pathogenic – disease causing.
public health surveillance – system of doctors and health officials collecting and comparing data on various diseases or infections within communities. Some more virulent diseases, by law, must be reported to public health officials every time they are diagnosed.
relative risk – ratio of the risk of disease or death among the exposed segment of the population to the risk among the unexposed.
symptom – evidence or sign of disease or infection.
virulence – relative degree of ability to cause disease of a pathogen.
virulent – able to cause illness or disease.
virus – ultramicroscopic infectious agent that replicates itself only within cells of living hosts; many are pathogenic.

OUTBREAK INVESTIGATION DATA

--Line Listing: Victims, Onset, Symptoms--

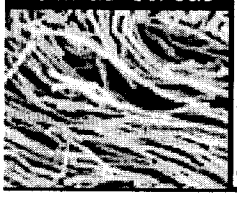
sex	ID#	init.	onset time	physician	symptoms
F	1	AT	8 pm	Dr. Harris	diarrhea, fever, abdominal cramps
M	2	BN	8:15	Warren	diarrhea, cramps
F	3	RC	after dinner	?	fever, cramps
M	4	BJ	9 pm	?	diarrhea, fever, cramps
M	5	CS	midnight	Farrell	fever, cramps, nausea, headache
M	6	DF	9:30	Harris	fever, diarrhea, cramps
M	7	GB	8:30	Dr. Horner	diarrhea, fever, cramps, aches
F	8	RV	8	?	fever, chills, headache, nausea
M	9	AT	10	?	fever, upset stomach, diarrhea
M	10	BW	7:15	Foley	fever, body aches, nausea, diarrhea
M	11	JR	9 pm	Harris	diarrhea (bad)
F	12	TC	8	Logan	headache, nausea, fever, diarrhea
F	13	HP	8:30	Foley	diarrhea, cramps
M	14	AC	10ish	?	fever, chills, sweating, diarrhea
M	15	SC	7:45	Logan	stomach ache
M	16	RW	8	?	diarrhea, fever, chills, nausea
M	17	FT	9:00	Harris	diarrhea, fever, cramps
F	18	HS	9	Harris	fever, diarrhea
M	19	GW	8	Foley	fever, diarrhea, vomiting
F	20	NL	7:45	Wentz	diarrhea, fever, loss of appetite
M	21	CC	8 pm	?	sweating, diarrhea
F	22	JM	morning	Kipling	headache
M	23	RW	8pm	?	fever, diarrhea
F	24	BN	7	?	nausea, diarrhea
M	25	TR	10	?	just diarrhea
M	26	GF	9	Harris	nausea, diarrhea, cramps
M	27	AD	9:15	Barker	fever, diarrhea
F	28	MK	9:30	Dr. Warren	diarrhea, fever, cramps
	29				
	30				Prepared by: B. Hartford, RN

FOODBORNE ILLNESS: THE USUAL SUSPECTS

Bacteria

GRAM-POSITIVE (+)

Bacillus Cereus

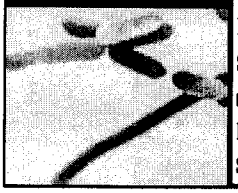


TYPE: Large rods
INCUBATION PERIOD: 1-6 hours
SYMPTOMS: sudden onset of severe nausea, vomiting
DURATION OF ILLNESS: 24 hrs
SUSPECT FOODS: fried rice, meats

C. perfringens

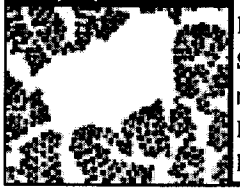
TYPE: Spore-forming rod
INCUBATION PERIOD: 8-16 hours
SYMPTOMS: watery diarrhea, abdominal cramps, nausea
DURATION OF ILLNESS: 24-48 hrs
SUSPECT FOODS: meats, gravies

Listeria



TYPE: Rods
INCUBATION PERIOD: 9-48 hours
SYMPTOMS: Fever, muscle aches, nausea, diarrhea
DURATION OF ILLNESS: varies
SUSPECT FOODS: cheese, meats

Staphylococcus



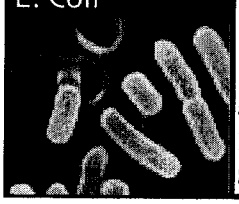
TYPE: Cocci (ball-shaped)
INCUBATION PERIOD: 1-6 hours
SYMPTOMS: severe vomiting nausea, abdominal cramps, fever
DURATION OF ILLNESS: 24-48 hrs
FOODS: meats,salads,cream pastries

GRAM-NEGATIVE (-)

Campylobacter

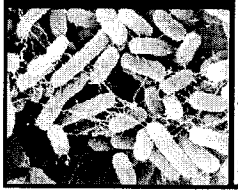
TYPE: Curved rods
INCUBATION PERIOD: 2-5 days
SYMPTOMS: Diarrhea, cramps, nausea, vomiting
DURATION OF ILLNESS: 2-10 days
SUSPECT FOODS: poultry

E. Coli



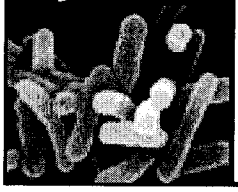
TYPE: Rods
INCUBATION PERIOD: 12-48 hours
SYMPTOMS: watery diarrhea, abdominal cramps, nausea
DURATION OF ILLNESS: 3-7 days
SUSPECT FOODS: varies (fecal/oral)

Salmonella



TYPE: Rods
INCUBATION PERIOD: 6-36 hours
SYMPTOMS: Fever, diarrhea, abdominal cramps, vomiting
DURATION OF ILLNESS: 4-7 days
SUSPECT FOODS: eggs, poultry

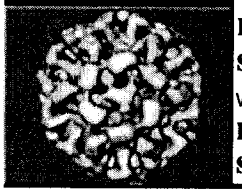
Shigella



TYPE: Rods
INCUBATION PERIOD: 24-48 hours
SYMPTOMS: Fever, abdominal cramps, diarrhea
DURATION OF ILLNESS: 4-7 days
SUSPECT FOODS: varies (fecal/oral)

Other possible culprits

Viruses



TYPES: Norwalk (shown), rotavirus
INCUBATION PERIOD: 10-72 hours
SYMPTOMS: nausea, vomiting watery diarrhea
DURATION OF ILLNESS: varies
SUSPECT FOODS: varies (fecal/oral)

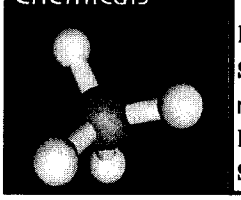
Parasites

TYPES: Cryptosporidium (shown)
INCUBATION PERIOD: > 24 hours
SYMPTOMS: varies (nausea, fever, vomiting, diarrhea, cramps)
DURATION OF ILLNESS: >48 hours
SUSPECT FOODS: varies

Marine Toxins

TYPES: Pufferfish (shown), shellfish
INCUBATION PERIOD: 1 min-3 hours
SYMPTOMS: vomiting, nausea, paralysis, death
DURATION OF ILLNESS: varies
SUSPECT FOODS: seafood

Chemicals



TYPES: Metals (tin, copper), arsenic
INCUBATION PERIOD: 1 min-2 hours
SYMPTOMS: vomiting, diarrhea, nausea
DURATION OF ILLNESS: <24 hours
SUSPECT FOODS: varies

OUTBREAK INVESTIGATION DATA

------Potential Sources: School Lunch------

East Coliville High School
8001 Dysentery Rd.
Coliville, NJ

FAX:

To: Disease Detectives

From: Betty Hartford, School Nurse

Re: Foods served at lunch yesterday

Food Item Eaten	Number sick	Number not sick
meatball sub	~~////~~ ~~////~~ ~~////~~ ~~////~~	~~////~~ ~~////~~ ~~////~~ ~~////~~
cheeseburger	~~////~~ /	~~////~~ /
salad	////	~~////~~ ~~////~~
macaroni & cheese	~~////~~ ///	~~////~~ ~~////~~ //
ice cream	//	~~////~~ ~~////~~ //
fruit cup	~~////~~ ~~////~~ //	~~////~~ ~~////~~ ///
milkshake	~~////~~ ~~////~~ ~~////~~ ~~////~~ ////	////
French fries	~~////~~ ~~////~~ ////	~~////~~ ~~////~~
milk	~~////~~ /	~~////~~ /
juice	//	~~////~~ ~~////~~ //
nachos	~~////~~ ///	~~////~~ ~~////~~

OUTBREAK INVESTIGATION DATA

----Possible Sources: Food Sources----

NUTRI-SERVE SCHOOL FOOD SERVICES

Vendor, Food and Ingredients Listing

DMG Supply

cheeseburger
- seasoned ground beef
- American cheese
- sesame seed buns
- lettuce
- tomato
- catsup

French fries
- potatoes
- vegetable oil

juice
- apple juice from concentrate

macaroni & cheese
- macaroni noodles
- cheddar cheese
- salt
- butter
- milk

meatball sub
- ground beef
- bread crumbs
- eggs
- french bread
- mozzarella cheese
- spices
- tomato sauce
- sugar
- salt
- whole tomatoes

milk
- 2% regular
- 2% chocolate
- skim

nachos
- tortilla chips
- cheddar cheese sauce
- jalapeño peppers

Market Source, Inc.

fruit cup
- peaches
- pears
- grapes

ice cream
- cream
- sugar
- vanilla

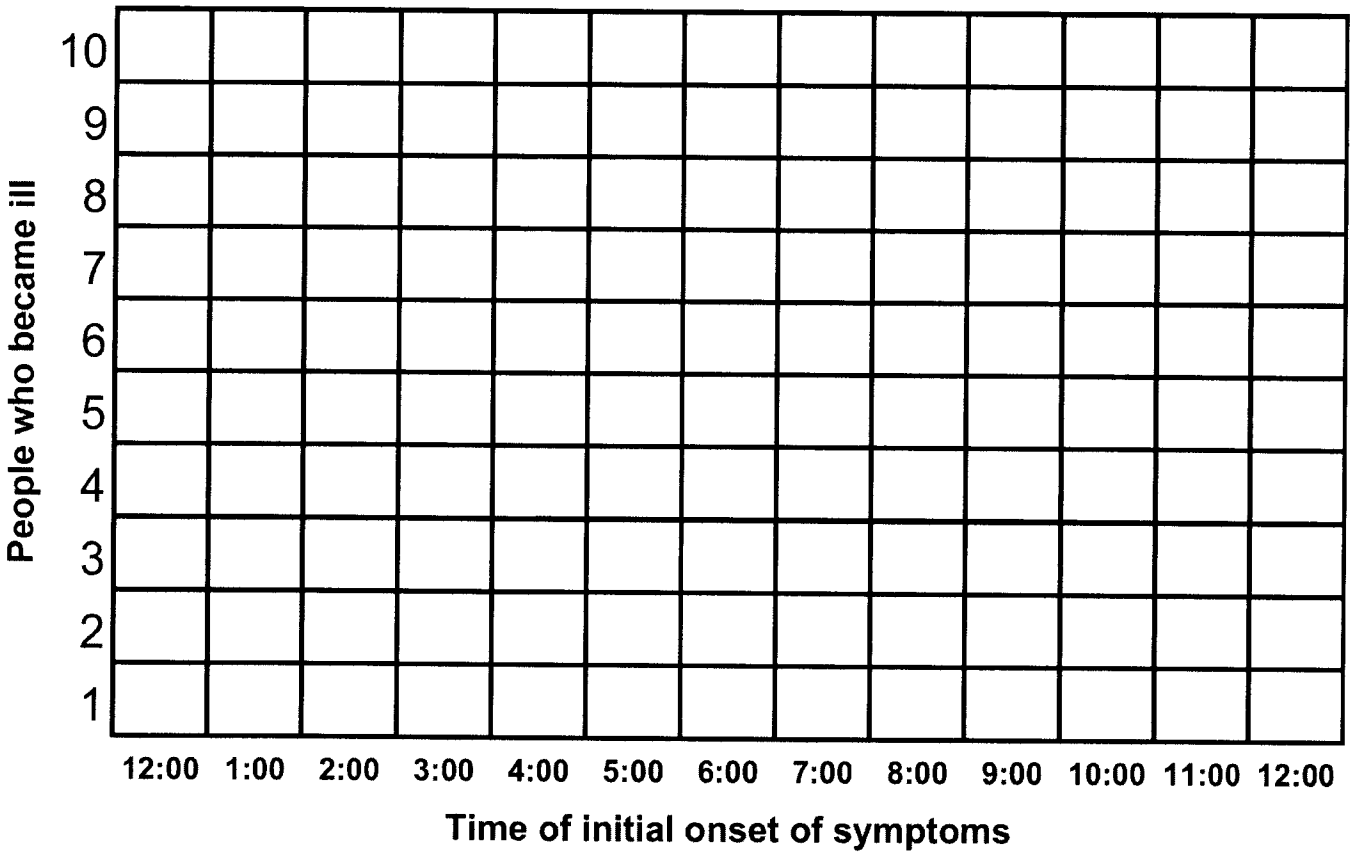
salad
- lettuce
- cabbage
- carrots
- mushrooms
- green peppers
- radishes
- diced chicken
- cheddar cheese
- ranch or Italian dressing

Coliville Custard Co.

milkshake
- cream
- sugar
- eggs
- vanilla
- milk

TIME WILL TELL: THE EPIDEMIC CURVE

Epidemic Curve for Acute Gastroenteritis - 12 Hour Period



INSTRUCTIONS:

Fill in the grid above to create a **histogram** (bar graph) of the time of **onset** of first **symptoms**. Use a pencil to shade in one box for each person who become ill at each time point, beginning with 1 and working upward. Do you see a pattern? Determine the **incubation period** for the illness by calculating the time between **exposure** (the time the food was eaten) and the time when the first symptoms were observed as recorded above. What is shortest observed incubation time? ____ What is the longest? ____ Can you determine the median incubation period? ____ Can you calculate the average (mean) incubation period? ____ Why didn't everyone get sick at the same time?

FINAL REPORT

INSTRUCTIONS:

This form is used to report foodborne disease outbreak investigations to the CDC (Centers for Disease Control). You may not have enough data to complete all the items. Complete as much of the form as you can. You will have to do some additional calculations not covered in the program.

1. Location of exposure:

State: ___ ___
☐ Multi-state exposure

County: _____
☐ Multi-county exposure

2. Dates:

Date first case became ill: ___/___/_____

Date of 1st known exposure: ___/___/_____

Date of last known exposure: ___/___/_____

3. Number of Cases Exposed:

Laboratory confirmed cases: _____ (A)

Probable cases: _____ (B)

Estimated total ill: _____
(If greater than sum of A + B)

4. Age of Cases:

< 1 year ____ %
1 - 4 years ____ %
5 - 19 years ____ %
20 - 49 years ____ %
>=50 years ____ %

5. Sex:

% of total cases

Male: ____ %

Female: ____ %

6. Investigation Methods

(Check all that apply)
☐ Interviews of cases only
☐ Case-control study
☐ Cohort study
☐ Food preparation review
☐ Investigation at source/factory
☐ Food samples/case samples

7. Implicated Food(s)

_____
_____
_____
_____
_____

☐ Could not be determined

8. Etiology: (Name the bacteria, virus, parasite or toxin)

Agent(s)

_____
_____

☐ Confirmed
☐ Suspected
☐ Unknown etiology (cause)
☐ Multiple etiologies (causes)

Isolated and identfied from
(Check all that apply)
☐ Patient specimen(s)
☐ Food specimen(s)
☐ Environment specimen(s)
☐ Food Worker specimen(s)

9. Symptoms & Outcomes:

Enter number of cases

Vomiting _____
Diarrhea _____
Bloody stools _____
Fever _____
Abdominal Cramps _____

Healthcare visit ____
Hospitilization _____
Death _____

10. Incubation Period:

Shortest: _____ (hours, days)
Longest: _____ (hours, days)
Median: _____ (hours, days)
(circle appropriate time unit)

☐ Unknown

11. Illness Duration:

Shortest: _____ (hours, days)
Longest: _____ (hours, days)
Median: _____ (hours, days)
(circle appropriate time unit)

☐ Unknown

12. If Cohort Investigation Conducted

Event-specific Attack Rate =

_____ / _____ x 100 = _____ %
ill total # of people interviewed

13. Where Was Food Prepared?

☐ Restaurant/deli
☐ Day care center
☐ School
☐ Church/temple
☐ Camp
☐ Caterer
☐ Grocery Store
☐ Hospital
☐ Workplace cafeteria
☐ Nursing home
☐ Prison, jail
☐ Private home
☐ Fair/festival
☐ Other _____

14. Where Was Food Eaten?

☐ Restaurant/deli
☐ Day care center
☐ School
☐ Church/temple
☐ Camp
☐ Grocery store
☐ Hospital
☐ Workplace cafeteria
☐ Nursing home
☐ Prison, jail
☐ Private home
☐ Picnic
☐ Fair/festival
☐ Other _____

15. Comments