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REQUEST FOR CORE NATURAL SCIENCE DESIGNATOR

SUBMITTED BY:

Department	Biology	College/School	CNSM
Prepared by	Andrea Bersamin	Phone	474-6129
Email	abersamin@alaska.edu	Faculty	Andrea Bersamin

learn the process by which nutrition science research is translated into local and national

CORE DESIGNATOR REQUEST REQUIREMENTS (A-G)

A. COURSE SYLLABUS

Please see appended syllabus

B. TITLES OF LABORATORY EXERCISES

Lab 1: Scientific Inquiry, experimental design and graphing

Lab 2: Dietary Assessment: Validity and reliability

Lab 3: Nutrition Labeling Using a Computer Program

Lab 4: Digestion and Enzyme Activity

Lab 5: Macromolecules: personal nutrition portfolio

Lab 6: Energy Balance, Basal Metabolic Rate and Body composition

Lab 7: Energy drinks: What Are You Really Drinking?

Lab 8: Food safety: outbreak investigations

E. A LIST OF THE MAJOR SCIENTIFIC CONCEPTS THAT THE COURSE WILL CONVEY.

- Scientific methods
- Anatomy and physiology
- Energy metabolism
- Essential nutrients
- Microbiology

F. RELATIONSHIP BETWEEN SCIENCE AND SOCIETY

This course encourages students to consider how food and activity choices impact society and vice

[redacted]

health. They will also consider how local, state, and federal policies affect healthy eating and physical

BIOLOGY 1-- X
INTRODUCTION TO HUMAN NUTRITION
[redacted]

Time: TBD
Location: TBD
CRN: TBD
Prerequisites: ENGL F111X or higher; placement in DEVM F105 or higher; or permission of instructor. This course may not be used as a biology elective credit for a major in biological

science.

Instructor Information

Andrea Bersamin, Ph.D.
Email: abersamin@alaska.edu
Office: 234 AHRB, Telephone: (907)474-6129

Office Hours

TBD. If you have questions about the class or would like to discuss your class performance, I encourage you to come and see me during my office hours (or by appointment).

Course description

Instructional Methods

The course will include lectures, class discussion, in-class activities, text book and journal article

readings, and assignments. ***Student participation is important and this requires that all students come prepared having read the required readings in advance***.

This class will focus on teaching scientific concepts in addition to exploring personal decision-making. My goal is for you to consider your own food choices in light of the knowledge you are gaining. Concepts covered in class will use the following types of supplementary activities to accomplish this goal.

- **Health checks:** Activities will guide you to "check" your own behavior or health status based on the lesson content

Student Evaluation

Points Possible:

Exams	3 @100 points
Final Exam	100 points
[redacted]	[redacted]

[redacted]

Total Possible Points: ***620***

Grades will be on a straight percentage basis. [redacted]

B+= 87-89.9%; B= 84-86.9% ;B-= 80-83.9%
C+= 77-79%; C= 74-76.9% ; C-= 70-73.9 %
D+= 67-69%; D = 64-66.9%; D-= 60-63.9%
F= 59% and below

Instructor and course evaluation:

Labs
You are required to attend the lab section in which you are officially enrolled. If you need to change lab sections, you must officially change your section enrollment through the Registrar. You are expected to be on time to labs. Assignments are collected at the **start** of lab; work turned in after that is considered late. You must be present for lab in order to earn any credit for the work on that lab; in other words, if you aren't at lab one week, you can't turn in the work for that lab and will receive a zero on it.

Reaction cards: 2 point each for a maximum of 20 points
At the end of each class session on Thursdays, please write a short (two to three sentences) question or comment pertaining to the class discussion or provide feedback on how the class is

going for you. Write your comment or question on a 3x5 card with your full name and date

integrity of the academic work you submit. For the student code or additional information

please use the following URL http://www.uaf.edu/catalog/current/academics/regs3.html

UAF Disability Services

Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials

Activities:

[redacted]

[redacted]

[redacted]

Readings:

[redacted]

Chapter 5

Lipids
February 26 and 28

Objectives:

- Describe the functions, types, food sources and recommendations
- Explain the digestion and absorption
- Discuss the role of lipids in promoting health

Activities

Systems thinking: Transfats

Health check: Cardiovascular disease, are you at risk?

[redacted]

Readings:

Chapter 6

Proteins
March 5 and 7

[redacted]

- Describe the functions, types, food sources and recommendations
- Explain the digestion and absorption
- Discuss the role of protein in promoting health

Activities:

Readings:
Chapter 8

Activities:
Health check: Mindful vs mindless eating

Systems thinking/ health challenge: Make your own 100- calorie packs

Exam II
March 26

Vitamins: vital keys to health
March 28 and April 2

- Compare the water and fat soluble vitamins with respect to their function, digestion, absorption, transport, and requirements
- Explain the function, food sources, and requirements of select vitamins
- Define antioxidants and discuss their food sources and health benefits

Readings:
Chapter 9

Current controversies: Organic or conventional produce

Activities:
Current controversies: Genetically modified foods
Systems thinking: Don't waste food, but keep it safe

Food Systems: linking food choice to personal and environmental health
April 18 and 23

Concepts and key terms:

- Describe the food system and food supply chain
- [redacted]

Readings:

Feenstra, GW. (1997) Local food systems and sustainable communities. *American Journal of Alternative Agriculture.* 12;1 pp28-36

Ericksen, PJ (2008) Conceptualizing food systems for global environmental change research. *Global Environmental Change.* 18 pp 234-245

[redacted]

Objectives:

By the end of this lab you should be able to:

- Formulate hypotheses and predictions
- Differentiate between observational and experimental studies and discuss the

provides a foundation for improving our choices about personal health and the health of our community.

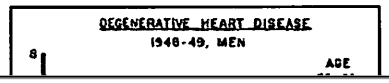
References:

http://science.education.nih.gov/Supplements/NIH50/Inquiry/guide/nih_done_comp.pdf

Katan MB, et al. (2009) Which are the greatest recent discovereis and the greatest future challenges in nutrition? *Europ J Clin Nutr 63*

1.1 Hypotheses and predictions

Science is a way of finding out how the world works. It is a creative process in which one attempts to explain the formation of patterns in nature by forming and testing hypotheses. The scientific process begins with observation of patterns in nature. The next step is to pose a hypothesis. A hypothesis is a tentative explanation for observed events. For example, one might observe that people in countries where



The first step in testing a hypothesis is to make predictions. Predictions are often stated as "if—then" statements: "If the hypothesis is true, then ..." Many

predictions may stand from a single hypothesis. For example, if olive oil

protects against heart disease, then we might predict that people who consume

associated with the formation of plaques in blood vessels. Another prediction might be that people whose diets is supplemented with olive oil will be less likely to suffer heart disease in the future than those whose diet is not supplemented with olive oil.

control group is the group of people consuming the water placebo. Other than the contents of the capsule, the participants in the control group should be treated the same as those in the treatment groups. Sometimes more than one control is necessary. For example, if there is reason to believe that the capsule itself might affect health (the "placebo affect"), another group that is given no capsule at all could serve as the capsule control.

Nutrition science is often concerned with the effects of diet on human health.

in defined populations. Nutritional epidemiology involves research to: examine the

choose to measure one or several dependent variables. You can think of the dependent variable as the "effect" is cause and effect.

The **independent variable** (or predictor variable) is the variable represents the hypothesized "cause". In an experimental study, an investigator manipulates the independent variable. In the olive oil example, the olive oil is the independent variable.

Variables can be categorical or continuous.

Categorical variables are discrete and contain information that can be sorted into

[redacted]

categories. Examples of categorical variables include education (no high school, HS degree, some college, etc.), agreement (strongly agree, agree, neutral, disagree, etc.), frequency

[redacted]

study could be frequency of olive oil consumption (every day, once a week, a few times a month), whether someone consumed less than 1 tablespoon a day (yes/no), or level of olive oil intake (high, medium, low).

Continuous variables are always numeric and theoretically can be any number, positive or

Figure 2: Examples of correlations between two variables.
a) positive correlation; b) negative correlation

It is important to understand the difference between correlation and causation. Two

Criterion	Comment

1.5 Exercise: Hypothesis, predictions, and experimental design

Working with one lab partner:

1. Suggest a hypothesis to explain one of the following observations. Note that a hypothesis is NOT merely a restatement of the observation: your hypothesis should address the underlying <u>cause</u> of the observation.
2. Make at least two testable predictions that extend from the hypothesis.

- Vegetarians have a low incidence of heart disease
- Children who watch a lot of tv have a higher BMI

Hypothesis:

Experimental Study to test prediction 1:

Dependent variable(s):

Independent variable(s):

Treatment:

Control:

2. Making graphs

In order to communicate scientific results to a reader, one must summarize quantitiatve information in a form that is both relevant and accessible. Tables and graphs are the best ways to display quantitative information. Graphs can be more visually powerful than tables, but the type of graph must be carefully chosen to show the pattern you wish the reader to see.

2.1 Basic rules for graphs

1. Label both the x and y axes
2. Specify units
3. Provide a title that describes the graph (e.g. the relationship between olive oil and heart disease)
4. Keep graphs as simple and readable as possible
5. When showing average responses

2.1 The importance of variation

Showing variation in data is important because it helps the reader decide how much confidence to place in the results.

spread out all your values are. Standard deviation for a sample is calculated as the sum of the squared difference between each individual value and the mean for the sample divided by the degrees of freedom (number of samples minus 1):

$$s = \sqrt{\frac{\sum(x - \overline{x})^2}{N - 1}}$$

s = the standard deviation, x = the value for a given individual, x = the mean for the sample, N = the sample size

Standard error – more precisely, the standard error of the mean - does something slightly different - it provides an indication of the margin of error around the mean you calculated. It is calculated as the standard deviation divided by the square root of the sample size.

2.2 Some common types of graphs

Showing a <u>correlation</u> between two variables
The best way to display this kind of data is a scatterplot. Figure 2 is a scatterplot that shows an example of a positive and negative correlation between two

2.3 Exercise- using Excel to make graphs

In this exercise you will use Excel to construct two simple graphs. The first two

[redacted]

can be found in appendix A. **(Note: this will be provided to students)**

2.3.1 Make a scatterplot showing the relationship between to categorical variables

1. Come up with a hypothesis about the relationship between two variables related to nutrition or and/or physical activity that you can measure. Be creative! The measurements can be length volume, weight, time counts, survey responses, etc. The data can come from students in the class (participants), food prices in Wood Center, etc. Record your measurements in the data table on the next page. Make at least 2 measurements on at least 5 participants, foods, etc.

[redacted]

2.3.2 Graph the average and variation of a categorical variable measured in two groupsand run a t-test to compare the means of the two groups.

1. Generate a new nutrition hypothesis. This one should be a hypothesis about how two groups will differ for a particular variable that you can measure. To test your hypothesis, you will measure a continuous variable from at least 10 participants in two groups. For example, you might measure BMI in people who eat breakfast on a regular basis compared to those who don't.

Record your hypothesis and briefly justify your expectation. .

[redacted]

yourself and your instructor. Also print a copy to turn in with your worksheet.

3. Using your data file, run a 2-sample t-test in excel. E-mail a copy of your analysis to yourself and your instructor. Also print a copy to turn in with

POST LAB QUESTIONS

USING A CLINICAL TRIAL TO TEST THE EFFECTIVENESS OF EPHEDRA

Scholars Program (YES) and was supported by The Robert Wood Johnson Foundation and administered by the College Board.

Ephedra is one of the many herbal supplements that claim to help people burn fat, build muscle and increase endurance. As a result, many athletes are taking it, in the hope it will give them a cutting edge against their competitors. The question is "are these claims really true?" If they are, by how much? If they are not, why are these manufacturers allowed to make these claims? Look at the advertisements that are included. Both were taken from the

2. When testing the experimental variable, a researcher must understand the possible

5. In a clinical trial, subjects are randomly assigned to either the experimental or the comparison group. Another requirement is that the participants do not know which group they are placed in, so the participants do not know whether they are taking the placebo or the actual drug. This procedure is called blinding. In addition to the subjects of the

Sample Advertisements for Ephedra-Containing Products

Nature's SUPER CAP

850 mg Ephedra Extract

[redacted]

airway and dramatically enhancing breathing performance. It is also a preferred product among serious

[redacted]

GRADING FOR SCIENTIFIC INQUIRY, STUDY DESIGN AND GRAPHING

Points	Item
_____/1	Hypothesis
_____/1	Prediction 1
_____/1	Prediction 2
_____/2	Test 1
_____/2	Test 2
_____/3	Data and graph 1
_____/3	Data and graph 2
_____/3	t-test and evaluation of hypothesis
_____/9	Post-lab questions

LAB 3

Digestion and Enzyme Activity

[redacted]

Objectives:

[redacted]

- list the essential nutrients found in food
- describe the basic chemical composition of carbohydrates, proteins, fats, and vitamins
- identify nutrient content in foods and test for nutrients in unknown samples
- learn the parts of the digestive system
- explain functions of major nutrients in the body

1. Introduction

Food, glorious food! Movement, processing information and responding to the environment, and maintenance of homeostasis all require energy. Ultimately, energy is derived from food. In addition, food provides building material for cells and tissues.

The job of the **digestive system** is to break down food and absorb **nutrients**: **carbohydrates**, **proteins**, and **lipids** and smaller quantities of **vitamins** and **minerals**. Most of the water we

Pre-lab questions: Answer the following questions based on your reading of the introduction.

1. List the five nutrients found in food.

2. What is an omnivore? How does the fact that humans are omnivores influence our

Proteins have numerous functions. They are the basis for tissue and organ structure; some are capable of movement (socalled "motor proteins") while others act as enzymes. All proteins are chains of amino acids. Twenty amino acids combine to form thousands of different proteins. Twelve amino acids can be assembled in the body but eight must be obtained directly from the diet. Dietary sources of proteins include fish, soybeans, meat, and dairy products.

Lipids are hydrophobic (insoluble in water). They include fats, oils, waxes, phospholipids, and steroids. Concentrated sources of energy, each gram of lipid has more calories than a

support for joints, tendons, and internal organs. Dietary sources of lipids include nuts, meat, butter and cheese, and vegetable oils.

Although only minute quantities of **vitamins** and **minerals** are required, a deficiency can have devastating effects. Vitamins help control chemical reactions, often facilitating the actions of enzymes. They are necessary for normal growth and metabolism. Thirteen

food. A color change of an indicator is usually a positive test for the presence of a certain

you the expected result, then your experimental results are not valid and you must

Part I. Identification of Protein

Materials:

- test tube rack
- test tubes
- tape for labeling your tubes
- 0.5% CuSO4
- 10% NaOH
- albumin protein solution (egg white)

[redacted]

- four different experimental samples (share with the people at your table)

The test chemicals used in this experiment react with the covalent bonds that link amino acids together in protein chains. In the presence of protein, the chemicals will turn varying shades of purple.

NOTE: NaOH (sodium hydroxide) is very caustic and will burn your skin and damage your clothes. Handle it with caution. If you do come into contact with it, notify the instructor and flush the area thoroughly with running water. NaOH is the ingredient in hair removal products. It works by dissolving protein, which is what hair is made of.

Procedure:

1. Predict which organic compounds your experimental samples might contain.
1. Record your predictions in Table 1

[redacted]

2. Label your tubes 1 through 6.

[redacted]

Table 2. Identification of Protein

Tube #	Solution in Tube:	Color of reaction	Presence of Protein? (yes or no)
1	1.5 ml albumin solution		
2	1.5 ml distilled water		
3	Sample #1		
6	Sample #4		

Part II. Identification of Monosaccharides

Materials:

7. Remove the tubes using the test tube clamp and record the resulting color.

[redacted]

note the color change in the immediate vicinity of your sample. The rest of the Benedict's may stay blue since a solid cannot mix well.

9. Record your results in Table 3.

[redacted]

		Color of Reaction Tube # Solution in tube:		
Tube #	Solution in tube:	Before Heating	After Heating	Presence of Monosaccharides? (yes or no)

Table 4. Identification of Starch

2	1.5 ml distilled water			

4. The sucrose sample in the test for monosaccharides is also a negative control. Why does it not react with the Benedict's reagent?

F. For each food you tested, list the organic compounds it contained

POST-LAB QUESTIONS

Parts of the Digestive System

The previous experiment explored some of the nutrients in food. How are nutrients extracted from the food we eat? In this activity, we will follow a bite of food through the digestive system and identify the structures that it passes through.

1. Use the torso model to examine the parts of the system. Beginning at the mouth,

2. On the figure of the human digestive system, label the indicated structures:
   - Mouth
   - Pharynx
   - Esophagus
   - Stomach
   - Small intestine
   - Large intestine
   - Rectum
   - Liver
   - Gall bladder

[redacted]

Points	Item
_____/5	Pre-lab questions
_____/7	Questions
_____/2	Table 1
_____/2	Table 2
_____/2	Table 3
_____/2	Table 4
_____/10	Post-lab questions

LAB 7

Food Safety:

This lab is from the Food Systems Project from the Johns Hopkins Center for a Livable Future

Objectives:

By the end of this lab you should be able to:

- Identify potential sources of contamination in the food system
- Give examples of how foodborne pathogens and chemical contamination of food can impact health
- Describe the steps involved in a foodborne illness outbreak investigation, and the

food supply; this is often how bean sprouts, lettuce and other fresh produce become

into contact with food animals or manure have a greater chance of being exposed to and spreading *E. coli* and other pathogens.5,8 Feeding large amounts of grain to beef and dairy cattle, another standard IFAP practice, may also increase food safety risks by altering the animals' digestive systems in ways that foster greater populations of a disease-causing strain of *E. coli*.9

The scale at which industrialized **food processing** facilities operate can increase food safety

The use of chemical pesticides allows farmers to exert some control over crop pests like

weeds and certain insects (at least in the short term; refer to *Agriculture and Ecosystems*),
but this practice can leave pesticide residues on and inside fruits and vegetables. Even at

Household

The USDA suggests four steps to help prevent foodborne illness at home: clean, separate, cook and chill. The first step, "clean," encourages people to wash their hands, countertops and any utensils that may be used before touching any food. The second, "separate," means keeping raw meat separate from ready-to-eat food (such as salad) when preparing meals or even in the refrigerator. "Cook" refers to cooking food thoroughly by using a food thermometer when necessary and making sure to stir or rotate dishes when cooking. The

13. Kessel J Van, Karns J, Gorski L, McCluskey B, Perdue M. Prevalence of salmonellae, listeria monocytogenes, and fecal coliforms in bulk tank milk on US dairies. *Journal of Dairy Science*. 2004;87(9):2822-2830.
14. Centers for Disease Control and Prevention. Campylobacter: general information. 2010. Available at: http://www.cdc.gov/nczved/divisions/dfbmd/diseases/campylobacter/.
15. Centers for Disease Control and Prevention. Norovirus: Q&A. 2010. Available at: http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-qa.htm.
16. Alavanja M, Hoppin H, Kamel F. Health effects of chronic pesticide exposure: cancer and neurotoxicity. *Annual Review of Public Health*. 2004;25:155-197.
17. UNEP Chemicals Branch. *The Global Atmospheric Mercury Assessment: Sources, Emissions, and Transport*. Geneva, Switzerland: 2008.

[redacted]

Registry ToxFAQs: Mercury. 1999.
19. Silbergeld EK, Nachman K. The environmental and public health risks associated with arsenical use in animal feeds. *Annals of the New York Academy of Sciences*. 2008;1140:346-57.
20. HACCP Alliance. HACCP questions and answers. 2011. Available at: http://haccpalliance.org/alliance/haccpqa.html.
21. Food Safety and Inspection Service. Key facts: microbial testing programs--FSIS testing for

On Friday, June 7, the physician noticed that during the morning of her shift she had seen several people with similar symptoms. She began asking questions about their previous

OUTBREAK INVESTIGATION QUESTIONNAIRE DATA

Number	[illegible]	[illegible]	[illegible]	[illegible] Salad	Cole Slaw	Ice Cream
10	[illegible]	[illegible]	[illegible]	[illegible]	Did not eat	Did not eat
11	8th	Ate	Did not eat	Ate	Ate	Ate
12	8th	Ate	Ate	Ate	Ate	Ate
13	7th	Ate	Did not eat	Ate	Did not eat	Ate
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Did not eat
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	7th	Ate	Did not eat	Ate	Ate	Ate
18	8th	[illegible]	Ate	[illegible]	[illegible]	[illegible]

2.1 OUTBREAK INVESTIGATION: ATTACK RATE

What percent of people who attended the event got sick?

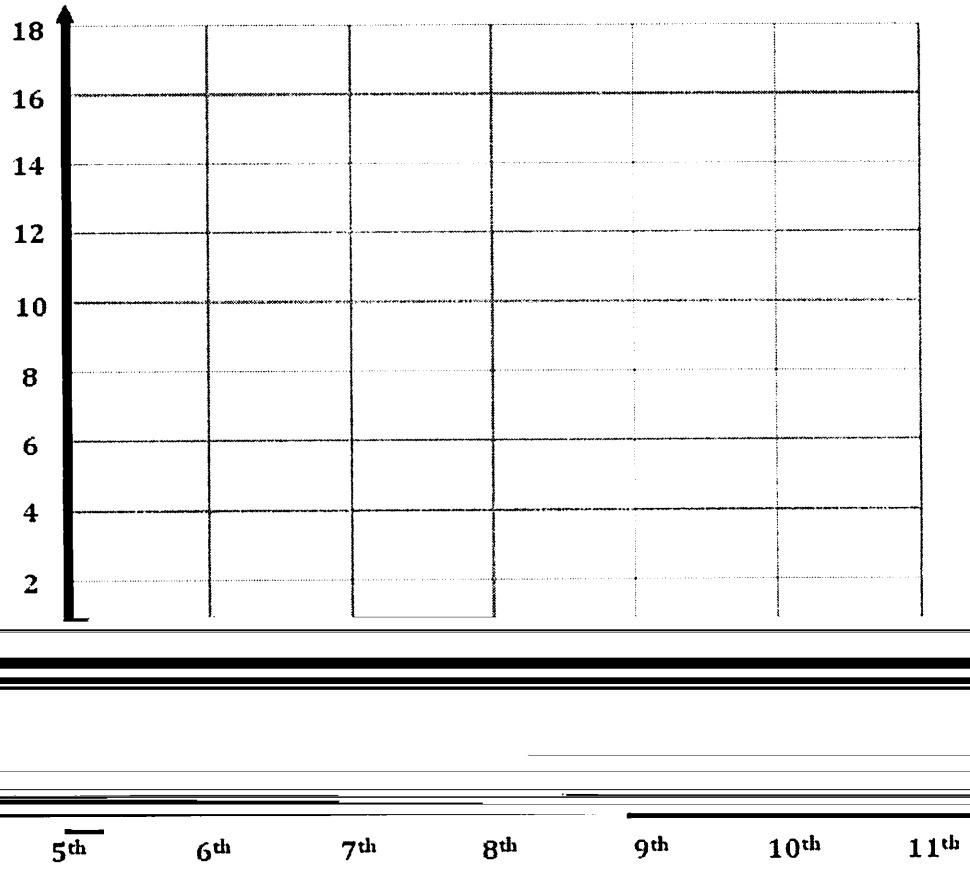
Instructions: Using the *Questionnaire Data*, count how many people became sick and how many did not. In order to determine the attack rate (the percentage of people who became sick), divide the number sick by the total number of people who answered the questionnaire. Write your results in the table below.

Number of people	Number of people	Total number of	Attack rate:

2.2 OUTBREAK INVESTIGATION: EPIDEMIC CURVE

Instructions:

Determine when each person first reported his or her sickness. Graph your results below to determine when the majority of people became ill. Label the X-axis as "date of onset" and the Y-axis as "number of people."



1. On what date did the most people become sick?

2. What is the mode incubation period? Hint: The time from exposure to the day when the most people became sick is the mode incubation period.

3. What is the median incubation period? Hint: The median incubation period can be found by making a list of the individual incubation periods, from shortest to longest. The middle value in the list (or the average of the two middle values if there is an even number of cases)

2.3 OUTBREAK INVESTIGATION: IDENTIFYING THE PATHOGEN AND CONTAMINATED FOOD

Instructions:

Work as a group to answer the questions below about the pathogen and food that probably caused the outbreak. Consider the results of your investigation so far: the symptoms of people who became ill, the attack rate and the median incubation time. Compare these against the descriptions of each pathogen in the handout labeled *Outbreak investigation:*

Pathogens.

1. Which pathogen do you suspect caused the illness?

2. Which food do you suspect was contaminated by the pathogen?

OUTBREAK INVESTIGATION:
PATHOGENS Salmonella
Incubation period: 1-3 days
Signs and symptoms:
• Fever
• Vomiting
• Diarrhea

Campylobacter
Incubation period: 2-5 days
Signs and symptoms:
• Fever
• Vomiting
• Diarrhea

Commonly associated foods:
• Eggs
• Poultry
• Cheese
• Unpasteurized milk or juice
• Raw fruits and vegetables1

Commonly associated foods:
• Raw and undercooked poultry
• Unpasteurized milk
• Contaminated water2

Norovirus
Incubation period: 1-2 days
Signs and symptoms:
• Nausea
• Vomiting
• Large volume diarrhea

E. coli
Incubation period: 1-8 days
Signs and symptoms:
• Vomiting
• Severe diarrhea
• Abdominal cramps

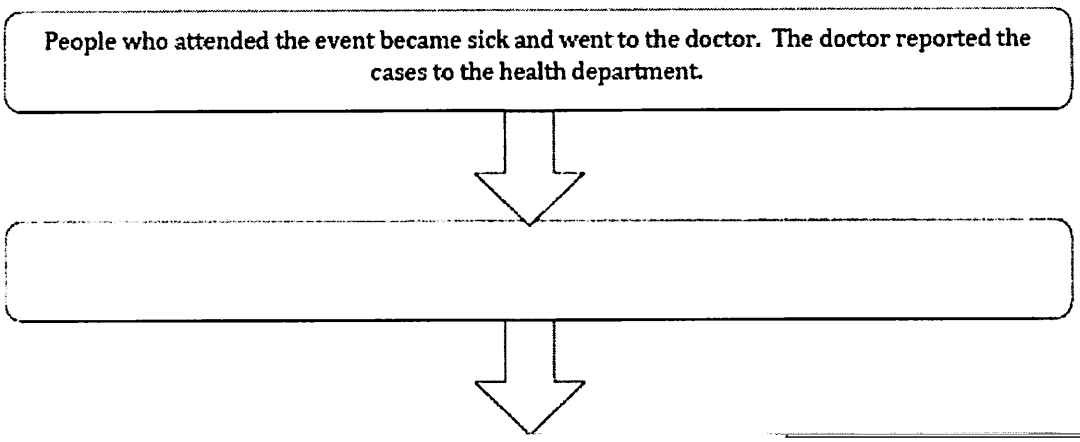
Commonly associated foods:
• Poorly cooked shellfish

Commonly associated foods:
• Undercooked beef, salami

• Ready to eat foods handled by infected persons like salads or sandwiches
• Contaminated water3

• Contaminated water
• Unpasteurized milk or juice4

Instructions:
How do health departments respond to an outbreak of a foodborne illness? Think about the steps you took to determine the cause of the outbreak. For each step in the investigation of an outbreak, write a sentence describing the activity that took place at that step.



POST-LAB QUESTIONS

OUTBREAK INVESTIGATION: PRESS RELEASE

Instructions:

Draft a press release (about a paragraph in length) for the local newspaper about the

Include recommendations for how to prevent foodborne outbreaks at future community events.

GRADING: FOOD SAFETY

Points	Item
_____/2	Attack Rate
_____/3	Attack Rate by Food
_____/4	Epidemic Curve
_____/4	Identifying the pathogen and contaminated food
_____/4	Summary of Action Steps
_____/8	Post-lab questions: Press release
_____/25	**Total**