FOOD BORNE ILLNESSES: GROUP READING ACTIVITY

READ: Food borne illness is carried or transmitted to humans by eating food that has been contaminated with an unwanted micro-organism. Bacteria, parasites and viruses are micro-organisms that can cause food borne illness or "food poisoning". Microbes and pathogens also describe the microorganisms that cause food borne illness.

➢ DISCUSS: Have you, or anyone you know, ever had “food poisoning”? What were the symptoms? How severe were they and how long did they last?

READ: The U.S. Food and Drug Administration estimate 7 million cases of food-borne illness a year result in seven thousand deaths. Many cases of food borne illness go unreported because their symptoms often resemble the stomach flu. The most common symptoms of food borne illness include stomach cramps, nausea, vomiting, diarrhea and fever.

The more you know about food borne illness the more you can protect yourself.

DIRECTIONS: In groups of 2-4
1. Read about the food borne pathogen(s) on the paper your kumu (teacher) gives you.
2. Draw 2 pictures to show how people get ill from this pathogen, and what they can do to avoid getting ill from it.
3. Complete the Cloze notes (fill in the blanks) on the Food Borne Pathogens worksheet for your section.
4. Then share your notes with the class and tell them what you drew and what it means.
5. Help each other complete the entire worksheet.
FOOD BORNE PATHOGENS – Read & Draw

1. **SALMONELLA** (**SAL-MUH-NEL-UH**)

Salmonella is a large group of bacteria, which causes more food-borne illnesses in the United States than any other organism. There are several strains of salmonella, but these two are most common in food-borne illness, *Salmonella enteritidis* (en-tuh-RID-i-tis) and *Salmonella typhimurium* (tie-pha-MUR-i-am). Salmonella can make people ill with a disease called salmonellosis.

**What are the symptoms?**

Symptoms typically show up in eight to 72 hours after eating contaminated food. They include nausea, vomiting, abdominal cramps, headache, diarrhea, and fever. The symptoms can last anywhere from 1 to 8 days.

**Where is salmonella found?**

Salmonella bacteria are found in the intestines of animals. This means that foods or environments contaminated with animal waste may contain salmonella bacteria. Foods that most likely carry salmonella bacteria include raw or undercooked foods such as poultry, unpasteurized or raw milk or other dairy products and meats. Salmonella has also been found in a low percentage of unbroken raw eggs. Fruits and vegetables can contain salmonella bacteria if they have been in soil contaminated with animal waste, or if they have come in contact with an infected product or surface (such as a countertop or hands during food preparation).

**How to avoid salmonella**

Cooking destroys Salmonella. Thoroughly cook meats, poultry, fish and eggs. Avoid raw egg dishes. Wash hands and utensils before preparing food. Use separate cutting surfaces and knives to prepare raw and cooked foods. Clean cooking utensils, cutting boards and counters regularly, especially after touching raw meat or poultry — this goes a long way to prevent the spread of contamination during food preparation. Never consume unpasteurized, raw or undercooked foods of animal origin.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FOOD BORNE PATHOGENS – Read & Draw

2. **STAPHYLOCOCCUS AUREUS** *(STAF-I-LOW-COCK-US OR-EE-US)*

What are the symptoms?
Nausea, vomiting, chills, and shallow breathing may begin 2 to 4 hours after eating contaminated food. The symptoms can last anywhere from 24 to 48 hours.

Where is *Staphylococcus aureus* found?
*Staphylococcus aureus* bacteria are found on our skin, in infected cuts and pimples, and in our noses and throats. Hand-contact, improper food handling, coughing or sneezing spreads bacteria and grow on protein-rich foods such as meats, poultry, fish, milk products, milk-based sauces, puddings and custards.

How to avoid *Staphylococcus aureus*
Prevention includes washing hands and utensils before preparing and handling foods and not letting prepared foods -- particularly cooked and cured meats and cheese and meat salads -- sit at room temperature more than two hours.

Proper storage of foods is needed to prevent bacterial growth (place meat, fish and poultry in the coldest part of the refrigerator - on a low shelf at the back).

Thorough cooking destroys "staph" bacteria but *Staphylococcal* enterotoxin is resistant to heat, refrigeration and freezing.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ka Hana ‘Imi Na‘auao – A Science Careers Curriculum Resource  Go to:  www.cds.hawaii.edu/kahana
NOT FULLY FIELD TESTED
3. CLOSTRIDIUM PERFRINGENS (KLAS-TRID-E-UM PER-FRIN-JENZ)

What are the symptoms?
Symptoms are relatively mild and include diarrhea and gas pains, which begin between 6 and 24 hours after ingestion and last approximately 24 hours. The illness is most serious for the sick and elderly.

Where is Clostridium perfringens found?
Meat, poultry, cooked dried beans ("refried" beans) and gravies are the most common carriers. The organism lives in soil, so contamination from unwashed vegetables also is possible. "Perfringens" is called the "cafeteria germ" because it may be found in large quantities of food left for long periods of time on inadequately maintained steam tables or at room temperature.

How to avoid Clostridium perfringens
Keep hot foods hot (at or above 140 degrees F) and cold foods cold (at or below 40 degrees F). Use shallow storage pans; food should be no more than 2 inches deep. Reheat leftovers to at least 160 degrees F before serving. Wash away all soil from vegetables using clean drinkable water. Wash hands and utensils before preparing food.

Prevention is to divide large portions of cooked foods such as beef, turkey, gravy, dressing, stews and casseroles into smaller portions for serving and cooling. Keep cooked foods hot or cold, not lukewarm.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ka Hana ‘Imi Na’auao – A Science Careers Curriculum Resource  Go to: www.cds.hawaii.edu/kahana
NOT FULLY FIELD TESTED
4. **CAMPYLOBACTER JEJUNI** *(KAM-PI-LO-BAK-TER JI-JOON-EYE)* or *C. jejuni* Campylobacter is the number one pathogen causing illness in each and every month.

**What are the symptoms?**
Muscle pain, headache and fever followed by diarrhea, abdominal pain and nausea. Symptoms begin 1 to 10 days following ingestion.

**Where is Campylobacter jejuni found?**
Poultry, shellfish and livestock carry this organism. *C. jejuni* have been attributed to undercooked poultry and meats, raw (unpasteurized) milk and non-chlorinated water.

**How to avoid Campylobacter jejuni**
Avoid eating raw or undercooked poultry, unpasteurized milk and untreated water.

Cook ground meats to a uniform internal temperature of at least 160 degrees F, ground poultry to 165 degrees F (non-ground poultry to 170 F). Once cooked, keep hot foods above 140 F and cold foods below 40 F.

Wash hands and utensils before preparing food.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. **ESCHERICHIA COLI** OR **E.COLI** *(ESH-AR-IK-EEYA COLI)*

### What are the symptoms?
Symptoms include abdominal cramps, stomach pain and watery diarrhea. Severe cases may include bloody diarrhea, vomiting and nausea, low-grade fever and even shock or kidney damage. Symptoms generally begin 3 to 9 days following infection and may last 2 to 9 days.

### Where is *Escherichia coli* found?
*Escherichia coli* can be found in ground beef products, unpasteurized milk and plant foods. It can be transmitted through inadvertent contact with fecal matter during processing of animal foods or because of improper food handling. It can contaminate unpasteurized apple cider and fresh vegetables.

### How to avoid *Escherichia coli*
*E. coli* is killed by completely cooking ground meats (160 degrees F, or higher) and heating fresh apple cider.

Reheat foods to 160 degrees F. Keep hot foods at or above 140 F and cold foods at or below 40 degrees F. Avoid unprocessed fruit and vegetable juices and unpasteurized milk and milk products.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FOOD BORNE PATHOGENS – Read & Draw

6. CLOSTRIDIUM BOTULINUM (KLO-STRID-EE-UM BOCH-AH-LI-NUM)

What are Clostridium botulinum and botulism?
Clostridium botulinum (C. botulinum) causes the illness called botulism. Botulism is a food intoxication. C. botulinum itself does not make people ill; the poisons produced by C. botulinum do.

What are the symptoms?
The toxin attacks your nervous system causing nausea, vomiting, fatigue, headache, diplopia (double vision), dizziness, constipation, paralysis, difficult breathing and dryness in the throat and nose. Symptoms may progress to respiratory and cardiac failure. The onset of symptoms takes approximately 12-36 hours following infection. The duration of illness may be 1-10 days, although some symptoms may linger much longer.

Where is Clostridium botulinum found?
Clostridium botulinum is widely distributed in soil. Low-acid fruits and vegetables that pick up botulinum spores from soil promote growth if improperly canned. Canned (especially home canned) low acid foods are most likely to contain C. botulinum.

How to avoid Clostridium botulinum
Do not use foods in cracked jars or cans that are swollen, leaking, damaged or with bulging ends. The food may not have spoiled but it may still contain the toxin. Don't eat canned fruits or vegetables that have a milky, instead of clear, liquid surrounding them. When canning foods at home, be sure to cook all products in a pressure canner following the manufacturer’s instructions closely. To kill the toxin, boil all home canned foods for ten minutes in a pressure cooker immediately before eating them.

Do not feed honey to children under one year old. Honey may be contaminated with C. botulinum. The bacterium cannot grow or make toxin in the honey, but it may grow and make toxin in the baby's body. Processors add nitrites to many vacuum-packaged foods to enhance flavor and color. This family of ingredients also helps reduce the growth of C. botulinum.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. LISTERIA MONOCYTOGENES
What are Listeria monocytogenes and listeriosis?
Listeria monocytogenes is a bacterium and is often found in the environment, particularly in soil, vegetation, and humans and animals feces. Listeriosis is a disease that may develop when the level of Listeria monocytogenes in the body rises after eating contaminated food.

What are the symptoms?
Symptoms include flu-like symptoms such as nausea, vomiting, cramps, diarrhea, headache, constipation and persistent fever. It can also cause meningitis. In the very young, elderly or those with poor immune systems, these symptoms may be followed by a brain or blood infection, either of which can result in death. It can cause miscarriage if listeriosis is developed during the first three months of pregnancy. If listeriosis is developed later in the pregnancy, the baby may be stillborn or acutely ill.

Where is Listeria monocytogenes found?
Listeria monocytogenes can be found in a variety of dairy products such as unpasteurized milk and soft-ripened cheese, raw and leafy vegetables, raw or undercooked meat, poultry, and raw and smoked fish. Listeria monocytogenes will multiply slowly on foods at refrigeration temperatures (these bacteria can be found in cold foods typically served on buffets). Listeria monocytogenes can also be spread by contact with an infected product or surface (such as hands or countertops during food preparation) and by food contaminated by feces.

How to avoid Listeria monocytogenes
Keep foods out of the temperature danger zone (between 4 and 60 C or 40 and 140 F). Keep the refrigerator at 4 C (40 F) or colder. Wash all raw vegetables thoroughly. Each leaf of lettuce or cabbage should be washed separately. Meats should be well cooked and only pasteurized dairy products should be used. Carefully observe "sell by" and "use by" dates on processed foods, and thoroughly reheat frozen or refrigerated processed meat and poultry products before consumption.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. CYCLOSPORA CAYETANESIS
Cyclospora are most common in tropical climates but outbreaks have occurred in the United States.

What are the symptoms?
*Cyclospora cayetanensis* infects the small intestine (bowel) and usually causes watery diarrhea, with frequent bowel movements. Other symptoms include loss of appetite, weight loss, bloating, increased gas, stomach cramps, nausea, vomiting, tiredness, muscle aches, and low-grade fever. Other infectious organisms can cause similar illness. Some persons infected with *C. cayetanensis* do not develop any symptoms. The onset of symptoms takes approximately several days to a week following infection. The duration of illness may a few days to a month or longer, if not treated. It may also return one or more times.

Where is *Cyclospora cayetanensis* found?
*Cyclospora cayetanensis* is a one-celled parasite found in soil or water that comes into contact with infected feces. It is usually seen in imported berries.

How to avoid *Cyclospora cayetanensis*
Wash all produce that will be consumed raw, even if you’re peeling it.

Since berries are impossible to thoroughly wash, the Food and Drug Administration is working with Central American berry growers to identify the source of the Cyclospora and find ways to control contamination.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. HEPATITIS A VIRUS

What are the symptoms?
Hepatitis A is a virus that causes fever, fatigue, abdominal pain, loss of appetite, intermittent nausea, diarrhea and jaundice. The illness may not appear until 30 days after eating the contaminated food.

Where is hepatitis A found?
Food that has been contaminated by infected feces.

Usually it is linked to water, shellfish and improperly washed salads from water contaminated with human sewage and foods prepared or served by a person infected with hepatitis A who didn't adequately wash his or her hands after using the toilet.

How to avoid hepatitis A
To prevent the spread of Hepatitis A practice good sanitary and personal hygiene habits such as washing hands after using the toilet or changing diapers.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. **VIBRIO VULNIFICUS (V. VULNIFICUS)**

*Vibrio vulnificus* is a bacterium that normally lives in warm seawater.

**What are the symptoms?**

*Vibrio vulnificus* can cause vomiting, diarrhea, and abdominal pain. In immunocompromised persons, particularly those with chronic liver disease, *V. vulnificus* can infect the bloodstream, causing a severe and life-threatening illness characterized by fever and chills, decreased blood pressure (septic shock), and blistering skin lesions. *V. vulnificus* bloodstream infections are fatal about 50% of the time.

**Where is Vibrio vulnificus found?**

It is most commonly associated with raw shellfish, particularly oysters.

**How to avoid Vibrio vulnificus**

Avoid serving or eating raw oysters or other raw shellfish. Cook shellfish (oysters, clams, mussels) thoroughly: For shellfish in the shell, either a) boil until the shells open and continue boiling for 5 more minutes, or b) steam until the shells open and then continue cooking for 9 more minutes. Do not eat those shellfish that do not open during cooking. Boil shucked oysters at least 3 minutes, or fry them in oil at least 10 minutes at 375°F.

Avoid cross-contamination of cooked seafood and other foods with raw seafood and juices from raw seafood. Eat shellfish promptly after cooking and refrigerate leftovers.

Avoid exposure of open wounds or broken skin to warm salt or brackish water, or to raw shellfish harvested from such waters.

Wear protective clothing (e.g., gloves) when handling raw shellfish.

<table>
<thead>
<tr>
<th>Pathogen Causes</th>
<th>Pathogen Prevention</th>
</tr>
</thead>
</table>
Food Borne Pathogens (Cloze Worksheet)

Salmonella:
Symptoms appear: _____ to _____ hours after ingestion.
Found in ________________ of animals.
Foods that usually carry salmonella:

Why can fruits and vegetables have salmonella?

Staphylococcus aureus:
Symptoms appear: ____ to ____ hours after ingestion.
Found on:

Why would you want to store meat, fish and poultry in the back lower shelf? (think about it)

Clostridium perfringens:
Symptoms appear: _____ to ____ hours after ingestion.
More serious to the ___________ and ____________.
Found on:

Organism lives in ____________.
Also called ________________ _________ because it may be found in large quantities.
Reheat leftovers to at least ___________ degrees. Never leave it ______________

Clostridium botulinum:
Causes the disease called ________________ that releases a food ________________.
Symptoms begin _____ to _____ hours after ingestion.
Found on:

To kill/neutralize the toxin, boil home canned foods for _____ minutes in a ______________

Campylobacter jejuni:
The most ________________ disease causing pathogen.
Symptoms appear: _____ to _____ days after ingestion.
Spread of C. jejuni have been attributed to:

Vibrio vulnificus:
Organism usually lives in ____________ ________________.
Commonly associated with ________________.
How do you kill the Vibrio vulnificus organism?
Overview:
1. What is the most common symptom to all food borne pathogens? What would you need to know in order to diagnose one from the other?

2. What is the difference between the 2 different clostridium “bugs”?

3. On ounce of prevention is worth a pound of cure. How can you prevent these types of “bugs” affecting your life? Note how you’d change the way foods are handled at home, or even when you notice people handling foods in other establishments such as restaurants and markets.

4. Why do you think the USDA have people who go out into the field “undercover” to many establishments to inspect them? Why would you expect such strict consequences for violators?