

MAKING THE CONNECTIONS TO FOOD SAFETY

Grade 12

SNC4M **Food Safety Resource**



in partnership with



*This resource has been developed by the
Science Teachers' Association of Ontario /
l'association des professeurs de sciences de l'Ontario
with funding and technical support from Maple Leaf Foods.*

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Project Rationale

The enclosed Food Safety Resource was developed collaboratively between the Science Teachers' Association of Ontario and Maple Leaf Foods. It is intended to be used as a summative project for the SNC4M Grade 12 Science University/College Preparation course or as supporting documents to be used throughout the duration of the course. The summative research project can be used in conjunction with the student activities: students can hand in all or a portion of the completed activities as part of their portfolio towards completion for the summative assignment. The activities include both stand-alone material and pieces that join strands together. Each section includes:

- i. An overview of the topic. This can be used by the teacher or by students to gain some background on the topic.
- ii. Specific expectations coded for the teacher.
- iii. Suggested changes to assignment allowing for the teacher to take into consideration differentiated instruction and multiple intelligences as well as making modifications and accommodations for individual student needs or general class needs.
- iv. Assessment pieces to be completed by students. These are intended as guides and activities to support the evaluation pieces to be completed later.
- v. Evaluation piece to be completed by students and evaluated by the teacher.

We hope this resource will be useful to you and your students!



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1. What You Will Learn – Overall Expectations

After completing this project, you will be able to:

- A1. demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating);
- C1. evaluate the impact of individual behaviour on the control of pathogens and the prevention of disease;
- C2. investigate the nature and growth of pathogens, and the effectiveness of measures intended to prevent their spread;
- C3. demonstrate an understanding of pathogens, the diseases they cause, and ways of controlling their spread;
- D1. assess how personal and societal factors affect eating behaviours, and evaluate the social and economic impact of the use of non-nutrient food additives;
- E1. assess the impact of government initiatives on public health;
- E2. investigate various strategies related to contemporary public health issues;
- E3. demonstrate an understanding of major public health issues, past and present.

2. Accommodations and Modifications

If a student has an IEP, consideration is to be given to accommodate the student's needs.

- Instructional accommodations/modifications – decreased number of questions, use of computer, pre-made organizational sheets, fill-in-the-blank worksheets, photocopied notes or overheads, and the use of supplemental software
- Environmental accommodations – preferential seating, reduced distractions
- Assessment and evaluation accommodations – additional time, oral answers, reduced number of questions
- English Language Learners – language pairing, visuals to help explain material and instructions, additional time and help, vocabulary cards

Note: Some of the websites listed are written for elementary students and would be appropriate for students with lower reading levels.

2.1 Differentiated Instruction

Suggestions for differentiated instruction:

- Musical/Rhythmic learner – allow students to present information in the form of songs, rhymes, poems or by acting
- Visual/Spatial learner – encourage the use of diagrams, charts, graphs, photographs
- Verbal/Linguistic learner – have students write stories, work with a partner to read out loud or discuss information, create a storyboard
- Bodily/Kinesthetic – have students use or make models, act out ideas, use body movement or gestures
- Logical/Mathematical – encourage students to write out steps, use flow-charts or graphs and timelines

3. Introduction

Your body is under constant assault from microscopic organisms, or microorganisms, which are trying to make you into their new home. Every day, with every breath you take and every bite of food you eat, you are introducing potential invaders. Your environment, your home, your skin, and the inside of your mouth all contain invisible ecosystems of bacteria, viruses, and protists, all fighting for a warm place to call home. Most of these will not harm you, but some have the ability to cause serious, even life-threatening diseases. Our ability to control their spread depends, in part, on our understanding of how these pathogens reproduce and how their spread can be prevented.

In this summative activity, you will look at the 2008-2009 listeriosis outbreak and its consequences. You will begin by exploring foodborne pathogens and their prevention. You will also look at the specific details of the outbreak at Maple Leaf Foods, what was done to stop it, and its effectiveness. You will explore the medical technologies used in diagnosis and treatment of foodborne illnesses. Finally, you will analyse the role of public health and government legislations in preventing future outbreaks, and potential future applications of biotechnology that could be used to safeguard our food supply.

4. Section 1: Nutritional Science and Pathogens and Disease

Microorganisms Are All Around Us

“Four more ready-made sandwich brands have been added to a massive voluntary meat recall in connection with a deadly listeriosis outbreak across the country, the Canadian Food Inspection Agency said.”

- Canadian Broadcasting Corporation.

“CBC News - Toronto - Recall over listeriosis fears expands to 4 more products.”

CBC.ca - Canadian News Sports Entertainment Kids Docs Radio TV. CBC, 26 Aug. 2008. Web. 24 June 2010.
<http://www.cbc.ca/canada/toronto/story/2008/08/26/listeriosis.html>

In 2008, a massive recall of meats occurred across Canada. The culprit, a bacterium named *Listeria monocytogenes*, was found in deli meats. The contaminated food caused 57 confirmed cases of listeriosis, and 23 deaths where the bacterial infection was seen as the underlying or contributing cause.

Where do the *Listeria* bacteria come from? Bacterial contamination of food relates to the immediate environment in which the food is grown, processed, and stored. Many people play a crucial role in keeping your food safe: farmers, fishermen, processors, transporters, grocers, and you, the consumer. The safe handling of food is a key to prevent foodborne illness.

According to Health Canada, between 11 and 13 million Canadians are affected by foodborne illness each year. We commonly refer to it as food poisoning. Because the symptoms are similar to other digestive illnesses, many cases are never reported. With such high numbers of individuals affected, it is time for us to rethink our food safety practices.

As Canadians, we should be proud of the safety of our food supply. We have some of the highest standards of food safety in the world! Our food supply is so reliable that we often forget about the role of the many individuals who ensure its safety. Along with the manufacturers, transporters, and grocers, you, the consumer, are also responsible for its safety!

Student Activity #1

Overview

In this activity, students will research the main causes, symptoms, and preventions of foodborne illness.

Expectations

- C1.2 Evaluate the impact of individual choices on the control of pathogens and the prevention of disease
- C3.2 Describe the mode of transmission of various diseases

Alternatives

- Students could create a concept map to summarize the learned information.

What is Foodborne Illness?

Use the links included as starting points to research what is a foodborne illness. As you gather information, fill in the table below in point-form.

Some starting points:

<http://www.mapleleaf.com/en/market/food-safety/food-safety-at-home/>

<http://inspection.gc.ca/english/fssa/concen/tipcone.shtml>

http://canfightbac.org/cpcfse/en/safety/safety_factsheets/

<http://inspection.gc.ca/english/fssa/concen/causee.shtml>

Foodborne Illness	
Definition	
Common Causes	
Symptoms	
Prevention	

Student Activity #2

Overview

In this activity, students will design an effective safety survey to carry out with at least two of their family members based on the prevention information they gathered in Student Activity 1. A sample food safety survey is available at http://www.canfightbac.org/en/_pdf/BAC_1-44.pdf, on page 8 of that document. You can use a think-pair-share format to help students brainstorm ideas for their survey questions.

Expectations

- C1.2 Evaluate the impact of individual choices on the control of pathogens and the prevention of diseases
- C3.7 Describe aseptic techniques used, and explain their importance in preventing the spread of pathogens

At-Home Survey of Safe Food Handling Practices

Now that you know some of the causes of foodborne illness and the ways to prevent it, you will work to design a survey on safe food handling practices within your own home. Start off by thinking about at least two questions you could ask under each of categories below. Once you have come up with your questions, join with a partner or partners and together come up with four questions for each category. You will ask these questions of family members. Record their answers carefully in the table provided below.

Category	Question	Answer
CLEAN	1.	1.
	2.	2.
	3.	3.
	4.	4.
SEPARATE	1.	1.
	2.	2.
	3.	3.
	4.	4.
COOK	1.	1.
	2.	2.
	3.	3.
	4.	4.
CHILL	1.	1.
	2.	2.
	3.	3.
	4.	4.

Keeping Food Safe

The hypothesis of spontaneous generation, the belief that living things come from non-living matter, was widely accepted in Western medicine well into the 19th century. For example, it was a widely held belief that maggots came from meat, mice from grain, and illnesses from “bad humours”. It wasn’t until Louis Pasteur proved through his famous swan-necked flask experiments the existence of microscopic pathogenic organisms that the health establishment acknowledged the existence of microscopic pathogenic organisms. Pasteur was a chemist, originally hired by the French wine industry to determine what factors contributed to the making of wine, as opposed to vinegar. Through systematic investigations, Pasteur was the first to conclusively demonstrate to the medical community that microscopic organisms do exist and are all around us. The diagram below illustrates his experiment.

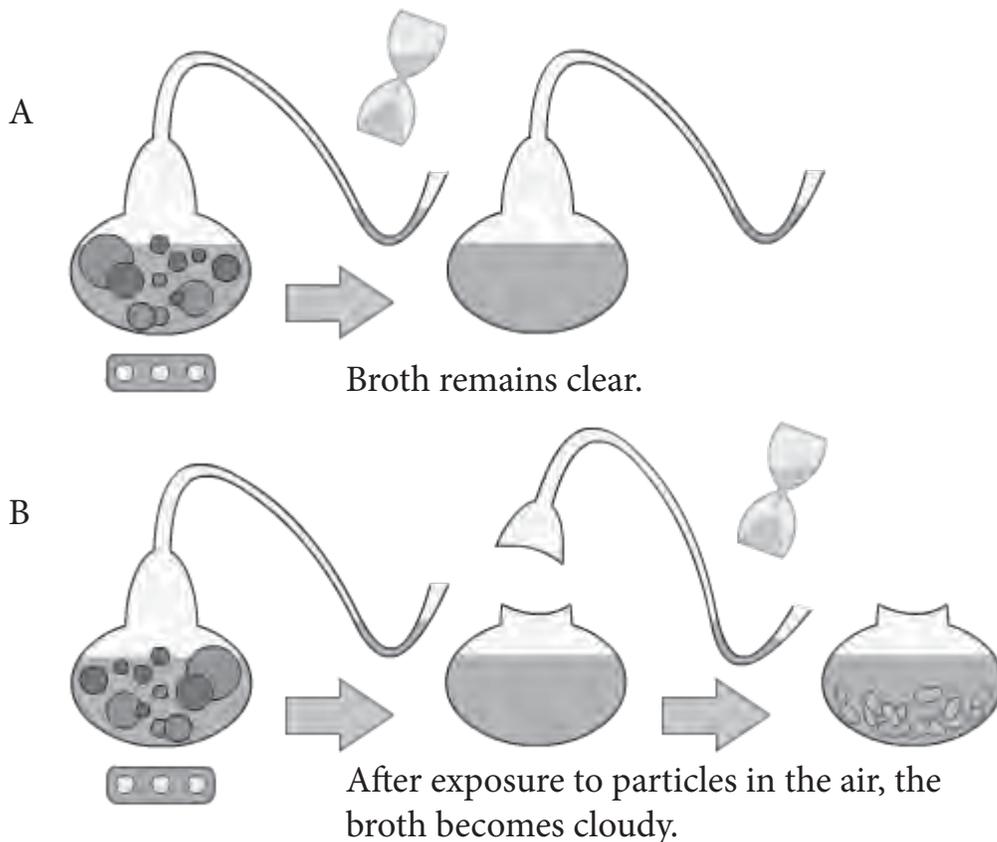


Figure 1: Pasteur’s germ theory experiments. In 1859, Louis Pasteur boiled a meat broth inside a swan-necked flask to kill off any potential living organisms. One flask (A) was left intact, unexposed to particles from the air due to the bend in the neck. A second flask (B) was exposed to particles. Over time, a clear difference was seen between the two flasks: the exposed broth became cloudy with bacteria, while the unexposed remained clear.

Source: http://commons.wikimedia.org/wiki/File:Experiment_Pasteur.png

Pasteur’s experiments established the “Germ Theory of Disease”, stipulating that microorganisms are the cause of many diseases. We refer to these disease-causing microorganisms as pathogens. The germ theory revolutionized modern medicine, leading to the development of vaccines, antibiotics, anti-virals, as well as non-medical methods of controlling the spread of pathogens.

Louis Pasteur, along with many other accomplishments, developed a process of preventing food spoilage and foodborne illness through the technique of pasteurization. This technique is still used today with milk products and juices. Also, many other techniques of keeping your food supply safe also exist.

Student Activity #3

Overview

In this activity, students will research the many techniques used to keep food safe and prevent the spread of foodborne illnesses.

Expectations

- C1.1 Analyse, on the basis of research, the impact, both positive and negative, of scientific and technological advances intended to prevent the spread of foodborne illness and disease
- C1.2 Evaluate the impact of individual choices on the control of pathogens and the prevention of disease
- C3.7 Describe aseptic techniques used, and explain their importance in preventing the spread of pathogens

Alternatives

- This assignment could also be done as a jigsaw, allowing students with IEPs to pair up with stronger students. Students would research one technique used to prevent foodborne illnesses in their expert group, share the information learned with their home group, and then receive the information on the other techniques from the other members in their home group.
- Another possibility would be for students to work in groups to research a technique used to prevent foodborne illnesses, write, and then present a skit depicting the technique. When the skits are presented to the class, students will complete the chart below.
- Students could organize answers into a concept map.

Preventing Foodborne Illnesses

Many techniques are currently used to prevent the spread of foodborne diseases. Use the links provided below to find out about several of them, and use your information to fill in the table below.

Some starting points:

<http://hc-sc.gc.ca/fn-an/securit/index-eng.php>

<http://inspection.gc.ca/english/fssa/concen/tipcon/eveprae.shtml>

<http://inspection.gc.ca/english/fssa/concen/tipcon/irrade.shtml>

http://www.foodsafetynetwork.ca/asp/public/publication_detail.aspx?cID=441&id=59

http://www.foodsafetynetwork.ca/asp/public/publication_detail.aspx?t=&id=338

TECHNIQUE	WHAT IT IS	HOW IT WORKS
Cooking		
Refrigeration		
Pasteurization		
Radiation		
Filtration		
Use of food preservatives		

Evaluation: Student Activity #4

Overview

In this activity, students will participate in a guided design of an experiment on bacterial growth under different conditions. In order to successfully carry out the experiment, the students will need access to standard LB (bacterial growth gel) and LBA (bacterial growth gel with ampicillin) plates and non-pathogenic bacteria culture. These can usually be obtained for a nominal fee from your local post-secondary education centre's microbiology department or from a biological supplier. If you do not have an incubator, it is relatively easy to simulate one by placing a high-watt light bulb inside a closed box. Be sure to include an open-water dish to allow for sufficient humidity. One additional thing to consider, the gel plates must be disposed of according to your Board Policy. There are waste disposal companies in most areas that will collect the plates when students have completed the activity. Again, if you do not have an autoclave available, you will need to enlist the help of the closest post-secondary institution that has one. The plates may need to be autoclaved prior to disposal. Once again, check with your Board and waste removal company for further details.

Since this is a design-a-lab activity, the rubric for this should be derived as a class, once the students have completed collecting their data. You can use a brainstorming technique to elicit the qualities of a good laboratory analysis that they feel should be evaluated.

Expectations

- C2.2 Analyse, on the basis of inquiry, the effects of various treatments on pathogens
- C3.5 Describe non-medical ways to protect oneself from contracting pathogenic disease in a variety of situations
- C3.7 Describe aseptic techniques used, and explain their importance in preventing the spread of pathogens

Accommodations

For students with an IEP, consider assigning them a condition and giving them the procedure.

Bacterial Growth Design-a-Lab

Bacteria are living organisms and, as such, are affected by their growing conditions. In this laboratory session, you will design and perform an experiment on bacterial growth under different conditions. Once you have inoculated your bacterial growth plates, you will allow them to incubate for 72 hours, making observations every 24 hours. Your observable result will be the amount of bacterial growth on the bacterial growth plates.

MATERIALS AND METHODS

The following is a list of available materials. You are by no means obligated to use all of them! Please feel free to propose other materials that might be useful to your group.

growth plates

- LB plates (bacterial growth plates)
- LBA plates (bacterial growth plates that contain the antibiotic ampicillin)

incubation conditions

- 37°C incubator
- 4°C incubator
- ambient/room temperature incubator

sources of bacteria

- non-pathogenic culture (provided by teacher)

treatments for bacteria

- regular soap
- antibacterial soap
- hand sanitizer

other

- cotton swabs
- permanent marker to write on your plates (be sure to write around the edges of the plates, so as not to obstruct your observations)
- masking tape

STEPS TO COMPLETE (during this period)

1. Working individually or in groups of up to three students, pick a focus for your experiment. What bacterial growth conditions would you like to test?
 - the effects of temperature
 - the effects of antibiotics
 - the effects of different hand treatments on the bacteria
 - other conditions, discussed with your teacher

Condition chosen:

Your general purpose is “To determine the effects of different conditions on bacterial growth”. Rewrite the general purpose in view of your chosen conditions.

Purpose:

2. As individuals, come up with a testable hypothesis. A hypothesis is an educated guess. Under which conditions do you think the bacteria will grow best? Share your hypothesis within your group and create a new group hypothesis that you will test.

Hypothesis (what do you think will happen?):

3. Pair up with another group and exchange your hypothesis statements. Make suggestions for improvement and listen to their suggestions. Modify your hypothesis if needed.
4. Brainstorm to design a procedure that will allow you to test your hypothesis. How do you plan to manipulate the independent variable? What variable(s) will you need to control? What safety precautions should be taken? Your dependent variable will be the amount of observable bacterial growth.

Independent variable (What are you testing?):

Controls:

Safety precautions:

5. Write a step-by-step procedure for your experiment. You can use any of the previous laboratory activities you have done to help structure your Procedure section. Be sure to include the information below:

What will go on each growth plate?

plate 1 –

plate 2 –

plate 3 –

plate 4 –

Step-by-step procedure (attach an additional page if necessary):

6. As a group, decide how you will record your data. Will you be using a table? What observations will be important?
7. Once you have completed the design, including how you will measure and record your observations, once again exchange information with another group and comment on each other's designs. Modify the procedure if needed.
8. Submit your procedure to the teacher for review. Come prepared to carry out your experiment during the next class!

Complete Individually and Hand In for Evaluation

1. Hypothesis:
2. Results:
3. Conclusions:
 - a. Provide an analysis of your results. What are your overall conclusions? Were you able to test your hypothesis? Does your hypothesis need to be modified? If so, give a modified hypothesis.
 - b. Evaluate the processes that you followed to plan and perform the experiment. What changes do you propose to your experimental design?
 - c. In three paragraphs or less, explain how this laboratory activity connects to food safety.
 - d. In 250 words or less, explain some of the other ways in which the spread of foodborne illness can be prevented.
 - e. Use your internet search skills to create a list of foods your family eats most often and how long they should be stored in the refrigerator. Be sure to include at least 5 different items from each food group!
Suggested format:

Food Item ex. sliced cold meat	How Long Can I Store It? 2-3 days
1.	
2.	
3.	
4.	
5.	

Some starting points:

<http://www.mapleleaf.com/en/market/food-safety/#>

<http://canfightbac.org/cpcfse/en/cookwell/charts/>

The Life Cycle of Different Organisms is Closely Linked to Their Mode of Transmission

Several different bacterial pathogens are linked to food poisoning. Two bacterial pathogens that we hear a lot about are *Escherichia coli*, the cause of hamburger disease, and *L. monocytogenes*, the cause of listeriosis. Each of these organisms has its own characteristics, including the symptoms that it causes and its source.

Student Activity #5

Overview

In this activity, students will compare the characteristics of *E.coli* and *L. monocytogenes*.

Expectations

- C3.1 Describe the characteristics and life cycles, including reproductive cycles, of representative pathogens
- C3.2 Describe the mode of transmission of various diseases, including those that are foodborne
- C3.4 Describe the role of vaccines, antibiotics, antiretrovirals, and other drug therapies and antiseptics in the control of pathogens
- C3.7 Describe aseptic techniques used, and explain their importance in preventing the spread of pathogens

Alternatives

- Students could create a Venn diagram comparing the two organisms.

Comparing Bacteria

Many different types of pathogenic bacteria are linked to food poisoning. In this activity, you will compare the characteristics of the two pathogenic bacteria we hear the most about in the news: *E.coli* and *L.monocytogenes*, the causative agents of hamburger disease and listeriosis, respectively. Use the link below as a starting point to help you find and fill in the necessary information.

<http://inspection.gc.ca/english/fssa/concen/causee.shtml>

	<i>E. coli</i>	<i>L. monocytogenes</i>
Disease caused		
Cells, tissue, organs, systems affected		
Symptoms		
Where can it be found?		
Mode of transmission		
Most common contaminated food source		
Seriousness of infection		
Who is at the highest risk of serious illness?		
How does it spread?		
How can its spread be prevented?		
Life Cycle		

Student Activity #6

Overview

In this activity, students will become familiar with the criteria that will determine reliable sources of information. This will intentionally prepare them for the research project they will complete as part of their summative task.

What Makes a Source of Information Reliable?

Canada is by no means immune from the breakout of potentially deadly diseases. In May of 2000, the worst-ever outbreak of *E.coli*, a bacteria associated with hamburger disease, hit a small community in Bruce County, Ontario. Use the Google search engine to find an article on this preventable tragedy. Use the table below and your knowledge of what makes an on-line source of information reliable, which will be used to assess the reliability of your article. In point-form, provide at least two points for each criterion. In sentence form, justify your opinion in the “overall reliability” section. The following template will help you assess the reliability of your resource:

<i>Criteria</i>	<i>Article</i>
<i>Website</i>	Who maintains it? Who is responsible for it? In this day and age when anyone can put up a website, it is preferable for you to use websites that are either published by the government or associated with universities and other academic institutions.
<i>Author</i>	What is his/her background? Can you find out more information on them? Have they given you contact information? Many people will put up anonymous, untraceable postings, which put their credibility into question. Look for experts in the field, with verifiable contact information. Some websites, such as those associated with government publications, will not give you a single author but rather will tell you which department is responsible for the posting. Either way, someone needs to “claim” the posting in order for it to be considered reliable.
<i>Date of publication</i>	When was the page last updated? Is it being maintained on an ongoing basis or has it been orphaned? Are the links functional?
<i>Objective reasoning</i>	<ul style="list-style-type: none"> - What do you know about the author? How does this contribute to their reliability? - Are the statements provided verifiable? Can they be proven true or false? - Does the author support opinions with facts and statistics? - Are the arguments logical? - Is the author trying to sway your opinion?
<i>External links</i>	Look for links to other, supporting sources of information. Check that the links are working and that your posting is using reliable sources.
<i>Overall reliability</i>	Can the source of information be considered reliable or not, with a brief justification.

Your article:

Criteria	Article
<i>Website</i> (2 marks)	
<i>Author</i> (2 marks)	
<i>Date of publication</i> (2 marks)	
<i>Objective reasoning</i> (2 marks)	
<i>External links</i> (2 marks)	
<i>Overall reliability</i> (2 marks)	

The Battle Within: The Immune System

Have you ever considered why some people have food allergies and others don't? Have you ever thought about why you and a friend can get exposed to the same cold or flu virus, but only one of you becomes sick? The answer to both of these questions lies in your individual immune system. Inside every one of us, our immune system is fighting a permanent battle to keep us pathogen free.

Your immune system is made up of two essential components: innate immunity and acquired immunity. Innate immunity includes physical barriers that stop bacteria from getting in, or kills them on contact, such as your skin, tears, mucus, and sweat. Innate immunity also includes some chemical barriers, such as fever. Fevers are an effective way of fighting pathogens because they work the same way as cooking – by raising the overall temperature of the environment, proteins inside bacteria become denatured and bacteria die. Acquired immunity, as the name implies, is a type of defense mechanism that we acquire through exposure to pathogens. When first exposed to something foreign, some of the “clean-up” cells of innate immunity, such as macrophages and dendritic cells, will pick up pieces of the pathogen and train more specialized B cells and T cells to recognize their shape. B and T cells are part of acquired immunity, and they provide long-term protection through fast recognition of the pathogen once they have been trained.

Both listeriosis and hamburger disease tend to affect some groups in a population more than others. Those at higher risk of listeriosis include the elderly, young children, pregnant women, and people who are immunosuppressed. The list repeats itself for hamburger disease. The answer lies with the “cell-mediated” component of immunity. Although healthy adults and children do occasionally get infected with *Listeria*, those infections rarely cause serious illness. Their T cells will work hard to get rid of the pathogens, before illness develops. On the other hand, those individuals whose cell-mediated immunity is lowered will be more affected. During pregnancy, a woman's immune system becomes naturally depressed, making her more susceptible. Immune systems of very young children have not been sufficiently “trained” through exposure to adequately fight off *Listeria* and *E.coli* infections. Some other adults, such as those with immune systems that are depressed following cancer treatment or organ transplants, are also more likely to develop severe infections. The same holds true for the elderly. Individual immune system differences make all the difference in terms of consequences of exposure!

Food allergens are another area where individual immune systems make all the difference. As many as 1.2 million Canadians may be affected by food allergies!

Student Activity #7

Overview

In this activity, students will explore the causes of food allergies and how the industry's labeling practices are trying to prevent allergic reactions.

Expectations

- C3.3 Explain how the human immune response acts as a natural defense against infection
- D1.2 Evaluate the impact of some personal and societal factors (e.g., allergies) on eating behaviours
- E3.5 Describe public health measures that are used for the protection of the public

Alternatives

- Students could research and report on the information by taping an interview with someone who has a food allergy.

Food Allergens

With as many as 1.2 million Canadians affected by food allergies, chances are you know someone who has food allergies. In this assignment, you will use the link given to find out more about food allergies and their influence on the food industry. In point-form, answer the questions below.

Some starting points:

<http://inspection.gc.ca/english/fssa/labeti/allerg/allerge.shtml>

http://fsrio.nal.usda.gov/nal_web/fsrio/fseddb/fseddbsearch.php

1. What causes an allergic reaction?
2. What are the symptoms of an allergic reaction?
3. How are allergic reactions treated?
4. How can they be avoided?
5. What is the role of the Canadian Government in ensuring food allergen safety?
6. What is the industry's role in ensuring food allergen safety?

Evaluation: Student Activity #8

Overview

In this activity, students will develop an information booklet for at-risk individuals on how to avoid foodborne illness.

Expectations

- D1.2 Evaluate the impact of some personal and societal factors on eating behaviours
- C1.2 Evaluate the impact of individual choices on the control of pathogens and the prevention of disease
- C3.3 Explain how the human immune response acts as a natural defence against infection
- C3.5 Describe the non-medical ways to protect oneself from contracting pathogenic disease in a variety of situations
- C3.7 Describe the aseptic techniques used, and explain their importance in preventing the spread of pathogens
- E3.6 Explain why some populations are particularly susceptible to specific health problems

Alternatives

- Students could create a comic strip using the website <http://www.bitstripsforschools.com>
- Students could create a Photo Story using Photo Story 3 for Windows.

Foodborne Illness Prevention

Foodborne illnesses are more serious among certain groups of individuals. In this activity, you will design a user-friendly information pamphlet on foodborne illness, targeted at a specific susceptible group. You can choose to make a bi- or tri-fold brochure or pamphlet for one of the following groups:

- older adults
- people with weakened immune systems
- pregnant women.

Target Group Chosen: _____

What to include in your pamphlet

1. What is foodborne illness?
2. Symptoms of illness and what should be done if your target group is experiencing those symptoms.
3. Why your target group is at higher risk, including statistics on that risk.
4. Foods that are considered most likely to cause illness.
5. How to minimize the risk of infection.
6. Chart of internal cooking temperatures for your target group's use.

Some starting points:

<http://inspection.gc.ca/english/fssa/concen/tipcone.shtml>
<http://www.mapleleaf.com/en/market/food-safety/food-safety-101/>
<http://foodsafety.gov/keep/index.html>
http://www.fsis.usda.gov/Fact_Sheets/index.asp

Evaluation Scheme

<p>Knowledge and Understanding</p> <ul style="list-style-type: none"> • Answers what is a foodborne illness • Discusses the symptoms of illness • Discusses what should be done if they are experiencing those symptoms • Includes what foods likely cause illness • Uses key terms correctly 	<p>4 3 2 1 R</p>
<p>Thinking</p> <ul style="list-style-type: none"> • Pamphlet is well researched • Includes statistics and chart of internal cooking temperatures 	<p>4 3 2 1 R</p>
<p>Application</p> <ul style="list-style-type: none"> • Gives at least three concrete examples of what to do to prevent foodborne illness that are relevant to target group 	<p>4 3 2 1 R</p>
<p>Communication</p> <ul style="list-style-type: none"> • Pamphlet is colourful and easy to read • Includes an introduction to topic • Proper spelling and grammar are used • Level of writing is appropriate for intended audience • Ideas are clearly expressed 	<p>4 3 2 1 R</p>
<p>Additional Comments and Suggestions</p>	

Non-Medical Ways of Preventing Infections

“Microbes are challenging us in ways we wouldn’t have imagined 10 years ago and for which we’re not well prepared”

James Hughes, Director of Centers for Disease Control and Prevention

Although antibiotics are available to help treat bacterial infections, antibiotic resistance is a growing issue. Antibiotic resistance occurs when bacteria become insensitive to antibiotics (Figure 2). It is due in part to the selection for naturally occurring genetic variations in a bacterial population, and in part by the use of antibiotics. During exposure to antibiotics, the bacteria that are most susceptible die first, leaving behind a population of less susceptible pathogens. If these are allowed to reproduce, they in turn will produce less susceptible offspring. As this cycle is repeated through use of antibiotics, resistant strains of bacteria develop.

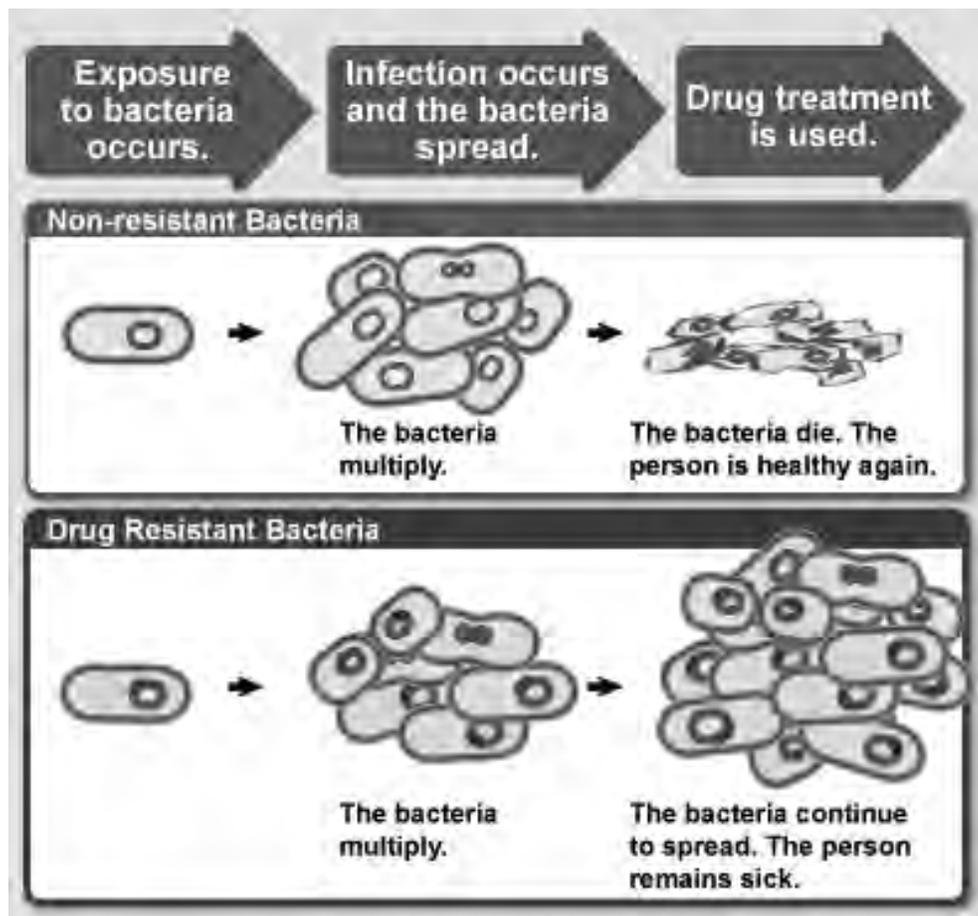


Figure 2: The difference between non-resistant and drug-resistant bacteria. Non-resistant bacteria will die off in response to antibiotic treatment. Resistant bacteria will continue to multiply despite the presence of antibiotics, and will continue to cause sickness.

Source:

<http://www.niaid.nih.gov/topics/antimicrobialresistance/understanding/pages/drugresistancedefinition.aspx>

Therefore, rather than entering into an arms race with pathogens, the preferred way of preventing illness is through avoiding bacterial growth and subsequent exposure. For foodborne illness, this focuses on the Clean and Chill aspects of food handling at the home.

Student Activity #9

Overview

In this activity, students will explore how keeping a focus on cleanliness and prompt refrigeration helps control foodborne illness.

Expectations

- C3.5 Describe the non-medical ways to protect oneself from contracting pathogenic disease in a variety of situations
- C3.7 Describe the aseptic techniques used, and explain their importance in preventing the spread of pathogens

Clean and Chill: Preventing Bacterial Growth

Although antibiotics are available to help us fight off bacterial infections, there are several problems with overuse of antibiotics. Prevention is always preferable to treatment. Hence, it is better to prevent the growth and subsequent exposure to bacteria than to treat the infection. Many non-medical ways of protecting oneself from contracting pathogenic diseases exist. Use the links as starting points to research information on the following issues:

Some starting points:

<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/med/antibio-eng.php>
http://www.fsis.usda.gov/Fact_Sheets/index.asp
http://canfightbac.org/cpcfse/en/safety/safety_factsheets/clean/
http://canfightbac.org/cpcfse/en/safety/safety_factsheets/chill/
<http://www.phac-aspc.gc.ca/fs-sa/index-eng.php>

1. What is an antibiotic resistance? How does it occur?
2. How can keeping surfaces clean prevent bacterial growth?
3. What are disinfectants?
4. Give three concrete examples of preventing bacterial growth in the kitchen.
5. How does refrigeration prevent foodborne illness?

Evaluation: Student Activity #10

Overview

This activity is a follow-up to Student Activity #9: Clean and Chill: Preventing Bacterial Growth.

Expectations

- C1.2 Evaluate the impact of individual choices on the control of pathogens and the prevention of disease
- C3.5 Describe the non-medical ways to protect oneself from contracting pathogenic disease in a variety of situations
- C3.7 Describe the aseptic techniques used, and explain their importance in preventing the spread of pathogens

Alternatives

- This activity can be modeled on the differentiated instruction strategy known as RAFT: R - role, A - audience, F - format, and T - topic. Students choose the following: the role they want to play (writer, speaker, reporter, sibling, eyewitness, scientist, etc); their intended audience (sibling, students, elderly, etc.); the format through which the information is given (drawn, spoken, written, acted, etc.); and the topic related to prevention of bacterial growth.

A Letter to Your Younger Sibling

In this activity, you will write a two-page letter to your younger sibling using the “Clean” and “Chill” principles of foodborne illness prevention. Your imaginary younger brother/sister is about 14 years old and just starting to prepare his or her own meals. You can choose to write your letter on one of the following topics:

- How to safely thaw and handle meat
- How to store leftovers
- How to safely pack a lunch box.

Topic chosen: _____

Use the links provided in Student Activity #9: Clean and Chill: Preventing Bacterial Growth on page 23, as starting points.

Your letter should include:

1. Why it is important to prevent foodborne illness.
2. How cleanliness prevents bacterial growth.
3. At least three concrete examples of what to do to prevent foodborne illness.

Evaluation Scheme

<p>Knowledge and Understanding</p> <ul style="list-style-type: none"> • Answers what is a foodborne illness • Discusses the symptoms of illness • Discusses what should be done if they are experiencing those symptoms 	<p>4 3 2 1 R</p>
<p>Application</p> <ul style="list-style-type: none"> • Gives at least three concrete examples of what to do to prevent foodborne illness that are relevant to target group 	<p>4 3 2 1 R</p>
<p>Communication</p> <ul style="list-style-type: none"> • Follow letter format with date, salutation, and closing • Includes an introduction and conclusion to sibling • Proper spelling and grammar are used • Level of writing is appropriate for intended audience • Ideas are clearly expressed 	<p>4 3 2 1 R</p>
<p>Additional Comments and Suggestions</p>	

Role of the Food Industry

“A food additive is any chemical substance that is added to food during preparation or storage and either becomes a part of the food or affects its characteristics for the purpose of achieving a particular technical effect. Substances that are used in food to maintain its nutritive quality, enhance its keeping quality, make it attractive or to aid in its processing, packaging or storage are all considered to be food additives.”

- Health Canada, 2010

Many different types of food additives exist. Some are used to make the food more attractive, while others serve the purpose of helping to prevent foodborne illness.

Student Activity #11

Overview

In this activity, students will begin to think about the role that food additives play in their everyday lives.

Expectations

- D1.1 Analyse the social and economic costs and benefits of the use of non-nutrient food additives in food preservation and food enhancement techniques

Alternatives

- The activity can be carried out in small groups.
- The activity can be carried out as an individual exercise with results discussed as a class.
- It can be turned into a class discussion where students debate as industry stakeholders in front of a panel of “judges”.

Food Additives Warm-Up

In this day and age, we expect to have easy access to a wide variety of foods at any time. Consider your last shopping trip. Was the food you bought made/produced close to where you live? If not, how did it make it there and stay fresh?

A number of food-related businesses or organizations are listed below. For each, predict what they think of food additives. Then, explain the reasons behind your response.

- **Vending Machine Operators**

Opinion:

Reason:

- **Restaurants**

Opinion:

Reason:

- **Organic Food Associations**

Opinion:

Reason:

Student Activity #12

Overview

In this activity, students will learn about some specific food additives and their purpose.

Expectations

- D1.1 Analyse the social and economic costs and benefits of the use of non-nutrient food additives in food preservation and food enhancement techniques

Food Additives: What and Why

In this day and age, where we expect to have easy access to a wide variety of foods at any time of the year, the use of food additives is prevalent throughout the food industry. Different food additives serve different purposes. In this activity, you will discover the role of several food additives and write a short opinion piece on your view of the functionality and safety of food additives.

Some starting points:

- <http://www.hc-sc.gc.ca/fn-an/securit/addit/index-eng.php>
- <http://active.inspection.gc.ca/eng/util/aze.asp?sid=43>
- <http://www.inspection.gc.ca/english/fssa/frefra/safsal/additivese.shtml>
- <http://www.foodsafetynetwork.ca/aspx/public/default2.aspx?id=441>

1. List three reasons to preserve food.
2. Provide three ways that food preservation can be accomplished.
3. What is a food additive?
4. What is not considered a food additive?
5. How are the additives of food regulated in Canada?
6. Fill in the table below.

Additive	Foods in which it is used	Purpose	Potential side effects*
Nitrates/nitrites			
Sulfites			
Aspartame			
MSG			

* be sure to use reputable websites to establish the potential side effects

5. Section 2: Science and Public Health

Government Plays a Role in Our Health

The different levels of government all play a role in helping to keep Canadians healthy. The government is responsible for enacting legislation which will govern health practices and help prevent Canadians from becoming sick. Government is also responsible for making sure that these regulations are being followed by food producers. Finally, if there is a risk to Canadians, government agencies ensure that proper measures are put in place to mitigate or contain the effects of a foodborne illness outbreak in a timely and effective manner, thereby protecting the health of Canadians.

For food-related illnesses, Health Canada sets policies and standards governing the safety and nutritional quality of all food sold in Canada. The Canadian Food Inspection Agency enforces those policies and standards. Two goals of the Public Health Agency of Canada are to prevent and control infectious diseases, and to prepare for and respond to public health emergencies. Health Canada, Canadian Food Inspection Agency, and Public Health Agency of Canada work together to prevent and, when necessary, to respond to outbreaks of foodborne illness.

Student Activity #13

Overview

In this activity, students will research the legislation to protect Canadians' sources of food. Students will also examine the role of Health Canada, Public Health Agency of Canada, and Canadian Food Inspection Agency.

Expectations

- E3.5 Describe the public health measures, including legislation, that are used for the protection of the public

Food Legislation and Regulation

Using the Public Health Agency of Canada website, research the following information regarding the roles and responsibilities of those involved in food legislation and regulation.

<http://www.phac-aspc.gc.ca/fs-sa/index-eng.php>

1. What are the three (3) Government of Canada agencies involved in ensuring food safety? What are their specific roles with regards to public food safety?
2. How do these agencies collaborate with other groups to maintain a safe food source for Canadians?
3. What is FIORP 2010 and why was it recently updated?
4. What is a national outbreak?
5. What is an international outbreak?

Student Activity #14

Overview

In this Jigsaw activity, students will explore the roles of Health Canada and Canadian Food Inspection Agency in protecting the food standards set by the government.

In their expert groups, students will research one topic from the information on Health Canada's website and one topic from the information on the Canadian Food Inspection Agency's website. Then, in their home groups, where each member researched a different topic, students will share what they have learned.

Expectations

- E3.5 Describe the public health measures, including legislation, that are used for the protection of the public
- E1.1 Assess the impact of scientific research and technological advances on public health around the world
- C3.5 Describe non-medical ways to protect oneself from contracting pathogenic disease in a variety of situations
- D1.1 Analyse the social and economic costs and benefits of the use of non-nutrient food additives in food preservation and food enhancement techniques

Health Canada and Canadian Food Inspection Agency

<http://www.inspection.gc.ca/english/fssa/fssae.shtml>

<http://www.hc-sc.gc.ca/fn-an/securit/index-eng.php>

1. What is the role of Health Canada in terms of food safety?
2. In the left hand tool bar of Health Canada's website, click on "In Your Kitchen: Safe Food Handling Tips". Choose the topic for your expert group and, as an expert group, summarize the information given.
3. In your home group, each having researched a different tip, share the information learned.
4. What is the role of the Canadian Food Inspection Agency with regards to food safety?
5. In your expert group again, you have been given one of the products and sectors that the Canadian Food Inspection Agency regulates. Summarize the information given in the section.
6. In your home group, each person having researched a different product or sector, share the information.
7. What are three (3) other activities performed by the Canadian Food Inspection Agency?

Student Activity #15

Overview

In the efforts to keep Canadians healthy, there is always an investigation into what caused an outbreak and how to prevent future outbreaks. In this assignment, students will research the outcomes of the investigation into the 2008-2009 listeriosis outbreak.

Expectations

- E2. Investigate various strategies related to contemporary public health issues
- E1.2 Assess, on the basis of research, and the effectiveness of municipal, provincial, or federal government initiative intended to protect the public health of Canadians
- E3.5 Describe the public health measures, including legislation, that are used for the protection of the public

Results of the Investigation into the Listeriosis Outbreak – Lessons Learned

In the summer of 2008, there was an outbreak of listeriosis from the consumption of ready-to-eat meat products from Maple Leaf Foods. As a result of this outbreak, 57 people became ill and 23 died.

An investigation into the outbreak was conducted by the Government of Canada and several outcomes were reached.

“In all likelihood, none of the individual elements that contributed to the outbreak was sufficient to have caused it alone, so each part of the food safety system must work together as perfectly as possible.”

Dr. John Carsley
Medical Health Officer for the Vancouver Coastal Health Authority in British Columbia
Member of the Listeriosis Investigation Expert Advisory Group

Some starting points:

http://www.listeriosis-listeriose.investigation-nquete.gc.ca/index_e.php?s1=rpt&page=summ
http://www.hc-sc.gc.ca/fn-an/pubs/securit/eclosion_listeriosis_outbreak-eng.php
<http://www.inspection.gc.ca/english/fssa/movava/movavae.shtml>

1. Why was an independent investigator appointed?
2. Why was it important to investigate this outbreak? Why does it matter?
3. What is it about listeriosis that makes it more difficult to prevent?
4. Was any one thing or person responsible for the 2008 listeriosis outbreak? Explain.
5. What were the four critical parts of the food safety service in which weaknesses were found?
6. What were the three measures that the Canadian Food Inspection Agency took following the listeriosis outbreak?

Student Activity #16

Overview

In this activity, students will gain an appreciation of the role the food industry can play and some of the ways in which the industry can improve its safety precautions and help with the education of the public.

The video link provided below can be viewed as a class or individually. Answers to the questions should be taken up as a class and discussion should be encouraged.

Maple Leaf Foods Safety Pledge

Products manufactured by Maple Leaf Foods were determined to be the source of the listeriosis outbreak in 2008. In particular, some of their slicing equipment was harbouring the *Listeria* bacterium. Although the company had previously obtained some positive test results for the *Listeria* bacterium, they believed that the problem had been corrected through their sanitation procedures and other corrective actions.

Following the outbreak, Maple Leaf Foods made a commitment to become a global leader in food safety. Their goal is to lead and support the food industry stakeholders in the effort to improve consumer understanding of food safety and potential risks. They also want to assist both higher risk Canadians and the general population in making good decisions when purchasing, handling, and eating food.

<http://www.mapleleaf.com/en/market/food-safety/food-safety-at-maple-leaf/food-safety-pledge/#videotabs>

1. Paraphrase the 6 Food Safety Pledges that Maple Leaf Foods makes.

Answer the following questions while watching the video on Food Safety Leadership. You may need to watch the video more than once. After completing the questions, partner with another student and share your answers.

2. What are some of the new sanitation protocols put in place by Maple Leaf Foods?
3. What are some of the testing changes that have been introduced as a result of the outbreak?
4. What are some of the changes in training that have been initiated?
5. What is the job of the new Chief Food Safety Officer? What are some of his responsibilities?
6. What are three other things being done to ensure food safety at Maple Leaf Foods?
7. What does “federally registered” mean?

Media's Role in Informing the Public About Health Issues

Media plays a huge role in informing the general public about current health issues. The media's ability to reach most Canadians via radio, television, newspaper, and internet allows the public to be informed of health issues in a timely fashion so that preventative measures can be taken.

However, the media can also cause people to overreact to a situation if the reporting is inaccurate or sensational. Reporting a situation to be worse than it is can cause the general public to panic and overreact, which can cause a situation to get out of control. On the other hand, if the media downplays the situation, the general public may not take the appropriate measures and more people may be at risk. Therefore, it is very important that the media take all public health issues seriously and report on them as accurately as possible.

Student Activity #17

Overview

For this assignment, students will create a survey and assess the effects and results of the media's reporting on the recent H1N1 epidemic.

Expectations

- E2.4 Use a research process to locate a media report on a public health issue, summarize its arguments, and assess them from a scientific perspective

2009-2010 H1N1 Influenza Pandemic and the Media

In the latter half of 2009 and the beginning of 2010, Canadians were being warned of a possible H1N1 influenza pandemic. Canadians were being strongly encouraged to get the H1N1 vaccine and use proper sanitation methods, particularly in public places.

Most information that Canadians received came from the media. The question is, did the media's reporting of the possible pandemic cause Canadians to react properly, over-react or not react at all?

Warm Up

Using a Google search, spend 20 minutes doing some research on the possible H1N1 pandemic. Remember to check that you are reading information from reliable sources.

Answer the following questions:

1. When and where did the H1N1 pandemic start?
2. When was the pandemic expected to reach Canada and when was it expected to be at its worst stage?
3. Why was H1N1 expected to be so wide spread and dangerous to Canadians?
4. What were the precautions suggested to Canadians to avoid contracting H1N1?

Task

As a class, generate a survey of 10 multiple choice or yes/no questions to assess the effects and results of the media's reporting of the H1N1 pandemic.

Once the questions have been created, each student will ask 5-10 people the questions and collect their responses. (It would be preferable if the people surveyed were from different areas of Ontario or even Canada, and not just other students.)

As a class, the answers should be tallied.

A class discussion can take place to determine the role media plays in informing the general public of a public health issue. Some discussion into the balance between making sure the public takes any threat seriously and not having the public overreact should be highlighted.

Student Activity #18

Overview

Students will look into the various reports on the listeriosis outbreak at Maple Leaf Foods. They will assess one news report to see what information it contains.

Expectations

- E2.4 Use a research process to locate a media report on a public health issue, summarize its arguments, and assess them from a scientific perspective

News Reporting of the Listeriosis Outbreak

The main method of informing the general public of a major health issue is via the media. Therefore, the media plays an important role in letting Canadians know what is happening and what they need to do to protect themselves.

The main components of a news article are who, what, where, when, why (5 Ws), and how.

Using the link to the article below, assess the information about the 2008 listeriosis outbreak given in the article.

<http://www.citytv.com/toronto/citynews/life/health/article/4266--one-dead-in-ontario-as-health-officials-warn-of-possible-listeria-contaminated-deli-meat>

1. Does the article contain the information of who, what, where, when, why, and how?
2. If it is missing any information, what do you feel the article is missing?
3. In your personal opinion, does the article headline get people's attention? Why is this important?
4. If you read this article, what would you do next?

Evaluation: Student Activity #19

Overview

For this assignment, students will be creating a media report of a public health issue involving an illness, preferably an outbreak or emergency issue (real or made up), which is or will affect the general public. To avoid plagiarism issues, it is recommended that teachers collect and assess students' rough work. Students will also be able to pick their own public health issue which should also limit plagiarism.

Students can also be given a choice of media: newspaper, television news report (could be taped or live), radio news report (could be taped or live), PowerPoint, poster, Prezi, comic strip, magazine article or brochure.

Students can work with a partner or alone.

Expectations* *Depending on the topic that the student chooses, only some of these expectations will be covered.*

C1.2 Evaluate the impact of individual choices on the control of pathogens and the prevention of disease

C3.2 Describe the mode of transmission of various diseases

C3.3 Explain how the human immune response acts as a natural defense against infection

C3.5 Describe non-medical ways to protect oneself from contracting pathogenic disease in a variety of situations

C3.6 Describe some of the means used by international non-governmental organizations to control the spread of disease

C3.7 Describe aseptic techniques used in the workplace, and explain their importance in preventing the spread of pathogens

E2.1; C2.1 Use appropriate terminology related to public health issues, pathogens, and diseases

E2.3 Use a research process to investigate public health strategies developed to combat a potential pandemic

E3.5 Describe the public health measures, including legislation, that are used for the protection of the public

E3.6 Explain why some populations are particularly susceptible to specific health problems

Media Report of Public Health Issue

You are a young reporter asked to report on a public health issue. This health issue is your choice and it could be a real, current issue or a fictional one (but must still be about a possible issue, no invented illnesses!).

Remember to include all the important components of a media report (who, what, when, where, why, and how) and the balance between making the public concerned about the issue enough to act but not overreact. You also need to make sure that your title and/or opening line grabs the attention of the intended audience. Media reports often include interviews or quotes from people/officials.

Possible choices of topic:

Listeriosis, E. coli, H1N1 influenza, avian bird flu, cholera, typhoid, plague, West Nile virus, influenza, HIV/AIDS, tuberculosis, MRSA infection in hospital ward, mad cow disease (vCJD), salmonellosis, poliomyelitis, hemorrhagic ebola, cholera, SARS, smallpox, anthrax.

Your report could be a newspaper article, television news report, radio news report, PowerPoint bulletin, poster, brochure, comic strip or magazine article.

Remember that the information about the issue on which you are reporting must be accurate and from reliable sources. You must use at least three different sources for information, and one **must** be a print source. References must be included using the standard school format (see your Teacher-Librarian).

Your chosen topic: _____

Chosen media: _____

Partner: _____

Due Date: _____

Rough Work

Who? Who is getting sick? Who is at greatest risk?

What? What is the illness or area of concern? What are the symptoms? What is the treatment?

Where? Where is the outbreak/emergency occurring? Where might it spread?

When? When did it start?

Why? Why did it start?

How? How is it spreading? How do you prevent being affected? How is the government reacting?

Evaluation Scheme

<p>Knowledge and Understanding</p> <ul style="list-style-type: none"> • Provides an accurate summary of the topic • Defines key terms and concepts used in article • Information makes sense and is correct • Key words and ideas are correctly used • Complicated vocabulary is explained/defined 	<p>4 3 2 1 R</p>
<p>Thinking</p> <ul style="list-style-type: none"> • Rough work handed in indicates that research was completed ahead of time • The references are presented in an appropriate format • At least 3 sources are used, one print • News report contains who, what, where, when, why, and how 	<p>4 3 2 1 R</p>
<p>Application</p> <ul style="list-style-type: none"> • Realistically assesses the potential impact of the outbreak on public health • Proposes a practical course of action to deal with the problem 	<p>4 3 2 1 R</p>
<p>Communication</p> <ul style="list-style-type: none"> • Has an attention-grabbing opening or title • Uses quotes or interviews to highlight or deliver information • Proper spelling and grammar are used • Level of writing is appropriate for audience • Ideas are clearly expressed 	<p>4 3 2 1 R</p>
<p>Additional Comments and Suggestions</p>	

6. Culminating Task

Overview

The final task is a research project based on linking several aspects of the sections above. The aim of the project is to provide students with an opportunity to conduct research within a guided framework, with continuous feedback from both peers and the teacher.

Any of the above tasks can also be submitted together with the project as part of rough notes or a portfolio of resources used.

The teacher can choose to assign topics, provide them as choices, or simply make the project open-ended and student-directed. To facilitate the choosing of a topic, some potential topics of interest are included at the end of the student handouts.

The Teacher-Librarian in your school should be able to help students choose topics, find resources, and properly reference material. Consider partnering with them on this project.

One final note: The rubric is intentionally left with two marking sections to enable the students to self-evaluate their projects. The shaded area is intended for teacher-use. To keep in the spirit of assessment for learning, re-submissions of both individual components and of the final project for teacher feedback should be encouraged. By allowing each student to choose their own topic, both non-engagement and plagiarism issues are avoided.

Suggested timeline, from initial introduction to final project completion: 1 month.

Food Safety Research Project

In this project, you will choose a topic that interests you and that deals with food safety. You will present your research project to the class/your teacher in a format of your choice. Once you have a topic and spend some time researching it, you will narrow it down to a thesis. Based on your thesis, you will be able to formulate an outline for your research project and choose a method of presenting it. Your final project will be due on _____. Your project will be evaluated on the basis of both your final product and the interim steps you took to arrive at it. Don't forget: you need to hand in your research project along with your portfolio, as well as hand-written, point-form, and referenced notes! You will be assessed based on the attached rubric.

Your project needs to include the following:

1. A thesis statement
 - description below
2. An overview of the topic, including
 - how your topic relates to nutrition
 - how your topic relates to pathogens and disease
 - how your topic relates to public health and safety regulations
3. Analysis
 - analyze, on the basis of research, the impact, both positive and negative, of scientific and technological advances intended to prevent foodborne illness
 - look at the impact of individual choices within your topic
 - look at the potential role of public health and safety regulations in reference to your topic
 - propose a course of practical action: what should be done next?
 - clearly express your opinion on the issue
 - use a variety of formats (at least 3) to present information: data tables, maps, graphs, models, charts, diagrams
4. References
 - you should have at least 3 references, one of which has to be print
 - use the standard school format (ask your Teacher-Librarian) to organize your references

Along the way, you will need to complete the following:

1. Choose a topic and explore some potential subtopics within it.
 - a. Start off by reading general information about foodborne illness and see what catches your interest.
 - b. Explore that subtopic further: dig for information and formulate some questions you would like to answer about the subtopic.
 - c. Try to come up with questions that are not only describing the topic, but also tie it to what you already know about nutrition, pathogens, and public health. Try to bring ideas together to create something new.

Some starting points:

- Canadian Food Inspection Agency: <http://inspection.gc.ca/english/toce.shtml>
Health Canada: www.hc-sc.gc.ca
Public Health Agency of Canada: <http://www.phac-aspc.gc.ca/fs-sa/index-eng.php>
Maple Leaf Foods: <http://www.mapleleaf.com/en/market/food-safety/#>
Canadian Partnership for Consumer Food Safety Education: <http://canfightbac.org/en/>
U.S. Food Safety Information: <http://foodsafety.gov/>

2. Narrow your topic and formulate a hypothesis. (Due _____)

Supporting resources:

3. Write an outline for your paper & choose a method of presentation below (submit together with rough notes).
(Due _____ for peer review, one week later _____ for teacher review)

Supporting resources:

Formulating an Outline for a Research Paper

4. Choose a potential method of presentation:
- essay format
 - booklet
 - poster
 - magazine article
 - PowerPoint presentation
 - method of your choice (please see the teacher)
5. **Final Project Due** _____ (Submit together with portfolio and rough notes).
6. **Plagiarism - THE SUBMISSION IS WRITTEN IN YOUR OWN WORDS**
* **Note: if you plagiarize (copy word-for-word) in your submission, you will receive a zero (0) for that section; if you plagiarize more than 1/3 of the content of your presentation, you will receive a zero (0) for the ENTIRE submission.**

Name: _____

Research Project RUBRIC

You will be evaluated based on the criteria below. You will submit this rubric and your research information in point-form format together with your finished project.

KNOWLEDGE <i>do not fill in shaded areas</i>					
		provides an accurate summary of the topic			
		defines key terms and concepts used in the paper			
		information makes sense and is correct			
		key words and ideas are correctly used			
		complicated vocabulary is explained/ defined			
	Mark*:	4	3	2	1 R
	Mark:	4	3	2	1 R

THINKING <i>do not fill in shaded areas</i>					
		the hypothesis formulated is specific, based on observed issues and research, and focuses on further inquiries (How to Write a Thesis Statement)			
		rough work handed in indicates that research was completed ahead of time			
		portfolio is complete and includes at least ___ items			
		the rubric was used to evaluate own work			
		the references are presented in an appropriate format			
		at least 3 sources are used, one print source			
		body of project addresses the following: - analyze arguments on both sides of the issue (pros/cons analysis) - analysis is unbiased and scientific, not based on personal feelings - conclusions are drawn based on research findings and justified with reference to scientific knowledge			
	Mark*:	4	3	2	1 R
	Mark:	4	3	2	1 R

APPLICATION <i>do not fill in shaded areas</i>					
		analyzes, on the basis of research, the impact, both positive and negative, of scientific and technological advances intended to prevent foodborne illness			
		evaluates the impact of individual choices on the control of foodborne illness			
		suggests/analyzes the potential role of public health and safety regulations			
		proposes course of practical action to deal with problems			
	Mark*:	4	3	2	1 R
	Mark:	4	3	2	1 R

COMMUNICATION <i>do not fill in shaded areas</i>					
		the outline is clear and presents a logical sequence for the research project (Formulating an Outline for a Research Paper)			
		participates well in the peer-review process, providing valuable feedback to others			
		clearly expresses personal stance on issues			
		logically organizes argument			
		uses a variety of formats to present information: data tables, maps, graphs, models, charts, diagrams (at least three)			
		proper spelling and grammar are used throughout			
	Mark*:	4	3	2	1 R
	Mark:	4	3	2	1 R

*4 (excellent), 3 (good), 2 (satisfactory), 1(needs improvement), R (incomplete, resubmit)

ADDITIONAL COMMENTS:

7. Research Project Supporting Resources

Making Quality Notes

It is easy to get off-track when you conduct research. The following suggestions will help you stay focused. As you take notes, remember that the purpose of doing research is to understand a topic sufficiently to formulate and defend your own ideas!

As you take notes on your topic, make sure that they are:

1. Focused

- look for key ideas that help you answer your questions
- record both factual information (numbers, statistics) and the opinions of experts on the topic
- record your own thoughts on the topic

2. Concise

- use point-form, do not copy sentences
- use your own words
- don't repeat information
- be brief
- avoid quoting, unless you are quoting an expert's opinion

3. Organized

- keep your notes together in a folder for this assignment (ex. portfolio)
- make sure you know where you are getting the information
- use different pages for different sources OR use different coloured pens for different sources
- make sure you write down your source of information!

4. Reliable

- assess the reliability of your sources, especially on-line sources (see Student Activity # 6 on page 16)

How to Write a Thesis Statement

A thesis statement is a summary of the main point of your project. It is normally placed at the beginning of a project, usually in the introduction, in order to tell the reader what to expect. Having a thesis statement will allow you to better focus and organize your project. A strong thesis statement takes a stand on a specific issue, is somewhat controversial, thereby suggesting a discussion, and contains one main idea. For example, if you are doing a project on preventing sexually-transmitted infections, you might come up with the following thesis statement:

HIV is a sexually transmitted infection.

This is just an observation and, therefore, is a weak thesis statement. A strong thesis statement needs to be specific and suggest that a discussion is justified.

While irresponsible sexual behaviour should be punishable by law, the public release of identities of HIV positive individuals who engage in high risk sexual activities without informing their partners of their status, discourages individuals from finding out whether they are HIV positive, therefore promoting the spread of the disease.

How to Generate a Thesis Statement

1. Begin by wording your chosen topic as a question. For example, if your assignment is “**Biotechnology: an everyday application of genetic engineering**”, turn the topic into a question like, “What is the impact of biotechnology on our everyday lives?”
2. Once you have chosen the question, compose one or two sentences to answer it and take a position on the topic, based on your background research:

Q. What is the impact of biotechnology on our everyday lives?

A. **Most people underestimate the impact of biotechnology on their everyday lives.**

or

A. **Biotechnology is a global experiment that is jeopardizing our lives.**

3. Be specific. Define what it is that you will be talking about and narrow down your topic.

Ex. **The genetic modification of food is a global experiment that, while bringing a lot of income to companies that control the biotechnology market, is leading to environmental degradation.**

Formulating an Outline for a Research Project

An outline is a plan of how you will explain and support your thesis statement. Although it may seem like a waste of time, it allows you to plan your paper and organize it in order to keep it focused during the writing process. It's also an excellent tool to take to your teacher to make sure that you are on the right track before you start writing! While there is no single way to create an outline, the following is a sample guide:

Introduction

This is your opportunity to introduce your project and grab the readers' attention. You will want to include:

- i. an interest grabber
 - something relevant to the topic that will encourage the reader to keep reading
- ii. your thesis statement
 - your focus and opinion on the topic
- iii. a short overview of how you will defend your thesis statement
 - you will expand on your support/argument in the body of your project.

Body

Start off with an overview of your topic. Provide factual information, background, and an historical overview if relevant. This is also the main support for your thesis statement. You should analyze your topic, providing at least 3 arguments that support your thesis statement (pros). To keep the project balanced, you will also need to provide arguments against your thesis statement (cons), and you will criticize them to defend your own view.

Conclusion

Restate your thesis statement and summarize your supporting argument. Leave the reader with some interesting point. Suggest an extension or a potential future direction for your topic.

SAMPLE OUTLINE

Thesis: Safe injection sites are an effective way of preventing the spread of blood-borne diseases and should be funded using tax dollars.

1. Introduction
2. What are safe injection sites?
3. History of safe injection sites in Canada.
4. History of safe infection sites in the world.
5. Where are they being used?
6. Positives of safe injection sites
 - prevent spread of infections through needle exchanges
 - provide ongoing medical access to drug users
 - provide an opportunity for an "out"
7. Negatives of safe injection sites
 - access to needles
 - neighbourhood concerns
 - promoting negative behaviour
8. My opinion
9. Conclusion

Potential Topics of Interest

- Analyse, on the basis of research, positive and negative impact of the 2008 listeriosis outbreak. What scientific and technological advances occurred as a consequence of the listeriosis outbreak? How have food handling practices changed? In your opinion, what else could be done to ensure the safety of our food?
- Conduct a pros/cons analysis on the use of preservatives in the meat processing industry.
- Analyse the costs and benefits of the use of non-nutrient food additives in food preservation and food enhancement techniques (e.g., sulfites in dried fruit; food colouring; MSG).
- Analyse the impact of some personal and societal factors (e.g., allergies, ease of access, living alone) on eating behaviour.
- Analyse, on the basis of research, negative and positive impact of scientific and technological advances intended to prevent the spread of foodborne illness and disease.
- Analyse the costs and benefits of using irradiation of foods to reduce the incidence of foodborne illness. Why is the use of this technology controversial?
- Analyse the pros and cons of having 3 organizations: Health Canada, Canadian Food Inspection Agency, and Public Health Agency of Canada, responsible for food safety for Canadians.
- Analyse the role the media plays in reporting a public health emergency. Include in your analysis, the pros and cons of being a freedom of speech society.