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| **TEXAS CTE LESSON PLAN**  [www.txcte.org](http://www.txcte.org) | |
| **Lesson Identification and TEKS Addressed** | |
| **Career Cluster** | Hospitality and Tourism |
| **Course Name** | Food Science |
| **Lesson/Unit Title** | Food Safety Principles – Microorganisms Everywhere! |
| **TEKS Student Expectations** | **130.256. (c) Knowledge and Skills**  (6) The student evaluates the principles of microbiology and food safety practices. The student is expected to:  (A) Investigate the properties of microorganisms that cause food spoilage  (B) Compare food intoxication and food infection  (C) Examine methods to destroy or inactivate harmful pathogens in foods  (D) Compare beneficial and harmful microorganisms  (E) Analyze sanitary food-handling practices |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | **Students will:**   * Develop an understanding of the properties of microorganisms that cause food spoilage * Define the difference between food intoxication and food infection * Identify the correct handwashing procedures * Research the conditions under which the important pathogens are commonly destroyed, inactivated, or rendered harmless in foods |
| **Rationale** | According to the Centers for Disease Control (CDC) 2010 statistics, in one year there were 48 million gastrointestinal illnesses, 128,000 hospitalizations and 3,000 deaths reported cases related to foodborne illnesses in the United States. Being aware of food safety risks is vital to everyone who prepares, purchases, and consumes food on a daily basis. This lesson will help students better understand decisions and practices that can impact personal health and identify microorganisms that are both good and bad for us. |
| **Duration of Lesson** | Five 45-minute class periods |
| **Word Wall/Key Vocabulary**  *(ELPS c1a, c, f; c2b; c3a, b, d; c4c; c5b) PDAS II (5)* | **Cross-contamination:** The transfer of bacteria from one food to another food or location  **Food infection:** Foodborne illness that occurs when microbes release digestive enzymes that damage body tissue and cause illness  **Food intoxication:** Foodborne illness caused by a toxin released by microbes  **Food safety:** A scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness  **Foodborne illness:** An illness caused by eating food that has been contaminated in some way  **Microorganism:** A microscopic life form that cannot be seen with the naked eye. Types of microorganisms include: bacteria, viruses, protozoa, fungi, yeasts and some parasites and algae  **Pathogen:** Any microorganism that is infectious or toxigenic and causes disease. Pathogens include parasites, viruses, and some fungi/yeast and bacteria  **Sanitation:** The act of maintaining a clean condition in a food-handling situation in order to prevent disease and other potentially harmful contaminants  **Spores:** Microorganisms in a dormant, inactive, or resting state  Note: Many terms on the PowerPoint presentation can be identified. Encourage students to include the definition of these words in their notes. |
| **Materials/Specialized Equipment Needed** | **Equipment:**   * Computer with projector for PowerPoint presentation * Computers with Internet access (be sure to follow district guidelines for Internet access) * Light projector (Elmo)   **Materials:**   * Cardstock   Images of:   * Bread that is growing mold * Blue cheese * Cheese that is growing white mold * Spoiled chicken   **Important:** It is recommended that you NOT try to grow mold on food or save spoiled food for students to view for this lesson. Moldy and spoiled food may attract pests, rodents or the possibility of a person eating the contaminated food.  **Supplies:**  For handwashing lab:   * Black light * GloGerm® gel or powder (if available) * Hand washing sink * Hand washing soap * Paper towels   For bacteria lab:   * Aprons * Cotton tipped applicators * Permanent markers * Nutrient agar * Parafilm * Petri dishes * Copies of handouts   **PowerPoint:**   * Food Safety Principles: Microorganisms Everywhere!   **Technology:**   * Free iPad App:   + USDA Food Safety USDA provides an important role as U. S. Government’s Agency for food, agriculture, natural resources, and related issues. <https://itunes.apple.com/us/app/usdafoodsafety/id457796600?mt=8> * Infographic:   + Recipe for Food Safety Food poisoning can happen to anyone. Each year, about 48 million people in the United States (1 in 6) get sick from eating contaminated food.<http://www.cdc.gov/vitalsigns/listeria/infographic.html> * TED Talks: * A New Fix for Food Safety: Don Stull at TEDxTexasTechUniversity The United States wastes as much as 40 percent of its food due to spoilage and suffers through 76 million cases of food-borne illness every year. Don speaks about how to solve these important issues by eliminating pathogens and extending food shelf life to reduce waste.https://youtu.be/B4oIPdTQr4Y   **Graphic Organizer:**   * Food Safety – Infection vs. Intoxication * Food Safety – Infection vs. Intoxication (Key) * Microorganisms * The Science of Handwashing * The Science of Handwashing (Key) * The Scientific Method for Food Science Experiments   **Handouts:**   * Bad Bug Book * Foodborne Illness-Causing Organisms in the U.S. * Note-Taking: Food Safety Principles: Microorganisms Everywhere! * Rubric for Food Science Lab Experiments * Rubric for Microorganism Research |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | **Before class begins:**  Note to teacher: Order the free food safety curriculum from the United States Food and Drug Administration (FDA) and the National Science Teachers Association (NSTA) for information on how to plan and prepare for the microorganism labs.   * Science and Our Food Supply Investigating Food Safety from Farm to Table<http://www.fda.gov/downloads/Food/FoodScienceResearch/UCM134949.pdf>   The curriculum includes teacher’s guides for high school and middle school classrooms, an interactive video DVD and a Food Safety: A to Z reference guide.   Refer to lesson Keeping It Safe in the Food Science Lab about using lab equipment safely before students attempt the lab experiments.  As students enter the classroom, have the following video playing:   * Food Safety Music – Microbes Medley – Animation A two-song medley: “Microbes, They Might Kill You” and “We Are the Microbes” is a parody of Queen’s “We Will Rock You” and “We Are the Champions,” as performed by Carl Winter.<http://youtu.be/1EkehFkhWf4>   Begin the class with the following questions and have students share their responses:   * Has anyone ever had food poisoning? * Nausea? Upset stomach? * How did you feel? * Do you know what foods made you ill? * Do you know how germs are spread?   Allow time for students to describe the accidents they have had or have seen. These are the reasons that food safety is of utmost importance.  Display on the light projector, images of food that has spoiled such as:   * Bread that is growing mold * Blue cheese * Cheese that is growing white mold * Spoiled chicken   Ask the students the following questions?   * Do you think these food items are safe to eat? * What could happen if we ate any of these foods? * Would we be able to tell if the food is spoiled by looking at it? Smelling it? * Can you see microorganisms growing on the food? |
| **Direct Instruction \*** | Introduce lesson objectives, terms, and definitions.  Distribute the graphic organizer and handout Food Safety: Infection vs. Intoxication and Note-Taking: Food Safety Principles: Microorganisms Everywhere! so that students may take notes during the slide presentation.  Introduce the PowerPoint Food Safety Principles: Microorganisms Everywhere! and begin the discussion about how microorganisms can spoil food.  View YouTube videos in this order:   * True Story Behind Typhoid Mary | Dark Matters  The real “Typhoid Mary” was an Irish immigrant who worked as a cook in well-to-do American households. Though she was connected to several outbreaks of the disease, she never fell ill herself.<http://youtu.be/XE8HwwNqHG4>   Recipes for Disaster – Contaminated Carbo Load Learn the right food safety steps as Maria does everything wrong.<https://youtu.be/5giiq2tBXig>  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations me include, but are not limited to:*   * checking for understanding * providing assistance with note-taking |
| **Guided Practice \*** | Distribute the handout The Science of Handwashing and log on to the Centers for Disease Control and Prevention (CDC) website:   * Show Me the Science – How to Wash Your Hands CDC recommends cleaning hands in a specific way to avoid getting sick and spreading germs to others.<http://www.cdc.gov/handwashing/why-handwashing.html>   Guide the students through the steps.  View the CDC video:   * Put Your Hands Together Researchers in London estimate that if everyone routinely washed their hands, a million deaths a year could be prevented. From doorknobs to animals to food, harmful germs can live on almost everything. Handwashing may be your single most important act to help stop the spread of infection and stay healthy.<http://www.cdc.gov/cdctv/handstogether/>   Demonstrate how to properly wash your hands and then have students practice this on their own. Encourage them to sing the Happy Birthday song twice or sing the ABC song as they wash their hands.  GloGerm®  [http://glogerm.com/](%20http://glogerm.com/)  If available, the GloGerm® kit may be used at this time to reinforce the importance of hand washing. Follow directions on the product.  Demonstrate the difference between cleaning and sanitizing. Have a student wipe off a counter top or table with a dry towel.  Ask students if the area is clean enough for food prep? Why or why not?  Demonstrate making a simple sanitizing solution.  For Teachers only Sanitizing solution: Add 1 teaspoon regular household bleach to 1 quart (4 cups) of tap water in a large spray bottle. Sanitize counters and lab equipment before and after use.  Solution can be made in a large container and then poured carefully into smaller spray bottles.  Note:   * Wear an apron and gloves when adding bleach to water as bleach can discolor clothes * Spray bottles must be labeled * Store out of children’s reach * Replace sanitizing solution often   Have a student wipe off a counter top or table with a towel that has been immersed in the sanitizing solution. Once again, ask students if the area is clean enough for food prep. Why or why not?  Read more:   * How to Make a Bleach Sanitizing Solution eHow.com http://www.ehow.com/how\_6225300\_prepare-chlorine-sanitizing-solution.html   Stress the importance of sanitation and its connection to preventing many foodborne illnesses.  Discuss which areas of the lab are expected to be sanitized and whose job it is to sanitize these areas. Stress sanitizing areas BEFORE and AFTER food science experiments.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*   * providing peer tutoring * checking for understanding |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Introduce the following scenario to the students:  You are a microbiologist and are your job is to investigate microorganisms. There has been a foodborne illness outbreak at a school. How will you be able to investigate the source of the microorganisms causing this illness?  If you have ordered the *Science and Our Food Supply: Investigating Food Safety from Farm to Table,* follow the instructions for the *Bacteria Everywhere* lab.  This lab experience will allow students to swab different areas/items of your classroom (or school with permission) for bacteria.  Areas/items may include:   * Cell phone * Computers * Counters * Desks * Door knobs * Fingernails * Light switches * Tablets * Water fountains   Distribute the handout The Scientific Method for Food Science Experiments and the Rubric for Food Science Lab Experiments and complete each section for the lab experiment.  Remind students of the following:   1. No eating or drinking in the lab 2. Tie long hair back 3. Wear closed toe shoes 4. Wear a lab coat or apron 5. Wash hands before and after lab   If you have ordered the *Science and Our Food Supply: Investigating Food Safety from Farm to Table,* follow the instructions for *the 12 Most Unwanted Bacteria* research.   Before class, print and separate the Microorganisms cards.  Divide the class into subgroups of two or three students.  Place the Microorganisms cards in a basket and ask students to select a card. Students will research the information needed and demonstrate or present to the class.  Students should use reliable sources for their research such as:   * Bad Bug Book (Second Edition)<http://www.fda.gov/downloads/Food/FoodborneIllnessContaminants/UCM297627.pdf> * Centers for Disease Control and Prevention<http://www.cdc.gov/> * Foodsafety.gov<http://www.foodsafety.gov/> * U.S. Food and Drug Administration Protecting and Promoting Your Health<http://www.fda.gov/Food/FoodborneIllnessContaminants/default.htm>   Distribute Rubric for Microorganism Research so that students will understand what is expected.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*   * assisting student in gathering information * providing praise and encouragement |
| **Lesson Closure** | Have students sing along with the Food Safety Music to reinforce the importance of handwashing.   * Food Safety Music – You’d Better Wash Your Hands – Animation A parody of The Beatles’ “I Wanna Hold Your Hand,” as performed by Carl Winter.<http://youtu.be/AtlcS77LaB0>   Allow students to practice washing their hands before they leave the classroom. |
| **Summative/End of Lesson Assessment \*** | Students will present their research.  Students will be assessed with appropriate rubric.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*   * grading according to work done * providing praise and encouragement |
| **References/Resources/**  **Teacher Preparation** | **Guidebook:**   * Food Safety A to Z Reference Guide A treasure trove of scientific and comprehensive food safety information in one user-friendly, alphabetical format<http://www.fda.gov/Food/FoodScienceResearch/ToolsMaterials/ucm216150.htm>   **Textbook:**   * Mehas, K. Y., & Rodgers, S. L. (2002). *Food science: The biochemistry of food and nutrition.* New York, NY: Glencoe/McGraw-Hill. * Ward, J. D., & Ward, L. T. (2013). *Principles of food science.* Tinley Park, IL: Goodheart-Willcox Company.   **Video:**   * Put Your Hands Together Researchers in London estimate that if everyone routinely washed their hands, a million deaths a year could be prevented. From doorknobs to animals to food, harmful germs can live on almost everything. Handwashing may be your single most important act to help stop the spread of infection and stay healthy.<http://www.cdc.gov/cdctv/handstogether/>   **Websites:**   * Science and Our Food Supply – Free Supplementary Curriculum for Middle and High School Classrooms. The Food and Drug Administration (FDA) in collaboration with the National Science Teachers Association (NSTA) have created Science and Our Food Supply, an innovative, interactive supplementary curriculum for use in middle level and high school science classes.<http://www.fda.gov/Food/FoodScienceResearch/ToolsMaterials/ucm2006976.htm> * Show Me the Science – How to Wash Your Hands CDC recommends cleaning hands in a specific way to avoid getting sick and spreading germs to others.<http://www.cdc.gov/handwashing/why-handwashing.html>   **YouTube:**   * Food Safety Music – Microbes Medley – Animation A two-song medley: “Microbes, They Might Kill You” and “We Are the Microbes” is a parody of Queen’s “We Will Rock You” and “We Are the Champions,” as performed by Carl Winter.<http://youtu.be/1EkehFkhWf4> * Food Safety Music – You’d Better Wash Your Hands – Animation A parody of The Beatles’ “I Wanna Hold Your Hand,” as performed by Carl Winter.<http://youtu.be/AtlcS77LaB0> * Recipes for Disaster – Contaminated Carbo Load Learn the right food safety steps as Maria does everything wrong.   <https://youtu.be/5giiq2tBXig>   * True Story Behind Typhoid Mary | Dark Matters  The real “Typhoid Mary” was an Irish immigrant who worked as a cook in well-to-do American households. Though she was connected to several outbreaks of the disease, she never fell ill herself.<http://youtu.be/XE8HwwNqHG4> |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** | * Word wall * Draw visual representations of terms on word wall * <http://www.learnerdictionary.com> for pronunciation and meaning of terms |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **Recommended Strategies** | |
| **Reading Strategies** | Incorporate current events – Students can explore articles about foodborne illness, microorganisms and food safety and sanitation in newspapers, magazines, or internet sources that are current and relevant.  Other articles pertaining to this lesson students may read include:   * How to Prevent Bacterial Growth in Food Avoid getting sick from bacterial growth in food by practicing safe food handling techniques.<http://www.ehow.com/how_5074661_prevent-bacterial-growth-food.html> * Potential Food Safety Hazards The Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA) are two governmental agencies that regulate food safety to protect the general public from potential hazards such as chemical contamination, spoilage, and food poisoning.<http://www.ehow.com/list_6759082_potential-food-safety-hazards.html>   Reading strategy: Encourage students to “visualize” as they read. Many students are visual learners and will benefit from making sketches or diagrams on scrap paper as they read. Providing students with graphic organizers to help them organize their thoughts is also helpful. |
| **Quotes** | This was predictable. Microorganisms respond to chemical physical changes in an environment. Everything that you do to your body affects the microorganisms that live there. **-Philip Tierno**  Salad bars are like a restaurant’s lungs. They soak up the impurities and bacteria in the environment, leaving you with much cleaner air to enjoy.  **-Doug Coupland**  It’s probably something that just lives in the environment. We forget that microorganisms rule the world. Now we’re looking and finding things we didn’t know were there. **- Tara O’Toole**  Producers of antimicrobial products must ensure that their products kill all the microorganisms claimed on their product labels. The false claim by a registered pesticide product of its effectiveness against bacteria may result in an increased risk to human health and the environment. **-Enrique Manzanilla**  Don’t forget that the flavors of wine and cheese depend upon the types of infecting microorganisms.  **- Martin H. Fischer** |
| **Writing Strategies**  **Journal Entries + 1 Additional Writing Strategy** | **Journal Entries:**   * Foodborne illness is a serious matter because … * Washing your hands often while cooking is important because … * An example of cross-contamination could be … * Cooking food to the right temperatures will … * Refrigerating foods promptly will …   **Writing Strategy:**  RAFT writing strategy is designed to demonstrate student understanding of material in a creative and relevant way.   * Role – microbiologist * Audience – public * Format – bulletin * Topic – new foodborne bacteria   The bulletin will detail the new bacteria found in a popular food. |
| **Communication**  **90 Second Speech Topics** | * The steps to correct hand washing are … * Three things to remember to keep food safe are … |
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| **Enrichment Activity**  (e.g., homework assignment) | **Infographics:**  Infographics are graphic visual representations of information, data or knowledge intended to present complex information quickly and clearly.  The infographic below is related to this lesson. Allow students to view the image on a projector and lead a discussion concerning the information provided.   * Recipe for Food Safety Food poisoning can happen to anyone. Each year, about 48 million people in the United States (1 in 6) get sick from eating contaminated food.<http://www.cdc.gov/vitalsigns/listeria/infographic.html>   **TED Talks:**  TEDx is a program of local, self-organized events that bring people together to share a TED-like experience. At a TEDx event, TEDTalks video and live speakers combine to spark deep discussion and connection in a small group. These local, self-organized events are branded TEDx, where x = independently organized TED event.  The video below is related to this lesson. Allow students to view the video and lead a discussion concerning the TED Talk.   * A New Fix for Food Safety: Don Stull at TEDxTexasTechUniversity The United States wastes as much as 40 percent of its food due to spoilage and suffers through 76 million cases of food-borne illness every year. Don speaks about how to solve these important issues by eliminating pathogens and extending food shelf life to reduce waste.https://youtu.be/B4oIPdTQr4Y |
| **Family/Community Connection** | * Encourage your students to practice good hygiene at home and to teach their families about correct handwashing techniques and keeping food safe. * Assign students to check the refrigerator and pantry in their kitchens at home for expired foods and foods that spoiling. Helping to clean the appliance and checking food storage will help prevent foodborne illness. |
| **CTSO connection(s)** | **Family, Career, and Community Leaders of America (FCCLA)**  <http://www.texasfccla.org>   * Applied Technology  An individual or team event – Recognizes participants who develop a project using technology that addresses a concern related to Family and Consumer Sciences and/or related occupations. The project integrates and applies content from academic subjects. * Chapter Service Project (Display and Manual) A team event – recognizes chapters that develop and implement an in-depth service project that makes a worthwhile contribution to families, schools, and communities. Students must use Family and Consumer Sciences content and skills to address and take action on a community need. |
| **Service Learning Projects** | Successful service learning project ideas originate from student concerns and needs. Allow students to brainstorm about service projects pertaining to lesson. For additional information on service learning see:<http://www.ysa.org>   * Possible idea: Develop a pamphlet or brochure that describes an aspect of food safety that could be distributed at local grocery stores or farmers market. |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)