

SAFE FOOD HANDLING AND NUTRITION



INTRODUCTION

As students at the upper elementary level grow in independence, they are likely taking an interest in preparing their own snacks and helping to prepare family meals. To reduce the chances of spreading and picking up germs through food, it is important for students to know how to safely handle food and food equipment. Also, in this age of fast food and increasing childhood obesity, it is important for

students to learn to make healthy food choices.

This section covers safe food handling, followed by nutrition:

- **Safe food handling** refers to precautions taken when storing, preparing, and eating food, which reduce the risk of **food-borne illnesses**, illnesses that are caused by eating food **contaminated** by bacteria and other microorganisms. Contaminated means that a substance,

such as food, has been made impure or unsafe. Handling food safely requires clean hands, work surfaces, and equipment. It also requires taking other safety measures, such as never drinking milk straight out of the container from which other people will be pouring, and storing and cooking foods correctly.

- **Nutrition** generally has two meanings: (1) the study of how food affects the health of the human body; (2) the process by which the nourishing substances in food are taken in and used by the body for growth, repair, and overall health.

SAFE FOOD HANDLING



Background Information

Even the most nutritious foods can hinder good health if these foods are not handled safely. This section will provide students with information for safe food handling that will help avoid food-borne illness, which is

caused by the contamination of food by bacteria and other microorganisms. Even though bacteria may be generally thought of as the germs that contaminate food, other things can contaminate food as well, such as viruses and **parasites**. Parasites are organisms that survive by living inside another life form. One example is the **tapeworm**, which can set up home inside the human intestines.

For the sake of simplicity, this section on safe food handling will focus on bacteria, with the implicit understanding that food can also harbor viruses and parasites. Bacteria thrive in unclean, warm, moist environments. Foods that are prepared with unwashed hands or unclean utensils and work surfaces become breeding grounds for harmful bacteria. Foods that are stored at inappropriate temperatures, and foods that are cooked insufficiently also encourage the growth of harmful bacteria. Safe food handling requires cleanliness and appropriate storage and cooking methods.

Washing hands

Bacteria are everywhere, including on the hands. Careful hand washing is the single most important thing one can do before eating or preparing food, as it washes away many of these microorganisms. Some bacteria are harmless, but others can cause illness. For example, **salmonella** (pronounced “sal-mon-ell-ah,” with the emphasis on the “ell”) is a type of bacteria often found in raw or undercooked poultry and eggs (and in other foods) that can cause **food poisoning**. Food poisoning is an irritation of the stomach and intestines caused by eating food contaminated with harmful microorganisms. The symptoms of

food poisoning usually include vomiting, stomach cramps, and diarrhea, and can range from mild to severe.

Botulism is a particularly deadly type of food poisoning caused by bacteria that grow in canned food that has been improperly processed — meaning that the food was not placed in sterilized containers, and/or was not cooked adequately prior to being placed in containers. **Sterilization** is the process of killing harmful microorganisms on food and food equipment through high temperatures and other methods.

Hand washing is a crucial step in protecting oneself and others from harmful bacteria. A person normally touches many objects in a day — tables, chairs, doorknobs, taps, toilets, light switches, handrails, elevator buttons, money, telephones, computer mice and keyboards, other people’s hands, and books. Other people have touched all of these things, and all these things have bacteria on them. When people prepare or eat food with unwashed hands, harmful bacteria may be transferred onto the food and into the digestive system.

Since bacteria cannot be seen with the naked eye, some students (and some adults) may find it hard to understand that bacteria are on their hands. Students may look at their hands and think that they are clean because there is no visible dirt on them. For example, a student might use the toilet and decide that her/his hands look clean, so there is no need to wash them. Of course, one of the most germ-laden environments is the bathroom. Harmful bacteria are easily spread when people eat or prepare food without washing their

Hand washing steps

- Use warm water to wet the hands.
- Dispense soap into hands and scrub thoroughly for at least 15 to 20 seconds, right up to the wrists. Be sure to:
 - rub palms together
 - rub the palm of each hand over the back of the other hand
 - scrub the fingertips and thumbs
 - interlock the fingers and scrub in between the fingers
 - scrub under the fingernails with a soapy nailbrush, if available
- Rinse thoroughly with warm running water.
- Dry hands with a clean towel, paper towels, or an electric hand-dryer.
- Use a paper towel to turn off the taps to avoid contaminating hands with the same bacteria just washed off.
- When leaving a bathroom, use a paper towel to open the bathroom door whenever possible, or push the door open with a shoulder.

hands after using the toilet, and serious illness can result. The activities in this section will help students recognize that “dirt-free” does not necessarily mean clean or germ-free. Here are steps for effective

hand washing, which can be copied for students to take home. Students may wish to add illustrations. Teachers may also wish to make a laminated chart of these steps for use in activities and to post in the bathroom next to the sink.

Preparing and eating food

When handling food, it is not only the hands that need to be kept clean. There are many other objects with which hands come in contact while preparing and eating food. For example, when preparing and eating a sandwich, the hands may touch many items including: the cupboard, fridge, and/or freezer door handle; the bread bag and bag fastener; containers of mayonnaise, mustard, butter, pickles, or other condiments; a package of cheese; a package or tin of lunchmeat or fish; plastic bags containing lettuce, tomatoes, or other vegetables; the food itself; cutting boards and drawer handles; knives, can opener, and plates; chair and table; napkins, placemats, sponges, and dish cloths. It can

be a little alarming to think about the bacteria on all these items!

To avoid being overwhelmed or terrified by the thought of all the potentially harmful germs on hands, food, food packaging, and food equipment, it is important for students to remember the valiant defender of the body's health — the immune system. The immune system, the body's natural defense system, normally does a terrific job of sorting out the bad from the good microorganisms and protecting the body from illness.

However, the immune system can always use support, which means following good cleanliness habits and practicing certain precautions when preparing and eating food. The following list, which is by no means complete, includes some of these precautions. What is important here is to begin a dialogue with students about the risks associated with unsafe food handling, and to encourage students' curiosity about, and practice of, safe food handling.

Precautions to take when preparing and eating food

- Be sure to have clean hands, clean equipment, and a clean surface for all food preparation. Wash with warm or hot, soapy water, and dry with a clean towel or paper towels.
- Replace kitchen sponges and dish cloths often, as bacteria multiply in these damp items. Keep sponges and dish cloths as dry as possible in between uses.
- Use a **bleach solution** to disinfect kitchen counters, cutting boards, cupboard door handles, sponges and dish cloths, and sinks. Use 1 tsp (5 mL) of bleach to 3 cups (750 mL) of water.
- Use separate cutting boards for meat products and non-meat products.

- Rinse cutting boards, dishes, and equipment after use, then wash in hot soapy water or in the dishwasher. (Studies show that rinsing items first removes many bacteria. If a used cutting board, for example, is placed directly into hot soapy dishwater without rinsing, the bacteria on the cutting board simply contaminate the dishwater.)
- Wash the tops of cans with warm soapy water before opening. Wash the can opener, including the blade, after each use.
- Allow dishes to air dry.
- Buy only the freshest, unblemished fruits and vegetables.
- Scrub all fresh fruits and vegetables with a clean brush under cold running water, even those that require peeling and slicing, as the knife or peeler can transfer bacteria from the outside to the inside of the fruit or vegetable.
- Discard any foods that have **mold** growing on them, and never breathe in mold. Mold is a type of microorganism called **fungi** that grows on food.
- Avoid double-dipping foods (i.e., dipping a carrot stick into food dip, taking a bite, and then dipping it again).
- Avoid placing utensils that have been inside the mouth into containers of food (e.g., using your fork to spear a pickle or olive from a jar.)
- Do not drink or eat straight out of a non-single serving milk or juice carton, or a yogurt or ice-cream container, for example.
- Put chilled foods, such as dairy products, back in the fridge immediately after using them, rather than letting them sit out on the counter.
- Do not refill and drink out of a plastic water or beverage bottle, unless it is a purchased bottle made from material that is meant for repeated use and washing.
- Wash skin cuts or scratches with warm soapy water, then cover with a bandage and rubber gloves before handling food.
- Do not place cooked food on the same plates that raw food was placed on.
- Be sure meats are cooked thoroughly before eating.

Storing food

In addition to keeping hands and food equipment clean, storing foods correctly will also reduce risks of food-borne illness.

Expiry dates or “best-before” dates on packaged foods indicate the time frame in which the food is safe to eat. Some packaged foods also indicate whether the contents need to be consumed within a period of time once the package has been opened. For example, a carton of soy milk may indicate that the contents need to be consumed within five to seven days after the carton has been opened.

There are many web resources containing guidelines for safe food handling and storage — several of which are listed at the end of this section.



Precautions to take when storing food

- Be sure fridges and freezers are kept clean and at the recommended temperature settings.
- Keep storage areas clean to reduce the chance of pests such as mice or insects from contaminating foods.
- Use foods before their expiry dates.
- Keep foods wrapped separately in clean plastic bags or food wrap, or in clean glass or plastic containers.
- Pick up frozen and refrigerated items last (after canned goods, etc.) when shopping, take them directly home, and promptly place them in the freezer or fridge.
- Keep eggs in their original cartons in the fridge, as they will stay cooler than when placed in the egg holders in the fridge door.
- Place cooked leftovers immediately in separate, small, clean containers or food wrap, then refrigerate promptly. Small containers ensure that the food cools quickly, which reduces the growth of bacteria.
- Eat leftovers within two or three days; dispose of leftovers after three days.
- Most fruits and vegetables require refrigeration, except potatoes (other than new potatoes), onions (other than green onions), garlic, and bananas. Some fruits, such as apricots, plums, nectarines, and peaches, need to ripen at room temperature before being refrigerated.

Cooking

Many foods require thorough cooking in order to kill harmful bacteria present in them. The foods requiring special cooking attention are meat, poultry, eggs, and fish because certain harmful bacteria commonly thrive in these foods. Fish can harbor many bacteria that live right on the fish or that caught fish pick up from ice and storage containers before arriving at the dinner table. As mentioned, salmonella often contaminate eggs and poultry. **E. coli**, a type of bacteria found in the intestines of humans, can be found in meats such as ground beef. However, E. coli can also contaminate water supplies, vegetables, and many other foods. Thorough cooking will destroy E. coli as well as salmonella.

It is important that cooked meat, poultry, and fish products reach the internal temperature recommended in the recipe. This internal temperature ensures that any harmful bacteria in these foods will be killed. Food thermometers are strongly recommended when roasting, for example, a turkey. These thermometers are inserted into the thickest part of the meat before cooking, and indicate when the correct internal temperature has been reached deep inside the food. When cooking meat products, always follow the cooking instructions in reputable recipes or in the manual accompanying the stove or oven.

Some people believe that only meat or dairy products can make them sick, but any food, including fruits and vegetables, can carry harmful bacteria. Although not all fruits and vegetables require cooking, they all require proper handling and washing, as discussed previously.

Using a microwave oven for defrosting, cooking, and reheating food requires carefully following the instructions in the manual that accompanies the microwave. Since microwaves can heat foods unevenly, it is important to heat or cook foods for a sufficient length of time to ensure all bacteria are killed.

Did you know?

With all of the concern over the need to thoroughly cook certain foods, including fish, some may wonder how it is that people can eat raw fish in popular Japanese dishes such as **sushi**, which are small servings of rice topped or filled with raw fish and other food items.

The fish used in sushi is not the same fish one can buy at the local supermarket. Sushi requires what is referred to as **sushi-quality fish**, high-quality fish that has been carefully handled according to specific regulations from the time it is caught to the time it is served. Even so, it is recommended that raw fish not be consumed by persons with weakened immune systems or by women who are pregnant (to reduce risks of harming the developing fetus).



Did you know?

- Not all bacteria in food are bad. In fact, many foods depend on bacteria for their unique flavors. For example, certain bacteria are deliberately added to milk to produce yogurt and cheese.
- When a sink and soap are not readily accessible for hand washing, **hand sanitizers**, gels that are rubbed on the hands to reduce bacteria, are recommended. To be effective, these gels should contain a minimum of 60 percent alcohol.
- Since ancient times, people have been storing food for future use. Before refrigerators and freezers, people used many methods to preserve their food, such as drying fish and fruit in the sun, or smoking meat over a slow fire. These methods remove the moisture from foods, which prevents the growth of microorganisms.
- In 2000, several people died and many became ill from an E. coli contamination of the water supply in Walkerton, Ontario, Canada. In 2006, several people died and many became ill from an E. coli contamination of spinach in the US.

Resources

There are many excellent websites about safe food handling. Here are some examples:

- Canadian Food Inspection Agency. Food Safety Tips.
<<http://www.inspection.gc.ca/english/fssa/concen/tipcone.shtml>>
- Science News Online. "Sickening Food."
<<http://www.sciencenews.org/articles/20000101/food.asp>>
- USDA: Food Safety and Inspection Service. Fact Sheets.
<http://www.fsis.usda.gov/Fact_Sheets/index.asp>

ACTIVITY 1

Discovering the Microorganisms on Everyday Objects

Purpose

To observe that microorganisms live on objects that hands come in contact with everyday.

Material

Sterile agar plates with covers (one per student).

Sterile cotton swabs (two per student).

Objects to test (pen, coin, computer mouse, keys, doorknob, etc.).

Permanent markers.

Magnifying glass.

Health Sciences journals and pencils.

Presentation

- Most Montessori teachers introduce this concept in Year 4, and present it in more detail in Years 5 and 6.
- Announce that students will discover that microorganisms are on everyday objects, and that these microorganisms can end up in the stomach, causing sickness.
- Discuss how microorganisms can be found on surfaces that people touch daily, such as doorknobs, keys, money, computers, toilets, and sinks.



- Discuss how harmful microorganisms can be transferred from objects to hands to food to the digestive system, where they can cause food poisoning and other illnesses.
- Remind students that the immune system is constantly protecting the body from harmful microorganisms, and that people can make the immune system's job easier by keeping their hands clean. Explain that hand washing is the single most important way to reduce chances of getting sick.

TESTING OBJECTS FOR MICROORGANISMS

- At a worktable, give each student a sterile agar plate, and announce that students will be testing everyday objects for microorganisms.

- Ask students to each take a permanent marker and to make a line down the center of their plate cover.
- Ask students to decide on two different items they would like to test (e.g., coin, doorknob), and write each object's name on one half of the plate cover.
- Ask students to write their initials in small letters near the edge of the plate cover.
- Ask students to take a sterile cotton swab and swab one object, then take the cover off the plate and very gently streak the swab on the appropriate half of the agar plate and replace the cover promptly.
- Ask students to take another sterile cotton swab and swab the other object, then take the cover off the plate and very gently streak the swab on the appropriate half of the agar plate and replace the cover promptly.
- Ask students to place their plates on a table at room temperature undisturbed for one to two days.
- After two days, observe and discuss the microorganisms growing on the agar plates. Use the magnifying glass to see clearer. (Safety Note: do not touch or breathe in the microorganisms, as they may be harmful to health.)
- After observing the bacteria growing on the agar, remind students of the importance of washing hands when eating or preparing food to reduce the levels of microorganisms on their hands, which can cause food poisoning and other illnesses.
- Ask the students to use their journals to record their observations of the activity.

Extension

- Repeat the activity, dividing the agar plates into four areas and testing four different objects.

ACTIVITY 2

Investigating Whether Hand Washing Reduces Microorganisms

Purpose

To practice effective hand washing, and to observe the difference in microorganisms on washed and unwashed hands.

Material

Sink with warm water supply.

Soap, nailbrush, paper towels.

Chart: Hand washing steps (from Background Information).

Sterile agar plates with covers (one per student).

Sterile cotton swabs.

Permanent markers.

Magnifying glass.

Health Sciences journals and pencils.

Presentation

- Most Montessori teachers introduce this concept in Year 4, and present it in more detail in Years 5 and 6.
- Announce that students will discover that microorganisms are on hands, and that good hand washing ensures that these microorganisms do not end up in the stomach.
- Remind students how microorganisms can be found on surfaces that people



touch daily, such as doorknobs, keys, money, computers, toilets, and sinks.

- Remind students how harmful microorganisms can be transferred from objects to hands to food to the digestive system, where they can cause food poisoning and other illnesses. Remind them also that hand washing is the single most important way to reduce chances of getting sick.
- Discuss some of the bacteria that can cause food poisoning, such as salmonella and E. Coli. Ask students what they know about these bacteria, how they are spread, and how to avoid them.

TESTING UNWASHED HANDS FOR MICROORGANISMS

- At a worktable, give each student a sterile agar plate, and announce that

students will be testing washed and unwashed hands for microorganisms.

- Ask students to each take a permanent marker and make a line down the center of the plate cover.
- Ask students to write Washed on one side of the plate cover, and Unwashed on the other side, then to write their initials in small letters near the edge of the plate cover.
- Ask students to take a sterile cotton swab and swab one unwashed hand, then take the cover off the plate and very gently streak the swab on the appropriate half of the agar plate. Replace the cover promptly.

HAND WASHING

- Display the chart Hand washing steps, and discuss the reasons for each step.
- Ask students to gather around the sink for a demonstration, and demonstrate effective hand washing by following the steps.
- Ask each student to follow the hand-washing procedure demonstrated.

TESTING WASHED HANDS FOR MICROORGANISMS

- Invite students back to the table with the agar plates. Ask them to be careful not to touch any objects with their washed hands.
- Ask students to take another sterile cotton swab and swab the palm of one

washed hand. Ask them to take the cover off the plate and very gently streak the swab on the appropriate half of the agar plate, then replace the cover promptly.

- Ask students to place their plates on a table at room temperature undisturbed for one to two days.
- After two days, observe and discuss the microorganisms growing on the agar plates. Use the magnifying glass to see clearer. (Safety Note: do not touch or breathe in the microorganisms, as they may be harmful.)
- After observing the growth of microorganisms, remind students of the need to wash hands when eating or preparing food to reduce the levels of microorganisms on the hands, which can cause food poisoning and other illnesses.
- Ask the students to use their journals to record their observations of the activity, and to write out the steps for effective hand washing.

Extensions

- Repeat the experiment, this time comparing hands cleaned with a hand sanitizer and hands cleaned using soap and water.
- As a group, make an illustrated Hand Washing Steps chart to display next to all the sinks in the school.
- Research and write an illustrated report about one type of food poisoning caused by bacteria.

ACTIVITY 3

Brainstorming Safe Food Handling Tips

Purpose

To determine the many steps that can be taken to reduce the risk of food-borne illness when preparing, cooking, storing, and eating food.

Material

Large sheet of paper and felt marker for each small team of students.

Masking tape.

Health Sciences journals and pencils.

Note: Students may already know many methods for handling food safely. This activity is designed to encourage students to share their knowledge on this topic and to discover new knowledge by generating ideas with one another in small groups and through class discussion.

Presentation

- Most Montessori teachers introduce this concept in Year 4, and present it in more detail in Years 5 and 6. This activity may require more than one day, depending on the number of students.
- Announce that today students will discover many safe food handling tips, which are ways of preparing, storing, and eating food that reduce the risks of getting sick from food-borne illness.



- Remind students that microorganisms are found on surfaces that people touch daily, and that harmful microorganisms can be transferred from objects to hands to food to the digestive system.
- Ask students what is the most important way to keep food safe (good hand washing). Ask and discuss what other precautions, besides keeping hands clean, people can take to keep food safe.
- Discuss how correct storage and cooking methods help keep food safe.

BRAINSTORMING IDEAS AT A SAFE FOOD CONFERENCE

- Announce that students will have an opportunity to work in small teams to brainstorm and record their ideas for safe food handling.
- Ask students to imagine that each one of them is the head chef at a five-star restaurant, and that all the chefs are

meeting at a Safe Food Conference to discuss important ways to keep food safe.

- Divide the “chefs” into small teams. Ask the teams to discuss and list 12 ways they would practice food safety in their restaurants, so that their customers would never become ill from food-borne illness, and so that their restaurants would always have an excellent reputation.
- Ask each group to take a large sheet of paper and a felt marker. Give the groups ten minutes to brainstorm and write 12 safe-food tips.
- After ten minutes, ask the groups to tape their lists to the wall with masking tape, then sit together in a semi-circle around the lists.
- Begin with one group’s list. Ask a chef from this group to read the first tip, then discuss this tip with the class. Ask how and why following this tip would help keep food safe. (For example, if the tip is, “keep food in the fridge,” ask why keeping food in the fridge makes food safe, and discuss how cold temperatures slow the growth of bacteria in food.)
- Ask another chef from this same group to read the second tip, and follow the previous procedure for discussion. In this way, work through all 12 tips.

- Repeat the procedure with the 12 tips from the other groups of chefs.
- If any of the tips need modifying, ask the chefs to make the changes on their lists. (Ensure that cleanliness of hands, food, and food preparation equipment, correct storage and cooking methods are discussed and included on the lists.)
- Ask the students to use their journals to record the safe food handling tips generated at the Safe Food Conference.

Extensions

- Research food safety on government websites from local state, province, or country. Together, make a class chart of safe food tips to hang in the classroom’s food preparation area. Make the same chart to take home and keep in the kitchen.
- While following safe food handling precautions, prepare and eat a snack, then clean the food preparation area.
- Arrange a field trip to a program that trains restaurant workers how to handle and prepare food safely.
- Research and write a three-paragraph report about food storage methods used from prehistoric to modern times.
- Research and write a paragraph describing how to use a food thermometer.