

Germ Scientists (5th Grade)

This is a longer lesson; it can be split into two parts and taught over two days.



HAND-WASHING OBJECTIVES CHECK LIST

Students will be able to:

- perform** proper hand washing techniques.
- express ways** they can **remember to wash their hands regularly.**
- explain** the **importance** of washing hands and healthy eating.
- identify** that fruits and vegetables fit in the food groups of MyPlate and are healthy.

MATERIALS AND INGREDIENTS

Bin	Teacher Provides	Will be Delivered
<u>In Kitchen Bin</u> - cutting board - chef knife (teacher only) - large bowl <u>In Paper Goods Bin</u> - spoons/forks* (if needed) - paper plates* (if needed)	- poster papers* - coloring media (such as colored pencils, markers, crayons) - napkins*	- book: “Germs Make Me Sick” by Melvin Berger - seasonal fruit or vegetable

*one per student

EXPERIMENT MATERIALS

Bins	Teacher Provides	Will be Delivered
- N/A	- activity sheet copies* - text “Petri Dish Information” copies* - tape for keeping Petri dishes securely closed - paper towels* - permanent marker	- 5 Petri dishes (use at room temperature and store red side up) - 10 cotton swabs - hand soap

*one per student

Useful Information about Petri dishes:

Petri dishes should be refrigerated and stored upside down (red side up) until they are ready to be used. The experiment works best when the Petri dishes have been set out at room temperature (70°F) for one hour before the experiment. The pink gel that covers the bottom of the dish is an ideal medium for bacteria to proliferate. For best results, after the Petri dishes are imprinted with bacteria, set them upside down at room temperature (above 70°F) to promote bacteria growth. Have students observe the growth of germs after a couple of days or more. Discard dishes as soon as students have recorded their observations. If dishes are kept more than a week, the germs will quickly multiply as they absorb the food that is available. Therefore, there will be little difference between the two dishes that are being compared. This could be confusing for students. **Note:** The growth rate of germs depends on the room temperature. If the room is colder than 70°F, it may take longer than a couple of days for the germs to become visible.

SET - UP

Copies:

- Make copies of text “Petri Dish Information” (each student) or plan to use on overhead device and Petri dish experiment activity sheet (one per group). **Note:** The activity sheet for this lesson is three pages long, when making copies be sure to copy the complete activity.

Work area:

- Students will work in four groups. Have four work spaces ready for them to use.
- **Time Saving Tip:** Conduct the experiment as a whole class instead of dividing students into groups. Use overhead device to fill in activity sheet together as a class.
- Have nutrition table ready for lesson materials and ingredients.

Food-prep:

- Wash seasonal fruit or vegetable for snack. Cut and divide the fruit or vegetable into an appropriate number of pieces for the class.
- Have small paper plates and napkins ready to pass out to each student.

Other-prep:

- Have 5 Petri dishes, 10 cotton swabs, permanent markers, and scotch tape ready for the experiment. Each group will get 1 Petri dish and 2 cotton swabs, along with markers and tape. **Note:** One Petri dish and 2 cotton swabs will be used for demonstration.
- **IMPORTANT:** Take Petri dishes out of the fridge an hour before using, red side up. *Dishes need to be taped shut while germs grow. To dispose of Petri dishes properly, keep them taped shut and throw away in trash.*
- Have soap and paper towels ready for hand washing.
- Have the book “Germs Make Me Sick” ready to read to the class.
- **(Optional):** Have poster papers and coloring media of your choice ready to pass out to students.

INTRODUCTION WITH STUDENTS



Let's Wake Up Our Brains! Brain Boost Exercise!

Shake those Germs Off- Repeat to get your heart going!

- ♥ We're gonna shake, shake, shake those germs off
- ♥ Shake, shake, shake those germs off
- ♥ We're gonna jump, jump, jump those germs off
- ♥ Jump, jump, jump those germs off
- ♥ We're gonna jog, jog, jog those germs off
- ♥ Jog, jog, jog those germs off
- ♥ We're gonna wash, wash, wash those germs off
- ♥ Wash, wash, wash those germs off
- ♥ Good –Bye Germs!! (adapted from Kid's Country Song & Dance CD by The Learning Station)

Now that our minds are ready to go, let's get started on our nutrition lesson.

- Ask students what they know about germs. Give students 3 minutes to talk with their neighbors about germs.
- Lead the discussion with some of the following questions:
 - ✓ Where do we find germs?
 - ✓ What do germs look like?
 - ✓ How do germs get on our body?
 - ✓ What do germs do to our bodies?
 - ✓ How do we get rid of germs?
- Ask students to discuss what hand washing does to germs.
- **Refer to Key Behavior on the board and tell students that it is important to wash your hands before eating and cooking. Tell students that today they will learn about the importance of hand washing.**
- Read the book "Germs Make Me Sick".
- Tell students that they will do an experiment to discover where germs live in the classroom.
- Explain that the process of scientific investigation always starts with a question. For example, "I wonder," or "I would like to know" Inquisitiveness often leads to great scientific discoveries.
- What a scientist does:
 - ✓ **Asks questions-** *What are you curious about, or what have you seen that makes you wonder?"*
 - ✓ **Investigates/Uses tools-** *What do you think is the answer to your question? How will you find out? What tools will you use to find out?*
 - ✓ **Keeps records-** *How will you show what you found out?*
 - ✓ **Develop explanations-** *What did your investigation tell you? What did you find out from your data that was unexpected, interesting, or new?*
- Tell students that today they are going to become germ scientists and ask some questions about germs.

- Tell students that after they conduct their experiments they will practice thorough hand washing and eat a healthy snack.

PROCESS

- Step 1: Divide class into four groups. Explain that today they are going to investigate the following question: “*Where do germs live in our classroom?*”
- Step 2: Show students a Petri dish and tell them that they are going to use them for this experiment. Pass out the copies of “Petri Dish Information” or display on overhead and read together.
- Step 3: Pass out the activity sheet to each group. Have each group select two places in the classroom to test and then share their ideas with other groups. **Note:** Encourage groups to choose different places to maximize the areas being tested. (examples: trash cans, rug, sink, sponge, doorknob, telephone, keyboard, pencil, or pencil sharpener)
- Step 4: Have them decide two places as a group and have them write their reasoning on the activity sheet.
- Step 5: Tell students that they are going to answer their questions by performing the experiment. Demonstrate how to do the experiment step by step.
1. Describe two places in the classroom you want to test and explain why you chose them.
 2. Show students one Petri dish, 2 cotton swabs, and a marker. Explain why you need to keep the Petri dish lid closed; because germs are everywhere, even in the air.
 3. Turn the Petri dish upside down and draw a line down the middle. Write the name of the places you chose on each side of the dish.
 4. Go to the first place you would like to get the sample germs and swab the place with the cotton swab.
 5. Open the lid of your Petri dish and transfer the sample germs onto the side that matches your label, by swiping the cotton swab lightly on the pink gel, then close the lid immediately.
 6. Repeat the same procedure for the second sample of germs.
 7. After getting two samples, seal the Petri dish with the tape and place it in a warm place with the red side up. **Tip:** Avoid extreme places such as on the top of radiator, in the front of heater, or on the window sill where the sun shines.
- Step 6: Have students complete the experiment part of their activity sheets. The materials are: 1 Petri dish, 2 cotton swabs, 1 marker, and tape.
- Step 7: Review the experiment procedure and emphasize the importance of being mindful and careful. Remind students that to have a successful experiment, every student in each group should be aware of each step he/she is taking. Have them write the procedure and have them conduct their experiments by working together and taking turns.

- Step 8: After students are finished, discuss the predictions. Have them fill out their predictions and reasons for their predictions on the activity sheet. Set the activity sheets aside and remind them that they will go back to the sheet after a couple of days.
- Step 9: Tell students that now they will focus on the importance of hand washing. Explain that germs stick to the very thin layer of oil that covers our skin and they are washed away when that oil is mixed with soap and warm water.
- Demonstrate how to do thorough hand washing.
- ✓ Use soap and warm water.
 - ✓ Rub all parts of the hands. (between fingers, the whole palm, the top of hands, wrists)
 - ✓ Wash for 20 seconds.
 - ✓ Towel or air dry.
- Step 10: **(Optional)** Have students work in groups while they wait their turn to wash their hands, they can work on posters (in pairs or individually) which promote good hand washing.
- Step 11: Have posters include:
- ✓ drawings
 - ✓ facts about germs
 - ✓ reasons why it is important to wash your hands
 - ✓ when to wash your hands
- Step 12: Send small groups of students to the sink to wash their hands with soap and warm water while the others make posters.
- Step 13: After students have practiced thorough hand washing, pass out the snack, small paper plates, and napkins to students. Tell them that eating fruits and vegetables every day helps keep our body healthy and better able to fight germs. If time permits, have them share their posters and display their work on the wall in the classroom or in the hallway.
- Step 14: **Let's Eat, Let's Talk. Help students verbalize how they plan to wash their hands regularly. Ask and discuss the questions in the box Make Health Happen.**
- Step 15: After two days (or when the sample germs are becoming visible), have students take out their activity sheets, observe their Petri dishes, and record their observations. Have students compare their results with other groups and finish the rest of their activity sheets.
- IMPORTANT: *Do not* wait more than a couple of days to observe as the germs will continue to grow in both dishes and you will not be able to see a difference between the two.**
- IMPORTANT: Keep the Petri dishes taped shut and throw them away after observing.**

Make Health Happen

- When should you wash your hands?
- How can you make sure to remember to wash your hands before eating and after you go to the bathroom?
- When you wash your hands what are the steps you should take to do it thoroughly?

REINFORCING STANDARDS

Comprehensive Health

- **GR.5-S.2-GLE.1** Demonstrate the ability to engage in healthy eating behaviors.
- **GR.5-S.2-GLE.5** Comprehend concepts, and identify strategies to prevent the transmission of disease.

Reading, Writing and Communicating

- **GR.5-S.1-GLE.2** Listening strategies are techniques that contribute to understanding different situations and serving different purposes.
- **GR.5-S.2-GLE.2** Ideas found in a variety of informational texts need to be compared and understood.
- **GR.5-S.2-GLE.3** Knowledge of morphology and word relationships matters when reading.
- **GR.5-S.3-GLE.2** The recursive writing process creates stronger informational and persuasive texts for a variety of audiences and purposes.
- **GR.5-S.3-GLE.3** Conventions apply consistently when evaluating written texts.

Science

- **GR.5-S.2-GLE.1** All organisms have structures and systems with separate functions.
- **GR.5-S.2-GLE.2** Human body systems have basic structures, functions, and needs.
- Scientific Processes-Organizing Concept- select and use appropriate tools, ask testable questions, gather, analyze and interpret data, research, communicate, and justify an evidence-based explanation, share evidence-based conclusions, provide feedback on evidence and conclusions.

BACKGROUND INFORMATION

- It is important for students to learn about germs (bacteria and viruses), the environment in which they live and grow, and how germs can affect our health.
- Germs are part of nature and of our lives. They are invisible and they are everywhere! Many kinds of germs are helpful, such as soil bacteria, which make compost. However, there are other harmful germs (bacteria and viruses) that cause a variety of illnesses. The spread of germs (bacteria and viruses) is preventable through simple public health precautions, such as covering the mouth when coughing, or washing hands after exposure to contaminated objects.
- Using soap and warm water for hand washing is the best way to get rid of germs.
- Soap is made of tiny molecules. Soap is a product of hydrolysis between fats and the alkaline base. The chemical reaction is called saponification.
- Each soap molecule has two ends: one end is a long hydrocarbon chain and is hydrophobic (water-fearing). The other end is a carboxylate end and is hydrophilic (water-loving). The hydrophobic end is attracted to oil and is repelled by water. The hydrophilic end is attracted to water, not to oil.
- When soap is used, the oily dirt gets stuck to one end of the molecule, and the water hooks onto the other end. A shell-like structure (called micelle) is formed, with the oily dirt in the center of the structure and surrounded by a thin shell of soap, and with the water molecules on the outside of the shell. Soap also acts as an emulsifying agent, holding oily dirt particles in suspension until they can be rinsed away.
- Although soap removes dirt and germs, it does not kill the bacteria. Antibacterial soap has become a popular alternative to traditional soap because it kills bacteria, as well as some antibacterial hand sanitizers which are easier to use because they don't require water. Although it may seem more effective to use antibacterial soaps, some studies suggest that those types of soaps can be harmful because they only kill weak bacteria and leave the strong strains, which may survive, reproduce, and be even more difficult to kill.
- Hand washing before any cooking or food preparation is always required and particularly important to teach in nutrition classes. Contagious diseases can be limited by establishing good hand washing habits and wearing disposable gloves when handling food. **Note:** In some nutrition lessons, students prepare uncooked dishes, such as salads. For those particular food preparation activities, students are required to wear plastic gloves on both of their hands. Have students wash their hands before putting on gloves and treat the plastic gloves as their cleanest hands. The only things they should touch when wearing disposable gloves are the ingredients and the utensils.

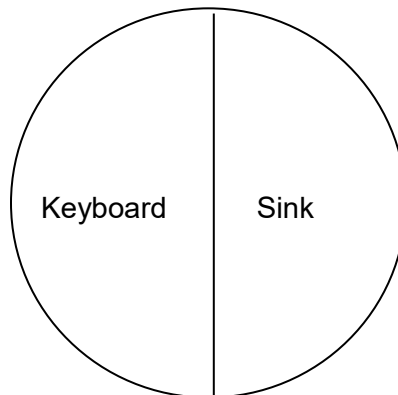
Petri Dish Information

Petri dishes are used in science laboratories to grow microorganisms, including germs (bacteria). The pink gel in the dish is food for germs. The dish starts out sterile (germ-free) so that only the germs the scientist puts on it will grow in the dish. It usually takes about 48 hours (two days) for the new germs to become visible.

For germs to grow well, Petri dishes should be stored upside down (red side up) in a warm place. After the sample germs are transferred onto the dishes, they need to be taped shut and never opened so the growing germs can't get out. It is possible to see the growing germs through the plastic top.

To keep track of where your sample of germs came from, draw a line with a marker down the middle of the Petri dish on the bottom (not the lid). Label each side with the name of the place where you got your sample germs.

For example:



Germs are invisible to the naked eye. The reason we can see germs on a Petri dish is that there are many thousands of germs growing together in colonies. The more germs in the colony, the easier it is to see them.

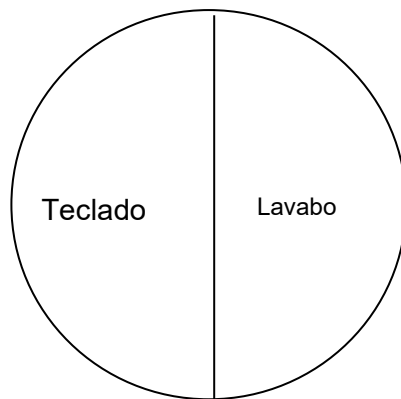
Información de la Caja de Petri

Las cajas de Petri se usan en laboratorios de ciencias para crecer microorganismos, incluyendo los gérmenes (bacterias). La jalea rosa es comida para los gérmenes. Al principio éste medio está estéril (sin gérmenes), de modo que sólo aquellos gérmenes que el científico ponga en el plato pueden crecer. Usualmente toma 48 horas (dos días) para que los gérmenes nuevos sean visibles.

Para que los gérmenes crezcan bien, las cajas de Petri deben mantenerse boca abajo (lado rojo hacia arriba) en un lugar tibio. Después de transferir la muestra de gérmenes a la caja de Petri, se debe cerrar la caja con cinta y no volverla a abrir para que no se salgan los gérmenes que están creciendo. Se puede ver a través del plástico los gérmenes que están creciendo.

Para no perder de vista de dónde vino tu muestra de gérmenes, dibuja una línea con un marcador por la mitad en el fondo de la caja de Petri (no en la tapa). Marca cada lado con el nombre del lugar donde obtuviste tu muestra de gérmenes.

Por ejemplo:



Los gérmenes son invisibles a simple vista. La razón por la cual podemos ver los gérmenes en la caja de Petri es porque hay varios miles de gérmenes que están creciendo en colonias. Cuantos más gérmenes hay en una colonia, más fácil es verlos.

Petri Dish Experiment

Name: _____ Date: _____

Question: *Where do germs live in your classroom?* To answer this question you can design and conduct an experiment. Before running an experiment scientists try to **predict** or guess the outcome based on what they already know. In science we call this a **hypothesis**.

Pick two places in your classroom where you think germs are likely to live and tell why you picked those places.

1. We hypothesize that germs live _____

because _____

2. We hypothesize that germs live _____

because _____

An **experiment or investigation** is a way to gather **direct evidence** to try to answer your question or test your **hypothesis**.

Here are the **materials** we will use for the experiment:

•Petri dish •2 Cotton Swabs •Marker •Tape

Here is the plan we will follow for the experiment:

1. We will draw a line on the plastic bottom of the Petri dish to divide it in half with a marker.

2. We will write _____ on one half of the plastic bottom and _____ on the other half of the plastic bottom. Those are the two places we have decided to test for germs.

3. We will use the cotton swab to _____

4. We will use tape to close the Petri dish.

5. We will store the Petri dish _____

6. We will look at the Petri dish to observe the germ growth on

_____ (name the day).

Predictions are what you think will happen based on what you know.

What do you think you will find when you look at the Petri dish after two days and why?

Stop! Complete the rest of this activity sheet after you have let the germs grow for two days. **Now it is time to perform the experiment.**

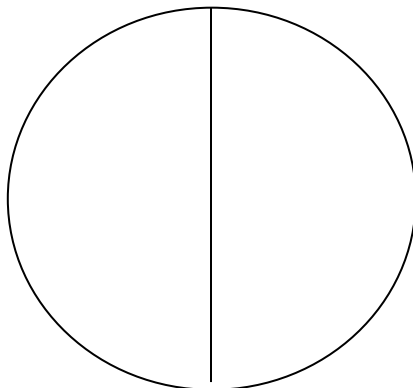
AFTER TWO DAYS

Results are what you observe from your experiment. **Keeping records** of your results is an important part of a scientist's job.

Draw what you see on the Petri dish after the germs have started to grow.

Place _____

Place _____



Develop Explanations:

Compare your **results** with other groups and write what you discovered. If you had unexpected results, describe them and explain what you think caused those results.

Conclusions are based on the **results** of your experiment and help determine if your predictions were correct or incorrect. Therefore, you can answer your original question.

Write your conclusions.

After doing this experiment, explain why it is important to wash your hands.

Experimento con la Caja de Petri

Nombre: _____ Fecha: _____

Pregunta: ¿En que parte del salón es más probable que vivan los gérmenes? Para contestar esta pregunta, puedes diseñar y realizar un experimento. Antes de realizar un experimento, los científicos tratan de predecir el resultado. En ciencia, esto se llama una **hipótesis**.

Escoge dos lugares en tu salón donde pienses que haya gérmenes y explica por qué escogiste esos lugares.

1. Formamos una hipótesis que los gérmenes viven _____

Porque _____

2. Formamos una hipótesis que los gérmenes viven _____

Porque _____

Un **experimento** es una forma de juntar información para responder una pregunta o para probar una hipótesis.

Aquí están los **materiales** que usaremos para el experimento:

- Caja de Petri
- 2 hisopos de algodón
- Marcador
- Cinta

Estos son los **pasos** que seguiremos para el experimento:

1. Dibujaremos una línea con un marcador en la tapa plástica (inferior) de abajo de la caja de Petri para dividirla por la mitad.
 2. Escribiremos _____ en una mitad de la tapa plástica de abajo (inferior) y _____ en la otra mitad de dicha tapa. Estos dos son los lugares donde hemos decidido probar si hay gérmenes.
 3. Usaremos un hisopo de algodón para
-
-

- Usaremos cinta para cerrar la caja de Petri.
- Guardaremos la caja de Petri _____
- Veremos la caja de Petri para observar el crecimiento de los gérmenes el _____ (nombre el día).

Una **predicción** se basa en tu hipótesis. Predice el resultado de tu experimento.

¿Qué piensas que encontrarás cuando mires la placa de Petri después de dos días?

¡Para! Completa el resto de esta hoja de actividad después que los gérmenes crezcan por dos días. **Ahora es tiempo de realizar el experimento.**

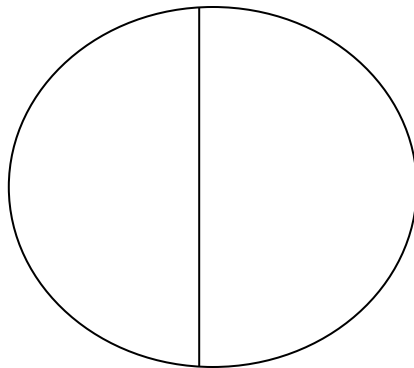
DESPUES DE DOS DIAS

Resultados son los que tu observas en el experimento. Mantener buenas notas de los resultados es una parte importante del trabajo de un científico.

Dibuja lo que ves en la placa de Petri después que los gérmenes han empezado a crecer.

Lugar _____

Lugar _____



Discusión:

Compara tus resultados con otros grupos y escribe lo que descubriste. Si obtuviste resultados inesperados, descríbelos y explica lo que piensas que causó esos resultados.

Las **conclusiones** se basan en los resultados del experimento y ayudan a determinar si la hipótesis era correcta o incorrecta. De este modo puedes contestar la pregunta original.

Escribe tus conclusiones.

Después de hacer éste experimento, explica por qué es importante lavarse las manos.
