D-Sci

Diamante Scientific

Enthusiastically supporting STEM education!

STEM

SCIENCE TECHNOLOGY ENGINEERING MATH

EDUCATION

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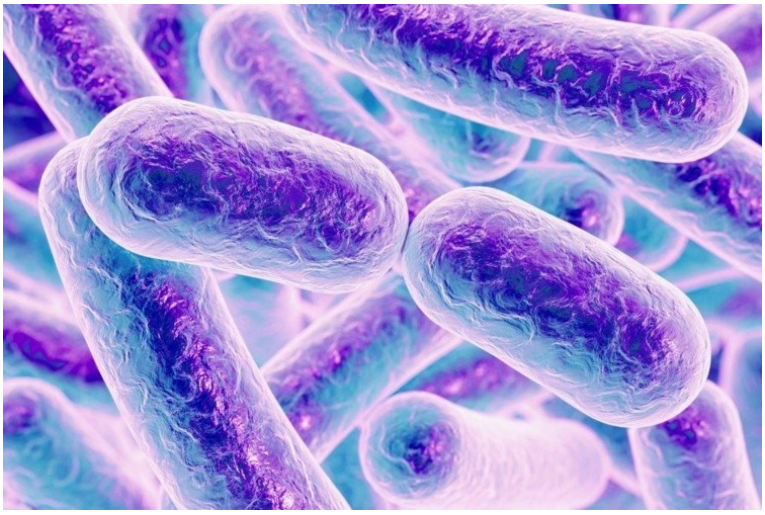
Toll Free: 1.866.279.8665 | www.diamantescientific.com | Email: info@diamantescientific.com

Diamante Scientific is a Diamante Companies portfolio company.
Diamante Companies are located at: 1714 Boardman-Poland Rd., Suite 12 Poland OH 44514
www.diamantecompanies.com

What are Bacteria?

Bacteria constitute a large domain of prokaryotic microorganisms. Typically a few micrometers in length, bacteria have a number of shapes, ranging from spheres to rods and spirals. Bacteria are tiny living beings (microorganisms) - they are neither plants nor animals - they belong to a group all by themselves. Bacteria are tiny single-cell microorganisms, usually a few micrometers in length that normally exist together in millions.

The word ***bacteria*** is the plural of ***bacterium***. Grammatically the headline should just say "What are bacteria?" The incorrect usage has been included in the headline to remind readers that it is wrong - and hopefully help correct an increasingly common mistake in the English language.



Bacteria come in three main shapes:

- **Spherical (like a ball)** These are usually the simplest ones. Bacteria shaped like this are called *cocci* (singular *coccus*).
- **Rod shaped** These are known as *bacilli* (singular *bacillus*). Some of the rod-shaped bacteria are curved; these are known as *vibrio*.
- **Spiral** These known are as *spirilla* (singular *spirillus*).

Not all bacteria are bad!

Bacteria aren't all bad, in fact you couldn't survive without some bacteria! Good bacteria in your gut, like probiotics, help digest your food and fight invading microbes. Good bacteria are used in making some of the *dairy products* you like to eat and also some types of *medicines*! Bacteria are some of the best *decomposers* – they break down dead and decaying *organic* matter, from leaves to insects. Best of all, bacteria are being used to clean up oil spills to keep your *environment* healthy too.

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Some Basic Instructions

General Instructions:

- Our plates come pre-poured and vacuum sealed so they can be stored at room temperature for up to two years. They can also be refrigerated, but DO NOT freeze.
- Once vacuum seal is opened plates should be stored upside down, refrigerated, and should be used within 30 days.
- If plates were refrigerated let set at room temperature for at least 1 hour before conducting experiment.
- Label bottom of plates with a permanent marker to identify what has been tested. Label bottom of plates to prevent lids from being interchanged accidently.
- Cotton tipped swab should be moistened with **sterile water** when swabbing a dry object or surface. To sterilize water simply boil water on the stove in a pot or tea kettle (**Parental supervision is required**). Once boiled place water in a clean cup or mug. Dampen tip of swab and gently rub on object or surface to collect bacteria.
- Once collected, gently wipe swab on surface of plate. There is no need to press hard, bacteria will transfer to plate easily.
- During incubation period, plated must be placed face down with lids on, and remain at a temperature of between 84^0 and 100^0 F. A common desk lamp should be enough to maintain temperature. Placing a thermometer near plates will help you maintain proper temperature.
- You may see the beginnings of growth in as little as 24 hours, with optimal growth by day 4. Check daily and record progress.

General Tips:

1. Bacteria grow slower at lower temperatures below 84^0 F, and can be killed at higher temperatures above 100^0 F. So it is important to keep your experiment within the acceptable range.
2. Be patient, it takes time to grow bacteria.
3. **Do not** try to speed up the process with a hair dryer. You will ruin your experiment.
4. Take time to document progress, remember, it's an experiment.
5. **Enjoy!**

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Experiment #1:

Attempt to figure out if hand sanitizer really does clean your hands?

Part 1:

1. First, label the bottom of 2 petri dishes, label one “unsanitized hand” and the other “sanitized hand”.
2. Choose a hand, right or left.
3. With the hand you’ve chosen touch several household surfaces; door knob, light switch, cell phone, computer keyboard, etc.
4. Dampen one of your swabs with sterile water and swab your chosen hand.
5. Now apply to the pre-labeled (un-sanitized hand) petri dishes.

Part 2:

1. Now using the sanitizer included in your kit, apply several drops to your chosen hand and rub both hands together thoroughly making sure you spread sanitizer completely.
2. Now dampen a new swab with sterile water and swab your freshly sanitized hand.
3. Now apply to the pre-labeled (sanitized hand) petri dish.

Part 3:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.
3. On the 4th day document results of the test.

Conclusions:

- Was there less bacteria growth on the sanitized dish?
- Was the bacteria significantly less?

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Experiment #2:

Regular soap vs. Antibacterial soap, which kills more germs?

Part 1:

1. Label the bottom of 2 petri dishes; label one, regular soap and the other, antibacterial soap.
2. Using **both** hands, touch several common household surfaces; refrigerator handle, light switches, cell phone, computer keyboard, etc.
3. Now, employing the help of a friend or family member, have them wash one hand with regular soap and the other with antibacterial soap (remember which is which).
4. Have your friend or family member swab your hand washed with regular soap (remember to dampen swab with sterile water) and apply it to the dish marked regular soap.
5. Now have your friend or family member swab your hand washed with antibacterial soap (remember to dampen swab with sterile water) and apply it to the dish marked antibacterial soap.

Part 2:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.
3. On the 4th day document results of the test.

Conclusion:

- Was there a difference between the dishes?
- Was there significantly less bacteria on the antibacterial dish?
- What conclusion would you draw from the experiment?

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Experiment 3:

The five second rule—true or false?

Part 1:

1. Label the bottom of 2 petri dishes, label one “5 seconds” and the other “30 seconds”.
2. Now we need a test food. Try something substantial, like a piece of lunch meat. We need 2 pieces, one to drop and leave for 5 seconds, the other to leave longer than 5 seconds.
3. Now choose a floor to do the test. Preferably a tile or wood floor because they are easier to clean after the experiment is finished. We don’t want to use carpet, too hard to clean.
4. Get your stop watch ready!
5. Now drop both pieces of lunch meet. Make sure they are close together so the area is equally bacteria covered.
6. After 5 seconds pick up one of the pieces, leaving the other to soak up more bacteria, at 30 seconds.
7. Now swab the first piece, if you used lunch meet you shouldn’t have to wet the swab, lunch meet is naturally moist. Apply to dish labeled, 5 seconds.
8. Pick up the second piece after 30 seconds, swab it and apply to dish labeled, 30 seconds.

Part 2:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.
3. On the 4th day document results of the test.

Conclusion:

- Was there a difference between the dishes?
- Was there significantly less bacteria on the 5 second dish?
- What conclusion would you draw from the experiment?

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Experiment 4:

Does cleaning your kitchen countertop really remove all the germs and bacteria?

Part 1:

1. Label the bottom of 2 petri dishes, label one uncleaned, the other cleaned.
2. Dampen one swab with sterilized water and swab the countertop surface.
3. Apply swab to the petri dish labeled uncleaned.

Part 2:

1. Now clean the countertop (in the same place that you swabbed for the uncleaned dish) preferably with a countertop cleaner that contains bleach.
2. Dampen a new swab with sterilized water and swab the cleaned area of the countertop.
3. Now apply swab to the petri dish labeled cleaned.

Part 3:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.
3. On the 4th day document results of the test.

Conclusion:

- Was there significantly less bacteria on the cleaned countertop surface?
- What conclusion would you draw from the experiment?

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Experiment 5:

Does washing an apple remove all the bacteria?

Part 1:

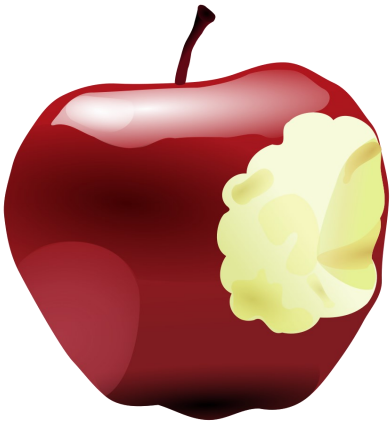
1. Label the bottom of 2 petri dishes, label one unwashed apple, the other washed apple.
2. Dampen one swab with sterilized water and swab the surface of the apple.
3. Apply swab to the petri dish labeled unwashed apple.

Part 2:

1. Now wash the apple by running it under cold water for about a minute while rubbing the surface. Rinse well.
2. Dry with clean paper towel. **DO NOT SET WASHED APPLE ON COUNTER IT WILL CONTAMINATE!**
3. Dampen a new swab with sterilized water and swab the freshly washed apple.
4. Now apply swab to the petri dish labeled washed apple.

Part 3:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.
3. On the 4th day document results of the test.



Conclusion:

- Was there a difference between the dishes?
- Was there significantly less bacteria on the washed apple?
- What conclusion would you draw from the experiment?

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Experiment 6:

Which is really dirtier, a human mouth or a dogs mouth?

BE CAREFUL WITH THIS ONE!! ADULT SUPERVISION REQUIRED!

Part 1:

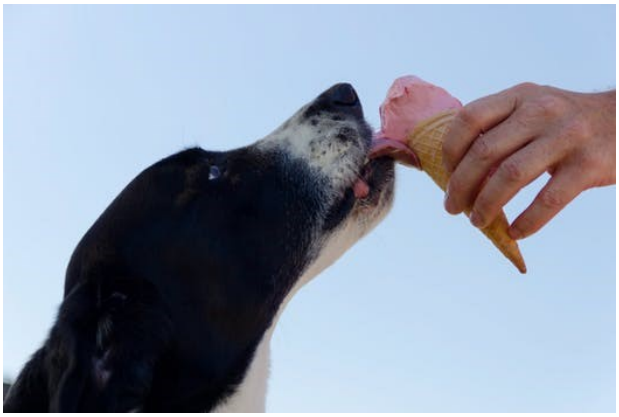
1. Label the bottom of 2 petri dishes, label one “human” and label the other “dog”.
2. Use new swab and let your dog lick the swab (**do not** try to put swab in the dog’s mouth).
3. Apply swab to the petri dish labeled dog.

Part 2:

1. Using a new swab, swab your mouth.
2. Now apply swab to the petri dish labeled “human”.

Part 3:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.
3. On the 4th day document results of the test.



Conclusion:

- Was there a difference between the dishes?
- Which petri dish showed the most bacteria, the human mouth or the dogs mouth?
- What conclusion would you draw from the experiment?

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Experiment 7:

Does antiseptic mouthwash kill bacteria in your mouth?

Part 1:

1. Label the bottom of 2 petri dishes, label one “no mouthwash” and label the other “with mouthwash”.
2. Use new swab and swipe along your tongue, teeth, and/or cheek (best to do this in the morning before brushing your teeth to really test results)
3. Apply swab to the petri dish labeled “no mouthwash”

Part 2:

1. Wash your mouth with antiseptic mouthwash as directed by the bottle.
2. Using a new swab, swab your mouth again (for clear results on if the mouthwash is killing the bacteria, do not brush teeth yet).
3. Now apply swab to the petri dish labeled “with mouthwash”.

Part 3:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.

Conclusion:

- Was there a difference between the dishes?
- Which petri dish showed the most bacteria?
- What conclusion would you draw from the experiment?

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Experiment 8:

Does brushing your teeth kill bacteria in your mouth?

Part 1:

1. Label the bottom of 2 petri dishes, label one “before brushing” and label the other “after brushing”.
2. Use new swab and swipe along your tongue and teeth (best to do this in the morning)
3. Apply swab to the petri dish labeled “before brushing”

Part 2:

1. Brush your teeth with your normal toothpaste and toothbrush (for best results, use a new toothbrush) making sure to clean your tongue as well.
2. Using a new swab, swab your teeth and tongue again (for clear results on if brushing is killing the bacteria specifically, do not use mouthwash yet).
3. Now apply swab to the petri dish labeled “after brushing”.

Part 3:

1. Place dishes upside down and keep at a temperature of between 84^0 and 100^0 F. A common household desk lamp should do the job.
2. Check daily for bacteria growth and document progress.

Conclusion:

- Was there a difference between the dishes?
- Which petri dish showed the most bacteria?
- What conclusion would you draw from the experiment?