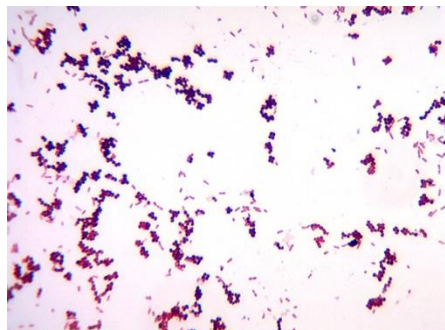


## Cell Structure: Bacteria on a Prepared Slide

Bacteria are everywhere. They are in us, on us and around us. They keep us healthy and can make us sick. Bacteria have been of interest to researchers since the golden age of microbiology (1850-1914) and continue to be actively researched. One of the first steps in studying bacteria is to isolate the organism of interest in pure culture, that is to have that one type of organism growing in a medium with no other different bacteria. One way researchers check the purity of a culture is to stain a sample and check the culture to see if only one organism is present. They stain a sample and then view the slide. Are all the cells the same size, the same shape and staining in the same manner? This process is made easier by special stains, called differential stains that stain bacteria with contrasting colors based on some structural characteristic. Arguably, the most important stain and certainly the most commonly used stain in microbiology is the Gram stain. The Gram stain differentiates bacterial cells based on their cell wall characteristics. It will stain cells either purple (Gram positive) or pink (Gram negative).



Gram stain of a mixed culture of bacteria. S. Finazzo

In this activity you are serving as the quality control specialist for a food fermentation company producing mozzarella cheese. The main fermentation is done with *Streptococcus thermophilus* in two large vats. The curds from separate vats are then pumped to a common refrigerated settling tank. There have been some issues with the product, apparent contamination somewhere along the production line. You have sampled and prepared slides from the material in vat 1, vat 2 and the line leading to settling tank. Examine the slides and determine where the contamination originated.

*S. thermophilus* (*S. salivarius* ssp. *thermophilus*) is a commonly used bacterium in the production of cheeses and yogurt. Its name is descriptive for the organism. Look up the meaning of strepto-, write the meaning of this prefix here \_\_\_\_\_. What does coccus mean? \_\_\_\_\_

In looking at your slides, you will be looking for a pure culture of *S. thermophilus*. What would a pure culture look like under the microscope?

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### Materials

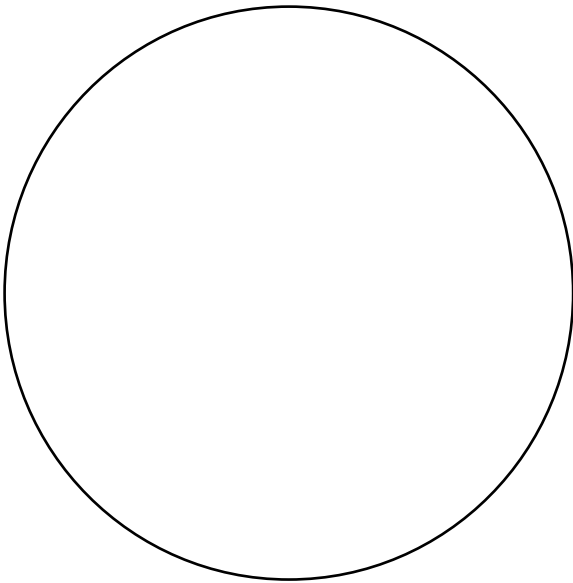
Prepared slide vat 1  
Prepared slide vat 2

Prepared slide common line to settling tank  
Microscope

1. Place one the prepared slides on the microscope. Make sure your smear (coverslip) is closest to the objective and that you have not placed the slide on the stage upside down. Start observing the slide at 4x. Use the mechanical stage controls to move the slide from side to side and front to back. You are looking for what appears to be colored dust. Remember, bacteria are very, very small. Once you have found some stain color on the slide, center the color in your field of view and increase the magnification (100 X). Fine adjust the slide to bring the image into sharp focus.

Center the image again and increase the magnification to 400X. The bacterial shapes and arrangements (single cells, pairs of cells, chains or clusters of cells) should be visible.

Draw what you see in the circle below.



Specimen (vat 1, vat 2, line) \_\_\_\_\_

Magnification: \_\_\_\_\_

Describe the organism/s shape & arrangement  
(single, chain, cluster):

\_\_\_\_\_

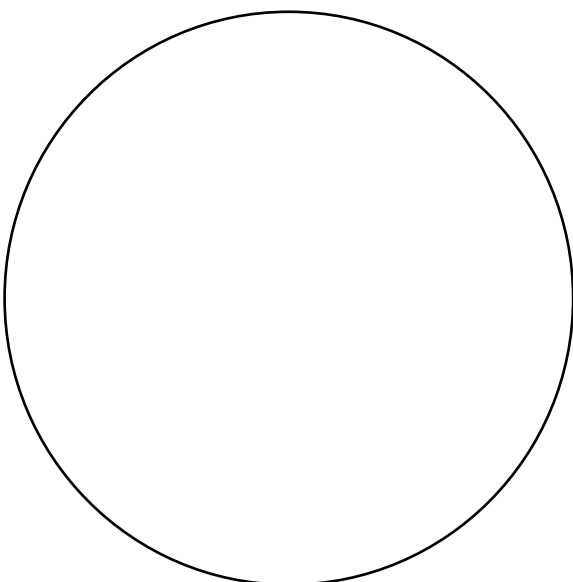
\_\_\_\_\_

Are the organisms the same size and color? \_\_\_\_

Is this a pure culture? \_\_\_\_\_

2. Place a different prepared slides on the microscope. Make sure your smear (coverslip) is closest to the objective and that you have not placed the slide on the stage upside down. Start observing the slide at 4x. Use the mechanical stage controls to move the slide from side to side and front to back. You are looking for what appears to be colored dust. Remember, bacteria are very, very small. Once you have found some stain color on the slide, center the color in your field of view and increase the magnification. Fine adjust the slide to bring the image into sharp focus. Center the image again and increase the magnification to 400X. The bacterial shapes and arrangements (single cells, pairs of cells, chains or clusters of cells) should be visible.

Draw what you see in the circle below.



Specimen (vat 1, vat 2, line) \_\_\_\_\_

Magnification: \_\_\_\_\_

Describe the organism/s shape & arrangement:

\_\_\_\_\_

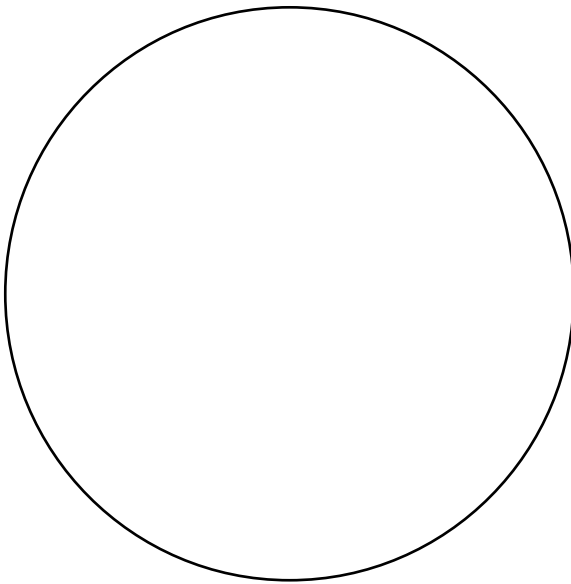
\_\_\_\_\_

Are the organisms the same size and color? \_\_\_\_

Is this a pure culture? \_\_\_\_\_

- Place the final prepared slides on the microscope. Make sure your smear (coverslip) is closest to the objective and that you have not placed the slide on the stage upside down. Start observing the slide at 4x. Use the mechanical stage controls to move the slide from side to side and front to back. Once you have found some stain color on the slide, center the color in your field of view and increase the magnification. Fine adjust the slide to bring the image into sharp focus. Center the image again and increase the magnification to 400X. The bacterial shapes and arrangements (single cells, pairs of cells, chains or clusters of cells) should be visible.

Draw what you see in the circle below.



Specimen (vat 1, vat 2, line) \_\_\_\_\_

Magnification: \_\_\_\_\_

Describe the organism/s shape & arrangement:

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Are the organisms the same size and color? \_\_\_\_

Is this a pure culture? \_\_\_\_\_

- Where was contamination noted?
- If you were the quality control manager, what would you recommend?
- What color are Gram positive cells?
- What color are Gram negative cells?
- What color (Gram reaction) was *S. thermophilus*?

6. Is *S. thermophilus* Gram positive or Gram negative?
  
7. What color (Gram reaction) was the contaminant? What shape was the contaminant? What was the cellular arrangement of the contaminant?