

Cell Structure: Bacteria in Yogurt

Ever wonder why advertisements for yogurt talk about live cultures or about keeping your colon happy with yogurt? It's not about the protein! It is all about the bacteria. Live cultures refers to the bacterial cultures found in yogurt. The bacteria found in yogurt will naturally colonize your bowel. So if you have been on antibiotics for a long time or if your colon is just acting up, it may be that your microflora is out of whack or imbalanced. Eating yogurt introduces safe bacteria into the colon that can help stabilize the microbial population.

The flavor, tartness and texture of yogurt is determined by the cultures used to make the yogurt and the length of time it incubates. Two commonly used bacteria in the commercial production of yogurt are *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. The bacteria together produce the texture, taste and tartness of yogurt. *Lactobacillus bulgaricus* as its name suggests is a rod-shaped bacterium (bacillus) that digests the lactose (milk sugar) in milk to produce lactic acid. *Streptococcus thermophilus* is a spherically-shaped bacterium that forms chains (strepto-) and prefers warm temperatures. *S. thermophilus* also digests lactose to produce lactic acid. Lactic acid formation leads to the curdling of casein, the milk protein. This produces the typical smooth curd of yogurt.



CDC/ Debora Cartagena

Materials

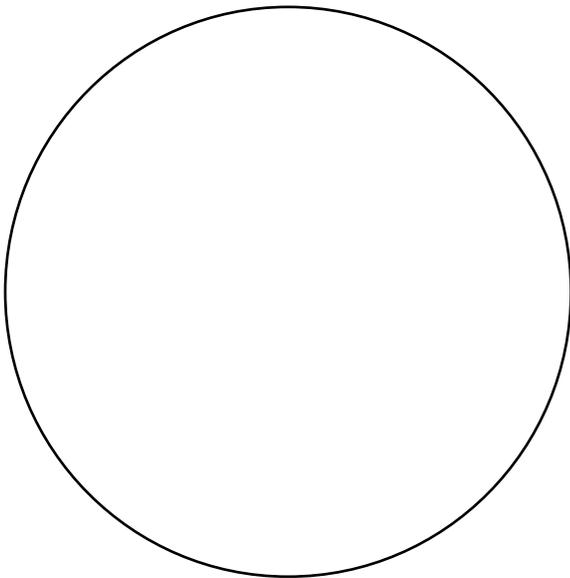
Methylene blue	Yogurt with live cultures (Dannon) dispensed in test tubes
Microscope slides	Slide clips or clothespin
Staining tray	Test tube rack
Distilled water	Loop (disposable loops)
Bibulous paper/ paper towel	Microscope
Bunsen burner	
Striker	

1. Obtain a slide, loop and yogurt sample.
2. Light your Bunsen burner. Open the valve on the bottom of the burner about $\frac{1}{2}$ way open. If there are air baffles, open those halfway. Turn on the gas at the benchtop. Place the striker near the top of the burner and ratchet the striker back and forth until the burner lights. Adjust the flame so that there is a tight blue cone in the center of the flame and a medium flame with no red or orange color.
3. Pick up the loop in your dominant hand. Insert the loop into the flame, outside the blue cone. The loop should glow red. Remove the loop and hold the loop for 15 seconds while it cools. DO NOT insert the hot loop into the yogurt. DO NOT put the loop down. DO NOT blow on the loop.
4. After the loop has cooled slightly, insert the loop into the yogurt sample. Withdraw a loop of yogurt. Place the test tube containing yogurt back in the test tube rack.
5. Spread the loop of yogurt in the center of the glass slide. The yogurt smear should be about the size of a nickel.
6. Allow the slide to air dry. Turn off the Bunsen burner by turning off the gas at the bench top.
7. Pick up the slide with the slide clip or clothes pin. Pass the slide through the flame of the Bunsen burner 4 or 5 times to heat fix the slide. Heat fixing denatures proteins in the cells so that the

cells stick to the glass slide. Do not hold the slide in the flame. This will incinerate your sample and may cause your slide to shatter.

8. Place the slide on the staining tray and allow it to cool for 2 minutes.
9. Apply methylene blue to the slide. Stain the slide for 5 minutes.
10. After 5 minutes tip the slide to drain the stain away. Gently wash the slide with distilled water for 20 seconds. Do not squirt water directly at the yogurt smear. Squirt the water above the smear and allow the water to wash down over the smear.
11. Place the slide in the book of bibulous paper or between several pieces of paper towel. Gently blot dry.
12. Place the slide on the microscope. Make sure your smear 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 light blue 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.

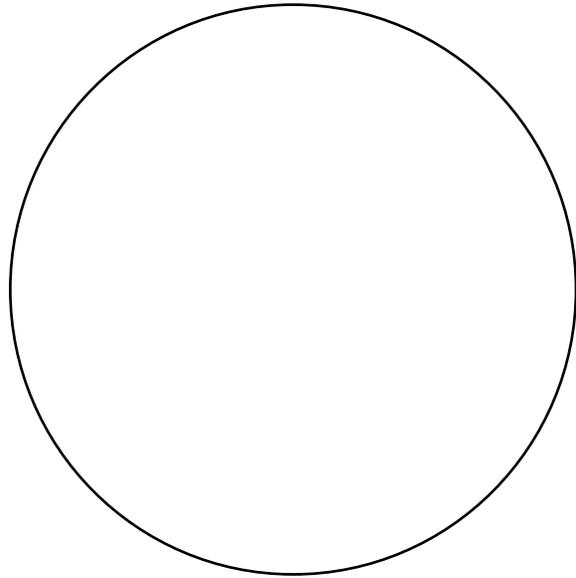
You should be able to find both *Lactobacillus* and *Streptococcus*. Draw what you see below or insert pictures of your slides. Remember to exaggerate the size of the specimen.



Organism name: _____

Magnification: _____

Describe the organisms shape & arrangement:



Organism name: _____

Magnification: _____

Describe the organisms shape & arrangement:

1. Why was it important to heat fix the slide? What would have happened if you hadn't heat fixed the slide?
2. Why was it important to stain the slide?
3. Name the organisms that were probably in your sample.
4. Why is yogurt considered a 'healthy' food?