Yogurt Bioprospecting Lab C. Kohn, Agricultural Sciences, Waterford WI

Name: Hour Date:

Date Assignment is due:  Why late? Score: + ✓ -  
 Day of Week Date If your project was late, describe why

**Overview:** Yogurt has been produced by humans for over 1000 years. It represents one of the earliest forms of bioprospecting (the search for useful enzymes produced by organisms found in natural environments). Over a millennia ago, humans realized that bacteria could turn ordinary milk into a more nutritious substance using the enzymes they produce naturally.

Modern yogurt manufacturers use a wide variety of bacteria to produce their product. Some have even gone to the extent to develop and patent their own species of bacteria and consider their process a trade secret. However, fundamentally the process of making yogurt is always the same: milk is treated with bacteria that will convert the lactose in the milk into lactic acid as shown in this chemical equation –

C12H22O11 + H2O 🡪 (bacteria) 🡪 4 C3H6O3   
*(Lactose plus water, when broken down by the bacteria, produces lactic acid)*

This is actually an over-simplification of the process; living organism would actually use many steps to complete this process. However, for the purposes of this lab, this is all you need to know.

Your job in this lab will be to test different companies’ yogurt bacterial specimens in order to find the most appropriate one for making your own yogurt. You will then produce your yogurt and compare your results to the rest of the class.

**Materials**: tape; marker; milk; spoons; incubator; hot plate or stove; goggles; tablespoon; glass mason jars (3 per group); large saucepan; food-grade thermometer; multiple brands of store-bought yogurt (ideally one unflavored); aprons and gloves

**Methods:** *Prior to the lab (completed by instructor)*

1. Place all jars in water in a saucepan, large pot, or other container and heat until water is boiling (keep lids OFF and in the water)
2. Boil jars and lids for at least 5 minutes to sterilize them
3. Let the water cool; take jars and lids out and let them dry upside down on clean dry paper towels (do not touch the inside)
4. Warm milk to 45o C

*During the lab (completed by students)*

1. Have each student group acquire 3 mason jars (size may vary). Have students practice sterile techniques and explain that they should not touch the inside of the jars.
2. Fill each jar half full of 45o C milk. Complete the pre-questions on the accompanying sheets.
3. Students should decide what 2 brands of yogurt they will choose to test. One jar of milk will remain untreated and will serve as the control. This jar should be covered and labeled with a “C”, group name, and the date on a piece of tape.
4. Once the student group has decided on what brands to test, they should add a tablespoon of one to another jar (not the control!) and cover and label appropriately with the brand, group name, and date on tape.
5. Repeat this step with the second brand of yogurt and a new jar. Cover and label the jar with the brand, group name, and date on tape.
6. Record your choice of yogurt and observations in the table below.
7. Place your jars of milk in the incubator (make sure your group name is on your jars). Jars should be left to incubate overnight.
8. After the jars have had the chance to incubate for 24 hours, remove them and make your observations; record them below. Then complete the questions on the accompanying pages.

|  |  |  |
| --- | --- | --- |
| Jar | Observations: Before Incubation | Observations: After Incubation |
| Control |  |  |
| Brand 1 (specify) |  |  |
| Brand 2 (specify) |  |  |

# Questions:

*Complete the following before adding your yogurt*

1. What criteria will you use to determine which jar’s contents are most effective for the production of yogurt? What characteristics (color, texture, consistency, odor, etc.) will the “best” brand have?   
     
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2. What two brands of yogurt did you choose? List *and* describe below:  
     
   *Brand 1­*    
     
   *Why chosen*    
     
   *­Brand 2*    
     
   *Why chosen*
3. What differences do you think you will see between your control and your yogurt-treated jars? Explain:   
     
   *I hypothesize that we will see the following differences*:   
     
   ­
4. What differences to you expect to see between Brand 1 and Brand 2? Explain:  
     
   *I hypothesize that we will see the following differences:*  
   ­   
     
   ­
5. Provide a rationale for all hypotheses made above: *I think these hypotheses will be proven correct because…*­   
     
   ­   
     
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*Complete the following questions after you have completed your incubation time.*

1. What differences did you see between your control and your treated jars?   
     
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   ­
2. Why was it necessary to boil the jars and lids before beginning?   
     
   ­   
     
   ­   
     
   ­
3. Which treatment (control, brand 1, or brand 2) do you think was most effective in creating yogurt?  
     
   ­ *Why?* ­   
     
   ­   
     
   ­
4. Did this support your original hypothesis? Explain:   
     
   ­   
     
   ­
5. Why was it necessary for the milk to sit overnight in an incubator? What happened during this time?  
     
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6. Why is it that some people with lactose-intolerance can eat yogurt without any problems?   
     
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