



Is there a Relationship Between Temperature and Metabolism?

Furnished as a Free Service to Home Educators

By

The Backyard Scientist
Jane Hoffman

The following experiment from the Backyard Scientist was developed expressly for use in newsletters serving home educators. This experiment is NOT contained in the award-winning *Backyard Scientist* books and science kits. As in the *Backyard Scientist* books, it is designed to be simple, fun, and of course to teach an important scientific concept.

Gather the following supplies:

- Four 16 oz. beverage containers
- Four 8-inch to 10-inch balloons
- 2 packages of dry baker's yeast
- Warm tap water
- Small bowl filled with ice water
- Small bowl filled with warm (40°C) water
- Thermometer
- 2 tsp. sugar
- Spoon
- Magnifying lens
- Marking pen
- Pencil and paper for recording observations

Begin experimenting.

1. Open a package of baker's yeast and pour a few granules and examine them with the magnifying lens.
2. Record your observations.
3. Divide the remaining yeast into two equal parts.
4. Place one portion into a container labeled **A** and the second part into a container labeled **B**.

5. Open the other package of baker's yeast, equally divide and place one portion into a container marked **C** and the remaining part into a container marked **D**.
6. Set container marked **A** aside.
7. Add ½ teaspoon of sugar to containers marked B, C and D.
8. Activate the yeast in B, C and D by adding half the water into each container that are on the back of the yeast packages.
9. Stretch a balloon over containers A, B, C and D.
10. Set containers marked A and B on a table.
11. Place container C in the bowl filled with warm water.
12. Place container D in the bowl filled with ice water (ice cubes removed).
13. After 15 minutes observe the containers and record observations.
14. Repeat your observations each 15 minutes three more times and record them.

Can you answer the following questions from your observations?

1. When you observed the yeast with the magnifying lens, did it appear to be alive?
2. Which balloons inflated?
3. Did all the balloons inflate?
4. Why? Why not?

Backyard Scientist solution to the experiment.

Saccharomyces cerevisiae is an one-celled organism commonly called baker's yeast. It is specially packed and stabilized so they can remain in a "suspended" form for long periods of time. When placed in warm water the cells activated. As their metabolism increased, the yeast chemically converted the sugar into carbon dioxide gas.

The balloon on container A (yeast only) did not inflate. There was no fuel (sugar in it) for the yeast to metabolize. Depending on the air temperature, the balloon on container B may have partially inflated during the hour you observed it.

The balloon on C did not inflate at all because its metabolism was never raised by the ice water. The balloon on container D in the warm water inflated fairly rapidly as the metabolism of the yeast was increased by the warm water.

Living things can survive cold temperatures by reducing their energy needs. In this "suspended" state, their cells, tissues and organs require little energy. The energy demands of these "quasi-living" organisms can be satisfied by a very slow metabolic rate. Metabolism refers to the physical and chemical processes that make energy available to an organism. The colder the temperature, the slower the reaction rate. When the rate of these life-sustaining reactions drops below a certain level, the organism will die.

Doctors can measure our metabolic rates to determine if we may have a disease or that our bodies are not functioning optimally.

In our experiment we observed the relationship between temperature and metabolism.

About the author.

Jane Hoffman, the Backyard Scientist, is the internationally known author of the award-winning *Backyard Scientist* hands on science books and science kits. The nine science books and three kits will excite, motivate and instruct any student.

Also available from the Backyard Scientist is the “Parent Guide to Teaching Science.” This work covering grades

K –12 helps parents insure they are teaching the science subjects and materials their students should be learning by grade level. Her newest book, *A Science Wonderland for the Very Young* targets children ages 2-7 years.

In addition to writing and developing these exciting materials, Jane is a sought-after speaker at Home School and other educational conferences nationwide where she makes science come alive. Everyone leaves her sessions better informed as well as motivated and enthused to apply the concepts they learned. Hoffman’s teacher inservice workshops for teachers are rated the best available by teachers and administrators. She has been serving the homeschool and educational markets with quality materials for more than 20 years.

For a free brochure, send a self-addressed, stamped (\$.55) envelope to: Backyard Scientist, PO Box 16966, Irvine, CA 92623 or visit her on the Worldwide Web at: www.backyardscientist.com