

Calcium and the Rubber Chicken

Introduction

The body contains more calcium than any other mineral, and 99% of this calcium is in bone. Calcium makes bones strong, hard, and durable. Most of the calcium in bone is in the form of insoluble hydroxyapatite $[\text{Ca}_5(\text{PO}_4)_3(\text{OH})]$. Although this structure is impressive, the calcium will easily dissolve in vinegar, removing it from the structure in the bone. Without calcium, the rigid structural component of the bone is lost, and the bone becomes bendable rather than strong. In this lab, you will dissolve the calcium from the long bone of a chicken leg using the chemical acetic acid, the active ingredient in vinegar. The decalcified bone will be so flexible and rubbery that you can actually tie it into a knot! This activity will take approximately 1 week.



Materials

chicken leg
rubber gloves

plastic wrap
vinegar (acetic acid, 5%)

Equipment

beaker, 400-mL
Bunsen burner or hot plate

glass jar

Safety Considerations

- Although it is not dangerous, vinegar can be irritating to the eyes and skin.
- Sometimes chemicals from previous labs still remain in glassware and on other lab equipment; wash all lab equipment before and after performing this lab.
- Wash your hands thoroughly after completing this lab.

Procedure

1. Boil a chicken leg in a 400-mL beaker filled with water until all of the meat is removed or loosened.
2. While wearing rubber gloves, pick any remaining meat from the bone and discard it in the trash.
3. Place the cleaned bone in a glass jar and completely cover it with vinegar. Lightly cap the jar or cover it with plastic wrap.
4. After 2 days, pour off the vinegar and examine the chicken bone. Record your observations in the Data Table.
5. Add fresh vinegar and allow the bone to soak for several more days. After a full week has passed, remove the bone from the vinegar and attempt to tie it in a knot. Record your observations in the Data Table.

Clean-up

1. Dispose of all chicken meat in the trash, NOT THE SINK.
2. Clean all used lab equipment with soap, water and a test tube brush.
3. Return all equipment to its proper location.
4. Wipe down your lab area and wash your hands before leaving the lab.

Data Table

Time	Chicken Bone Observations
immediately after removing meat	
after two days in vinegar	
after a week in vinegar	

Questions

1. Why is it important to our health that hydroxyapatite is insoluble?

2. Vinegar is in many foods, including ketchup, salad dressing and hot sauce. How is it possible that can we eat these foods without weakening our bones?

3. Some studies indicate that drinking soft drinks, many of which contain phosphoric acid, may increase the risk of osteoporosis, a disease that makes your bones fragile and more likely to break. Does this lab activity support or disprove this idea? Why do you think so?

4. Using the library or the Internet, determine two other minerals that are important in bone formation.

5. List one way you could change this lab and describe how your results might be different.
