



Dinosaur Bone Experiments

By chemically removing hard minerals from a Tyrannosaurus rex bone, paleontologists found, for the first time, the soft tissue of T. rex blood vessels. By exposing bones to vinegar or heat, you can see how bones change under experimental conditions.

Materials you will need

Two chicken bones (drumstick or thigh are best)
Pot of water for boiling
Jar with a lid
Ordinary white vinegar
Pan or cookie sheet
Paper towel



Experiment #1

Put the two bones in a pot of water. Boil the bones for a few minutes (30 minutes if bones were not previously cooked) so any remaining meat falls off. Remove the bones. Let them cool in the air for a few minutes or run them under cold water.

Gently try to bend one of the boiled bones. Can you feel it move at all? Put the bone you tried to bend into the jar. Pour in enough vinegar to cover the bone completely. Close the jar. Let it sit overnight, then take the bone out and try to bend it again. Do you feel any difference from the first time you tried?

Put the bone back in the vinegar and wait another day. Take the bone out once a day for a week and try to bend it each time. How does the bone change over the days? Keep notes on what you observe each day, or trace the bone each time you try to bend it.

Experiment #2

Try to scratch the second boiled bone with the edge of your thumbnail. Then put this bone on a pan or cookie sheet. Bake it in the oven for one hour at 400 degrees. (You might need to open a window, since hot chicken bones smell until they cool off.) Be sure to let the bone and pan cool completely before you touch them.

When the bone is cool, try to scratch it again. Then wrap the bone completely inside a paper towel. Step on the bone gently. Does the bone break easily? (Be careful touching any broken bone, since it can be sharp!)

What you can observe

Bones get their strength from a combination of apatite (a mineral that is a form of calcium) and collagen (a type of protein). In these experiments, you use a chemical reaction and heat to break down each of two bone materials, so you can see what bones are like without them.

In Experiment #1

Vinegar dissolves the calcium, or apatite, in the bone, leaving only the protein, or collagen, so you can bend the bone. After a few days of soaking in vinegar, almost all the calcium in the first experimental bone is gone. The bone becomes soft and rubbery. You can even tie it in a knot! Bone this flexible would not be able to support your body—or a bird's or dinosaur's!

Vinegar is a weak acid that dissolves apatite through a process called "demineralization." It's the same process that paleontologists used (with stronger acids) to reveal soft tissue in fossilized T. rex bone.

In Experiment #2

The bone you bake becomes brittle, because heat breaks down collagen fibers (protein), leaving only brittle apatite (mineral). Baked bone is still stiff because it has apatite, but the bone is not tough. You can scratch it with a fingernail, and it will break easily if you try to bend it.

More about bones

Bones don't break easily. The apatite in them is very strong and stiff; it can't bend. (Have you ever chipped a tooth? The enamel on the outside of your teeth is pure apatite). Apatite makes bones strong, so they can support your weight. Collagen is tough and flexible (like gristle, which is made of almost pure collagen). Collagen makes bones a little springy, so they can bend a bit without breaking (and won't chip like a tooth).