



# GELATIN

#### 4-H PROJECT AREAS

ANIMAL SCIENCE | STEM

### **INCLUDED SUPPLIES**

• 3 boxes of gelatin (any flavor)

### ADDITIONAL SUPPLIES

- 3 bowls to mix gelatin
- Water
- Salt
- Hand Mixer

#### BACKGROUND

What is meat? Meat is made up of muscle fiber, connective tissue and fat. Muscle fibers are comprised of protein. Proteins are made up of many chains of amino acids. When you eat meat, the digestive juices in your stomach and intestine break down the meat protein into basic units called amino acids. The amino acids then can be reused to make proteins for your own body. When meat is cooked, a chemical reaction occurs, and the protein is denatured or changed.

# DO REFLECT APPLY

Meat is loaded with collagen. During cooking, collagen breaks down into gelatin. Gelatin is a mixture of long, stringy animal-based proteins which bond together in three-stranded helical structures similar to DNA. The collagen in gelatin comes from boiling the bones and hides of animals processed for their meat. How does gelatin add texture and structure to foods? Conduct an experiment by making some gelatin using different methods of denaturation and observe what happens to the texture and structure.

- Make the first batch of gelatin following the directions.
- Next, make up the second batch of gelatin replacing the hot water with cold water.
- Make the third batch of gelatin using cold water and 2 teaspoons of salt.
- Place all of these in the refrigerator for 4 hours.
- While waiting on your gelatin, write a hypothesis for what you think

will happen with each of the different gelatins

• After four hours, take out the first, second, and third gelatin batches. Keeping them separate, either whisk it by hand or use an electric mixer. What happened?

To make gelatin set you need to heat it in water. Heating breaks the bonds holding the collagen together. Next, the heated water-gelatin solution must be cooled, allowing the collagen strands to re-bond in a network, but now with water trapped inside. The collagen network gives gelatin its semisolid properties, while the trapped water keeps it jiggly. At low temperatures, collagens will tend to bind to each other tightly causing a low solubility. But you can dissolve significant amounts of it at high temperatures, which breaks these non-covalent intermolecular bonds. If you now lower the temperature, they start sticking to each other again and cause gelation.

Mixing the gelatin with the mixer after it's been set in the refrigerator, breaks up the amino acid chains and therefore it will not set up.

What does the gelatin experiment have to do with meat? Meat is made of collagen (same as gelatin) and when it is heated, the bonds break allowing for the meat to become tender and juicy. Like gelatin, if meat is cooked and then mixed it cannot be put back together.

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