

Meal Prep + Meat Science EXPLANATION

DESCRIPTION: This SET activity will expose participants to meat science and the scientific effects of mechanical and physical protein degradation while teaching food safety, observation, and critical thinking skills

SUPPLIES:

- Meat
- Various pantry ingredients
- Containers with lids/covers (3)
- Items to label containers (stickers, tape, markers, etc.)
- Cutting board
- Forks
- Paper and Pencil

ACTIVITY STEPS:

1. Choose a whole muscle (not ground) animal protein that is easily available to you (beef, pork, chicken) for which you intend to use for three meals or can spare three "samples" from.
2. Place each portion or sample of the whole muscle animal protein in a separate container.
3. Label containers:
 - I. "Enzymatic"
 - II. "Physical"
 - III. "Control"
4. Using the questions from the "worksheet" make observations about the muscles before you begin.
5. In the container labeled "enzymatic" choose a provided marinade recipe, mix and cover the meat. Safely store in refrigerator until ready to cook. *Feel free to research a recipe using acidic ingredients in place of the provided marinades.*
 - I. Marinade #1: Ginger-Soy
 - 1/3 cup soy sauce (average pH 4.8)
 - 2 tablespoons fresh lemon juice (average pH 2.00 – 2.60)
 - 2 tablespoons honey
 - 1 tablespoon minced garlic
 - 2 teaspoons minced fresh ginger
 - 1 teaspoon freshly grated lemon peel
 - II. Marinade #2: Tangy Lime
 - 1/4 cup fresh lime juice (average pH 2.00 – 2.35)
 - 2 tablespoons vegetable oil
 - 2 tablespoons brown sugar

- 1 tablespoon Worcestershire sauce
 - 3 teaspoons minced garlic
6. For the container labeled "physical" remove and place meat on clean cutting board. Using a fork pierce the entire surface area of the muscle multiple times. Once the entire surface has been pierced, return to the labeled container, cover and safely store in refrigerator until ready to cook.
 7. For the container labeled "control" simply, cover and safely store in refrigerator until ready to cook.
 8. As you are ready to prepare a meal using one of these proteins use the questions from the "worksheet" and record observations about the muscles before and after cooking.
 9. Cook muscles as needed for a consumable meal.
 10. Observe and record tenderness levels and texture after each meal
 11. After all muscles are used review worksheet and compare the effects of enzymatic and physical protein degradations effect on tenderization of meat.

NOTE: Clean hands and equipment with soap and water after handling raw meat to avoid cross-contamination. Keep all proper food safety methods in mind when handling and cooking raw meat

RESOURCES:

Beef Checkoff. (n.d.) *Beef is what's for dinner: ginger-soy marinated top round steak*. Retrieved from <https://www.beefitswhatsfordinner.com/recipes/recipe/2879/ginger-soy-marinated-top-round-steak>

Beef Checkoff. (n.d.) *Beef is what's for dinner: tangy lime marinade*. Retrieved from <https://www.beefitswhatsfordinner.com/recipes/recipe/3277/tangy-lime-marinade>

THE SCIENCE:

Animal muscles are made up of fibers known as myofibrils. These fibers are why you see "grains" within the muscle, or it appears to have a direction. Amount and type of fibers along with connective tissue found in a specific muscle help determine if that muscle would be tough to eat. Disruption of the fibers can affect meat tenderness.

Enzymatic breakdown is when enzymes (proteins) help speed up biological reactions that can result in chemical changes of a product. This can occur with the addition of an acidic ingredient that is more acidic than the meat itself. Meat has an average pH of 5.4 - 5.7. When meat is covered with these ingredients, with time they will enzymatically work to breakdown the muscle fiber and collagen structures resulting in a more tender cut of meat.

Physical breakdown is the action of physically creating change in a product. This can occur when a tool such as a fork is used to physically break the muscle fibers apart. Shortening their length and in turn tenderizing the meat.

