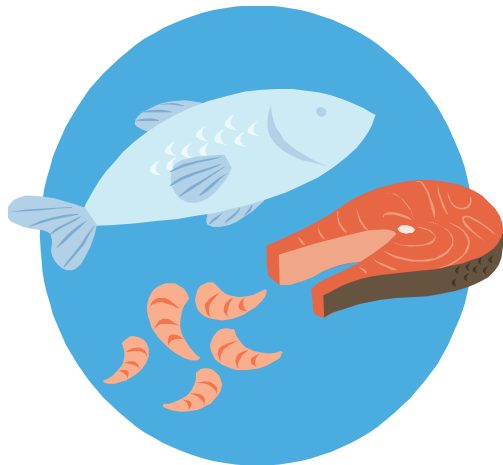


FUNCTIONS OF PROTEIN IN FOOD

- ◉ Describe ways in which protein is used in food preparation.
- ◉ Identify the essential and nonessential amino acids.
- ◉ Compare and contrast complete and incomplete proteins.
- ◉ Explain what happens during the denaturation of protein and how the process occurs.
- ◉ Explain coagulation and apply basic principles of the chemistry of protein to cooking eggs, milk, and meat products and in creating egg foams and meringues.

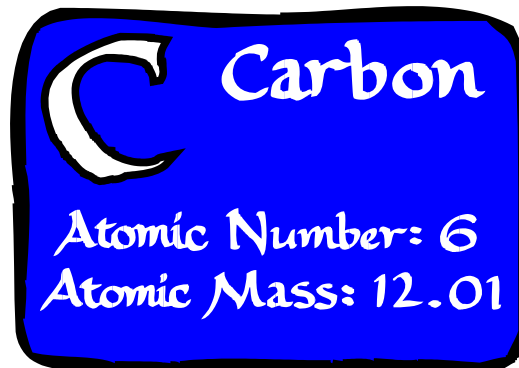
PROTEINS

- Proteins have a role in both living organisms and in food products
 - Primary food sources
 - Eggs, dairy products, meats, poultry, and fish
 - Grain sources



PROTEIN STRUCTURE

- Protein molecules are made up of a chain of acids that contain carbon molecules called amino acids
 - There are 20 amino acids in the human body, and about 150 others found in plants and animals



AMINO ACIDS

- Amino acids can be classified into two groups: essential and non-essential
 - There are 20 AA's found in the body
 - 12 Non-essential AA's can be made by the body
 - This leaves 8 essential AA's that must be supplied by the diet
 - The body must have these to grow new tissue and maintain its health
 - The essential AA's are as follows:
 - Lsoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan, and Valine

COMPLETE AND INCOMPLETE PROTEINS

- Foods that contain all eight essential AA's are called complete proteins
 - Most of these sources come from animal products, with the soybean plant also added to the list

COMPLETE AND INCOMPLETE PROTEINS

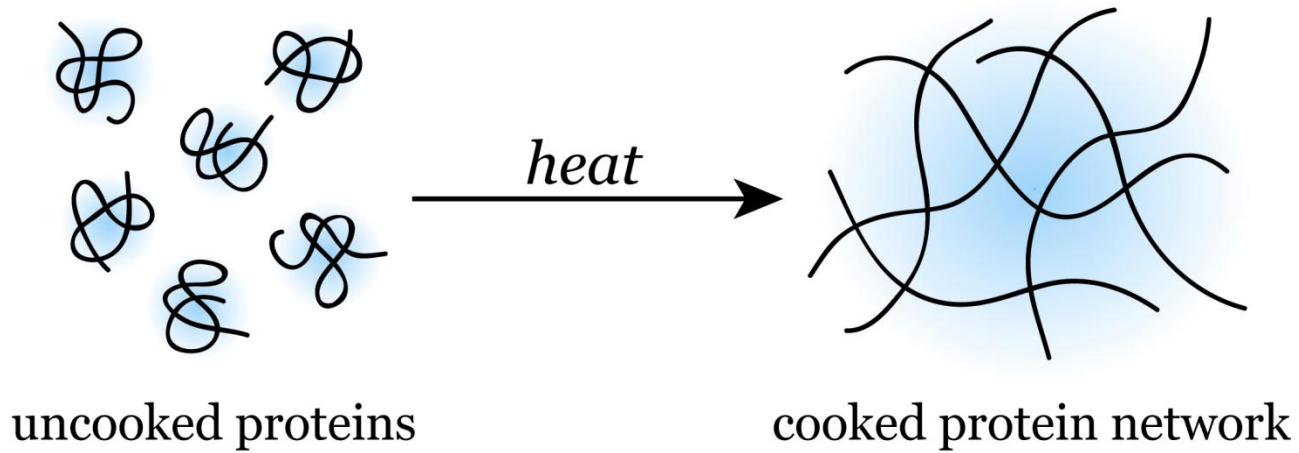
- Foods that are short of one or more of the essential AA's are called incomplete proteins
 - Most of these are found in grains and vegetables
 - Combining these will create an essential AA (examples):
 - Whole wheat bread and peanut butter
 - Rice and red beans
 - Refried beans and corn tortillas

DENATURATION OF PROTEINS

- **Denaturation is when the actual nature of the protein is changed.**
 - This usually occurs during food preparation when a protein is heated, agitated, or when chemicals are added to it
 - The molecules unravel themselves and lose their coiled structure.
 - This process is usually not irreversible



DENATURATION



COAGULATION OF PROTEINS

- **When a protein is heated, coagulation occurs.**
 - Coagulation is when proteins form clots
 - Examples include curdling milk to form cheese or cooking an egg.



Coagulation



Native egg proteins



Unfolded egg proteins



Coagulated egg proteins



COAGULATION OF PROTEINS

- ◉ When a protein is *agitated*, disrupts the protein structures and causes them to form new positions with other molecules.
- ◉ When chemicals, such as acids, are added to a proteins, it causes curdling



DENATURATION AND COAGULATION OF PROTEINS

- ◉ Both of these processes are used to make new foods (ex; milk to cheese) or to prepare foods (ex; cooking an egg)
 - Denaturation can be overdone (over coagulation), which can cause a change in taste and texture of food. It also can ruin a recipe (ex; over agitation of a meringue will cause clots to form)



FUNCTIONS OF PROTEINS

- Proteins are used in the preparation of foods in many ways:
 - Gelling agents
 - Gelatin protein can be heated in water and then cooled; or eggs, milk and sugar can be heated to make a custard
 - Gelatin provides several benefits:
 - Structure and support
 - Stabilizer
 - Thickening agent
 - Controls ice crystal growth in frozen foods



FUNCTIONS OF PROTEINS, CONT.

- Texturize
 - Proteins can be texturized through denaturation
 - This process is used to make soybeans into meat substitutes, or to create processed cheeses



FUNCTIONS OF PROTEINS, CONT.

■ Emulsifiers

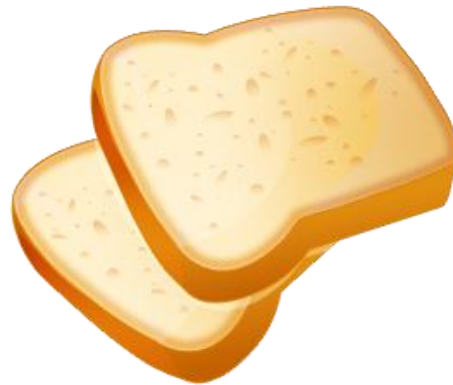
- An emulsion is a stable mixture of a fat and a water based liquid
 - An emulsifier is a molecule that has a polar end and a non polar end and require heat or mechanical action to denature and form the emulsion
 - Egg yolks are an excellent emulsifier, as is milk and cheese
 - Food products such as ice cream and mayonnaise require emulsifiers to stay together

Emulsifiers



FUNCTIONS OF PROTEINS, CONT.

- **Gluten**
 - Gluten is an elastic protein formed when wheat flour is combined with moisture and stirred
 - It coagulates when baked and forms an airy texture, such as bread



FUNCTIONS OF PROTEINS, CONT.

■ Foams

- Foam is gas suspended in a liquid or semi solid
 - Foams can be made using proteins such as eggs or dairy by incorporating air, mechanical agitation or by a sudden release in pressure (aerosol can)
 - Examples of foams are: Merinques, marshmallows, whipped cream, and bread



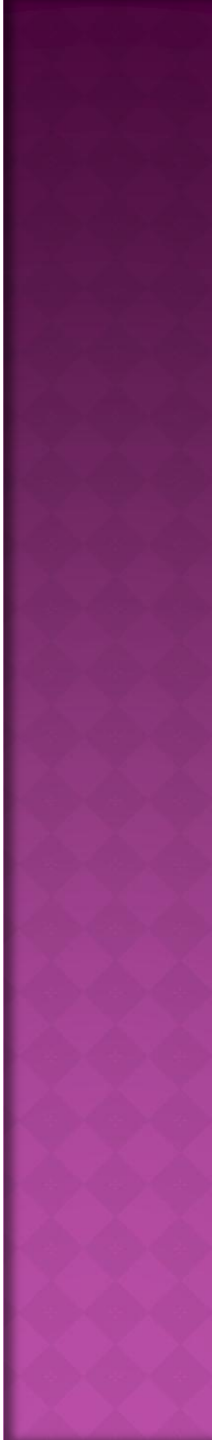
FOAMS CONT.

○ Gelatin

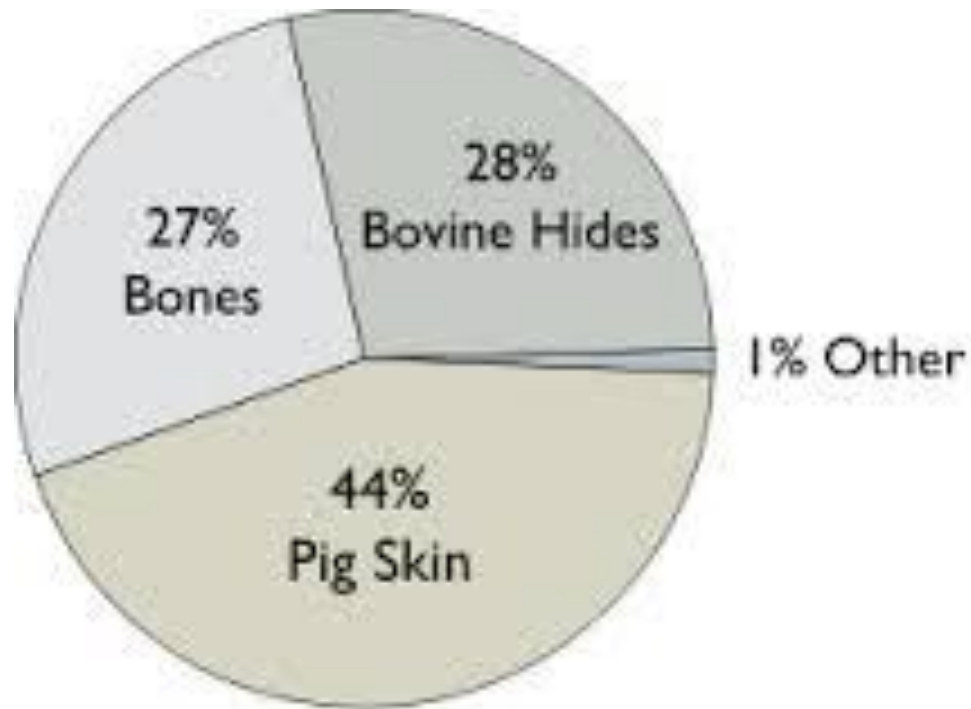
- Found in....
 - Gummy bears
 - Marshmallows
 - Peeps
 - Jello



BUT WHAT IS
GELATIN
MADE OF???



GELATIN



Materials Used in Gelatin Production

HOMEMADE MARSHMALLOWS

Homemade Marshmallows

Yield: Approximately 30 marshmallows

Prep Time: 25 minutes

Ingredients:

3/4 cup water, divided
3 (.25 ounce) packages unflavored gelatin
2/3 cup light corn syrup
2 cups white sugar
1 tablespoon ¹/₂ vanilla extract
1/4 cup cornstarch
1/4 cup confectioners' sugar

Directions:

1. Line a 9x9 inch baking dish with plastic wrap and spray with non-stick cooking spray. Spray another piece of plastic wrap to cover the top, and set aside.
2. Place 1/2 cup of water in the bowl of an electric mixer fitted with the whisk attachment, and sprinkle gelatin on top of water to soak.
3. While gelatin is soaking, combine 1/4 cup of water, corn syrup, and sugar in a saucepan. Bring the mixture to a boil over medium heat. Boil the mixture hard for 1 minute.
4. Carefully pour the hot sugar mixture into the gelatin mixture and beat on high for 12 minutes with electric mixer, until the mixture is fluffy and forms stiff peaks. Add in vanilla extract and beat until just combined.
5. Pour the marshmallow mixture into the prepared baking dish, using a greased spatula to smooth the top. Cover the candy with the piece of prepared plastic wrap, pressing it down lightly to seal the covering to the top of the candy.
6. Allow the marshmallow candy to rest for 4 hours or overnight. Mix together cornstarch and confectioners' sugar in a shallow dish. Using oiled scissors or an oiled kitchen knife, cut the marshmallow candy into strips, then into 1 inch squares. Dredge the marshmallows lightly in the cornstarch mixture and store in an airtight container.

Notes:

- For a peppermint twist, add in 1/2 teaspoon of peppermint extract with the vanilla extract.
- I used clear vanilla extract because I wanted to maintain a bright white color.
- I used a small, round, biscuit cutter to cut my marshmallows.

Source: <http://www.yummly.com/recipe/external/homemade-marshmallows-369320>

