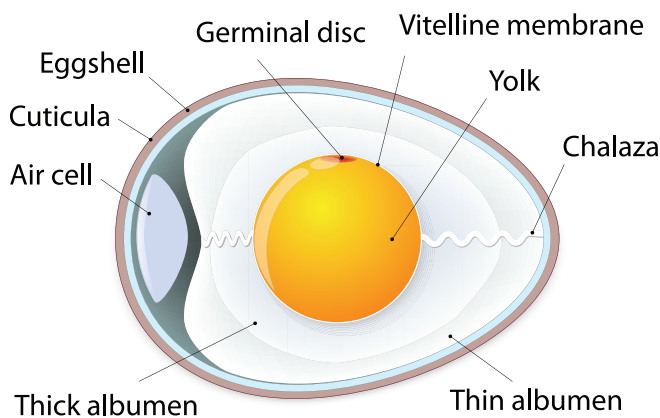


FOAMING BONDS

Did you know that eggs can be used to create foam?

The many components of eggs allow them to be very versatile. An egg consists of a shell, albumen, chalazae, membranes, and yolk. Each of these parts serve a specific purpose. Together, however, they provide us with a nutritious source of protein, fat, and vitamins and minerals.

Eggs contain **lecithin**, a substance in egg yolk that can help form **emulsions**. An emulsion is a mixture of two normally immiscible liquids, like oil and water. Without an emulsifier, like lecithin, the two liquids would separate. You can find emulsions in foods like mayonnaise.



The albumen, which is also known as egg white, can be beaten to form foams, also known as a **colloidal dispersion**. Colloidal dispersions represent a type of emulsion that occurs when a gas (air) is dispersed throughout a liquid (egg white) forming a uniform mixture. As eggs are beaten, peaks form because the protein begins to untangle and stretch, forming the foam. Factors that affect egg foams include temperature, fat, salt, acid, and sugar.



Eggs beaten at room temperature whip more easily than those at refrigerator temperature due to a lower **surface tension**. The tension created by molecules being pulled from the surface to the rest of the fluid is called surface tension. Fat interferes with foam formation because it does not readily bond with other molecules. Salt decreases the volume while increasing the whipping time. Like salt, acids increase whipping time. The end result is a stiff large volume. Many times an acid is added to the egg whites before whipping. Sugar will increase the whipping time by hindering egg protein coagulation. It will, however, produce a satiny appearance if added slowly.



Egg foams are used in a variety of products including soufflés, meringues, omelets, and angel food cake. Its unique characteristics produce light and airy products that are enjoyed by many. However, one mistake in the process may result in an undesirable product, possibly due to a decrease in stability. Whipped eggs that are stable will stay in a foamy state and appear firm with small air cells. On the other hand, an unstable whipped egg may appear to be liquid with large, foamy air cells.

Eggs can experience both chemical and physical changes. **Chemical changes** involve two or more molecules interacting

to form new molecules. When you cook an egg, breaking bonds within, you have made a chemical change. You cannot reverse this process.

Physical changes rearrange molecules, but do

not change internal structure. When you whip egg whites, you have rearranged the molecules with the air being forced into the egg white. You will observe examples of these changes in *Food Lab Explorations Lab 1* of this chapter.

Eggs are very versatile. They can be used alone, or in combination with other foods to provide a good source of protein. Let's see what they can do!



Think About It

Food Explorations Lab

1. A colloidal dispersion is formed when a gas and a liquid are uniformly mixed.
2. The part of the egg needed to create a colloidal dispersion with air is the albumen.
3. Another term for a colloidal dispersion is a(n) emulsion.