

Student experiment
(1st - 4th grade)

Demonstrating the presence of proteins with heat

🕒 Time: max. 15 min.

Safety:

Be careful during
heating

Instruments:

- a heat-resistant glass container
- a hotplate
- two smaller glasses

Chemicals:

- water
- a raw egg

Experiment:

- Fill a heat-resistant container with water and warm it to roughly 35-40 °C using a hotplate. While you are waiting, crack an egg and separate the yolk from the white.
- As soon as the water is warm enough, pour the egg white into the container. Continue heating the water. What do you observe?

Advice for the teacher:

By the end of the experiment a thick, stringy substance will be noticeable which, in comparison to the transparent egg white, is white in color. Egg white consists of many proteins, which are giant molecules made up of thousands of amino acid building blocks.

We can picture these molecules as long chains which can move past one another. When strongly heated, however, these threads connect to one another, becoming stiff and unable to brush past each other in the process.

Since the egg yolk contains even more proteins than the egg white, it is only natural that it, too, becomes stiff and discolored upon cooking.

Chicken egg protein coagulates at 60 °C; it precipitates. This curdling cannot be reversed. The technical term is "denatured" protein. Proteins are folded in a very specific, exact fashion due to their chemical bonding. When denatured, the protein's structure (the folding) is destroyed, which also accounts for the clotting effect and the color change when you cook an egg. Humans also have proteins in their blood. This protein coagulates at a temperature of roughly 45 °C; that is why high fevers are so dangerous.

Factors causing protein denaturalizing include not just heat, but also substances like acids, alcohol, heavy metals and X-rays.

The pupils should learn how to show the presence of protein in a substance.