

Determination of protein in foods and the ability to monitor the effect of heat on protein levels in food products is important for making accurate nutritional claims. Optical density is a common method of measurement used to quantify protein levels from a variety of sources and can be achieved in various ways. Depending on the food choice or preparation method for processing, protein levels can fluctuate and quantification can change. Spectrophotometers can use optical density measurements to create a [colorimetric assay of information to monitor these changes](#).

## Quantification methods

Animal proteins, such as meats, eggs, and dairy, are complete proteins and have essential amino acids that react to various chemical testing methods<sup>1</sup> by changing color based on the level of protein available. Legumes, such as beans and nuts, also contain these amino acids and respond similarly when exposed to color altering chemicals. Raw foods and processed food products can utilize these various methods by measuring the optical density of the sample to create a quantification of the available protein levels. These measurements can then be used to create a colorimetric display of data to monitor variations and changes for creating specific protein food formulations and making process changes when needed.

Change in protein “concentrations affect both the physical and nutritional characteristics of high protein foods and ingredients”<sup>2</sup>. Therefore, monitoring these changes is imperative to the final outcome and quality of the product. Many foods that claim to be high in protein undergo various stages of processing, which allow for more opportunities for these changes to occur. Food scientists utilize optical density measurements to help design processes that minimize protein loss.

## Effect of Heat on Protein

One of the major factors affecting protein concentration is heat. Changes in temperature during food processing can alter the protein content of raw protein ingredients such as eggs, milk, or legumes. Heating proteins denatures them<sup>3</sup>, causing them to lose some of their original properties. These changes can affect the texture and composition of many processed food products, so monitoring these changes can help inform the design of these processes. Protein interactions and storage stability are also concerns that affect protein changes and can be monitored with optical density measurement analysis.

## Optical Density and Instrumentation

The instrumentation used for optical density measurement varies according to the areas of the color spectrum that are utilized. Many of these optical density readings utilize spectroscopy to quantify color changes in nanometer increments. This method is not only simple and effective, but it is also extremely accurate for measuring even slight changes in protein content. Processed food manufacturers rely on this data to make changes to processing designs and [quantify final product protein content for proper labeling and quantification](#).

Full article with photos available here:

<https://www.hunterlab.com/blog/color-food-industry/various-methods-of-protein-quantification-using-optical-density-measurements/>