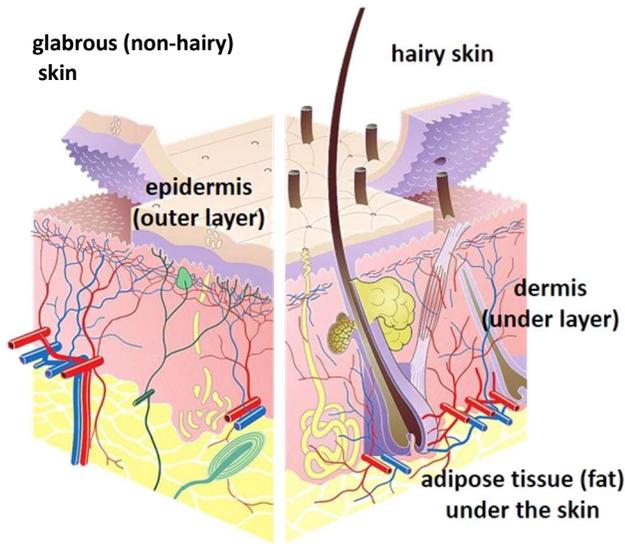


The Skin



The **skin** is the outer covering of the body and technically our largest organ. Skin has multiple layers and its primary job is to protect the tissues and organs beneath it, both from physical damage and from invasion by disease-causing organisms (aka pathogens). Our skin also guards against excessive water loss.

One of the most important proteins in skin is **keratin**. Keratin is the main structural protein that makes up the cells in the outermost layers of our skin. Hair and nails (and in other animals, feathers, claws, horns and hooves) arise from these outer skin cells, and are made from the keratin produced by them.

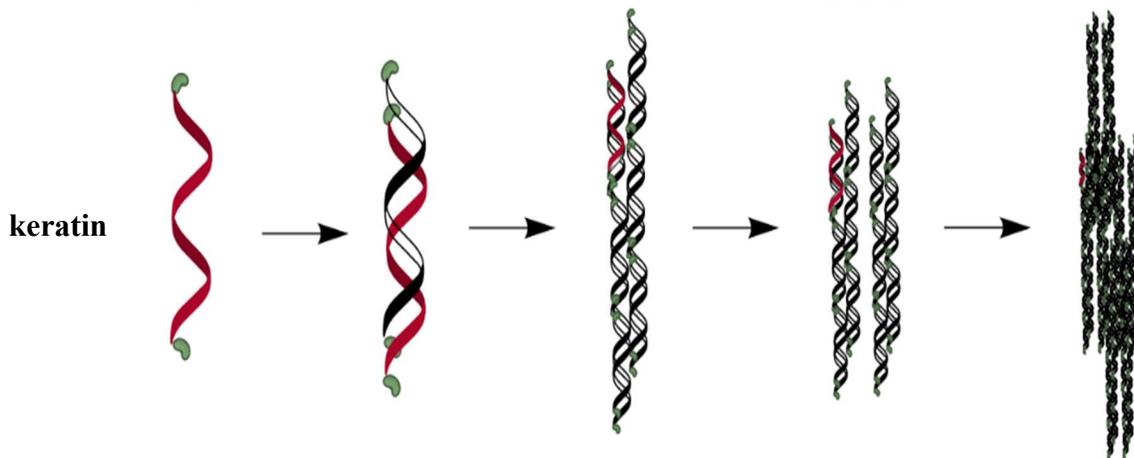
The properties of keratin play a major role in enabling skin to do its jobs of protecting the structures beneath it, and conserving water. The characteristics of keratin also explain many of the unique properties of hair, nails and other structures that arise from skin cells.

Featured Protein: Keratin

Of the nearly 20,000 different types of protein found in the human body, 14,857 are found in the cells of the skin. Of these, 120 are considered “**enriched**” in skin cells, meaning they are found at **much** higher levels in skin than in other tissues. Keratin is one of these enriched proteins. Keratin is unique in that it is completely insoluble in water (hot or cold), and is not affected by the enzymes that normally break down protein molecules. This means structures made purely of keratin are extremely strong, and cannot be digested (which is why cats cough up hair balls!).

The composition of keratin molecules helps explain its unusual strength and protective qualities. Keratin is rich in the amino acid **cysteine** (one of the three amino acids that contain sulfur), and its chains have the ability to self-assemble into bundles of fibers. Within these fiber bundles, individual strands are crosslinked through sulfur-sulfur bonds involving the cysteine side chains. In this way, keratin forms particularly tough, insoluble structures that are among the strongest non-mineralized tissues found in nature.

There are actually a number of different kinds of keratin in humans, and the genes coding for them are located in several clusters on chromosomes 12 and 17.



Assembly of a keratin filament from individual strands of the protein.

Image modified from, https://commons.wikimedia.org/wiki/File:Keratin_creation_red.svg