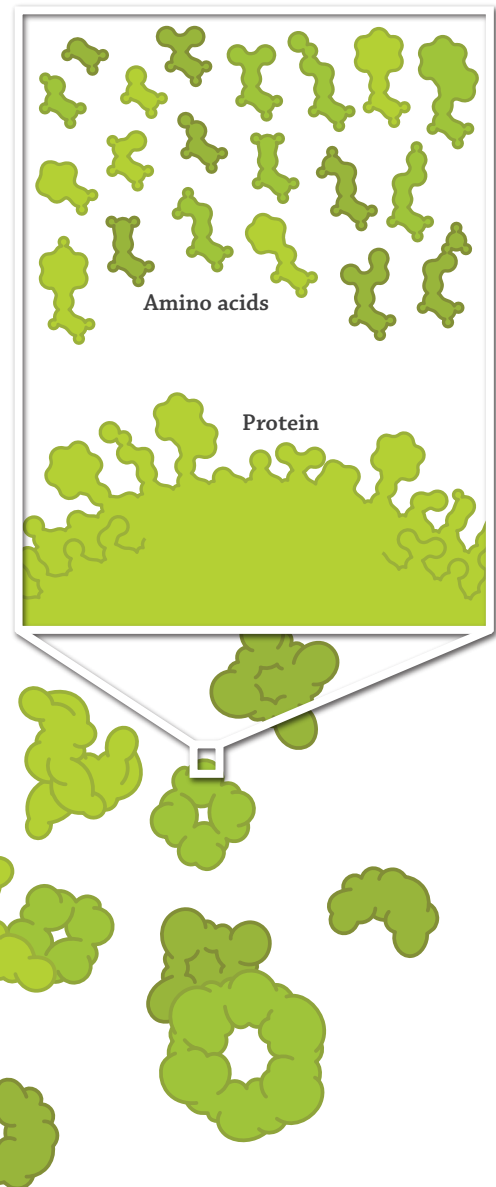


# Types of Proteins

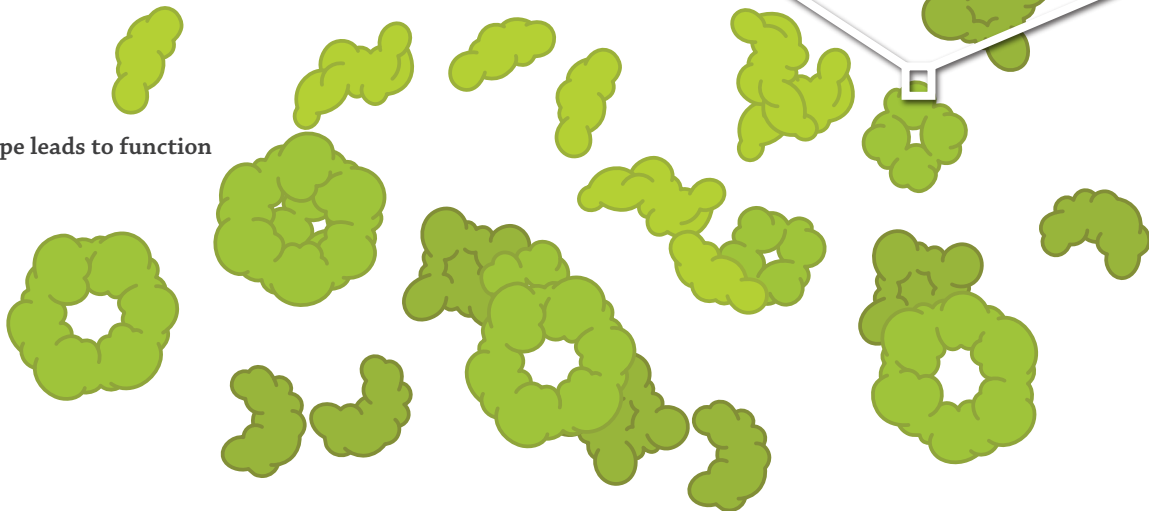
## Background

Proteins carry out most of the body's functions, and they make up the bulk of its structure. Yet students often have a hard time understanding the diverse roles that proteins have in the body. A common misconception is that the actions of proteins do not influence an organism's physical characteristics, or traits.

The **Types of Proteins** page on Learn.Genetics.utah.edu presents examples of specific proteins from nine different categories. You can use it to quickly point out the connections between genes, proteins, functions, and physical characteristics. It is also a good jumping off point for discussing protein structure and function.



Protein shape leads to function



ENZYMES	function: Build and break down molecules (carry out chemical reactions)
	examples: Lactase: helps infants digest lactose, a sugar in milk Luciferase: makes fireflies glow; controls a chemical reaction that gives off light DNA polymerase: Copies DNA molecules
STRUCTURAL PROTEINS	function: Serve as building materials for strengthening cells, tissues, organs & more
	examples: MaSp: makes up the black widow spider web Collagen: strengthens our bones, cartilage, tendons, ligaments, and skin Tubulin: forms hollow tubes, called microtubules, that support the structure of the cell Fibroin: used by silkworms to build cocoons

SIGNALING PROTEINS	function: Allow cells to communicate with each other
	examples: Adrenergic receptor: signals heart cells to beat faster and liver cells to release glucose during the fight or flight response Insulin: activates the insulin receptor, which signals muscle and fat cells to store blood sugar EGF: activates the EGF receptor, which signals skin cells to grow and divide during wound healing
REGULATORY PROTEINS	function: Bind DNA to turn genes on and off
	examples: p53: prevents a cell from dividing when its DNA is damaged (loss of p53 can lead to cancer) HOX: tell a group of cells what organ to become (image shows legs in place of antennae) Androgen and estrogen receptors: control onset of puberty in males and females
TRANSPORT PROTEINS	function: Move molecules and nutrients around the body and in and out of cells
	examples: Hemoglobin: carries oxygen from the lungs to all the tissues in the body Cytochrome c: moves electrons from one protein complex to another, releasing energy Channels in cell membranes: help ions cross the membrane
SENSORY PROTEINS	function: Detects information from the environment (light, sound, touch, etc.)
	examples: Opsins: detect light, convert light into signals that can be interpreted by the brain Olfactory receptors in the nose: sense airborne chemicals Cryptochrome in butterflies: sense the earth's magnetic field, guiding migration TRPA1 in rattlesnake: sense body heat and helps locate prey
MOTOR PROTEINS	function: Help cells move and change shape; move things inside cells
	examples: Myosin motors: slide along chains of actin proteins to make muscles contract Dynein and kinesin: carry vesicles and other cargo around the cell Bacterial motor: motor spins, the flagellum waves, propelling the bacterium forward
DEFENSE PROTEINS	function: Fight infection, heal damaged tissue, evade predators
	examples: Antibodies: battle the bacteria and viruses that make us sick Fibrin: forms blood clots and scabs at a wound site TD: made by tomato plants; sickens leaf-eating caterpillars
STORAGE PROTEINS	function: Store nutrients and energy-rich molecules for later use
	examples: Casein: supplies nutrients in milk that mammal babies need to grow Ovalbumin in egg whites: provides an energy source to the growing bird embryo Gluten in the seeds of wheat, barley, and rye: food for young plant seedlings