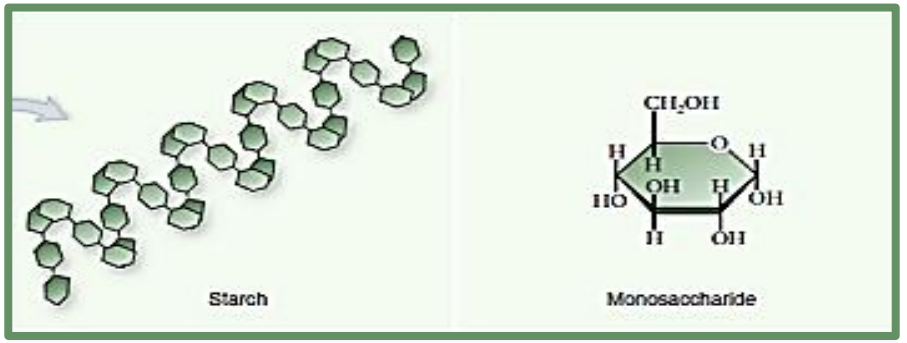
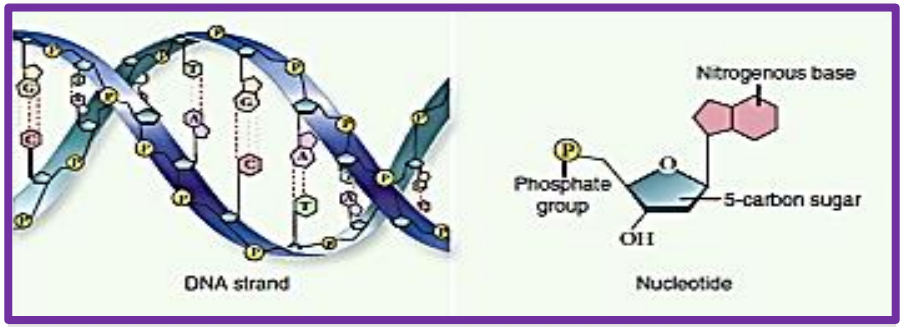
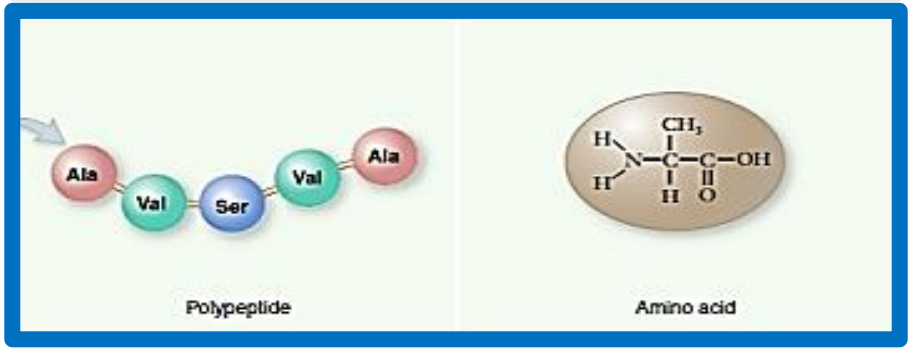
- Carbohydrates
- Nucleic acids

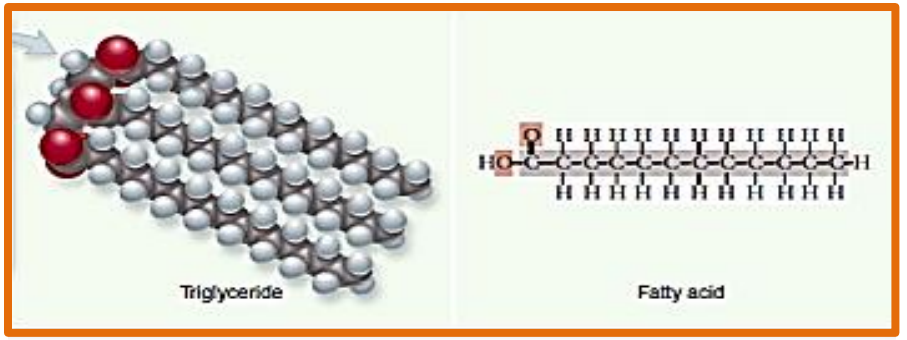
Four major classes of intracellular macromolecules (large biological molecules)

- Proteins - today
- Lipids





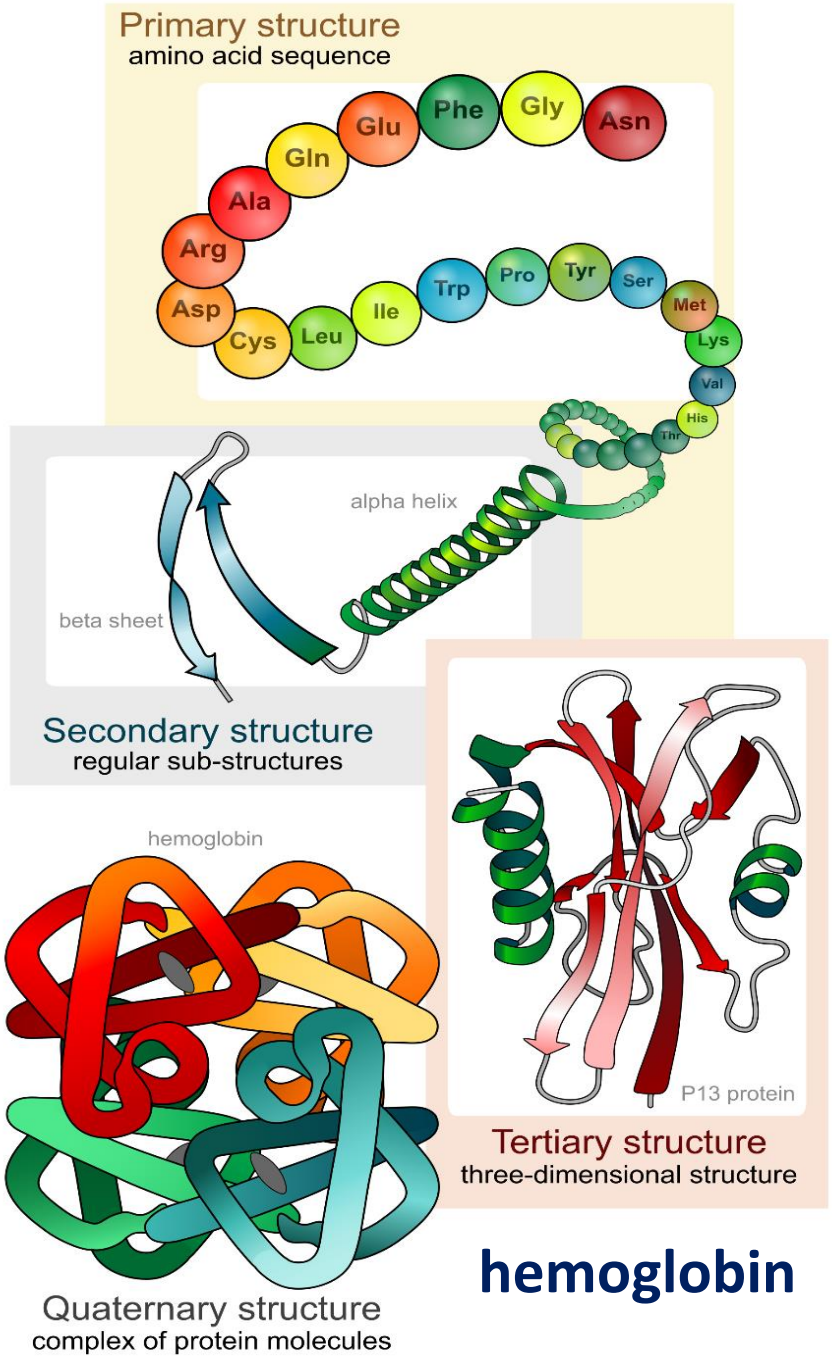




Proteins are the complex molecules that **do most of the work** (*that is produce change*) in living organisms.

- Made from **chains** of smaller molecules called **amino acids**.
- 20 kinds of standard amino acids.
- A protein is **defined by the sequence** of amino acids.
- The sequence determines the way a protein molecule "folds" upon itself: its ***secondary*** and ***tertiary*** structure.

Structure defines function!



PRIMARY STRUCTURE-
sequence

"beads on a wire"

20 kinds of amino acids

SECONDARY STRUCTURE-
spiral or sheet

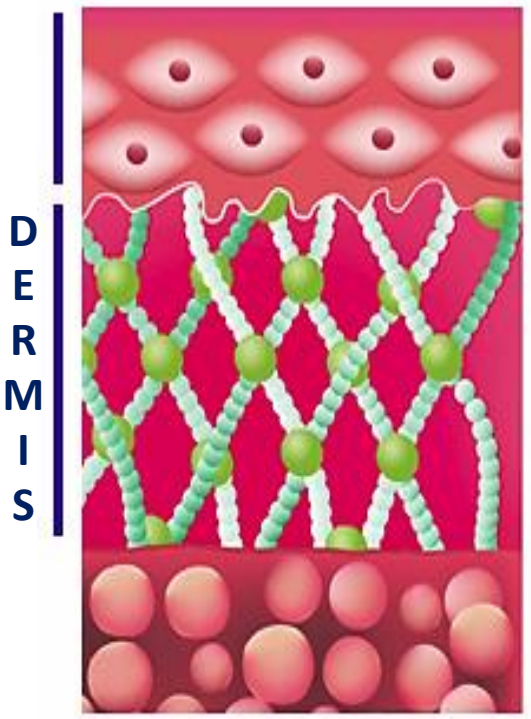
(α-helix)

TERTIARY STRUCTURE-
3-dimensional

A *FUNCTIONAL*
MOLECULAR
MACHINE!

Some proteins do an important job providing structure and support.

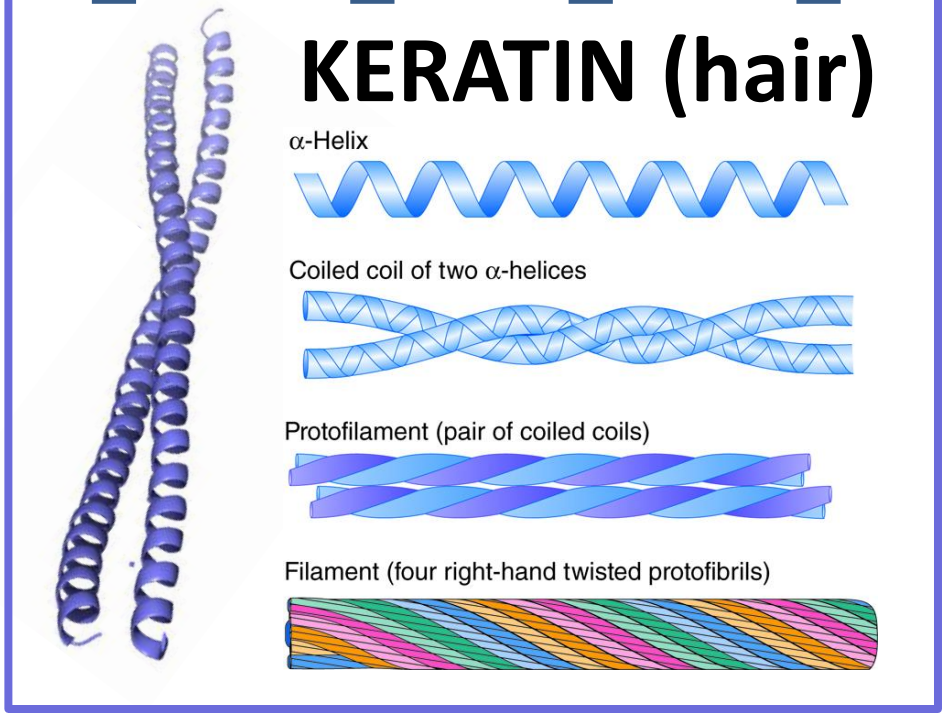
COLLAGEN, a ***fibrous*** protein, connects and supports your muscles, bones, tendons, ligaments, blood vessels, organs, cartilage, and even holds your skin together.

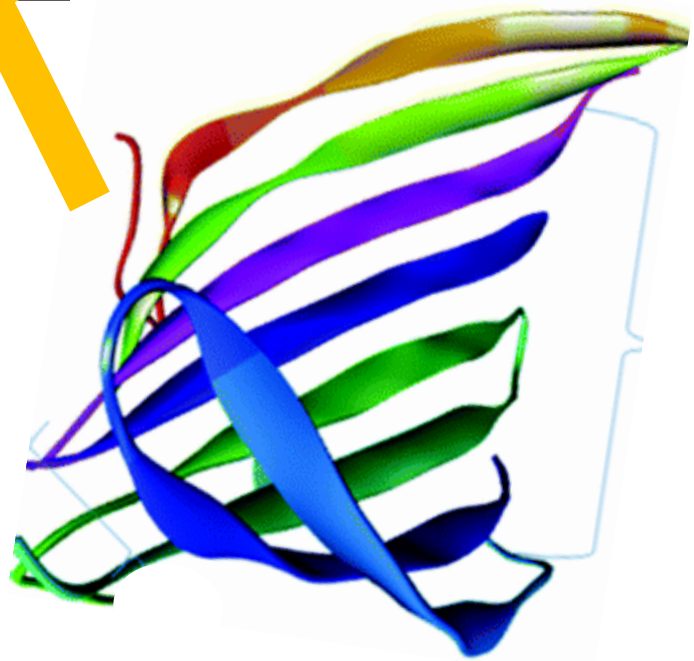


The most abundant protein in the human body, collagen provides a soft framework for bones, while calcium phosphate (a mineral) adds strength and hardens the framework. This combination of collagen and calcium makes bone strong and flexible enough to withstand stress.

Other *fibrous* proteins provide protection.

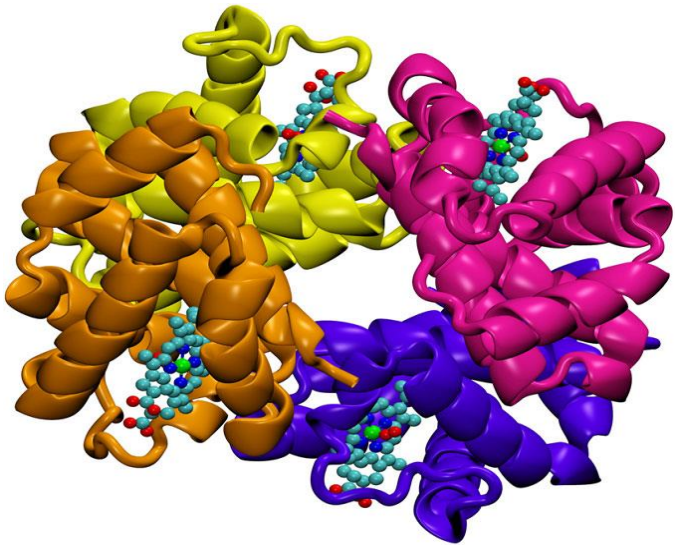
KERATIN (hair)

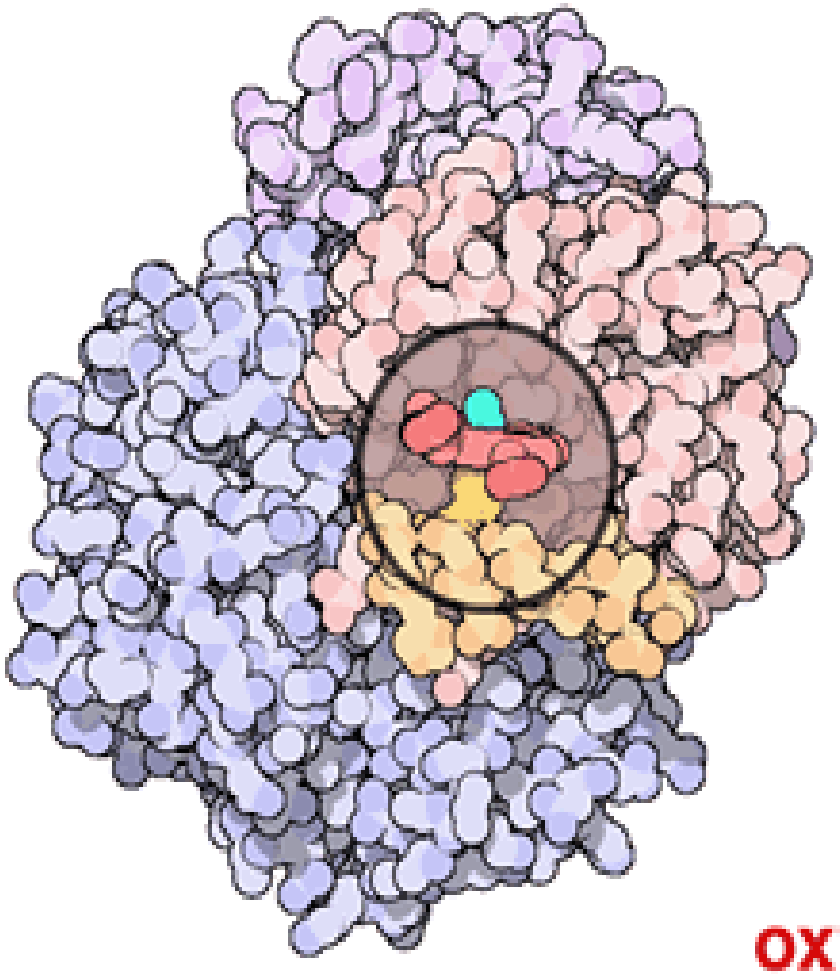




FIBROIN (silk)

Some proteins help <u>carry</u> other molecules around.



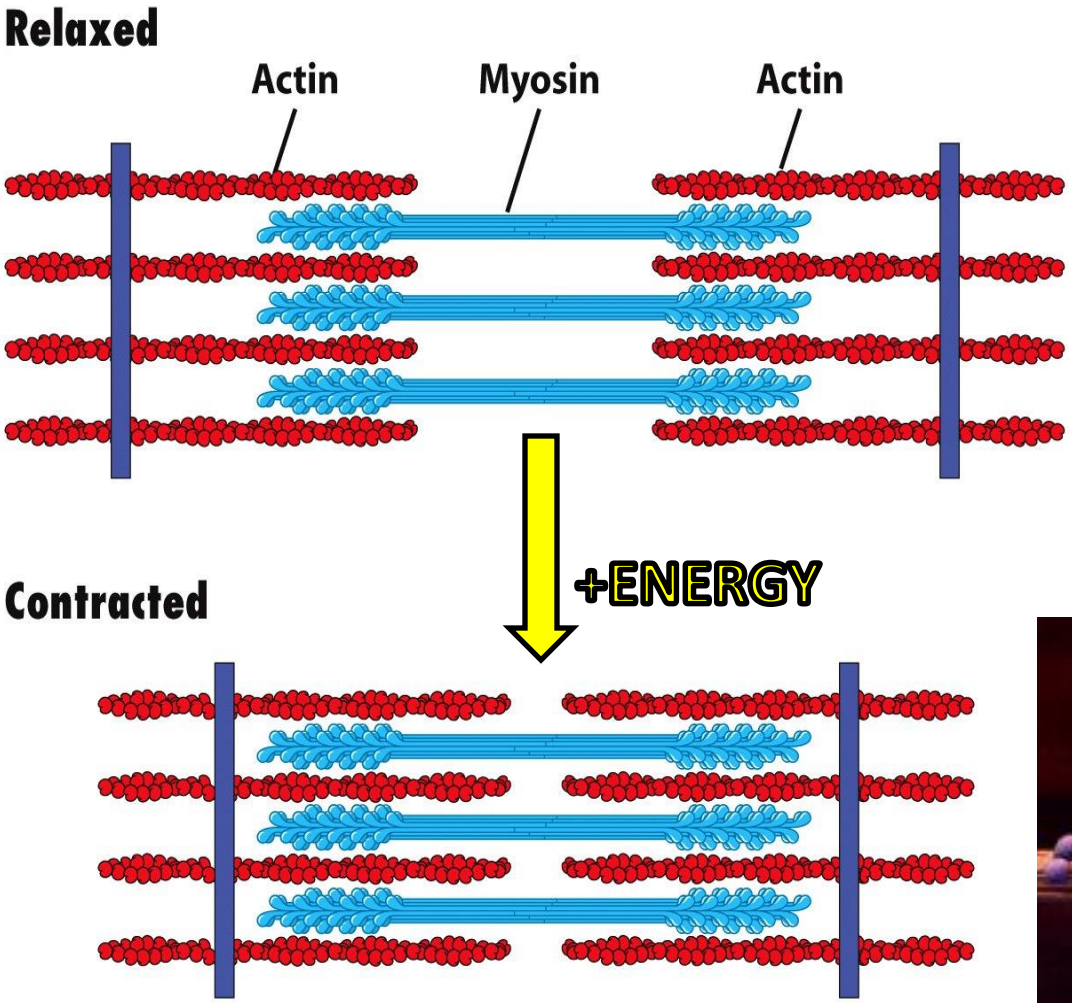


oxy

HEMOGLOBIN is a ***transport*** protein found in your red blood cells that carries oxygen from your lungs to every cell in your body.

Every time you take a breath, oxygen molecules from the air inside your lungs enter the capillaries and get picked up by the hemoglobin molecules inside your red blood cells.

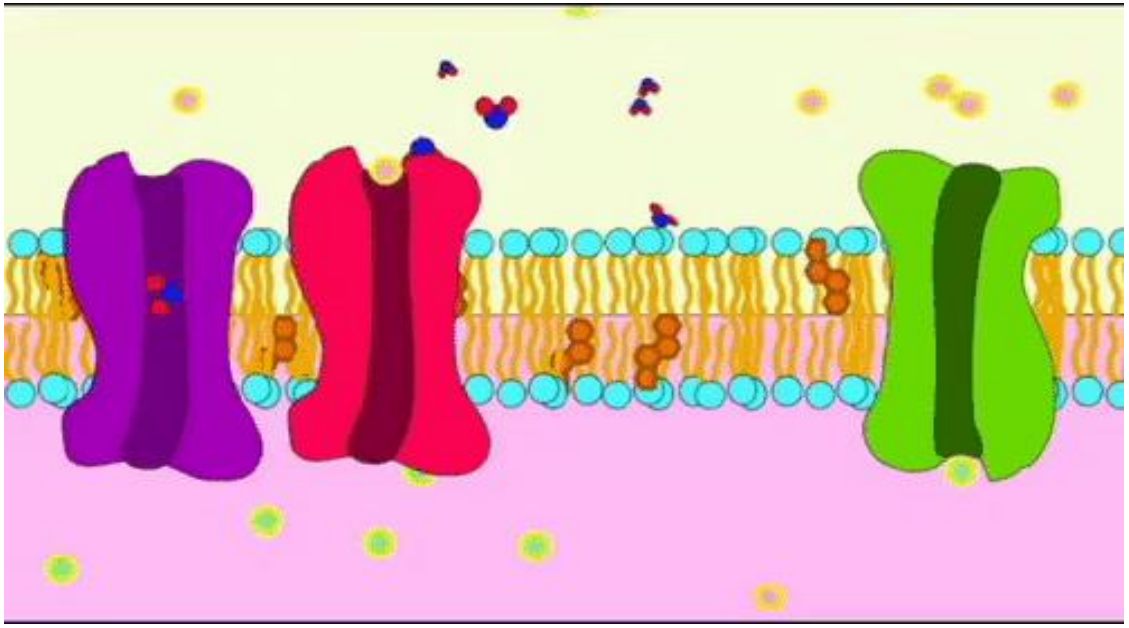
Muscle contraction involves the combined action of several proteins to provide <u>movement</u>.



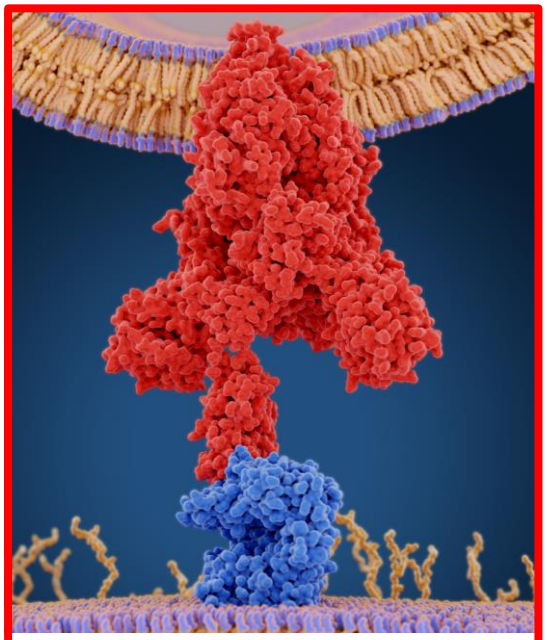
Actin is a ***structural fibrous*** **protein**

Myosin is a ***motor*** **protein**

Channel proteins are embedded in cell membranes and act like <u>doorways with a security guard</u> posted next to them.

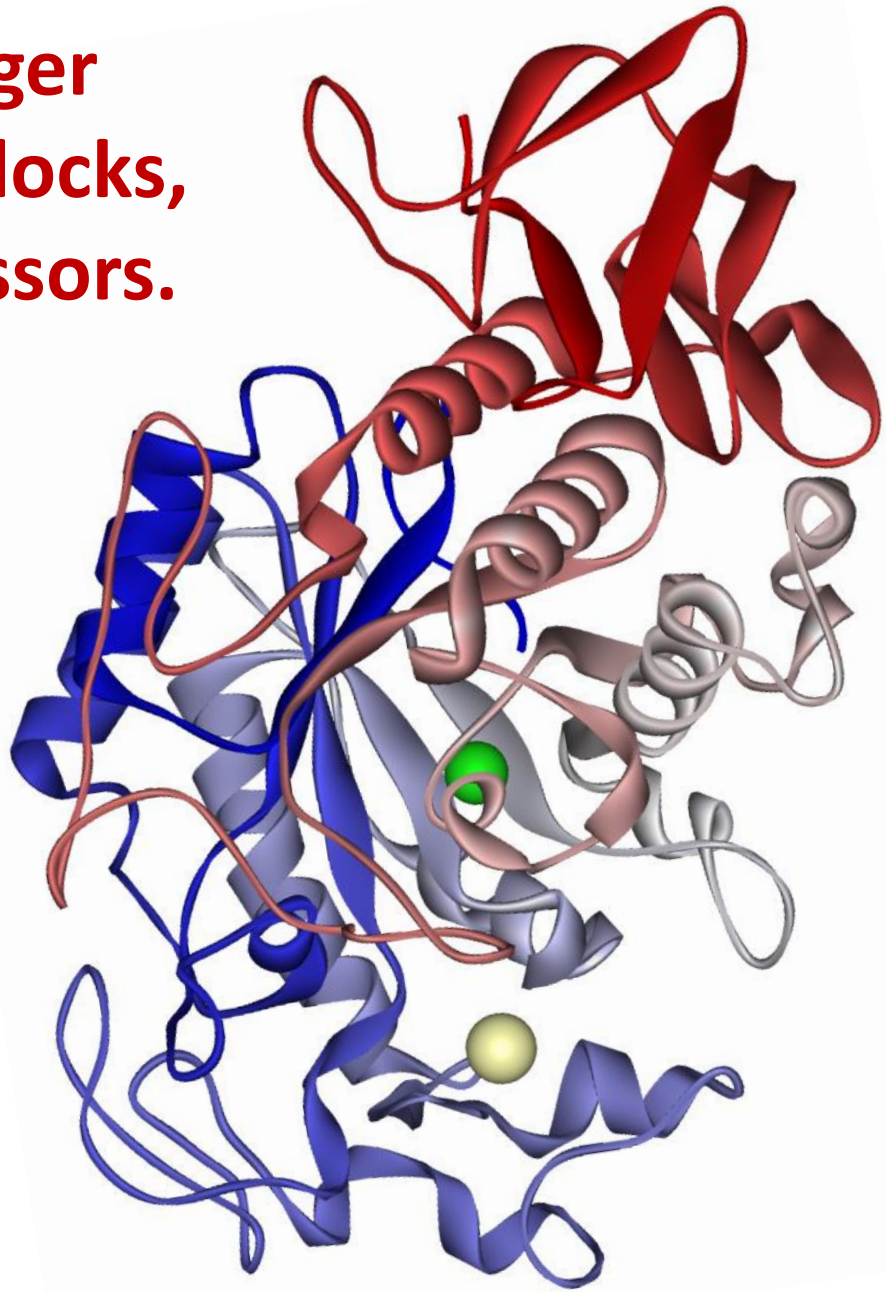


Channel proteins only let certain molecules into or out of the cell. Some are open all the time and some can be opened and closed depending on signals sent from the cell or received from the environment.



VIRUSES can "trick" the guard and get inside!

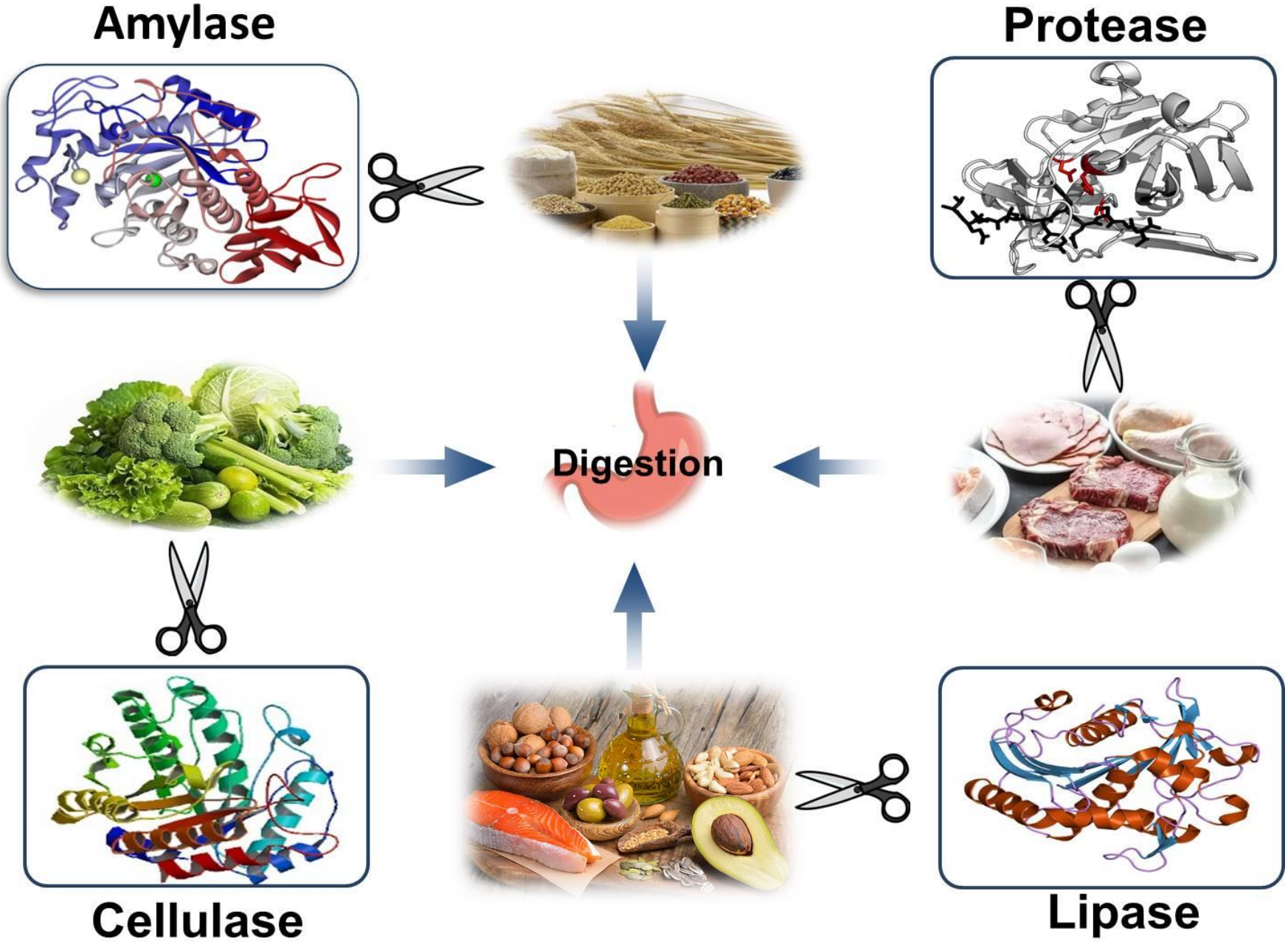
Some proteins cut bigger molecules into smaller blocks, acting like molecular scissors.



AMYLASE

is an *enzyme* made by your saliva glands to help break starch down into sugar.

Try this: put a cracker (salt side up) on your tongue and wait. At first, the cracker tastes rather plain, but as your mouth waters (makes saliva) the amylase will start to turn the starch in the cracker into sugar, making it taste sweet!


Amylase
Protease
Digestion
Cellulase
Lipase