Transcript
Proteins

A few introductory words of explanation about this transcript.

This transcript includes the words sent to the narrator for inclusion in the latest version of the associated video. Occasionally, the narrator changes a few words on the fly in order to improve the flow. It is written in a manner that suggests to the narrator where emphasis and pauses might go, so it is not intended to be grammatically correct.

The Scene numbers are left in this transcript although they are not necessarily observable by watching the video.

There will also be occasional passages in blue that are NOT in the video but that might be useful corollary information.

There may be occasional figures that suggest what might be on the screen at that time.

105 Glycine

Similar to the way fatty acids are the building blocks of fats, amino acids are the building blocks of proteins. So let's start by building an amino acid atom by atom.

This carbon atom wants to make four bonds, so let's give it a double bond with oxygen. And let's give it a single bond to an OH molecule -- that's a total of three bonds for the carbon…it still wants another. So let's give it another carbon for its fourth bond.

And let's give this new carbon atom a bond to a nitrogen atom that is also attached to two hydrogen atoms. This is called an amino group and is where amino acids get their name.

In amino acids, the carbon in the middle is always attached to a hydrogen and something else. In glycine that other side chain is just another hydrogen, but in other amino acids, the side chain is more complex.

110 Alanine

Here is a molecule of alanine, and as you can see the side chain is a carbon with three hydrogens attached. Other amino acids are even more complicated

Amino acid molecules attach easily end to end and can form long chains, and each time a new molecule joins the growing chain, a molecule of water is

released when the OH molecule on one end joins with a hydrogen from the amino group.

Because their physical shape is their most important distinguishing characteristic, we will represent the twenty different amino acids that are used in all life on earth as these geometric shapes.

(Alanine, arginine, asparagines, aspartic acid, cysteine, glutamine, glutamic acid, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, valine)

As each correct amino acid is fitted into place, it joins itself to the one in front.

These giant molecules of connected amino acids are called proteins. Some may contain thousands of amino acids.

As the string of amino acids grows, it bends and folds in a manner resembling origami.

The resulting protein molecule ends up as a complicated 3-dimensional shape…change even one of the amino acids in the string and you get a different shape.

And because proteins do their work by physically connecting to things, any change in shape means the protein won't function correctly.

Each of the 100,000 proteins in the human body has its own unique shape and function.

When you look in the mirror, what you see is mostly proteins. Some proteins provide structure as in our teeth, ligaments, fingernails, and hair. Others aid in digestion as in stomach enzymes. They can serve as hormones and neurotransmitters. Our muscle fibers are collections of thousands of proteins. Other proteins are building materials in our bones. Even the lens of our eye is 90% pure crystalline protein. (dry weight)