Collagen: The Glue of Life
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Introduction
In the 17th century, sailors struggled to overcome many obstacles. However, their biggest obstacle was not steering past jagged cliffs and sharp rocks or even withstanding the brutal weather but lack of vitamin C. This lack of vitamin C caused many sailors to suffer from scurvy. Although most prominent in sailors, scurvy affected the Ancient Egyptians, workers of the California gold rush, and increased after the development of pasteurization which decreased the amount of vitamin C in peoples' diets.

This deficiency in vitamin C caused several painful symptoms including bleeding gums, internal hemorrhaging, and loss of teeth. These symptoms occurred due to the improper synthesis of collagen. Vitamin C is essential to the formation of collagen.

Collagen Peptide Hydroxilation
During protein synthesis the third residue of collagen, a proline, is changed into a hydroxyproline when on –OH or hydroxyl group is added to the proline. This is known as hydroxilation. In order for this to occur, an enzyme known as prolyl hydroxylase is used. This enzyme requires iron (Fe2+) to work properly. More specifically it requires a stable form of Fe2+. However, Fe2+ is very unstable. Vitamin C also known as ascorbic acid, will keep iron in the Fe2+ form. With Fe2+ present in the correct form, hydroxylization can occur and collagen will form properly.

Abstract
Collagen, a structural protein, makes up 25% by mass of all proteins in our bodies. It is essentially the “glue” that holds our tissue together by providing strength and flexibility to our skin, cartilage, tendons, ligaments, and bones. So far, 28 types of collagen have been discovered.

The basic structure of collagen is a left-handed helix made from a repeating sequence of three amino acids. These amino acids follow the pattern Glycine-X-Y, in which X and Y could be almost any amino acid. To make the complete collagen molecule, three of these strands come together in the endoplasmic reticulum and are “zipped up” creating a trimer. Together, the polypeptides will form a right-handed helix. The individual strands are held together by hydrogen bonds between the Glycine. The Glycine is situated in the center of the helix because it is small and can be tightly packed together.

Problems with collagen can also be caused by dietary factors, as in scurvy. When people do not eat enough vitamin C, collagen cannot be hydroxylated and loses its strength, causing gum disease and skin hemorrhaging.

Functions of Collagen
- Supports tissue
- Supports cells inside and outside of cells
- Main component of
  - Cartilage
  - Ligaments
  - Tendons
  - Bones
  - Teeth
- Skin strength and elasticity
- Strengthens blood vessels
- Plays structural role in cornea and lens

In properly formed collagen the hydroxylation of collagen allows the three strands to come more closely together, adding strength and stability to the protein.

If collagen is incorrectly formed proteins, enzymes that breakdown proteins, will destroy it.