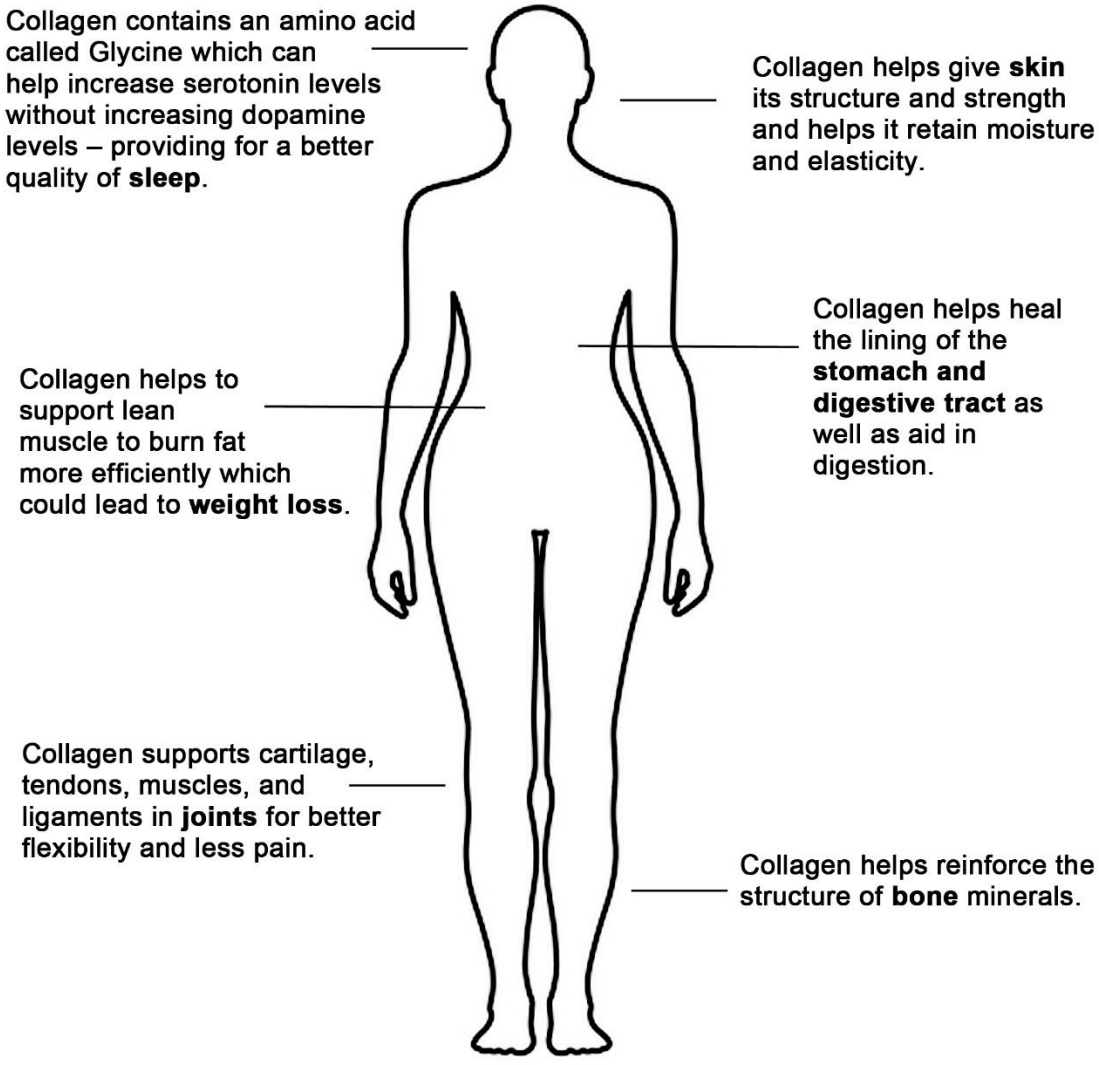
What is Collagen?

Collagen is the most abundant protein in the human body and is as diverse as it is multifunctional (1). It is found throughout the body in a variety of forms and functions making up 30 percent of your body tissue and 70 % of your skin tissue. Specifically, collagen is the protein in connective tissue that is in bone marrow, tendons, cartilage, ligaments, and linings of your body organs. It is often referred to as the glue of the body. (1) Hydrolyzed collagen means the protein has been broken down into individual amino acids which are easier for the body to absorb. Collagen serves to help repair tissue and also functions in various roles throughout the body.

Collagen and the Body

Locations of Collagen:

Collagen is the most abundant protein (25%) in your body.

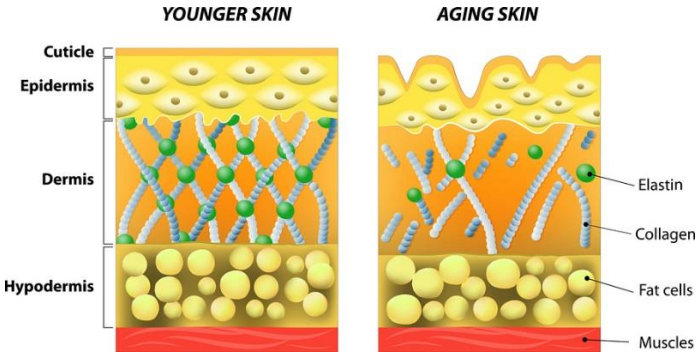


"It's estimated that after the age of 30, collagen production could decrease by 1% a year; so by age 50, the body could lose 20% of its capacity to produce collagen."

What Does Collagen Do?

Collagen has numerous structural properties but also plays a vital role in the repair of almost all the body's tissues. Some diseases are directly linked to lacking this essential protein. Depending on which part of the body it is located, collagen serves different purposes.

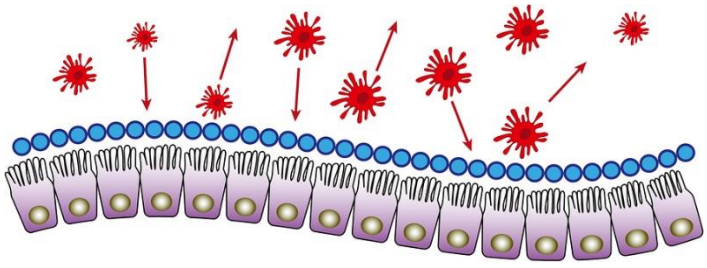
In skin: Found in the inner layer, this connective tissue gives the skin its structure and strength and also functions in the replacement of dead skin cells. A lack of collagen in the skin can contribute to a decrease in skin health leading to stretch marks, dark spots, and infections as well as affecting the skin's ability to maintain moisture.



In internal organs and blood vessels: In the lining of your organs like in the stomach, kidneys, blood vessels and spleen, collagen functions as a protective covering and a fibrous barrier. Specifically within these areas, collagen plays vital roles:

It helps heal the lining of your stomach and digestive tract and promote more healing.

The stomach has layers of tissues including several layers of connective tissue made of collagen, fibers, and fibroblast cells that produce more collagen and fibers. (2) When the layers are damaged, ingested particles can pass through into the bloodstream causing "leaky gut." When collagen is digested, it is attracted to these fibroblast cells and may help stimulate them to produce more collagen. (3) Since collagen is the building block of this connective tissue, supplementing with collagen may help heal and even encourage fibroblasts to rebuild the damaged parts of the connective tissue in your stomach and digestive tract lining.



It aids in digestion.

The amino acids in the collagen increase production of hydrochloric acid (HCl) in the stomach. (4) This has several positive implications.

- **It can help prevent further damage**. HCl breaks down proteins. Without sufficient hydrochloric acid, undigested proteins can cause allergic reactions which lead to the inflammatory immune system response that comes with leaky gut and further damage the lining of the stomach (5).
- **It kills off pathogens.** *HCl kills many organisms that can come from tainted, rotten, or undercooked food (5).*

- **It helps your body to absorb minerals.** *HCl helps ionize minerals which make it easier for your body to absorb (5).*

  Also, collagen itself naturally binds to water so it helps move your food through the digestive system. This can ***help prevent heartburn.***

In bones: Collagen helps reinforce the structure of bone minerals so a lack in collagen causes bones to become more porous thus weakening them. (6)

In joints (cartilage, tendons, and ligaments):

Cartilage-This connective tissue found in the nose, ears, knees, larynx, joints, and trachea consists of collagen for flexibility, movement, and support. 67% of cartilage is made up of collagen (7).

Tendons- Collagen makes up more than 95% of the weight of tendons (8). In the tendons, collagen provides flexibility and strength in supporting the movement around bone joints.

Ligaments- Ligaments connect bones at joints and provide stability preventing hyperflexion or hyperextension. Ligaments are made up of over 80% collagen, so a deficiency in collagen in this area can lead to serious injury (9).

Problems with Collagen in the cartilage, tendon, and ligaments can also cause slower healing and even lead to injuries as well as allowing more friction between bones causing further damage. (10)

In muscles: Muscles are comprised of cells interweaved by a connective tissue rich in collagen. Because of collagen's vital role in muscle support and repair, a lack of collagen in this area can lead to a number of issues including muscle pains, a decrease in the muscle's ability to work affecting metabolism, and even disease. In particular, fibromyalgia patients have shown deficiencies in collagen in muscles. Furthermore, evidence suggests that taking collagen hydrolysate may help decrease pain associated with the disease (11).

<u>The Sleep and Collagen Connection</u>

Glycine (one of the amino acids in collagen hydrolysate) can help increase serotonin levels without increasing dopamine levels – providing for a better quality of sleep.

<u>What Causes a Deficiency in Collagen?</u>

1. **Normal aging-** It is estimated that after the age of 30, collagen production could decrease by 1% a year, so by age 50, the body could lose 20% of its capacity to produce collagen.
2. **Injury**- In specific areas of the body such as muscles and joints, when the body sustains an injury, it utilizes its resources to heal the injury. If the body is already lacking in collagen, it can further exacerbate the deficiency.
3. **Lifestyle aging-** Sun damage, smoking, drugs, alcohol, processed foods, sickness, and more can have a drastic negative effect on the body's ability to produce collagen.

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