

What is collagen, and why do people use it?



Collagen is the most abundant protein in the human body, found in the bones, muscles, skin, and tendons. It is the substance that holds the body together. Collagen forms a scaffold to provide strength and structure.

Endogenous collagen is natural collagen, synthesized by the body. Exogenous collagen is synthetic. It comes from an outside source, such as supplements. Endogenous collagen has a number of important functions. Breakdown and depletion is linked to a number of health problems. Exogenous collagen is used for medical and cosmetic purposes, including the repair of body tissues.

Fast facts on collagen

Here are some key points about collagen. More detail is in the main article.

- Collagen occurs throughout the body, but especially in the skin, bones, and connective tissues.
- Some types of collagen fibrils, gram-for-gram, are stronger than steel.
- Collagen production declines with age and exposure to factors such as smoking and UV light.
- Collagen can be used in collagen dressings, to attract new skin cells to wound sites.
- Cosmetic lotions that claim to increase collagen levels are unlikely to do so, as collagen molecules are too large to be absorbed through the skin.

What is collagen?

Collagen is a hard, insoluble, and fibrous protein that makes up one-third of the protein in the human body. In most collagens, the molecules are packed together to form long, thin fibrils. These act as supporting structures and anchor cells to each other. They give the skin strength and elasticity.

There are at least 16 different types of collagen, but 80 to 90 percent of them belong to types 1, 2, and 3. These different types have different structures and functions. The collagens in the human body are strong and flexible. Type 1 collagen fibrils are particularly capable of being stretched. Gram-for-gram, they are stronger than steel.

Roles: What does collagen do?

Collagen is secreted by various cells, but mainly by connective tissue cells. It is found in the extracellular matrix. This is an intricate network of macromolecules that determines the physical properties of body tissues. A macromolecule is a molecule containing a large number of atoms.

In the dermis, or the middle layer of skin, collagen helps form a fibrous network of cells called fibroblasts, upon which new cells can grow. It also plays a role in replacing and restoring dead skin cells. Some collagens act as protective coverings for delicate organs in the body, such as the kidneys.

With age, the body produces less collagen. The structural integrity of the skin declines. Wrinkles form, and joint cartilage weakens. Women experience a dramatic reduction in collagen synthesis after menopause. By the age of 60 years, a considerable decline in collagen production is normal.

The proportion of the collagen types in skin change with age. Young skin is composed of 80% type I collagen and about 15% collagen type III. With age, the ability to replenish collagen naturally decreases by about 1.0%-1.5% per year. This decrease in collagen is one of the characteristic

hallmarks associated with the appearance of fine lines and deeper wrinkles. Moreover, deep inside in the dermis, fibrillar collagens, elastin fibres and hyaluronic acid, which are the major components of the extracellular matrix, undergo distinct structural and functional changes.

What studies say about collagen efficiency?

In an open-label study on 217 female volunteers, a nutritional supplement, that contains collagen, was tested for its ability to reduce the visible signs of ageing and it was compared to the effects of an aesthetic surgical intervention, such as Botox, laser treatment or the use of dermal fillers. The study reported on facial improvements in the nasolabial folds which extend from the side of the nose to the corners of the mouth. These folds typically deepen with age, and as they are more prominent than other facial lines, their depth is a useful parameter for measuring the effect of anti-ageing products. In 37% of subjects, a significant improvement in nasolabial fold depth was observed. Interestingly, a comparable significant decrease in nasolabial fold depth was reported regardless of whether subjects underwent surgical treatment for nasolabial fold area or not. This study shows that collagen is beneficial for skin.

Uses: Medical and cosmetic

Collagen is resorbable. This means it can be broken down, converted, and absorbed back into the body. It can also be formed into compacted solids or lattice-like gels.

Its diverse range of functions and the fact that it is naturally occurring make it clinically versatile and suitable for various medical purposes. Collagen for medical use can originate from humans, cows, pigs, or sheep.

Skin fillers

Collagen injections can improve the contours of the skin and fill out depressions. Fillers that contain collagen can be used cosmetically to remove lines and wrinkles from the face. It can also improve scars, as long as these do not have a sharp edge. These fillers are sourced from humans and cows. Skin tests should be done before using collagen from cows, to avoid aggravating any allergies. Collagen can fill relatively superficial volumes. More extensive gaps are usually filled with substances such as fat, silicone, or implants.

Wound dressing

Collagen can help heal wounds by attracting new skin cells to the wound site. It promotes healing and provides a platform for new tissue growth.

Collagen dressings can help heal:

- chronic wounds that do not respond to other treatment
- wounds that expel bodily fluids such as urine or sweat
- granulating wounds, on which different tissue grows
- necrotic or rotting wounds
- partial and full-thickness wounds
- second-degree burns
- sites of skin donation and skin grafts

Collagen dressings are not recommended for third-degree burns, wounds covered in dry eschar, or for patients who may be sensitive to products sourced from cows.

Guided tissue regeneration

Collagen-based membranes have been used in periodontal and implant therapy to promote the growth of specific types of cell. In oral surgery, collagen barriers can prevent fast-growing cells around the gum from migrating to a wound in a tooth. This preserves a space where tooth cells have the chance to regenerate. Collagen-based membranes can aid healing in these cases and they are resorbable, so this barrier does not need to be surgically removed after the main operation.

Vascular prosthetics

Collagen tissue grafts from donors have been used in peripheral nerve regeneration, in vascular prostheses, and in arterial reconstruction. While collagen prostheses are compatible with the human body, some have been found to be thrombogenic, or likely to cause coagulation of the blood.

Treatment of osteoarthritis

Collagen supplements or formulations may help treat osteoarthritis. A 2006 review found that supplements containing collagen helped decrease painful symptoms and improving joint function in people with osteoarthritis. As the supplement was absorbed, collagen accumulated in the cartilage, and this helped to rebuild the extracellular matrix. This review shows that collagen for joints is beneficial.

Skin revitalization

Many products containing collagen, including creams, claim to revitalize the skin by increasing collagen levels within the body. This is unlikely, however, as collagen molecules are too large to be absorbed through the skin. Any benefit is probably due to the moisturizing effects of these products. They do not directly increase collagen.

What damages collagen?

Some factors can deplete the levels of collagen within the body. Avoiding them could keep the skin healthy for longer.

High sugar consumption: A high-sugar diet increases the rate of glycation, a process where blood sugars attach to proteins to form new molecules called advanced glycation end products (AGEs). AGEs damage nearby proteins and can make collagen dry, brittle, and weak.

Smoking: Many chemicals present in tobacco smoke damage both collagen and elastin in the skin. Nicotine also narrows the blood vessels in the outer layers of the skin. This compromises skin health by reducing the delivery of nutrients and oxygen to the skin.

Sunlight: Ultraviolet rays in sunlight cause collagen to break down more rapidly, damaging collagen fibers and causing abnormal elastin to build up. The UV rays in sunlight damage the collagen in the dermis, and the skin rebuilds incorrectly, forming wrinkles.

Autoimmune disorders: Some autoimmune disorders cause antibodies to target collagen. Genetic changes can affect the extracellular matrix. The collagen that is produced can be lower, or it may be dysfunctional, mutated collagen.

The aging process causes collagen levels to deplete naturally over time. There is no way to prevent this.

Avoiding tobacco and excess sun exposure and following a healthful dietary and exercise regime can help reduce visible aging and protect collagen, keeping the skin, bones, muscles, and joints healthy for longer.

Preventing collagen loss

Laser therapy can help treat stretch marks, as it can stimulate the growth of collagen, elastin, and melanin.

A healthful diet can help the body produce collagen. Nutrients that may support collagen formation include:

- Proline: In egg whites, meat, cheese, soy, and cabbage.
- Anthocyanidins: In blackberries, blueberries, cherries, and raspberries.
- Vitamin C: In oranges, strawberries, peppers, and broccoli.
- Copper: In shellfish, nuts, red meat, and some drinking water.
- Vitamin A: Occurring in animal-derived foods and in plant foods as beta-carotene.

Stimulation of collagen production and/or inhibition of collagen degradation can be achieved in several ways, including the use of surgical aesthetic treatments, topical treatments, or use of oral supplements. The link between nutrition and skin ageing has also been reviewed in detail by Schagen et al. Of 11 intervention pathways/strategies mentioned in this review, 7 are directly related to collagen content in the skin, underlining the importance of this protein to skin integrity and ageing.

Supplement drinks containing hydrolysed bioactive collagen peptides, in combination with vitamins, minerals and botanical antioxidants are frequently used to improve skin elasticity, hydration and visible signs of fine lines and wrinkles. Furthermore, studies have reported benefits for nail growth and reduction of the symptoms associated with broken, brittle or split nails.

All proteins and peptides need to be hydrolysed in the gut to allow absorption into the bloodstream and transport throughout the body.

From a liquid format, the ingredients are readily absorbed into the bloodstream (typically in about 20 min after ingestion). By comparison, absorption from solid foods can take several hours.

The hydrolysed collagen has 2 distinct, but complimentary, functions. Firstly, the amino acids from hydrolysis of collagen in the GI tract are the building blocks used by the fibroblast cell to make more collagen. As collagen is uniquely rich in glycine, proline (and hydroxyproline, which is derived by post-translational modification during collagen synthesis), this represents an enriched supply of the specific amino acids required to make new collagen fibrils. Secondly, unique oligopeptide sequences, especially dipeptides containing hydroxyproline, are known to stimulate fibroblasts via receptor-mediated activation pathways to induce new collagen fibre synthesis.

The biological potency and clinical efficacy of hydrolysed collagen can be linked to both its unique amino acid profile and specific oligopeptide sequences, which underlines the key characteristics contributing to the major success of hydrolysed collagen as a supplement for health benefits in the body.

<https://www.medicalnewstoday.com/articles/262881>

<https://parjournal.net/article/view/3863>

#collagen, #drinking collagen, #collagen for joints, #collagen benefits, #liquid collagen.