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Bio-Maker Collagens Sources, Extractions and Applications

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Abstract

The most abundant protein collagen in the human body about one-quarter by weight is expressed as fibrils in basically cell-forming and vigorous conjunctive tissues like the skin, joints, ligaments, and bones. Additionally, the collagen macromolecule is assisting humanity in numerous ways among the biopolymers. Even though it has been used for a long time in cosmetics, its biological properties, such as being nontoxic, biocompatible, biodegradable, structural integrity, cellular affinity, and low antigenicity, have made it more popular in biomedical and pharmaceutical settings. Its amazing biodegradability and outstanding bioactivity by endogenous collagenases chemical believer exogenous collagen for biomedical use. The most suitable extracellular matrix (ECM) macromolecule is triple helix 29 collagen, which has three distinct variants. Type I collagen gradually loses thickness and strength over time, which can be linked to skin aging. The sources, structures, extractions, and properties (such as bioactive, mechanical, viscoelastic, tensile, etc.) are the primary focus of this review. of collagen proteins for applications in the biomedical field. Human tissue scaffolds, cardiac implantation, wound healing, cornea membranes, dental membrane, dermal filler, cosmetic surgery, etc. can all benefit from the abundance of collagen protein found in nature. as this review demonstrates. Prospects are also informed about bodysuit collagen's application-specific benefits and drawbacks.

Keywords: Bionanoparticles • Nanoelectronics • Nanotechnology

Introduction

One of the most suitable artificial film constituents for the regeneration of damaged tissue is collagen, a structural protein that is found in animals but not plants. The term "collagen" comes from the Greek word "kola," which means "gum," and "gen," which means "producing." The collagen template is a sufficient fit for biomineralization, which serves as a building block for connective tissues like bone, cartilage, tendon, and so on, in comparison to the cell response-ability of the other variants. The integration of organic and inorganic materials under the control of living organisms is the process known as biomineralization. Human-like collagen (HLC) becomes the primary material for skin grafts, artificial bones, blood vessels, and other applications due to its properties. However, when cells are cultured in vitro, it is one of the most common components of the extracellular matrix (ECM), which is responsible for the physical maintenance of protein cells and serves as a suitable environment for the synthesis or assembly of new fibrils [1].

Description

A plethora of collagenous proteins account for approximately 30% of the total weight of body cells. Because of the abundance of protein, this significantly increases internal and external organ tissue growth. In 1881, a body-absorptive surgical suture known as "catgut" was developed for biomedical applications. Every year, people get sick or get burned, or hurt in any other way. Because the donor site isn't up to the job, and every cell has a different immune response, artificial membranes are needed. Non-sterilized collagen promotes highly infectious diseases in biomedical applications, despite its quick biodegradation property. ECM is a non-cellular, three-dimensional component that is present in all human tissues and organs. It is composed of proteins like collagen, elastin, and others that control biochemical and biomechanical properties. One of the most important structural components of the ECM is collagen, which provides tensile strength, controls cell adhesion and migration, and directs the development of tissues. For wound dressing mats, artificial skin, hydrogels, and other applications, it is increasingly being combined with other polymers like chitosan, elastin, fibroin, polycaprolactone (PCL), and polyethylene oxide (PEO).

Electrospinning, layer-by-layer assembly, ionotropic gelation, covalent coupling, the sol-gel technique, freeze-drying, and other methods include have been utilized to produce collagen protein-based nanocomposite materials. Currently, computer-aided manufacturing-based rapid prototyping (RP) methods are also being used to fabricate the designed manufacturing materials. Insufficient mechanical strength, on the other hand, poses one of the most significant obstacles for native biomaterials based on collagen intended for use in medical applications. The main issue is rapid degradation when collagen is used alone. Most of the time, natural polymers and collagen are mixed together to change the rate of degradation in vivo and improve mechanical strength [2-5].

Conclusion

Collagen is a fascinating biopolymer that can be combined with other synthetic or natural polymers, such as silk fibroin, chitosan, elastin, and keratin, to make new materials. With the addition of additional biopolymers, various collagen materials have been utilized in biomedical applications. Collagen membranes, microfiber collagen scaffolds, electrospun collagen nanofibers, collagen nanocomposite, and collagen-containing sponges are some of these materials. In addition, gelatin is another biopolymer that is produced by heating triple helix collagen into single-stranded molecules using more than base one, making it less immunogenic and enhancing its capacity for cell adhesion. However, there are significant applications for both of these in wound healing and tissue engineering. The material fabrication, application, and characterization methods, as well as the most recent collagen inventions using various polymers, are presented. The names of the tests that will be done to see if collagen-based materials can be used in biomedical applications are listed.

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Conflict of Interest

None.

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