

Collagen-Based Biomaterials for Use as Implantable Materials And Drug Delivery Vehicles

Background

Collagen-based biomaterials are being developed for a number of tissue engineering and medical applications such as sealants, adhesion barrier, and scaffolds. In order to render collagen suitable for tissue engineering applications, the mechanical strength of collagen must be enhanced. Traditionally, harsh chemical crosslinking agents have been applied, but chemical crosslinking often compromises biocompatibility of collagen by releasing toxic residuals.

Also, the collagen-based biomaterial must be sterilized prior to use in tissue engineering applications. Historically, gamma irradiation has been used to sterilize collagen-based biomaterials, but significant alterations in the physical properties of collagen occur leaving the biomaterials unsuitable for tissue engineering applications. Other methods of sterilization such as use of ethylene oxide produce toxic residuals and affect biocompatibility of collagen. **Thus, there is a significant unmet medical need to develop new methods for enhancing the mechanical strength and durability of collagen.**

Description of the Technology

The present invention represents a new method for crosslinking and sterilizing collagen based biomaterials. The technology uses non-toxic chemicals to cross-link collagen and yields collagen-based biomaterials with superior mechanical strength. This technology when used in conjunction with gamma irradiation as a sterilization agent protected collagen from gamma radiation induced strand fragmentation and denaturation thereby demonstrating its protective effect and suitability for use in procedures requiring sterilization by gamma irradiation. The biomaterial derived using this technology was resistant to both enzymatic degradation and heat denaturation.

Advantages

- Alternative methods have limitations: -chemical crosslinking for enhancing the mechanical strength compromises biocompatibility of collagen
- -Gamma irradiation denatures collagen thereby decreasing its strength and increasing its vulnerability to enzymatic degradation.
- The biomaterial derived using the present invention is resistant to enzymatic degradation
- The present method is simple and does not yield toxic residuals.
- This method is quick and effective
- This method can be generally applied to derive a wide range of cross-linked collagen such as liquids, gels, pastes, powders, sponges, films and fibers suitable for bioimplantation

Applications

- To repair tissues such as bone, tendon, ligament, skin, vascular and connective tissues.
- For use as sealant, implant, coating, adhesion barrier and tissue engineering devices.
- Drug delivery applications: to develop scaffolds for delivery of genes, cell, growth factors, anesthetics, analgesics, antibiotics etc.

- . • Tissue augmentation: For use in plastic surgery
- . • For use in collagen coating of grafts

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- . • To enhance blood coagulation and platelet activation
- . • To enhance durability of allograft tissues
- . • Can be used for the generation of bone substitutes, wound dressings, nerve regeneration, artificial skin
- . • For use as a research tool to study diseases such as diabetes and aging, and to evaluate drugs

Patent Status

- . • US patent application filed
- . • Application published on 01/02/2003 (Publication No.: US-2003-0003157-A1)

Licensing Opportunity

- This technology is available for non-exclusive license.

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