

Medical Applications of Mulberry Silk

N Gokarneshan^{1*} and C Kayalvizhi²

¹Formerly Professor, Department of Textile Chemistry, SSM College of Engineering, Komarapalayam, Tamil Nadu, India

²Professor and Head, Department of Textile Technology, RVS College of Engineering and Technology, Dindigal, Tamil Nadu, India

***Corresponding author:** N Gokarneshan, Formerly Professor, Department of Textile Chemistry, SSM College of Engineering, Komarapalayam, Tamil Nadu, India

ARTICLE INFO

Received: 📅 April 04, 2026

Published: 📅 September 30, 2026

Citation: N Gokarneshan and C Kayalvizhi. Medical Applications of Mulberry Silk. Biomed J Sci & Tech Res 66(5)-2026. BJSTR. MS.ID.010418.

ABSTRACT

Mulberry silk (*Bombyx Mori*) is extensively used in medicine for its exceptional biocompatibility, biodegradability, and mechanical strength. Key applications include advanced wound dressings, tissue engineering scaffolds (bone, skin, cardiac), surgical sutures, drug delivery systems, and antimicrobial medical textiles.

Key Medical Applications

Wound Healing and Dressings

Silk fibroin and sericin are used to create bioactive, antibacterial wound dressings that accelerate healing without damaging new skin, with companies like Fibroheal Biotech leading in this area.

Tissue Engineering

Silk acts as a scaffold for regenerating tissue, including bone, ligaments, tendons, and vascular grafts due to its ability to mimic the natural extracellular matrix.

Surgical Sutures

A traditional yet standard application, silk sutures are widely used due to their high tensile strength and slow degradation.

Drug Delivery Systems

Silk fibroin is processed into microspheres, nanoparticles, and hydrogels for controlled release of drugs and insulin.

Regenerative Medicine

Used in nerve repair, such as in KLIS Bio's Silk Bridge for peripheral nerve repair.

Medical Textiles

Used for antimicrobial masks, hernia meshes, and hypoallergenic clothing (gloves, socks) to treat skin conditions like eczema, say this article.

Cosmetic and Topical Treatment

Sericin is used in skin care products for its antioxidant, anti-inflammatory, and moisturizing properties, as described in this ResearchGate article.

Key Components in Medicine

Fibroin

The structural protein used for high-strength scaffolds and implants.

Sericin

The silk gum, used for its anti-oxidant, anti-inflammatory, and anti-adhesive properties.

Mulberry Byproducts

Mulberry leaves and fruit are used to create pharmaceuticals for diabetes and blood pressure management. Mulberry silk, primarily derived from the *Bombyx mori* silkworm, is a versatile biomaterial

used in high-performance medical applications due to its biocompatibility, high mechanical strength, and tunable biodegradability. Its two primary proteins—fibroin (the structural core) and sericin (the glue-like coating)—serve distinct therapeutic roles.

Core Medical Applications

Surgical Sutures & Meshes

Used for centuries, braided silk sutures are preferred in cardiovascular, ocular, and neural surgeries for their excellent knot security and minimal tissue irritation. Modern applications include the SERI Surgical Scaffold, a silk-based mesh for soft tissue support in procedures like breast reconstruction.

Wound Healing & Dressings

Silk fibroin supports the growth of skin cells like fibroblasts and keratinocytes. Commercial products like DermaSilk or Fibroheal use silk to manage chronic wounds, burns, and inflammatory skin conditions like atopic dermatitis (eczema) by providing a breathable, non-irritating barrier.

Tissue Engineering Scaffolds

Silk can be 3D-printed or electrospun into scaffolds that mimic human tissues. These are used to guide the regeneration of:

Bone & Cartilage: Porous scaffolds support osteoblast growth and repair segmental bone defects.

Nerves & Vessels: Silk conduits act as “guidance structures” for peripheral nerve regrowth.

Intervertebral Discs: Hybrid scaffolds simulate the complex structure of the spine to treat disc degeneration.

Drug Delivery Systems: Because it can be processed into nanoparticles, hydrogels, or thin films, silk is used to deliver medications, vaccines, and insulin with high precision and controlled release.

Specialized Protein Uses

Silk Fibroin

Often used for internal implants and injectable fillers, such as Silk Voice, which is used to treat vocal cord insufficiency.

Sericin

Historically discarded as waste, it is now prized for its antioxidant, antimicrobial, and UV-protective properties. It is increasingly used in moisturizing dermatological creams, shampoos, and as a supplement in cell culture media.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2026.66.010418

N Gokarneshan . Biomed J Sci & Tech Res



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