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Short communication

Application of Natural Biomaterials in Tissue Engineering

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DESCRIPTION

Any material derived from plants or animals that is used to augment, replace, or repair biological tissues and organs is referred to as a natural biomaterial. Natural biomaterials are not a new notion; humans have been using naturally generated materials for thousands of years. To meet specific standards, scientists require functional biomaterials. Biomaterials must be biodegradable, biocompatible, and able to attach and develop cells as the most critical criterion. Furthermore, the material must be non-toxic, mechanically equivalent to the replacement tissue, and readily available and simple to manufacture. Natural materials are frequently created to match these criteria, making them suitable candidates for human usage [1].

Many natural biomaterials are available for human use. Some of the biomaterials are discussed below:

Alginate

Brown seaweed, especially *Laminaria hyperborea, Laminaria digitata, Laminaria japonica, Ascophyllum nodosum,* and *Macrocystis pyrifera,* are used to extract alginate. It is a polysaccharide made up of a series of linear copolymers made up of (1,4)-linked -D-mannuronate (M) and -L-guluronate (G) residues. It is used for Wound healing, drug delivery, and cell transplantation. Alginate-based wound dressings keep wounds moist and bacteria-free. Furthermore, alginate hydrogels are excellent in releasing molecules in a regulated manner, which is very beneficial in tissue engineering for delivering cells or signals to the correct location.

Matrigel

It is the brand name for a commercial product made from Engelbreth-Holm-Swarm mouse sarcoma and sold by Corning Life Sciences and BD Biosciences. This material, known as a basement membrane matrix, was patented in 1989 and serves as an interface between cells and connective tissue. When employed in tissue engineering, matrigel is frequently combined with other materials, particularly collagen. Cell survival, cardiac function, and left ventricle wall thickness were improved when matrigel and collagen were mixed with rat cardiomyoblasts [2].

Fibrin

Fibrin is a biomaterial that is generated from the body's natural damage response. Its precursor, fibrinogen, is produced in the liver and circulates in mammalian blood. Thrombin cuts fibrinogen to form fibrinopeptides A and B when an injury occurs. The "knobs" of A and B interact with the "holes" in this cut. Fibrin has been utilised as an injection and a patch with great effectiveness. Fibrin injections have been found to improve cardiac function, vascularization, and ventricular shape; the blood clots which stops the bleeding. Factor XIII stabilises fibrin by causing cross-linking between fibrins. With its potential to act as a scaffold for tissue healing and provide signals for cell growth onto the scaffold, fibrin is useful for tissue engineering. Fibrin can also be extracted from the patient's blood, preventing an immunological reaction that is damaging [3].

Collagen

Collagen-based materials come in a variety of forms, including sponges, fibres, powder, and dressings, and are available from practically every biomedical company. Collagen can be derived from a variety of animal tissues, although the most common sources are bovine skin and tendons, porcine skin or intestine, and rat tail. Collagen is commonly employed as a scaffold for cell development and tissue creation in a range of applications. Humans have employed collagen in the manufacture of leather, glue, gelatin, and musical strings. Collagen can help in heart cell differentiation and vascularization. Three hours after a myocardial infarction, type I collagen supplied without cells avoided remodelling and long-term loss of function, enhanced angiogenesis, and reduced cell death [4].

Silk

Protein polymers spun into fibres by *Lepidoptera larvae* such as silkworms, spiders, scorpions, mites, and flies are known as these. Silks are fibrous proteins made by specific epithelial cells in these species' glands. Silk fibroin polymers are made up of repeating protein sequences that serve as structural elements in cocoon creation, nest construction, traps, web formation, safety lines, and egg protection. Silkworm silk (Bombyx mori) and

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spider silk (Nephila clavipes) are the most widely utilised silks for numerous uses. Due to their glossy, flexible, elastic coating power, easy spreading, and adhesive characteristics, silk fibroin peptides are utilised in cosmetics [5].

CONCLUSION

Since naturally derived biomaterials can enable cell proliferation, biodegradability, and tissue remodelling, it have been examined and used in therapeutic applications as artificial tissues/organs. Although the existing results do not totally meet therapeutic needs, the potential applications of naturally generated biomaterials are still being studied, and research in this area is now being conducted all over the world. When compared to synthetic biomaterials, naturally produced biomaterials have immunomodulation, anti-toxic, and biomimetic properties with the cellular environment *in vivo*. For a long time, researchers in biomaterial science and cellular biology have been working to make biomanufacturing technologies more broadly available. The main area of focus is medicine, where technology is critical in the study and prevention of uncommon diseases.

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