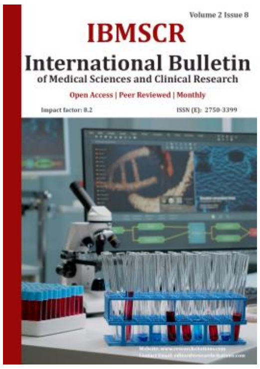

PHYSOMEMBRANA-ECOTECHNOBINT

Choriyev Jahongir Olimjon o'g'li
Student of Denov Institute of Entrepreneurship and Pedagogy
Djabbarov Saidjon Mamadaliyevich
Denov District No. 2 specialized boarding school, biology teacher
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Annotation: Nowadays, due to the development of biological sciences, medical sciences are also developing. In medicine, many diseases are treated biologically and naturally. Physomembrane is a new type of biomaterial that effectively heals skin wounds.

Key words: biomaterials, Physomembrane, Silk fiber, Spider web (spider silk protein), Aloe plant, amino acid, hormone, matrigel

Today, biomaterials play an integral role in medicine and many other fields - mainly in medicine, they restore the function of cells and facilitate the healing of people after injuries or diseases. Biomaterials can be natural or synthetic and are used in medical applications to support, improve, or replace damaged tissue or biological function. Biomaterials can be obtained from nature or synthesized in various laboratories using metal components, polymers, ceramics or composite materials. They are often used and adapted for medical purposes, so include all or part of a living structure or biomedical device that performs, augments, or replaces a natural function. Such functions can be relatively passive, such as those used for heart valves or bioactive with more interactive functionality, such as hydroxyapatite-coated hip implants. Biomaterials are also used every day in dentistry, surgery and drug delivery. For example, a construct with embedded pharmaceuticals can be implanted into the body, allowing the drug to be released over a long period of time. Biomaterial can also be autograft, allograft or xenograft used as transplant material. Biomaterials can be made using only plant and animal materials to modify, replace or repair human tissues and organs. The use of natural biomaterials has been used as far back as ancient Egypt, where the local population used animal skins as sutures. A more modern example is the ivory hip replacement, first recorded in Germany in 1891.

Valuable criteria for viable natural biomaterials:

Biodegradable

Biocompatible

Able to stimulate cell attachment and growth

Non-toxic

Examples of natural biomaterials:

Alginate

Matrigel

Fibrin

Collagen

Myocardial tissue engineering

Physomembrana - mainly includes 3 types of natural components.

- Silk fiber

- Spider web (spider silk protein)
- Aloe plant

We provide information about the components that make up the physomembrane.

Silk fiber

Natural silk fiber is mainly recycled cocoons from mulberry silkworms. A silkworm goes through four stages in its development: the cocoon butterfly lays an egg, which hatches into a cocoon and produces silk from its internal organs. The worm squeezes out the collected silk material through the glands in its mouth, forms a cocoon that completely surrounds itself, and turns into a dome inside it. A butterfly emerges from a mushroom. She comes out of the cocoon and lays eggs. Thus, the development process of the cocoon is repeated. In cocooning factories, cocoons are spun in cocoon wrapping equipment. During molting, the ends of several cocoons of silk are joined together. As a result, raw silk is produced. Raw silk threads consist of several cocoon threads bound together by protein-sericin. It is used to obtain spun silk from the waste generated during the collection and pulling of cocoons (top tangled layers, remnants of cocoon skins, punctured and unwashable cocoons). The constituent of the cocoon shell is its thread. The chemical composition of natural silk consists mainly of fibroin (75-80%) and sericin (20-25%). When evaluating the cocoon thread, both its total length and the length of the continuous twisted thread are taken into account. The length of the thread spun from a single cocoon varies depending on the breed of silkworm and the conditions under which it is reared. Some species of worms produce a single continuous thread up to 1,000 meters long as they cocoon. The cocoon thread, according to its nature, gradually thins from the beginning to the end. The linear density of the thread starting from the surface of the cocoon is 2-3 times higher than the linear density of its last part. This feature of the cocoon is called its internal unevenness.

Natural silk is mostly thin and elegant, and is used for women's blouses. The value of silk is that the fabrics made from it have a beautiful appearance, high durability, good dyeability, flexibility, and easy moisture absorption.

Spider web (spider silk protein)

The basic building block of silk proteins consists of non-essential amino acids, including glycine and alanine. Other heavier amino acids found in silk proteins are arginine, serine, leucine, glutamine and tyrosine, methylhexadecanoic acid. Spider silk is a commercially sought-after biomaterial due to its excellent properties such as high tensile strength, ultimate elasticity, and extreme stiffness. The importance of spider silk was understood even in prehistoric times. People have used it for thousands of years for various purposes. They use it for healing wounds, fishing, making bags and clothes. Historically, the ancient Greeks used spider webs to cover wounds due to their immune-stimulating effect and vitamin K content. In the native Solomon Islands, spider silk is mainly used in the production of fishing lines. Due to its elastic nature and the high strength of silk fiber, it can be a valuable building material in earthquake resistant houses. Silk fibers with high safety coefficients can be used in the production of ropes for elevators, bridges and pillars. Spider silk can be used in cosmetics to improve the softness and shine of products. Spider webs can also be used to assess industrial and residential pollution, mechanical, biomedical, bio-engineering and therapeutic applications and birds also use it to cover their nests with spider silk. This lining provides a smooth texture to the nest and prevents infections due to its antibacterial nature. Spider silk is also used in the production of rust. Spider silk has excellent mechanical properties. It is a

unique blend of high tensile strength and stretchability. Spider silk is hard. It is five times stronger than steel and twice as strong as Kevlar. It is the toughest material known to date due to its maximum load bearing capacity and elasticity. Some species of spider silk can stretch up to 140% of its original length without breaking. The mechanical properties of silk fibers spun by spiders vary depending on many external and internal factors. In addition, spider silk maintains its mechanical strength in a wide temperature range, that is, from -66 to 100 ° C.
Also, by reducing the temperature, the strength of the silk fiber increases significantly. Studies have shown that at extremely low temperatures (-196 °C), the strength of the fiber increases by 64%. compared to the power at room temperature. Having unique and unusual mechanical properties makes spider silk far superior to man-made fibers. Spider silk has amazing and valuable therapeutic, wound healing and restorative properties. This makes spider silk an amazing and unusual biomaterial. Spider silk plays an important role in the regeneration of many tissues and body cells, such as skin, nerves, bones and cartilage. Many damaged connective tissues, such as tendons and ligaments, can also be repaired. Due to the polyalanine segments, the elongation of the fibers is associated with glycine-rich regions. One of the most important and surprising discoveries about spider silk is its biocompatibility with living human tissue. This potential of spider silk has been studied in many other animals, such as pigs, mice and rats. Another important feature of Spider dragline silk implanted in these animals is its stability even at high temperatures. It can withstand very high temperatures without any change in its chemistry. Spider silk films support the structure and stimulate tissue regeneration. Biocompatibility and medical applications of spider silk These silk fibers retain their appearance, anatomy and elasticity even when autoclaved. This property enhances its use in therapy. This makes spider silk a viable candidate for advanced antimicrobial drug development. However, spider silk's antimicrobial compounds hold hope for effective treatment of emerging bacterial infections. Nevertheless, it is now necessary to solve the safety problems of new therapies on biological systems. Although most tested spider silk fibers are biocompatible, and different species of spider proteins have different amino acid conformations, their biocompatibility should be evaluated before use. Not all types of spidrion fibers are equally biocompatible. Silk fiber can also be used to treat nervous disorders. Basic ampullate silk fibers show biocompatibility and very low immunogenicity when cultured with human Schwann cells (nerve cells). Various classes of artificially engineered polymers such as poly-glycolic acid (PGA) and poly-L-lactic acid (PLLA) have been studied in detail for the treatment of various nervous system disorders, but these experiments have not yielded the desired results due to their complexity. . nervous system and structure, but it was found that spider silk is involved in the formation of myelin, the regeneration of damaged axonal cells. It has been reported that Nephila clavipes participates in the regeneration of neuronal cells in silk mammals. It also provides structural support and space for attachment to connective tissue and keratin-producing epidermal cells. Thus, spider silk fibers play a very important role in wound healing because it improves the regeneration of damaged cells. Because of its biocompatibility and durability, spider silk can be used to form artificial muscles, tendons, and ligaments.
Current research has shown that spider silk (eggs of Nephila edulis) can be used to help and support chondrocytes (cartilage tissue). After several successive attempts, a hyaline cartilage-like porous scaffold was successfully developed from spider silk fibers. This scaffold appeared

to support chondrocyte adhesion and proliferation. Spidroine plays an important role in the creation of these scaffolds because its mechanical properties are similar to those of natural chondrocytes. Spider silk can also be used to make long-term implants. Nowadays, prostheses made of silk are being developed to help with bone fractures. When used in the production of implants and prostheses, spider silk not only supports the damaged area, but also has a healing and regenerative effect on living tissues. Also, due to its biodegradable nature, it breaks down naturally in the body without having to be surgically removed. Spider silk finds a number of applications in the military and textile industries due to its versatile attributes of great strength and excellent flexibility. Until World War II, spider silk was used as a cross in optical devices such as telescopes, microscopes, and bomb-aiming artifacts.Because of its extreme toughness, spider silk is used in a variety of goods, including body armor, bulletproof clothing, security able to develop substitute material for belts, ropes and nets. Spider silk has excellent energy dissipation properties at high strain rates, so it can be used as ballistic protection. In addition, the super-tough fibers made from spider silk can be used in the manufacture of parachutes and their ropes. In the textile industry, spider silk can be used to produce light wear-resistant clothing. Another possible application of spider silk is the production of sports goods. Because spider silk is a strong and load-bearing biomaterial, it can be used to build bridges, stainless steel panels for vehicles, and even airplane bodies. The dilemma of emerging multidrug-resistant pathogens is a major concern. The problem is related to the overuse and misuse of broad-spectrum antibiotics. Today, the medical and pharmaceutical industries are working hard to develop effective treatments against common infectious diseases. In this regard, antimicrobial agents from natural sources are always superior to synthetic ones because they contain effective and biologically pure therapeutic agent. In addition, they provide a natural means of limiting microbial growth, and pathogens are less likely to develop resistance against them. Thus, in today's age of health concerns, spider silk may prove to be a miracle substance with powerful antibacterial properties.

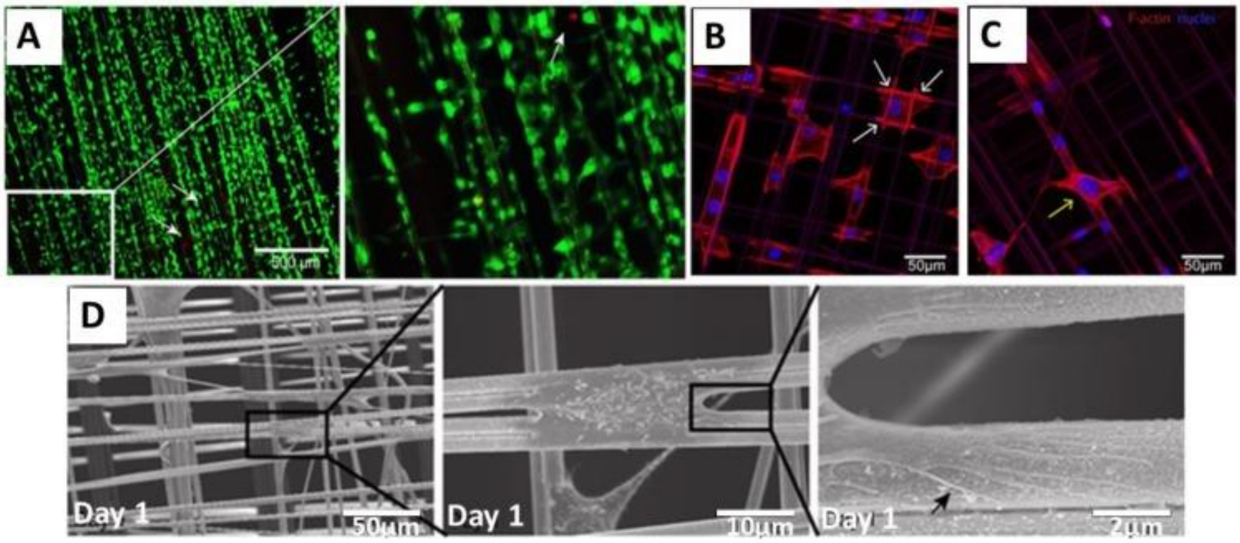

Fig. 1. Microscopic appearance of spider silk

Aloe plant

Any medicinal effect of aloe leaf extract is related to the polysaccharides located in the inner parenchymatous tissue of the leaf. Aloe gel is used as a moisturizer and to treat minor burns, skin rashes and irritations. Aloe vera is known for its soothing and healing effects on burns and other wounds. Aloe vera also increases the speed of wound healing when applied to a wound. Application of aloe gel causes migration and proliferation of fibroblast cells to the injured area. Growth factors in aloe are attracted to the wound and bind to fibroblast IGF receptors. This further strengthens collagen content and cross-linking. Thus, increasing the tensile strength of the wound. Sterols: These include cholesterol, Campesterol, β Sitosterol and Lupeol. All of these have anti-inflammatory effects and lupeol also has antiseptic and pain-relieving properties. Wound closure and tensile strength through cell proliferation. Amino Acids: Aloe vera gel provides amino acids essential for recovery and growth. It contains 20 of the 22 non-essential amino acids and 7 of the 8 essential amino acids.5 blood flow to the injured area. Aloe is the best wound healing agent ever discovered. The mechanism of this acceleration is explained as follows: Aloe vera has an anti-inflammatory effect by inactivating bradykinins. Hormones: auxins and gibberellins help in wound healing and have anti-inflammatory effects. Salicylic Acid: This is an aspirin-like compound with anti-inflammatory and antibacterial properties. Lectins have an anti-tumor effect. 7 gel increases collagen content and the level of collagen cross-linking in the wound, resulting in increased wound contraction and scar tissue breakdown, as well as hyaluronic acid and dermatan in granulation tissue. reported an increase in sulfate content. A 5.5 kDa glycoprotein isolated from Aloe vera has been shown to increase epithelial cell migration and improve wound healing in human keratinocyte monolayers.

In short, spider web is added to physomembrane silk products in a ratio of 2:1. Many studies show that this bandage heals wounds on the skin and removes spots on the skin. We know that skin cells are damaged due to wounds on the skin. That's why the bandage is treated with aloe plant leaf extract. In this, aloe provides nutrients to the cells and becomes a reserve for the growth of young cells. This is an environmentally friendly solution.

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