

# Artificial Skin

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## I. INTRODUCTION

Skin is the largest human organ. It is composed of two layers, the top or outer layer called the epidermis and the inner layer called the dermis. Skin covers the entire body and serves several vital purposes for the well being of people. The epidermis keeps harmful bacteria out and vital fluids inside the body. The dermis contains the blood vessels, nerves, hair, oil, and sweat glands that allow the human body to function properly. Unfortunately accidents occur, and when fire is involved, severe burns can leave the body dangerously vulnerable to infection or dehydration. Previous treatment would include covering the burned areas of the skin with a graft, which is transferred skin or bone of the victim from a healthy area of the body. Grafts are only somewhat effective however, and many patients would die because the bodies reject the grafts or large quantities of new skin can not be produced at a quick enough pace. The only other option is artificial skin. This is a synthetic, laboratory produced, skin substitute.

## II. HISTORY

The first synthetic skin was used in 1979 on a woman who suffered severe burns on over half of her body. This skin was designed by John Burke and Ioannis Yannas in Cambridge, Massachusetts as a collaborative project between Massachusetts General Hospital and Massachusetts Institute of Technology (MIT). Together they made a polymer, using collagen fibers and a sugar molecule to form a porous material that was very similar to human skin. The polymers were collected from shark cartilage and the collagen from cowhide. They dried the mixture to create a thin membrane mimicking the dermis layer of skin. A protective silicone layer was added to the top to serve as the epidermis.



## III. PRODUCT

The artificial skin was called Silastic. The skin serves as a frame for new skin cells, tissue, and blood vessels to grow and reproduce. It is applied after removing the burnt tissue. The skin grows and cells reproduce at a very quick pace, and just under three weeks the new skin applied to the patient is the same color as the original unburned skin. This Silastic skin is tremendously better than the original skin grafts used to treat patients with skin burns or diseases. However it still requires the use of animal cells which the human body has to absorb.

## IV. FUTURE

The future of artificial skin relies on Howard Green. A professor at Harvard University, Green is culturing human skin cells and growing sheets of human epidermis. However at first when this skin was placed on a wound it was rejected by the immune system. Green eventually perfected this technique and created a product called Graftskin. Some of the patient's own dermal cells are grown and it can be sutured or stapled onto a patient through a surgical procedure. It is yet to be officially used to treat a patient but in clinical trials it has yet to be rejected. It can be used to not only treat burn victims, but also those who suffer from skin cancer, or have chronic skin diseases or wounds. Graftskin is the future of synthetic skin that does not involve the testing on lab animals. Additionally, researchers in California are working on a polymer that would be self-healing, using epidermal electronics. Which would be a group of circuits that are attached to the skin, however they have yet to produce a polymer that is flexible enough. Additionally these circuits could provide sensory feelings to those with prosthetics.

## REFERENCES

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