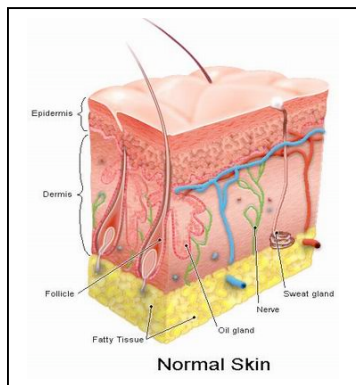


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Every year, burn injuries report to be second to motor vehicle accidents in reference to the cause of accidental death in the United States. Excluding minor and untreated burns, 2.4 million burn injuries are reported every year. Of these burn victims, 75,000 of them are hospitalized, and 20,000 of them suffer major burns (burns covering at least 25% of the body). Most injuries are reported to occur from the outdoors, with the kitchen being the second leading cause. The leading causes of burns for older adults are from flames, trash fires, furnaces, and bathing or falling asleep while smoking. The cost of burn treatment is extremely expensive. An average burn covering 30% of the body usually costs about \$200,000 in initial hospitalization costs. Extensive burns cost even more when repeat treatments and rehabilitation sessions are necessary.

Serious injuries to the skin require immediate skin coverage to repair and restore skin functions back to normal as soon as possible. The skin has two layers which include the epidermis and the dermis. The epidermis is the waterproof, outermost layer, which contains no blood vessels and provides protection. The dermis is the inner layer that consists of connective tissue and protects the body from stress and strain. The dermis holds the nerve endings that sense touch and heat. This layer also includes sebaceous glands, hair follicles, blood vessels, etc.



The best recovery option for burn victims are skin grafts. According to the UK Centre for Tissue Engineering, "The gold standard for skin replacement is the autologous skin graft in which an area of suitable skin is separated from the tissue bed and transplanted to the recipient area on the same individual from which it must receive a new blood supply," (418). This process is sometimes unable to

be completed if burns cover the majority of the body. Skin grafting also has an extremely painful recovery. Cadaver skin can be chemically treated using a three-step process to help patients with severe burns. The process includes removal of the epidermis, cell solubilization, and finally dry preservation to decrease the number of antigens in the skin.

There are some products that have been engineered to aid in skin growth from autografts and cadavers. Alloderm is one product that aids the regeneration of the dermis. AlloDerm acts as a full-thickness dermis underlying the thin epidermis from the autograft. AlloDerm is created from donated human tissue. The tissue is put through a multi-step process, which removes the epidermis and the cells that attribute to tissue rejection and graft failure. Other useful products have helped to further skin problems and disorders which include Integra, Dermagraft, Apligraf, and Epicel.

The current focus of research is focused on developing a completely tissue-engineered skin equivalent that provides the same functions of the skin and the comparability to an autograft. The tissue-engineered equivalent will have living cells and natural or synthetic cellular components. The equivalent must act as a barrier to micro-organisms, control fluid loss, have long-term elastic durability, be histocompatible (tissue compatibility), support healing, lack antigens and toxicity, yet also be cost effective. Currently, no manufactured skin substitutes have been engineered with an outcome as comparable to or as effective as an autograft.

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