CHAPTER 1

# BIOMEMBRANE USE IN WOUND CARE

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## INTRODUCTION

Biomembranes are a valuable tool for the wound care specialists to aid in the wound healing process. Advances have been made in the last decade to make the products easier to use, more efficient to store, and safe for the patient while maintaining their effectiveness in helping to heal difficult wounds.

Although biomembranes are very effective, they are not for every patient and should only be used at the appropriate time. The purpose of this paper is to discuss the categories of biomembranes and the time and way to effectively use them. A case study is presented at the end of the article to illustrate the principles presented.

Biomembranes provide an optimal environment for wound healing by preventing infection, helping to keep the wound hydrated, providing a stimulus to a dormant wound with cell products and basal structures for wound cellular migration. The goal is to get wounds to heal more quickly.

## CATEGORIES OF BIOMEMBRANES

The biomembranes used in wound care can be divided into 2 categories, live cell biomembranes and non-viable biomembranes. The live cell membranes have living components to them such as cells, which are viable and can colonize a wound bed and secrete growth factors to aid the wound healing process. These biomembranes will also have a layer that acts as a scaffold or a base layer for the tissue to build on. Although the risk is slight it is possible to have human cell disease transmission from these products. The storage of the living cell membranes is often more complex than the non-viable products and the shelf life is shorter. Generally the cost of the live cell biomembranes is greater than the non-living biomembranes. An example of a live cell biomembrane is Apligraph. Apligraph includes bovine collagen, allogenic keratinocytes, and fibroblasts.

Apligraph has a shelf life of 5 days and can be kept at room temperature.

The non-living biomembranes have components like collagen matrices and sometimes growth factors. The purpose of the membrane is to provide a base for the migration of skin cells and the appropriate signals from growth factors for skin healing. The tissue does not contain viable skin cells, which means that there is no chance of cell based human disease being transmitted. The shelf life of the product is going to be much longer and the application will usually be a simple process. There are several non-living biomembrane products available such as OASIS, Intergra, Graft Jacket, and Alloderm.

Oasis is made from an extracellular marix of porcine intestinal submucosa. This product includes collagen and growth factors. Oasis may be kept at room temperature and has a shelf life of 24 months. This product is also less expensive than the live cell biomembranes.

## THE ROLE OF BIOMEMBRANES IN THE WOUND CARE ALGORITHM

The use of biomembranes is not intended to be the first line of treatment for chronic wounds. Each product has FDA approved indications. In all instances certain conditions must be present for the sucsessful use of these products on chronic non-healing wounds.

The wounds need to be infection free and a suitable environment needs to be present for the wound to heal. The 4 areas that need to be addressed include: infection, blood supply, edema control, and reduction of pressure. If these are not addressed, wounds are less likely to heal even with biomembrane use.

A common example that the author sees in the wound center is the patient that has used biomembranes on plantar wounds that have not been off-loaded. Once the wound is off-loaded with changes in shoeware or crutch use, the wound will often heal well with the biomembane product.

## CASE PRESENTATION

The patient is a 79-year-old man with diabetes who originally developed a blister on his heel. An ulcer later developed and was treated by another physician with an incision and drainage. The patient started to soak the wound in warm water and would pour hydrogen peroxide in the wound afterwards. The patient was also on oral levafloxicin.

The patient also had active prostate cancer that was being treated with chemotherapy. Due to the recent wound and infection the treatment was stopped.

The patient was referred to the wound center for evaluation and treatment. (Figure 1) The first step in the treatment process was to determine what was preventing the wound from healing. The wound was recent and the patient did not have a previous history of ulcers before. The physical exam revealed good pedal pulses, moderate peripheral neuropathy and a necrotic wound on the heel that did not probe to bone. The wound was in the deep fascial layer and the tissue around the wound was not erythemetous. The wound did have callus tissue around the edge. The x-rays were negative for bone erosion. Since the chance of osteomyelitis was minimal, an MRI was not ordered. An initial debridement was done and cultures were taken. The wound bled easily and appeared much more viable afterwards.

At this point the wound appeared to have some level of infection so the patient was continued on his antibiotics. The pressure on the wound needed to be addressed so the patient was told to use a walker and wheel chair to maintain nonweight-bearing status.

The wound was to have a silvadene dressing applied twice a day and to be kept dry while the patient bathed. Since the patient had good circulation no treatment was needed in this area. The patient also had no edema and no compression was required.

The next visit was one week later. The culture grew out MRSA and the patient was teated with bactrim for 10 days. The wound was again debrided with a currete and the antibiotic dressings were continued. In 2 weeks the wound (Figure 2) had a healthy granular base and did not appear to be infected. The patient had been very compliant, but was anxious to get back on his chemotherapy to treat his prostate cancer.

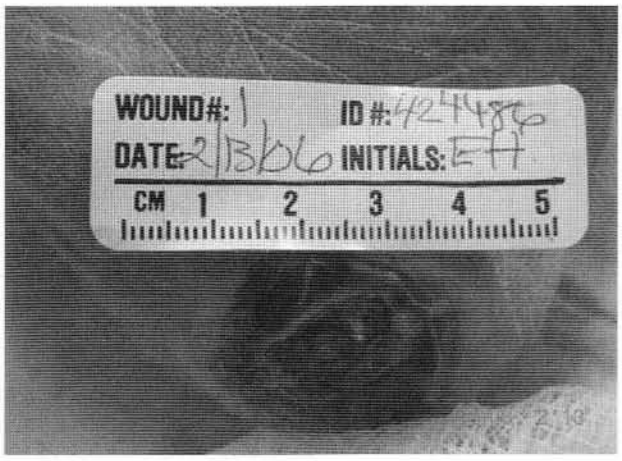


Figure 1. Initial presentation of the wound.

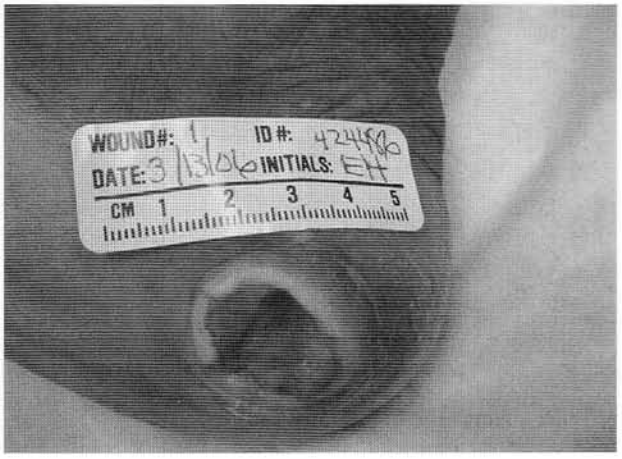


Figure 2. Wound after treatment with antibiotics and debridement.

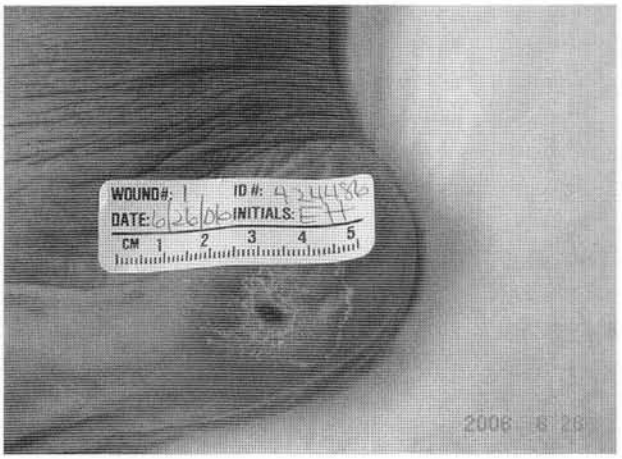


Figure 3. Healed wound.

The decision was made to start using OASIS to assist the healing process and speed it up.

One week later the wound was checked and debrided. Another application of OASIS was applied. The visits were now every 2 weeks and in about 4 months the patient was healed (Figure 3). The patient was now allowed to fully weight bear on his foot and after one more visit was released back to the care of his referring physician.

Biomembranes are a relatively new technology which as greatly improved the science of wound care. Over time the products have become more effective and easier to use.

Biomembranes can not over come obstacles such as infection, lack of blood supply, excessive edema or too much pressure, but when the physician eliminate these obstacles the biomembranes will often work to assist in the successful healing of a chronic wound.