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Research paper

Physico-mechanical properties of wound dressing material and its biomedical application

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ABSTRACT

A bioadhesive wound dressing material, based on gelatin, was prepared by solution casting, and its properties were evaluated. The tensile strength (TS) and percentage elongation at break (Eb) of the membranes were found to be 12.7 MPa and 40.4%, respectively. The buffer uptake and water uptake of the prepared membranes were found to be 298 and 312%, respectively, after 8 min. A scanning electron micrograph of the membrane revealed its uniform porosity, which is an essential criterion to be an ideal wound dressing. From microbial sensitivity analysis, it was found that the membrane had a significant resistance against infection. The wound-healing characteristics of the membrane were evaluated using a rat (*Rattus norvegicus*) model. Full-thickness wounds were created on the ventral side of the *Rattus norvegicus* and were dressed with the membrane; eco-plast was used as a control. The wound healing and bioadhesion were monitored at 3-day intervals by real-time imaging. The results revealed that the prepared membrane was more effective in healing the wound than conventional wound dressing.

1. Introduction

Wound healing is a dynamic process, and the performance requirements of the dressing can change as healing progresses. However, it is widely accepted that a warm, moist environment encourages rapid healing, and most modern wound care products are designed to provide these conditions (Winter, 1962; Barnett and Irving, 1991). Wound care often is labor intensive, requiring frequent attention by skilled professionals. Severe wounds (injury or burning) take millions of lives each year all around the world. Severe wounds damage the epithelium or even the endothelium of skin, which is the primary defense barrier of the body (Loke et al., 2000). People die due to severe infection and most likely due to dehydration (Hinrichs et al., 1992; Khil et al., 2003). Conventional wound dressing materials do not provide notable infection resistance. They also lack any water-retaining property to minimize the dehydration. But an ideal wound dressing material should control the wetness and humidity, provide bacterial resistance, and enhance the activities of the growth factors. It should have permeability for oxygen and carbon dioxide, and be able to absorb the wound exudate, and enhance the healing.

Biomaterials have taken part in the development of novel treatments over the last 30 years. The incorporation of natural materials such as gelatin, pectin, starch, cellulose, alginate, chitin, collagen, polyamino acids, hyaluronates, and dextran into synthetic wound dressings has been shown

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