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Infected Wound Healing Using Near-Infrared Responsive Hydrogels

Abstract:

One-third of the global mortality is related to bacterial infectious diseases, causing tremendous harm to human health. Skin plays a vital protective role in protecting the body from external harm, thus, it is of special importance to accelerate the treatment of damaged skin tissues especially bacterial infected ones. Benefiting from their favorable biocompatibility, distinctive physicochemical properties, and their ability to simulate the natural extracellular matrix, hydrogels are often used as excellent wound dressings. They have a three dimensional and porous structure and can absorb a large quantity of water, thus providing a moist environment to the wound environment. Due to wounds on the skin being often irregular in shape, conventional hydrogels cannot cover the wounds. Therefore, injectable counterparts have recently gained great attention because of their potential for filling an irregular wound.

Recently, photothermal therapy (PTT) has attracted great interest in the treatment of bacteria-accompanied wounds. Under near-infrared (NIR) light irradiation, a high local temperature (>50 °C) generated by the NIR-active wound dressing or nanosystem kills bacteria. This is mainly due to physical damage (thermal destruction) to bacteria and on demand drug release when an antimicrobial drug is used.

Here, we discuss recent advances on the development of novel photothermally active hydrogels in burn and infected wound healing. In addition, recent achievements at our research group on the design and fabrication of multifunctional hydrogels will be presented. To this aim, combination of PTT with gas delivery and chemodynamic therapy will be discussed in a wound healing process as well.

Biography

Aziz Maleki received his Ph.D. degree in organic chemistry from the Institute for Advanced Studies in Basic Sciences, Zanjan, Iran. He then worked as a postdoctoral fellow in Zanjan University of Medical Sciences (ZUMS). At present, he is currently an associate professor at department of pharmaceutical nanotechnology, ZUMS, Zanjan, Iran. His research interests focus on the fabrication and characterization of novel nanocomposites and hydrogels for catalytic nanomedicine, sonodynamic therapy, photothermal therapy, and tissue engineering applications.