New material improves wound healing, keeps bacteria from sticking

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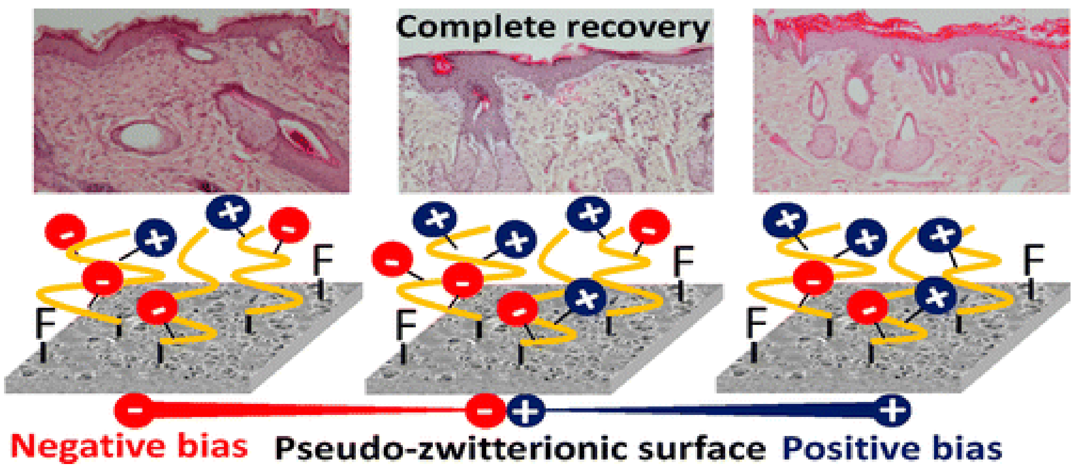

As many patients know, treating wounds has become far more sophisticated than sewing stitches and applying gauze, but dressings still have shortcomings. Now scientists are reporting the next step in the evolution of wound treatment with a material that leads to faster healing than existing commercial dressings and prevents potentially harmful bacteria from sticking. Their study appears in the journal *ACS Applied Materials & Interfaces*.

Yung Chang and colleagues note that the need for improved dressings is becoming urgent as the global population ages. With it, health care providers will see more patients with bed sores and associated chronic skin wounds. An ideal dressing would speed up healing in addition to protecting a wound from bacterial infection. But current options fall short in one way or another. Hydrogels provide a damp environment to promote healing, but they don't allow a wound to "breathe." Dry films with tiny pores allow air to move in and out, but blood cells and bacteria can stick to the films and threaten the healing process. To solve these problems all at once, Chang's team looked to new materials.

They took a porous dry film and attached a mix of structures called zwitterions, which have been used successfully to prevent bacteria stickiness in blood filtering and other applications. The resulting material was slick to cells and bacteria, and it kept a moist environment, allowed the wound to breathe and encouraged healing. When the scientists tested it on mice, their wounds healed completely within two weeks, which is faster than with commercial dressings.

More information: "Introducing Mixed-Charge Copolymers As Wound Dressing Biomaterials" *ACS Appl. Mater. Interfaces*, 2014, 6 (12), pp 9858–9870. DOI: 10.1021/am502382n

Abstract
Herein, a pseudozwitterionic structure bearing moieties with mixed positive and negative charges is introduced to develop a potential biomaterial for wound dressing applications. New mixed-charge matrices were prepared by copolymerization of the negatively charged 3-sulfopropyl methacrylate (SA) and positively charged [2-(methacryloyloxy)ethyl] trimethylammonium (TMA) onto expanded polytetrafluoroethylene (ePTFE) membranes. The charge balance was effectively regulated through the control of the initial SA/TMA ratio. The focus was then laid on the assessment of a variety of essential properties of efficient wound dressings including, hydration property, resistance to fibrinogen adsorption, hemocompatibility, as well as resistance to fibroblast attachment and bacteria colonization. It was

found that the pseudozwitterionic membranes, compared to those with charge bias in the poly(SA-co-TMA) structure, exhibited the best combination of major properties. Therefore, they were further tested for wound healing. Histological examination of mouse wound treated with the pseudozwitterionic membranes exhibited complete re-epithelialization and total formation of new connective tissues after 14 days, even leading to faster healing than using commercial dressing. Results presented in this work suggest that the mixed-charge copolymers with a perfect balance of positive and negative moieties represent the newest generation of biomaterials for wound dressings.

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