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Topic of the Speech:

Structural Design and Surface Functionalization of the Surgical Sutures for Promoting Tissue Healing

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Dr. Jifu Mao has been a distinguished research fellow in College of Textiles at Donghua University since 2019. He received his BS degree from Beijing University of Chemical Technology (BUCT) in 2009. After completing his MSc degree in Materials Science and Engineering from BUCT (2012) and Ph.D. degree in Experimental Medicine from the Department of Surgery at Université Laval, Canada (2017), he worked in the Research Center CHU of Quebec-Université Laval as a postdoctoral fellow from 2017 to 2019.

His current research involves electrically conducting polymeric bio-textiles, electro-mechanical bioreactors, and their biomedical applications. His research has been focusing on design and preparation of flexible conductive polymers/fabrics to electrically stimulate cells or tissues for improved tissue regeneration or functional remodeling.

He has published more than 30 peer-reviewed papers in the journals such as ACS Nano, Materials & Design, Journal of Material Chemistry B, applied for 7 patents and contributed two book chapters.

ABSTRACT SUBMISSION
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Structural Design and Surface Functionalization of the Surgical Sutures for Promoting Tissue Healing

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ABSTRACT (NO MORE THAN 500 WORDS:)

Surgical suture is an ancient medical device applied in almost all surgeries. The existing sutures can provide sufficient mechanical support for tissue repair. However, their positive roles in tissue healing and regeneration are minimal. The traditional solid structure of the sutures hinders tissue integration and exhibits severe cutting actions on the tissues, leading to high re-tear rates after surgeries. Besides, the surface of the sutures is inert, lacking the ability to respond to physiological signals and regulate tissue regeneration. Additionally, the suture as a foreign body implanted into the body often causes inflammation and infection. Herein, to address the issues mentioned above, the structural optimization and surface functionalization of the sutures were conducted. Inspired by the hollow structure of bamboo, we reported a simple strategy to fabricate the tape suture with hollow and porous structure *via* triaxial braiding combined with melting technology. The suture was then modified by a universal approach that was decorating the surface with chitosan/gelatin-tannic acid (CS/GE-TA) and polypyrrole (PPy). The mass and cutting behavior of the bamboo-inspired tape suture decreased by 36% and 61%, respectively, compared to the commercial USP No.2 PET suture. Besides, the unique porous and hollow structure ensured sufficient space for tissue integration. After CS/GE-TA surface decoration, the suture presented a better stress distribution along the axial direction of the suture due to the adhesive behavior of CS/GE-TA with the tissue, indicating a significantly decreased re-tear rate. Meanwhile, the introduction of TA endowed the suture with superior anti-inflammatory and antibacterial performances without any drug resistance. Furthermore, after *in situ* polymerization of PPy by taking the CS/GE-TA as the skeleton, the suture displayed a stable electrical signal response. The *in vivo* experiments demonstrated that the electroactive suture could significantly promote cell behaviors and tissue regeneration. These studies may provide new insights into the structure optimization and surface modification of the sutures to obtain the enhanced therapeutic effect of tissue healing and regeneration.