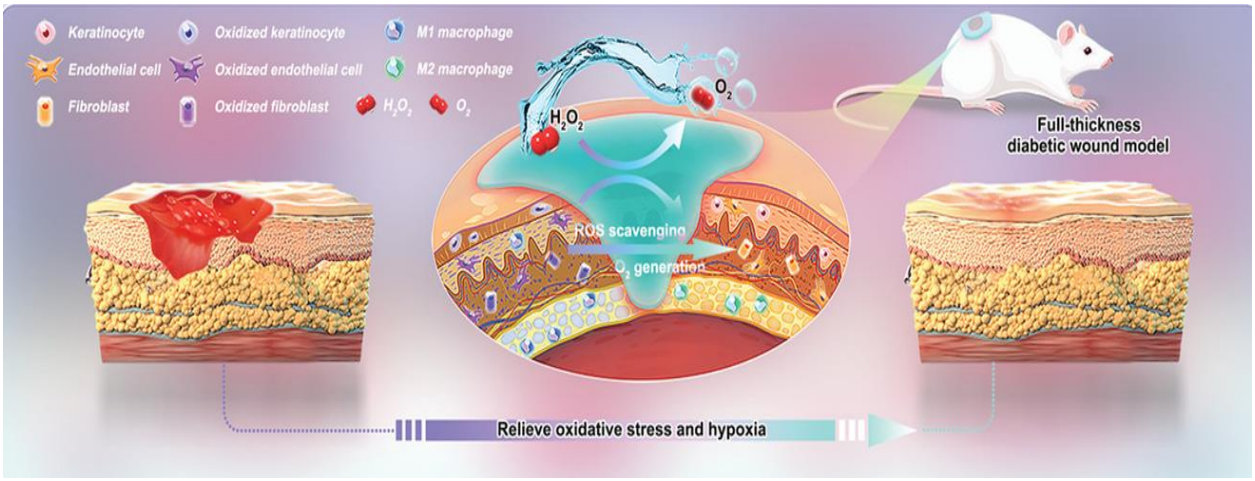
Hydrogel-based scavengers of ROS and oxygen generators for mitigating inflammation

The development of certain diseases such as atherosclerosis, myocardial infarction, cancer, and chronic inflammation has been linked to high levels of ROS (reactive oxygen species). Therefore, it is crucial to create materials that can reduce the harmful effects of excessive ROS generation locally. However, hypoxia (a condition of low oxygen levels) can worsen inflammation by causing abnormal ROS production.To address this issue, the proposed solution is to develop modified methacrylate silk fibroin hydrogels (SiMA) that contain calcium peroxide-encapsulated fluorinated hyaluronic acid (HA) particles. The objective is to alleviate hypoxia and scavenge ROSs. To achieve this goal, several steps must be taken: A) Conjugate perfluorocarbon groups onto HA, B) Encapsulate calcium peroxide into fluorinated HA particles, C) Modify silk fibroin with methacrylate groups and catalase, D) Incorporate the synthesized particles into modified SiMA gels, E) Evaluate the physical and chemical properties of the developed hydrogels. This research aims to create a hydrogel that can reduce the harmful effects of excessive ROS generation locally and alleviate hypoxia, which could be beneficial in treating diseases linked to high levels of ROS.



Schematic illustration of ROS scavenging and oxygen-generating hydrogel effects in biomedical applications. Copy right with permission from [1].

Related literature:

[1] Z. Li, Y. Zhao, H. Huang, C. Zhang, H. Liu, Z. Wang, M. Yi, N. Xie, Y. Shen, X. Ren, A Nanozyme-Immobilized Hydrogel with Endogenous ROS-Scavenging and Oxygen Generation Abilities for Significantly Promoting Oxidative Diabetic Wound Healing, Advanced Healthcare Materials 11(22) (2022) 2201524.

[2] J. Ding, Y. Yao, J. Li, Y. Duan, J.R. Nakkala, X. Feng, W. Cao, Y. Wang, L. Hong, L. Shen, A reactive oxygen species scavenging and O2 generating injectable hydrogel for myocardial infarction treatment in vivo, Small 16(48) (2020) 2005038.

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