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Advanced Hydrogels in Regenerative Medicine

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日時: 2025年7月4日(金) 15:00~16:30

場所: 22号館 1階 第2会議室

講演概要

Injectable hydrogels are extensively used in tissue engineering and regenerative medicine. In our laboratory, we developed a biomimetic injectable *in-situ* hydrogel using oxidized alginate-gelatin, whitlockite nanoparticles with simvastatin. The *in-situ* hydrogels was formed within 60-80 seconds. The developed hydrogel with whitlockite nanoparticles and simvastatin showed enhanced bone regeneration in the mice cranial bone defects. This gel has potential application for regenerating irregular bone defects. We also developed *in-situ* bioadhesive, hemostatic, and antibacterial hydrogel using chitin-fibrin with tigecycline nanoparticles to control bleeding and bacterial infections at the Mediastinum. This developed *in-situ* bioadhesive gel is formed within 30 seconds and exhibits excellent tissue adhesive properties and antibacterial activity against *Staphylococcus aureus*, methicillin-resistant *Staphylococcus aureus*, *Escherichia coli*, and their clinical isolates. The hemostatic potential of the developed hydrogel was also evaluated in deep injuries created in the liver and femoral artery of Sprague-Dawley rats. The developed gel exhibited rapid blood clotting potential by achieving hemostasis within 154 and 84 seconds under femoral artery (pressured) and liver (oozing) bleeding conditions, respectively. This developed bioadhesive, hemostatic, and antibacterial hydrogel well adheres at the surgical site for controlling bleeding and preventing bacterial infection after cardiac surgery.

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