# Early diagnosis of osteoarthritis using cathepsin B sensitive near-infrared fluorescent probes

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## 摘要

## Abstract

OBJECTIVE: Osteoarthritis is currently diagnosed utilizing X-ray and MRI-techniques, both of which are based on the morphological changes of tissue. However, once changes are detected, the tissue has an irreversible defect. This study investigates early diagnosis of OA on a molecular basis using a recently developed cathepsin B sensitive near-infrared (NIR) fluorescent probe. METHOD: Twelve male nude mice were induced osteoarthritis by intra-articular injection of collagenase (1.0%, w/v) into the right knee joint. The left knee joint served as the negative control. The cathepsin B NIR probe is activated by arthritis-associated cathepsin B, thus resulting in the emission of an intensive NIR fluorescence signal which can be detected in vivo. NIR fluorescence signals were acquired on an optical imaging system using an excitation wavelength of 610-650 nm and an emission wavelength of 680-720 nm. RESULTS: Mild to moderate degenerative cartilage was observed 1 month after collagenase injection. NIR fluorescence imaging of mice showed approximately a 3-fold difference in signal intensity between osteoarthritic and normal joints 24 h after intravenous injection of the reporter probe. Immunohistochemical evaluation also revealed cathepsin B expression in the arthritic lesion of femorotibial joints, and not in the control contra-lateral knee joints. CONCLUSION: As the cathepsin B activatable NIR fluorescent imaging showed a significant difference between the osteoarthritic and normal joints, the cathepsin B activatable NIR fluorescent probe thus offers a potential new imaging technology for early OA diagnosis.