Fluorescent probes for the detection of bacteria in body fluids

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Résumé

Rapid diagnosis of bacterial infections is a major challenge in the fight against antimicrobial resistance, particularly to enable targeted antibiotic administration and to avoid antibiotic overuse. Current diagnostic methods are slow as they rely on bacterial culture (1), leading to the widespread use of broad-spectrum antibiotics, which promotes resistance development and increases patient mortality. To address this critical challenge, we are developing an innovative strategy for bacterial detection in body fluids based on enzyme-activatable "turn-on" fluorescent probes. These probes consist of two Nile Red fluorophores linked by a peptide substrate specific to an exoenzyme from Staphylococcus species. In aqueous environments, the fluorescence of the probes is quenched due to the formation of non-fluorescent H-aggregates (2). Upon enzymatic cleavage, the fluorophores are separated, leading to the fluorescence "turn on". The validation of the concept was performed with a probe cleavable by trypsin, followed by the synthesis of four probes targeting glutamyl endopeptidase V8, a Staphylococcus-specific enzyme. The fluorogenic properties of the probes were assessed in various solvents and biological media, including bovine serum. Although promising fluorescence properties were observed, enzymatic and bacterial assays require further optimization. This approach may ultimately enable faster and more specific diagnosis, helping to limit the misuse of antibiotics and contributing to the fight against bacterial resistance.

Bibliography:

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