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Bioluminescent assay for rapid and sensitive screening of bacterial beta-lactamase activity

Researchers at Stanford University have developed a rapid and sensitive bioluminescent assay for screening bacterial infections using enzyme-produced photo emission for detection of beta lactamase activity. ß-lactam antibiotics are the most successful class of antibiotics, however there is growing resistance due to in part by inappropriate antibiotic treatment regimens that encompass a broad spectrum of antibiotics. Bacteria containing ß -lactamase enzymes such as extended-spectrum ß -lactamases (ESBLs), AmpC-type ß -lactamases (ACBLs) and carbapenemases (CARBs) hydrolyze ß -lactam antibiotics rendering them ineffective. Rapid and accurate detection of ß -lactamase activity would allow for targeted treatment of bacterial infection. Current detection methods take 2-3 days to generate results in clinical laboratories and genotypic testing while rapid, tend to generate false-positive results. These limitations are addressed in a reliable and fast bioluminescent ß-lactamase detection assay invented by researchers at Stanford University. They have improved upon their first-generation bioluminescent probe (BLUCO) for detecting ß-lactamase activity in Gram-negative bacteria. Their bioluminescence detection assay uses enzyme-produced photon emission which confers the advantage of low background and a rapid assay time of 15 minutes. This technology could be implemented into an in vitro diagnostic test for rapid assaying of ß -lactamase activity in patient samples for guided treatment of infectious diseases.

Applications

- In vitro diagnostic agent for assaying beta-lactamase activity in patient samples to guide antibiotic treatment

Advantages

- 15-minute ß -lactamase detection assay
- Sensitive, low background detection of ß -lactamase activity

Patents

- Published Application: WO2022245975
- Published Application: 20240229098

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