Nanoparticle-Mediated Methods for Antimicrobial Susceptibility Testing of Bacteria

Advantages
- Ability to ascertain an antimicrobial's effectiveness against a pathogen within 24 hours
- Can be utilized for bacterial pathogens and higher eukaryotic cells
- Is a simplified process which can be utilized by those not experts in the art
- Only small volumes of samples are required to detect changes in growth

Invention
A novel method of utilizing nanosensors to measure antimicrobial susceptibility of a microbe to current or potential antibiotics

Background
The identification and administration of an effective antimicrobial agent (antibiotic) is of the utmost importance in both the clinical and research settings. With the emergence of multi-drug resistant bacterial strains, such as MRSA, identifying the most effective antibiotic and administering it to the patient in a timely manner is paramount. Current technology requires at least 48 to 72 hours in order to assess a compound's ability to inhibit the growth of a pathogen. During this time period the patient's condition will continue to worsen, and the physician will often be forced to guess upon the appropriate antibiotic treatment; a practice which leads to the very resistant bacteria strains they are trying to combat. Additionally, the pharmaceutical industry is pressured to create novel fast and sensitive antimicrobial susceptibility assays for testing and discovery of new antibiotics. Novel assays should facilitate high-throughput screening of potential candidates while only requiring small sample volumes in order to reduce the cost associated with these research and development processes.

Rather than monitoring the cells doubling time (how quickly “one” cell becomes “two”) like traditional antimicrobial susceptibility assays, University of Central Florida researchers have chosen to measure a nutrient utilized by the bacteria in its surrounding media. The idea being that when that nutrient is actively utilized by healthy growing bacteria said nutrient’s concentration will be reduced. When the cell’s growth is inhibited by a compound, the nutrient’s consumption will slow. The presence of the nutrient is all the while measured by a highly keen nanosensor, leading to an assay able to determine the most effective compound to combat the pathogen within less than 24 hours.

Application
The technology can be utilized in both the clinical and research settings as a quick and reliable method of testing an antibiotic’s effectiveness against a wide range of pathogens. The nanosensor and its reagents could be designed into a kit for distribution to clinical laboratory departments in hospitals or into a novel high-throughput screening processes for pharmaceutical R&D facilities.

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Selected References