Genetic Test for Antimicrobial Resistance

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Scientists have put together a sensitive method to determine if bacteria carry a gene that can cause resistance to two common antibiotics. The test is rapid and has been tested against the bacterium which causes ‘strep throat’ and other respiratory illnesses.

The new development comes the American University, and it takes the form of a rapid genetic test to differentiate which bacteria carry gene that causes resistance to two common antibiotics.

The research demonstrates that the new method functions as accurately as culture-based methods; however, unlike conventional methods, the result is delivered within a few minutes compared to the several days required with moist standard methods.

Antimicrobial resistance

Antimicrobial resistance is a phenomenon the occurs naturally as bacteria respond to various pressures within the environment. What is of concern is the worldwide acceleration of resistance. U.S. Centres for Disease Control and Prevention (CDC) data finds that many high-income countries are entering a “post antibiotic era.”

One reason for the accelerated pace of resistance is down to the use and misuse of antimicrobial drugs, such as over-prescribing or the high levels that are used in agriculture. Antimicrobial resistance often occurs due to gene transfer, meaning that some organisms of a population are resistant to a certain antimicrobial, whereas others are not. This can be a spontaneous or induced mutation.

New test

The new rapid method is designed to show whether or not a patient is carrying bacteria with the Macrolide efflux gene A - mef(A), which causes resistance to two common antibiotics: erythromycin and azithromycin. There is growing resistance to both of these antibiotics in the community. Active efflux

refers to the mechanism responsible for moving compounds such as antibiotics, out of bacterial cells. This a process is considered by considered microbiologists to be a vital part of xenobiotic metabolism, and hence something that can contribute to bacterial antibiotic resistance.

Of the two antibiotics, azithromycin is used to commonly used to treat infections causes by species of *Streptococcus*, which cause ‘strep throat’. Azithromycin has relatively broad but shallow antibacterial activity. It inhibits some Gram-positive bacteria, some Gram-negative bacteria, and many atypical bacteria.

Erythromycin is used for the treatment of a number of bacterial infections, such as respiratory tract infections and skin infections. The drug can be given intravenously and by mouth. It is derived from the bacterium *Saccharopolyspora erythraea*.

The new assay is a type of Recombinase Polymerase Amplification (RPA), which uses recombinase-primer complexes to identify and denature the genomic segment of interest, along with single-stranded DNA-binding proteins to stabilize the open DNA. RPA is a single tube, isothermal alternative to the polymerase chain reaction. The RPA process utuilizes three core enzymes. These are: a recombinase, a single-stranded DNA-binding protein (SSB) and strand-displacing polymerase.

Commenting on the new assay, lead researcher John R. Bracht explains: “The test is able to detect the gene within 10 minutes of assay run-time. Standard antibiotic testing requires at least an overnight culture and often isn't performed in routine diagnostic work.”

He adds that instead “physicians guess which antibiotic to prescribe based on past experience and recommendations, and patients have to return if the treatment fails. We simplified the process of detecting antimicrobial resistance so a physician can determine whether or not a patient will be resistant to a prescribed drug while that patient is still in the waiting room. We think this is a game-changer for treating common illnesses."

The advantage of the new test is to help medics better assign medication on site, and to put in place improved point-of-care diagnostics.

Research paper

The research has been published in the journal BMC Infectious Diseases. The research paper is titled “Rapid molecular detection of macrolide resistance.”