New method for quickly determining antibiotic resistance

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Scientists from Uppsala University, the Science for Life Laboratory (SciLifeLab) in Stockholm and Uppsala University Hospital have developed a new method of rapidly identifying which bacteria are causing an infection and determining whether they are resistant or sensitive to antibiotics. The findings are now being published in the *Journal of Clinical Microbiology*.

'Clinical use of the method would mean that the right antibiotic treatment could be started straightaway, reducing unnecessary use of antibiotics,' says Professor Dan I. Andersson of Uppsala University, who headed the study jointly with Professor Mats Nilsson of SciLifeLab in Stockholm and Stockholm University.

Antibiotic resistance is a growing medical problem that threatens human health all over the world. Today, many people are dying because of infections caused by resistant bacteria. When an infected person is treated with antibiotics, 'empirical therapy' is usually provided. This means that the choice of antibiotic is based on the resistance situation of the bacteria in a large population (such as the Swedish population), rather than on the resistance, if any, of the bacteria in the infected person's body. The result is sometimes selection of an antibiotic drug that is ineffective against the bacteria concerned, because the latter is resistant to the drug chosen. This, in turn, boosts the use of antibiotics, especially what are known as 'broad-spectrum' antibiotics that work on many types of bacteria. One possible solution to these problems would be for us to have reliable methods of quickly and easily identifying the

bacterial species causing the infection and its resistance pattern, and apply the correct treatment immediately.

Professor Andersson continues: 'This is just what we've been working on in our stud. We have developed a new method that permits identification of both the species and the resistance pattern of bacteria in urinary infections in less than four hours. By comparison, the resistance determination done at present takes one to two days.'

The method is based on highly sensitive, bacterium-specific measurement of bacterial growth in the absence and presence of various antibiotics. If the bacterium is resistant, it can multiply with antibiotic present; this is detected as a rise in the number of copies of a specific DNA sequence. If it is sensitive, on the other hand, no growth takes place. The researchers showed that the method could identify correctly both the bacteria and their resistance patterns in all the clinical samples analysed.

Anja Mezger, the principal author, says that the method is highly specific and sensitive, and can be automated for use in a clinical laboratory. What is more, it is entirely general in application and could, in principle, be used for all types of bacteria and antibiotics.

An instrument based on the method is currently being developed at Q-linea, a company in Uppsala of which Mats Nilsson was a co-founder. This instrument focuses on blood infections. Such infections are life-threatening and it is extremely important for effective treatment that the patient should start taking the correct antibiotic without delay. The company expects to launch a working instrument on the market in 2017.

'We hope that the method can be used in the future at hospitals and health centres, so that the right treatment is given promptly, and also so that the use of antibiotics is reduced,' says Dan Andersson.

More information: "A General Method to Rapidly Determine Antibiotic Susceptibility and Species in Bacterial Infections," Anja Mezger, Erik Gullberg, Jenny Göransson, Anna Zorzet, David Herthnek, Eva Tano, Mats Nilsson and Dan I. Andersson, *J. Clin. Microbiol.* published ahead of print 19 November 2014, doi:10.1128/JCM.02434-14.

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