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ANTIMICROBIAL RESISTANCE 2019

Why clinical laboratory testing is key to fighting antibiotic resistance



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Clinical laboratory experts are using innovative new tests to provide doctors with the insights they need to curb unnecessary antibiotic use.

If I asked you what the solution is to the antibiotic resistance crisis, the first thing you might think of is creating new drugs that kill resistant microbes. What you might not realise, though, is that new clinical laboratory tests for infectious diseases are equally important. These tests – and the scientists who develop and perform them – are crucial to preventing antibiotic misuse, which is one of the major drivers of this global health threat.

Overuse of antibiotics – often with patient wellbeing at heart

Antibiotics are indispensable for treating bacterial infections like strep throat or pneumonia, but they don't work – and shouldn't be used – for viral illnesses such as the common cold or flu. In the past, however, traditional culture-based tests could take several days to determine whether a patient had a bacterial infection and which antibiotic would treat it effectively. Doctors couldn't postpone treatment for this long, especially in cases where a delay was potentially life threatening. So instead, they would often prescribe antibiotics automatically while waiting for test results to come in. This practice had patients' best interests at heart, but unfortunately contributed to rampant antibiotic overuse, which, in turn, has fueled the spread of resistance to these drugs.



Improved testing to reduce default prescribing

To help solve this problem, the scientists who work in clinical laboratories have developed new tests that greatly reduce the time it takes to diagnose infectious diseases. For simpler cases, such as when a patient has a respiratory infection, clinical laboratory experts have created tests that identify bacteria and viruses through their genetic material, and that return results in hours or even in minutes.

For more complex cases, such as surgical infections, clinical laboratory experts have also modified mass spectrometry (a powerful molecular analysis technique originally designed for research) to create tests that rapidly identify up to nearly 200 different microorganisms at a time.



Most of these new tests are less than a decade old, but thanks to their accuracy and speedy turnaround times, they are already essential tools in the battle against antibiotic resistance. Using these tests, clinical laboratory experts can now promptly provide the information that healthcare teams need in order to decide whether antibiotics are the right treatment for a patient. This will help limit unnecessary antibiotic use, while ensuring that antibiotics continue to work for the patients whose lives depend on them.



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Tuomas Tenkanen

CEO, Mobidiag

Antibiotic resistant bacteria are one of the major threats to the global healthcare system. Some have commented that it is a more immediate threat to us than global warming.

A UK independent review estimated that, unless effective action is taken, drug-resistant strains of certain bacterial infections will claim 10 million lives each year by 2050. This would be a horrific and tragic loss of life. The unchecked spread of infectious diseases was also predicted to result in an economic cost of 100 trillion USD over the next 35 years⁽¹⁾.

“The threat of antimicrobial resistance (AMR) and infectious diseases is rising. We will need all branches of the global healthcare system to take responsibility for their approach to antibiotics and work together to sustain them for future use – this includes clinicians, providers, companies and patients alike,” says Tuomas Tenkanen, CEO of Mobidiag.

“Even before treating conditions related to AMR, it is fundamental that we become smarter at identifying antibiotic resistant bacteria – and their sensitivity to antibiotics – using molecular diagnostics. Many molecular diagnostic systems available today can be complicated and expensive to use,” he continues.

Highly versatile platforms enabling broad application of molecular diagnostics

At Mobidiag our mission is to develop and infectious diseases by providing diagnostic tools that can rapidly, accurately and affordably detect both pathogens and antibiotic resistances to guide treatment protocols and avoid the misuse of antibiotics.



To address this challenge, we have developed two highly versatile, combined solutions, for affordable and differentiated AMR testing. The first is an advanced, cartridge-based multiplex PCR system providing highly sensitive results on demand; and the second a higher throughput diagnostic platform allowing for automated, mid to high-volume lab-based routine testing. Together, these platforms meet the differing needs of customers in multiple healthcare settings.

Unlocking the potential of molecular diagnostics to address the global challenge of antimicrobial resistance



Beta-lactams are by far the most used antibiotics worldwide and include carbapenems which are the most effective against Gram-positive and Gram-negative bacteria. However, during the last decade, Gram-negative bacilli (in particular *Enterobacteriaceae*) with a decreased susceptibility to carbapenems have been increasingly reported worldwide.



There is also a growing resistance to 'last resort' antibiotics such as vancomycin and colistin. With the aforementioned developments, our tests offer unique solutions to detect main CPO⁽²⁾, colistin and vancomycin resistance markers.

In 2017, the World Health Organization designated clarithromycin-resistant *Helicobacter pylori* a high priority for antibiotic research and development. Mobidiag offers a non-invasive qualitative multiplex real-time PCR test for identifying both *H. pylori* and its clarithromycin resistance directly from stool and gastric biopsies.

Finally, sepsis is a global healthcare issue and continues to be the leading cause of death from infection. AMR can jeopardise clinical management of sepsis because empirical antibiotic treatment is often required. "We are working to develop a revolutionary assay for quick detection of sepsis directly from blood", Tenkanen confirms.

⁽¹⁾Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations, The Review on Antimicrobial Resistance Chaired by Jim O'Neill, December 2014⁽²⁾CPO: Carbapenemase producing organisms including the family of *Enterobacteriaceae*, *Acinetobacters* and *Pseudomonas*.



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