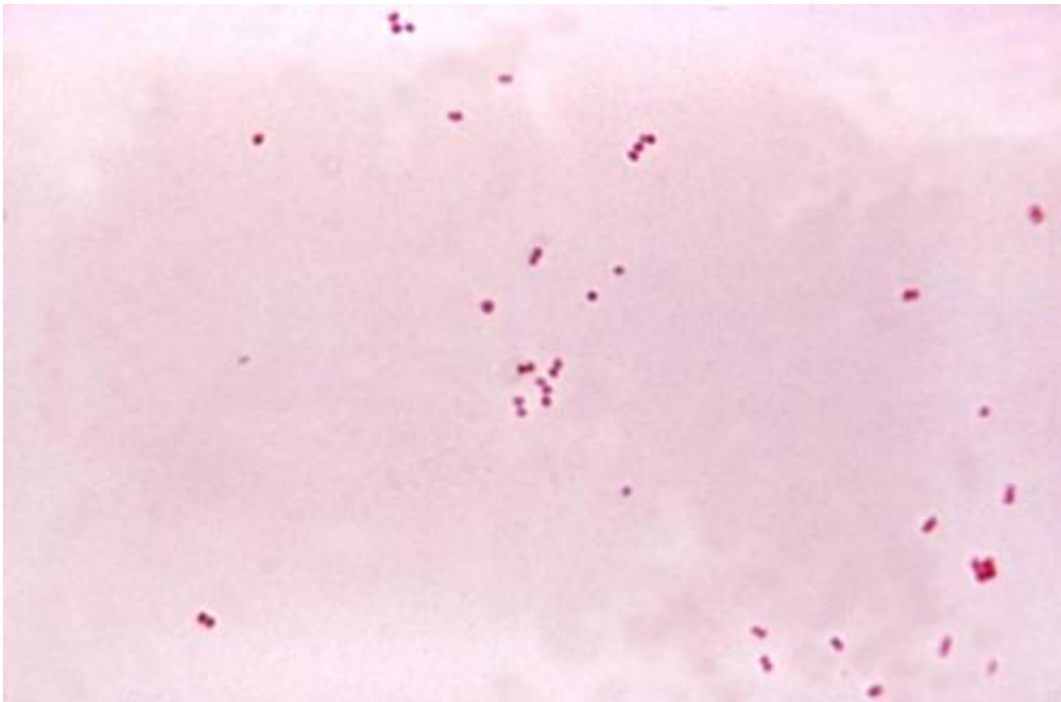


Potential new test to detect serious bacterial infections including meningitis and sepsis

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Gram stain of meningococci from a culture showing Gram negative (pink) bacteria, often in pairs. Credit: public domain

Scientists have identified two genes that are switched on only when a child is suffering from a bacterial infection. This could allow doctors to quickly distinguish between a viral or bacterial illness, and identify early cases of potentially deadly infections.

The international team of scientists, led by researchers at Imperial

College London, hope to now use the findings to develop a [rapid test](#) for use in hospitals and doctors' surgeries.

This would enable conditions such as meningitis, septicaemia or pneumonia - which are caused by bacterial infections - to be caught more rapidly. Such a test would also prevent children with viral infections being unnecessarily prescribed antibiotics, which are only effective against bacteria. This would help combat the growing threat of antibiotic resistance.

At the moment, when a child arrives at a surgery or hospital with fever, doctors have no quick method of distinguishing whether the child is suffering from bacterial or viral illness. Diagnosis relies instead on taking a sample of blood or spinal fluid, and seeing if bacteria grow in this sample. However this can take more than 48 hours.

Differentiating between viruses and bacteria is crucially important. Although [viral infections](#) are much more common than bacterial infections, the latter are far more dangerous, and lead to a deadly conditions such as meningitis, septicaemia and pneumonia.

Professor Michael Levin, from Department of Medicine at Imperial College London, who led the study explained: "Fever is one of the most common reasons children are brought to medical care. However every year many children are sent away from emergency departments or doctors' surgeries because the medical team thinks they have a viral infection, when in fact they are suffering from life-threatening bacterial infections - which are often only diagnosed too late. Conversely, many other children are admitted to hospital and receive antibiotics because the medical team are unable to immediately exclude the possibility of a bacterial infection - but in fact they are suffering from a virus."

Professor Levin, from the section for paediatric infectious diseases at

Imperial added: "Although this research is at an early stage, the results show bacterial infection can be distinguished from other causes of fever, such as a viral infection, using the pattern of genes that are switched on or off in response to the infection. The challenge is now to transform our findings into a diagnostic test that can be used in hospital emergency departments or GP surgeries, to identify those children who need antibiotics."

In the study, published in the *Journal of the American Medical Association (JAMA)*, the scientists studied 240 children with an average age of 19 months, who arrived at hospitals with fever across the UK, Spain, the Netherlands and the USA. Once the children were diagnosed with a viral or bacterial infection using traditional methods, the team studied the genes that had been switched on in the children's white blood cells. Using a method known as RNA micro arrays, which measure changes in 48,000 genes simultaneously using only a small drop of each child's blood, the team found two genes are switched on in bacterial infections. Further tests showed these genes, called IFI44L and FAM89A, predicted a bacterial infection with 95-100 per cent accuracy.

Dr Jethro Herberg, senior lecturer in paediatric infectious diseases at Imperial, and co-author of the research added: "We are facing a growing threat from antibiotic resistant bacteria. A large proportion of antibiotic use is driven by our inability to reliably identify the small number of children with bacterial infection from the much larger number with viral infection, who do not need antibiotics. Fear of missing life-threatening infections like meningitis and septicaemia result in doctors often prescribing antibiotics and undertaking investigations such as lumbar punctures just to be safe. A rapid test based on the two genes we have identified could transform paediatric practice, and allow us to use antibiotics only on those children who actually have a [bacterial infection](#)."

Vinny Smith, Chief Executive of Meningitis Research Foundation added: "We are proud to have supported the research underpinning this study over a number of years, and we are grateful to our family members who took part. This latest development is very exciting. Bacterial meningitis and septicaemia can kill in hours, and can leave survivors with life-changing after effects. Giving health professionals the tools to rapidly determine whether an infection is bacterial or viral will enable faster detection and treatment of meningitis and septicaemia."

The research team are now working on further studies to confirm the findings in larger numbers of [children](#).

Provided by Imperial College London

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