Medical Xpress

# New scientific method unmasks chronic infections

August 8 2012

Chronic infections are a large and growing problem throughout the developed world, and intensive research is being conducted in ways to combat the recalcitrant bacteria. When bacteria aggregate into so-called biofilm, they become resistant to antibiotics. Until now scientists have only been able to speculate about what happens when bacteria overpower the immune system during a chronic infection.

In close collaboration between various specialist fields, Danish scientists have now developed a method that gives a precise picture of how the immune system works. Using 5 mm silicone tubes, scientists created a model system that allows them to look closely at how the immune system and bacteria interact in isolation:

"Although we have always suspected that to cause a chronic infection, bacteria knock out the immune system's white blood cells, the new method allows us to see precisely what happens. Instead of looking down on the bacterial surface, we can examine a section to see the interaction directly and follow how the bacteria react to white blood cells and to antibiotics. That enables us to understand the basic processes behind chronic infections," explains Associate Professor Thomas Bjarnsholt, University of Copenhagen.

PhD student Maria Alhede adds: "The new method allows us to investigate which compounds the bacteria are secreting while overpowering the white blood cells. Conversely, we can also see what happens when the immune system works. The white blood cells make

DNA traps that capture the bacteria, but that used to be only a guess," relates Maria Alhede, Department for International Health, Immunology and Microbiology.

## Scientists follow the effect of drugs in the organism

The Core Facility for Integrated Microscopy at the Department of Biomedical Sciences has some of Europe's most sophisticated microscopes for conducting health research. By combining light microscopy and electron microscopy, scientists can show visually exactly what happens in the body when biofilm bacteria meet the immune system or are treated with antibiotics. The method also makes it possible to investigate what processes are activated when scientists test new medicine. Many different types of patients will benefit from the discoveries.

"Chronic infections most often arise when we introduce foreign objects into the body, such as catheters and implants like artificial hips and knees. But chronic bacterial infections also plague many children with middle-ear infections, as well as diabetics, who run a great risk of developing chronic sores on legs and feet. For patients with cystic fibrosis, the chronic pneumonia caused by the aggressive Pseudomonas bacteria is directly life-threatening. Now we have the opportunity to see the exact mechanism of a drug," explains Professor Niels Højby from Rigshospitalet.

Scientists hope that many people will eventually benefit from the method and that it can contribute knowledge to other areas, such as immunology, because the results were achieved in the interface between various research areas:

"We asked the right questions of the right experiments many times and over a long period. Success is due to collaboration across the lines of

research groups and our exploitation of the finely meshed network of expertise," explains Associate Professor Thomas Bjarnsholt.

**More information:** iai.asm.org/content/80/8/2601.full.pdf+html

Provided by University of Copenhagen