

Breakthrough could help combat superbugs

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(PhysOrg.com) -- Scientists have worked out a key mechanism that protects bacteria against stress in a major discovery that could lead to new ways of killing superbugs like *C. difficile* and MRSA.

In a paper published today in the premier journal *Science*, the researchers describe for the first time the mechanism of a bacterial pressure-release valve or channel - which helps safeguard bacteria.

The findings of the two teams from the University of Aberdeen, led by Professor Ian Booth, and the University of St Andrews, led by Professor James Naismith, could pave the way for new chemicals to combat potentially deadly bugs by acting on these channels.

All bacteria have tiny channels in their walls which operate like the valve on a pressure cooker – they open to release material when the pressure in a bacterial cell gets too great. If the channel didn't open to relieve pressure the bacteria would explode and die.

The work is the culmination of molecular studies at Aberdeen combined with structural studies at St Andrews. The two groups have been working together for several years and this type of partnership is encouraged by the SULSA initiative of the Scottish Funding Council.

Professor Booth said: "Channels in bacteria perform absolutely key roles in cell survival. We have been able to show how this channel opens and closes. Understanding how they work will play a major role in inhibiting the survival of bacteria and could have applications as basic as cleansing

hospital equipment and wards or helping to make food safer. These channels are found in MRSA and *C. difficile* and this knowledge has not yet been exploited. The future path is to find new chemicals and processes that exploit the importance of the channels to these bacteria."

Professor Naismith said: "The system is mechanical; the channel senses the pressure inside the bacteria. As a result the channel alters its shape and creates an opening, releasing the pressure. The motion is just like that of a camera iris and being able to see this motion is an amazing discovery.

"Not only is this a major step forward in scientific understanding of a fundamental process in biology but it paves the way for the development of new drugs against bacteria. It is vital to the bacteria that the channel fully closes and only opens at the right times as mistakes either way would be fatal.

"New chemicals designed to force channels to stay open or shut, are likely to kill or at the very least, greatly slow down the growth of bacteria. Slowing down the growth gives the body's natural defences time to tackle its bacterial invader."

Professor Booth added: "This was a very demanding project and is down to tremendous team work in both universities. In particular, Dr Wenjiang Wang, Dr Michelle Edwards and Dr Susan Black performed the crucial experiments."

Videos: Animations demonstrate the channel opening and shutting:

speedy.st-and.ac.uk/~naismith/orth.mov

speedy.st-and.ac.uk/~naismith/surf.mov

speedy.st-and.ac.uk/~naismith/perp.mov

Provided by University of Aberdeen

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