

# Scientists explore new window on the origins of life

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(PhysOrg.com) -- The remarkable behaviour of bacteria that have been forced to live without their protective wall has allowed Newcastle University scientists to open a new window on the origins of life on earth.

All living cells on the planet go through the process of division in order to survive and thrive. Cell division, or binary fission, allows one cell to split down the middle to become two cells.

In the work published in *Nature*, Newcastle University scientists have found that under some conditions, including treatment with antibiotics, common bacteria switch to a whole new way of increasing in number that may have been used by the first cells to evolve on the planet.

Bacteria have been around for more than two billion years and now occupy every corner of the environment. The secret of their success seems to be their tough outer skin or cell wall. This protective barrier can also be a weakness and is the target for many of our best antibiotics, including penicillin.

The Newcastle University scientists have found out how to induce a bacterium to live without a wall. These fragile cells called L-forms, have a wobbly shape with only a thin surface membrane holding them together. What has surprised scientists is that the bacteria seem to be pre-prepared to make this switch to life without a wall.

The scientists believe that the bacteria kept this ability as a way of surviving attacks on their wall that have been happening since the earliest life-form but now happen regularly when patients are treated with antibiotics.

Now that L-forms can be studied more closely the Newcastle University team led by Professor Jeff Errington has found the drug-resistant bacteria are multiplying in a way which has never been seen before.

Instead of dividing in two, the L-form bacterium pulsates and then ‘squirts out babies’, sometimes as many as five new bacteria each time. This was completely unexpected.

In the work the team describe how they made the L-forms and the simple genetic changes that happened in the cells when they adapted themselves to life without a wall.

“What we have uncovered seems to be a primitive mode of growth probably used by the very earliest cells on the planet,” says Professor Errington, Director of the Institute for Cell and Molecular Biosciences at Newcastle University.

“All modern bacteria are used to living inside their wall which is a great sheltered place to be but it’s an engineering feat to be able to expand it, keeping it intact at all times and then pinch it off into two. We now think that before the wall was invented, very early in evolution, cells used this squirting method to increase in number.”

During the research funded by the BBSRC, the scientists for the first time witnessed and were able to video the L-form bacteria multiplying.

The team now intend to work on understanding how the mechanism works that squirts the bacteria out, which might be important for

combating some forms of antibiotic resistance, as well as providing powerful new experimental tools for studying the all important cell wall.

More information: Life without a wall or division machine in *Bacillus subtilis*. M. Leaver, P. Dominguez-Cuevas, J.M. Coxhead, R.A. Daniel and J. Errington. *Nature* doi:10.1038/nature07742

Provided by Newcastle University

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