

Membrane-coat proteins: bacteria have them too

EMBL discovery could yield evolutionary insights and new model organism

Heidelberg, 19 January 2010 - Although they are present almost everywhere, on land and sea, a group of related bacteria in the superphylum Planctomycetes-Verrucomicrobia-Chlamydiae, or PVC, have remained in relative obscurity ever since they were first described about a decade ago. Scientists at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany, have discovered that these poorly-studied bacteria possess proteins thought to exist only in eukaryotes – organisms whose cells have a nucleus. Their findings, featured on the cover of today's edition of *PLoS Biology*, could help to unravel part of the evolutionary history of eukaryotic cells such as our own.

In eukaryotes, the endomembrane system is a network of membrane-bound compartments which stores and transports material within the cell. These compartments, which include organelles such as the endoplasmic reticulum and the Golgi complex, also exchange portions of membrane with each other, by forming and absorbing vesicles. Scientists believed that membrane-bound compartments were unique to eukaryotic cells, and that membrane-coat proteins, which have a unique architecture and are associated with the endomembrane system, existed only in eukaryotes. Recently, however, membrane-bound compartments were observed in PVC bacteria.

In the new study, researchers in the group of Iain Mattaj, Director General of EMBL, are the first to provide molecular evidence that the coat proteins that shape the eukaryotic endomembrane system also exist in prokaryotes. Using a combination of bioinformatics, molecular biology and electron microscopy, the EMBL scientists found that proteins with the characteristic membrane-coat architecture also exist in



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This electron microscopy image shows *Gemmata obscuriglobus*. This and other PVC bacteria, the EMBL scientists discovered, have membrane-coat proteins associated with the membranes of subcellular compartments like the one shown in green, in which vesicles can be seen as dark green regions. The bacterium's DNA is coloured purple.

members of the PVC group, but not in any other bacteria, in association with the membranes of subcellular compartments.

“Our findings provide unexpected clues as to how the endomembrane system of eukaryotes evolved,” says Damien Devos, who led the study, “and since they are relatively simple cells, these bacteria could be used as model organisms for studying how this system works.” ●

Source Article

Santarella-Mellwig, R., Franke, J., Jaedicke, A., Gorjanacz, M., Bauer, U., Budd, A., Mattaj, I.W., & Devos, D.P. The Compartmentalized Bacteria of the Planctomycetes-Verrucomicrobia-Chlamydiae Superphylum Have Membrane Coat-Like Proteins. *PLoS Biology*, 19 January 2010.

Contact:

Sonia Furtado, EMBL Press Officer, Heidelberg, Germany, Tel: +49 6221 387 8263, www.embl.org, sonia.furtado@embl.de

About EMBL

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