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Sewage Water Bacteria Fills 'Missing Link' in Early Evolution of Life on Earth

A common group of bacteria found in acid bogs and sewage treatment plants has provided scientists with evidence of a 'missing link' in one of the most important steps in the evolution of life on Earth -- the emergence of cells with a nucleus containing DNA (eukaryotic cells).

For billions of years, bacteria (single celled organisms without a nucleus) were the only cellular life form on Earth. Then, about 1.6 to 2.1 billion years ago, eukaryotic cells emerged. These cells (with a nucleus) heralded the evolution of multi-cellular life on Earth including: plants, insects, animals and humans.

Until, now scientists have been unable to identify an 'ancestral cell' linking the early prokaryotes with the later eukaryotes, so fusion theory -- where two cells merge to form a new cell -- is often put forward to explain the appearance of these new cell types.

But, new findings by scientists from University College Dublin, Ireland, and the European Molecular Biology Laboratory in Heidelberg, Germany, published in *Science* (Nov. 26, 2010), have put paid to the fusion theory explanation, and suggest that an intermediate or 'missing link' cell did exist all those billions of years ago.

"Our discovery means that the appearance of eukaryotic cells on Earth can be explained by Darwinian evolution over billions of years rather than a 'big bang' fusion

theory," says Cell Biologist Dr. Emmanuel Reynaud from University College Dublin, one of the co-authors of the scientific paper.

"Our analysis shows that PVC [Planctomycetes, Verrucomicrobiae, Chlamydiae] bacteria, members of which are commonly found in today's sewage treatment plants or acid bogs, represent an intermediate type of cell structure. They are slightly bigger than other known bacteria, and they also divide more slowly."

"The structure of PVC suggests that it is an ancestor of a 'missing link' cell which connected prokaryotic to eukaryotic cells along an evolutionary path all those billions of years ago," says Dr. Damien P Devos from the European Molecular Biology Laboratory, Heidelberg, Germany, who co-authored the scientific paper.

New research shows that PVC (Planctomycetes, Verrucomicrobiae, Chlamydiae) bacteria -- members of which are commonly found in today's sewage treatment plants or acid bogs -- represent an intermediate type of cell structure. **Credit:** iStockphoto/Viktor Balabanov