



Important legal notice

English ▾

European Commission &gt; Research &gt; Headlines

Contact | Search

What's new? | Site map | Index | FAQ | Forum | Links

## European Research Headlines

Published on 15 December 2009

### LIFE SCIENCES

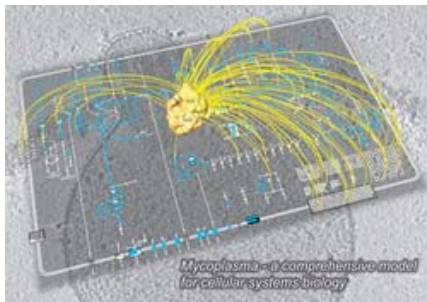
#### □ European researchers provide minimal cell blueprint

Your vote

Results

5/5 (2 votes)

**A German-Spanish team of researchers has successfully provided the first comprehensive image of a minimal cell that triggers atypical pneumonia, *Mycoplasma pneumoniae*. Presented in the journal *Science*, the research is part of the projects 3D-Repertoire and Prospects, which received EUR 13 million and EUR 11.78 million in EU funding, respectively.**



This figure links together proteome, transcriptome and metabolome data

© Dr T. Yamada, SCB, EMBL

The researchers from the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany, and the Centre for Genomic Regulation (CRG) in Barcelona, Spain sought to find answers to various questions, such as which elements are needed to generate a cell with the capacity to survive independently.

The study, presented in three papers in *Science*, sheds light on the novelties that are central to bacterial biology.

Led by Drs Peer Bork, Anne-Claude Gavin and Luis Serrano, the team selected *M. pneumoniae* as a model because it is a tiny, single-cell bacterium responsible for atypical pneumonia in people, and a small prokaryote (a nucleus-free cell) that is able to reproduce without using a host's cellular machinery. According to them, *M. pneumoniae* can survive on its own and represents a minimal cell because it is not complex.

The researchers from EMBL's Structure and Computational Biology Unit and CRG's EMBL-CRG Systems Partnership Unit focused on the bacterium at three different levels. Team 1 described *M. pneumoniae* identifying all the RNA (ribonucleic acid) molecules generated from its DNA (deoxyribonucleic acid) under a number of environmental conditions. Team 2 defined the metabolic reactions that occurred in it, what is known as the metabolome, under the same conditions. Team 3 identified every multi-protein complex generated by the bacterium characterising its proteome organisation.

'At all three levels, we found *M. pneumoniae* was more complex than we expected,' explained CRG's Dr Serrano who co-initiated the project at EMBL.

Evaluation of the proteome and metabolome led the researchers to discover the multifunctionality of many molecules, with metabolic enzymes catalysing multiple reactions and other proteins participating in more than one protein complex.

According to them, *M. pneumoniae* also combines biological processes in space and time. The parts of cellular machinery are involved in 'two consecutive steps in a biological process often being assembled together'.

The regulation of this bacterium's transcriptome (the set of all RNA molecules, produced in one or a population of cells) can be compared with that of eukaryotes (organisms whose cells have a nucleus). Most transcripts generated from the DNA of *M. Pneumonia* are not translated into proteins, and the genes are not always transcribed in one group. They can, however, express or repress individual genes within a group in a discriminatory way.

The researchers also discovered that the bacterium, which has features it shares with other, more evolved organisms, has the capacity to adjust its metabolism to extreme changes in the surrounding conditions that affect organisms.

'The key lies in these shared features,' said Dr Gavin of the EMBL. 'Those are things that not even the simplest organism can do without and that have remained untouched by millions of years of evolution — the bare essentials of life.'

The 3D-Repertoire ('A multidisciplinary approach to determine the structures of protein complexes in a model organism') project was funded under the 'Life sciences, genomics and biotechnology for health' Thematic area of the EU's Sixth Framework Programme (FP6). Prospects ('Proteomics specification in time and space') received EU support under the Health Theme of the Seventh Framework Programme (FP7).

#### More information:

- [Science](#)
  - [EMBL Heidelberg](#)
  - [Centre de Regulacio](#)
- [Genòmica](#)

[Share](#)

>> TODAY'S NEWS

>> ALL HEADLINES