SFB 960-/BZR – Kolloquium

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Neubau Biologie, H 53

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“Planctomycetes after the paradigm shift: more exciting than ever!”

Since their discovery in 1924, Planctomycetes seemed to bluer the pro- / eukaryotic dichotomy. Their unusual FtsZ-less cell division -mostly through polar budding- their lack of peptidoglycan and their complex subcellular membrane systems clearly set them apart from all other bacteria. Ultimately, even a nucleus-like structure with nuclear pores and separation of transcription and translation was suggested. With the postulation of endocytosis-like uptake of macromolecules the major eukaryotic hallmark trait required for gaining an endosymbiont was described for Planctomycetes. Even membrane-coat-like proteins -as in eukaryotes- seemed to be required for vesicle formation to facilitate endocytosis. With good reason, Planctomycetes were envisioned as potential ancestors of both, bacteria and eukaryotes and their traits appeared indeed beyond the bacterium.

However, with the advent of genetic tools, advanced genome research methods and high resolution imaging systems for light- (dSTORM and SRSIM) and electron microscopy (FIB-SEM and CET), multiple laboratories provided strong arguments for the Gram-negative cell architecture of Planctomycetes. Employing such methods, my group recently demonstrated that Planctomycetes in general lack additional membrane surrounded compartments, but that their cytoplasmic membrane can create invaginations to store complex carbon substrates in the enlarged periplasmic space. We further found that at least the suspected MC protein is not required for macro-molecule uptake and that a process different from endocytosis is employed to incorporate such molecules. Thus, we reject the hypothesis of the planctomycetal ancestral relationship with eukaryotes and suggest seeing Planctomycetes as maverick Gram-negative bacteria instead. However, in the past the clear majority of high impact publications on Planctomycetes focused on such eukaryote-like traits and their potential involvement in eukaryogenesis. Thus, the findings of others and us will cause a major paradigm shift in the field of planctomycetal research. One might even ask if Planctomycetes are important to study after all?
In my talk, I will present further evidence supporting this paradigm shift. I will focus on what is left of all these planctomycetal curiosities and which novel fields of future research such as the production of antibiotics or the planctomycetal role in global carbon cycles just emerged. In the light of these recent findings -without any doubt- Planctomycetes are even more exciting than ever!

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