

Postgenomics of plant pathogenic microorganisms that live intracellularly

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【 Outline of survey 】

Phytoplasmas are a group of plant pathogenic bacteria that live intracellularly, are transmitted by insects, and cause devastating agricultural damage. They can propagate in the cells of members of two different kingdoms: animals and plants. Recently, it was reported that phytoplasmas can infest the next generation of insects via ovarial transmission and plants via seeds. In addition, we recently isolated a non-insect-transmissible line of phytoplasma. These results suggest that infections in both hosts (animals and insects) are dispensable for phytoplasma survival. What allows phytoplasmas to inhabit two hosts in nature? The phytoplasma seems to shift its gene expression system to adapt to each host. Recently, we completed the genomic sequence of *Phytoplasma asteris*. The genome analysis revealed that the phytoplasma is the ultimate “ minimal genome ” bacterium, which has even lost the genes involved in energy synthesis. This study hopes to elucidate the molecular mechanisms for the pathogenicity and host determination of this unique microorganism, which can escape different defense systems and can invade plant and insect cells, using post-genomics based on the genome sequence of this intracellular plant-pathogenic bacterium. We will also attempt to assess the significance of the minimal gene set and to reveal the clever mechanisms that allow bacteria to be viable in extreme environments.

【 Expected results 】

This study hopes to elucidate the mechanisms of the interactions between hosts and intracellular parasitic plant pathogenic bacteria, to enable us to establish new strategies for introducing disease resistance into plants. Since phytoplasmas cause unique symptoms in plants, including virescence, phyllody, and witches ' broom, the study may offer a powerful breeding tool for fundamental studies on morphology control in plants. Furthermore, this microbe could be used as a stable intracellular expression vector for various purposes. Phytoplasmas, a model for reductive evolution and adaptive evolution, should allow us to define the minimal gene set that is essential for life.

【 References by the principal researcher 】

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【 Term of project 】 FY 2004 - 2008

【 Budget allocation 】 81,800,000 yen

【 Homepage address 】 <http://www.ab.a.u-tokyo.ac.jp/planpath/>