Mycoplasma

How Do they Survive?

Pathogenic bacteria have evolved a variety of mechanisms to avoid being killed by the immune systems of the humans and animals they invade. Among the most sophisticated is that practised by mycoplasmas, which regularly change their surface proteins to confuse the immune system. Recent work in the group of Renate Rosengarten and Rohini Chopra-Dewasthaly at the University of Veterinary Medicine, Vienna has revealed surprising new details of the way they do so and at the same time raised important evolutionary questions.

Mycoplasmas are responsible for a variety of important diseases, including atypical pneumonia in humans and mastitis in cows, sheep and goats, which results in loss of milk production. Mycoplasmal mastitis represents a particular problem in the dairy industry and is thus a subject of intense study.

Mycoplasmas possess the smallest genomes of any organism able to replicating itself. They thus represent ideal starting points for constructing synthetic genomes in the quest for a minimal genome. While several genes appear dispensable when mycoplasmas are grown under ideal conditions in the laboratory, most of the genes are thought to be essential for survival when mycoplasmas are attached to host cells and interact with the host's immune system. One such group of mycoplasma genes encodes the highly variable proteins located on the mycoplasma membrane surface, which compensate for the lack of a protective cell wall and enable the organisms to avoid the host's defence mechanisms during infection.

The mycoplasma researchers at the Vetmeduni Vienna have previously identified these variable surface protein genes in Mycoplasma agalactiae and described precisely how they are switched ON and OFF. It turns out that the so-called phase variation is caused by alterations in the order of short DNA sequences under the control of a special enzyme, a recombinase. Knocking-out the gene encoding the recombinase results in "phase-locked mutants", i.e. mycoplasmas, that can no longer vary their surface proteins.
Original publication:
Czurda S. et al.: Xer1-mediated site-specific DNA inversions and excisions in Mycoplasma agalactiae.

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