A story of a frog, a fungus and some bacteria: Siderophore mediated colonisation resistance against chytridiomycosis

Christos Paschalidis*[1], Elliot Murphy[2], Emily Read[3], Fritz Ka-Ho Ho[2], Marc-Emmanuel Dumas[2], Kieran Bates[3], and Olivier Cunrath[4]

[1]Métaux et microorganismes, UMR7242, BSC, ESBS – Université de Strasbourg, CNRS, UMR 7242 – France

[2]Division of Systems Medicine, Department of Metabolism, Digestion and Reproduction, Imperial College London, London, W12 0NN – Royaume-Uni

[3]Queen Mary University of London – Royaume-Uni

[4]Université de Strasbourg, CNRS, UMR7242, ESBS – CNRS : UMR7242 – France

Résumé

Batrachochytrium dendrobatidis (*Bd*) is a fungal pathogen that has led to catastrophic declines in amphibian populations worldwide. *Bd* zoospores infect amphibian skin, disrupting its function and ultimately leading to death. Iron competition is a well-defined battleground in host-pathogen interactions across diverse systems, ranging from the human gut to aquatic vertebrates. However, its role in amphibian skin defense remains unexplored. In parallel, we know that commensal bacteria can produce iron-chelating molecules, called siderophores. We hypothesized that the skin microbiome may drive this iron competition, through siderophores, acting in synchrony with the host to restrict metal availability to *Bd*. We used a combination of culture-dependent assays and LC-MS to screen and identify siderophores produced by skin bacterial isolates from *Alytes obstetricans*. To evaluate the anti-fungal potential, we challenged *Bd* with these siderophores in *in vitro* growth assays. Our research suggests that siderophore production is prevalent within *A.obstetricans* skin microbiome. These secondary metabolites displayed potent anti-fungal activity against *Bd*, in an iron-dependent manner. Consequently, we are currently designing siderophore producing synthetic communities (SynComs) of native skin bacteria to screen *in vivo* as probiotics. Our findings suggest that microbiome-derived siderophores may provide a critical layer of colonization resistance against *Bd* though iron limitation.

Mots-Clés: Batrachochytrium dendrobatidis, siderophores, skin microbiome, colonisation resistance

*Intervenant