UNIVERSITÉ Clermont Auvergne

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Laboratoire Microorganismes : Génome et Environnement

Conférence

«Using adaptive laboratory evolution to explore the plasticity of biofilm promoting factors and emergence of antibiotic resistance in biofilms»

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Site Dunant
Salle 37-39 Rez de chaussée allée R2

Abstract

Nowadays it is well accepted that, in most environments, microorganisms can switch from a free-living state to a sessile mode of life to form biofilms. Besides their ecological roles in nature, biofilms are recognized as major threats when developing in industrial and especially medical settings. In these contexts, they are an important source of contamination and infection that are extremely difficult to eradicate notably because of their well-described increased antibiotic tolerance that is often linked to the possible recurrence of infection. While tolerance associated to biofilm formation is considered one mechanism by which bacteria can “resist” the deadly activity of antibiotics the contribution of biofilms to the emergence of real antibiotic resistance in unknown.

Bacterial interactions with surfaces and biofilm formation rely on the coordinated expression and interplay between vast repertoire of surface exposed adhesion factors. However, how bacteria dynamically modulate their adhesion potential to achieve successful surface colonization is not yet well-understood.

Using *E. coli* as a model and adaptive experimental evolution (ALE), we explored, on one side, which molecular factors drive evolution towards enhanced biofilm capacity and, on the other side, how biofilms can influence the dynamics of emergence of antibiotic resistance.

We showed that mutations in the lectin domain of FimH, the tip adhesin of the type 1 fimbriae, are the main drivers of the evolution of *E. coli* adhesion capacities and that *in vitro* ALE can recapitulate FimH mutations selected in *E. coli* natural environments.

Additionally, we showed that the biofilm life style strongly influences emergence of antibiotic resistance and that biofilms can serve as reservoir of antibiotic resistance.

Altogether these results demonstrated that ALE is a powerful tool to study biofilm-associated functions and that evolution of these biofilm-associated functions could strongly influence bacterial behavior in natural or clinical situations.