ARNA Seminar Series

Monday, October 13 at 1 pm (Salle Nord)

Dual selection by antibiotics and phages drives cyclical plasmid evolution in *Staphylococcus*

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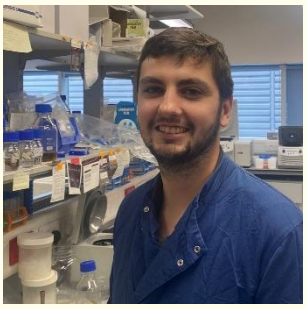

Antimicrobial resistance is a major concern and emerges rapidly following the introduction of new antibiotics. Plasmids enable quick bacterial adaptation, yet the forces and mechanisms driving plasmid diversification remain poorly understood. Analysis of *Staphylococcus* plasmid databases revealed a high proportion of plasmids with fusion signatures, particularly among conjugative plasmids and those carrying insertion sequence genes. Experimentally, we show that both recombination and transposition events can generate plasmid fusions and deletions, although at low frequency, in *Staphylococcus aureus* populations. Under strong antibiotic pressure, fusion events between large conjugative and non-transmissible plasmids are selected, thereby maintaining bacterial survival. While fusion should theoretically increase plasmid size, database shows high proportion of intermediate size plasmids. We demonstrate that phage infection counter-selects oversized plasmids, instead favoring deletions that yield plasmids size compatible with phage-mediated transduction. Together, our findings reveal a cyclical selection process—fusion under antibiotic pressure and deletion under phage pressure—that fuels plasmid diversification and drives the rapid emergence of multidrug-resistant *S. aureus*.

Host: Anaïs Le Rhun, ARNA laboratory