

MICROBIOLOGIE, INFECTIOLOGIE ET IMMUNOLOGIE



CONFÉRENCE

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Cell biology of starvation: Polyphosphate granules biogenesis in *Pseudomonas aeruginosa*

An ancient and ubiquitous starvation survival response in bacteria is the consumption of ATP to make an inorganic polymer, polyphosphate (polyP), which then forms granule superstructures. PolyP granules occur in all three domains of life, yet how and why cells form these structures is poorly understood.

Through the first high-resolution spatiotemporal characterization of *de novo* granule genesis in any organism, we find that polyP granule synthesis is coordinated with and required for efficient cell cycle exit in the opportunistic pathogen *Pseudomonas aeruginosa*. Following nucleation, polyP granules mature by consolidation in the nucleoid region of the cell and become transiently evenly spaced. Mutant cells lacking polyP elongate during starvation and contain more than one chromosomal origin. PolyP promotes cell cycle exit by functioning at a step after DNA replication initiation. Notably, we observe that cell cycle exit is temporally coupled to a net increase in polyP granule biomass.

While polyP may have functions deeper in starvation or cell cycle re-entry as an energy store, our results imply that net synthesis rather than consumption of polyP is required to drive completion of open rounds of cell division during starvation. One possible explanation for this phenomenon is that granule superstructures may serve as an important organizational microenvironment for specific chemical processes during starvation. The biophysical properties and significance of granules as structural elements in live cells are poorly understood.

We therefore use timelapse tracking of the Polyphosphate Kinase 2A (Ppk2A) protein, which co-localizes with granules, to characterize the dynamics of these superstructures, and their relationship with the chromosome during cell cycle exit in live cells. While the enzymatic machinery for polyP synthesis is not conserved between bacteria and eukaryotes, the formation of granule superstructures is observed in all three domains of life, suggesting that the ability to make polyP and form these structures is ancient and important.

**Jeudi 7 décembre à 11h40
Pavillon Roger-Gaudry, salle P-310**

EN VISIOCONFÉRENCE :

Campus de Saint-Hyacinthe, salle 2121

**Hôpital Maisonneuve-Rosemont, Salle TAV-1, porte 1120-A au 1^{er} étage du Pavillon J-A Desève
Hôpital du Sacré-Cœur de Montréal, Salle G-4001.1**

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