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Exploring possible quantum coherence in vault particles and its contribution to host infection defence

This project aims to explore possible quantum coherence of vault particles and their role in cellular defense against mycobacterial infections. *Dictyostelium*, a unicellular model organism for phagocyte function, expresses highly conserved vault particles, which we have shown to be upregulated during mycobacterial infection. The high symmetry and organized tryptophan networks of vault particles suggest that, like recently demonstrated for microtubules, these structures may exhibit quantum coherence at ambient temperature. The aims of the project are 1) to study quantum coherence and superradiance in purified vault particles, 2) to assess whether vault particles contribute to *Dictyostelium* defense against mycobacteria, and 3) to investigate a possible link between superradiance and anti-bacterial defense. We will measure quantum yield of purified *Dictyostelium*-derived vaults as well as study the role of vaults in *Dictyostelium* anti-mycobacterial defense. By systematically acquiring data from the described systems, we aim to determine whether vaults use quantum principles to interfere with mycobacterial survival, making the bacteria more vulnerable to host cell clearance mechanisms. The project thereby pioneers the study of quantum mechanism in host antimicrobial defence.

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