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Bacterial exploration in complex environments

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Bacterial motility and intestinal mucus quality have both been shown to be important issues related with different pathologies (diabetes, obesity, IBD...). In this context, I aim at understanding the properties of bacterial exploration in such environments which could open new ways for treatments and cure.

To study this complex medical problematic with a physicist eye, I was led to understand the exploration process of bacteria with different aspects :

- I shed light on the importance of confinement on transport properties and addressed the question of a memory process (BV model).
- I've tried to elucidate the emergent hydrodynamic properties of bacteria from anatomical reasons, specifically on surface.
- I studied the rheology of yield-stress fluids (clay, mucin, suspensions) and the impact on bacterial swimming. I eventually worked directly on intestinal piglets mucus that I have prepared and propose a preliminary in vitro trial to quantify the bacterial penetration of the mucus barrier.

The experiments have been done using an original 3D-lagrangian tracking system that I was brought to improve (using AI in particular).

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