

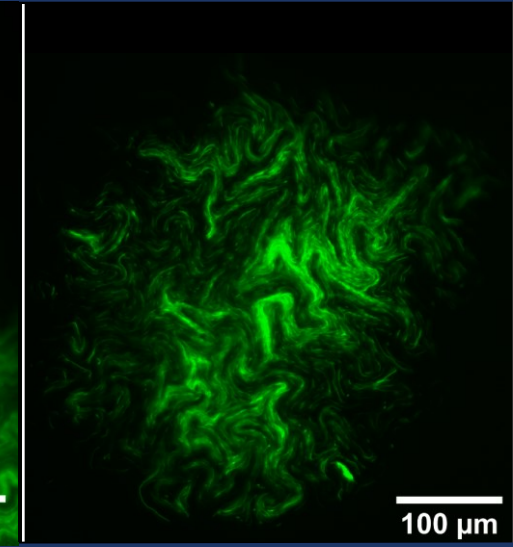
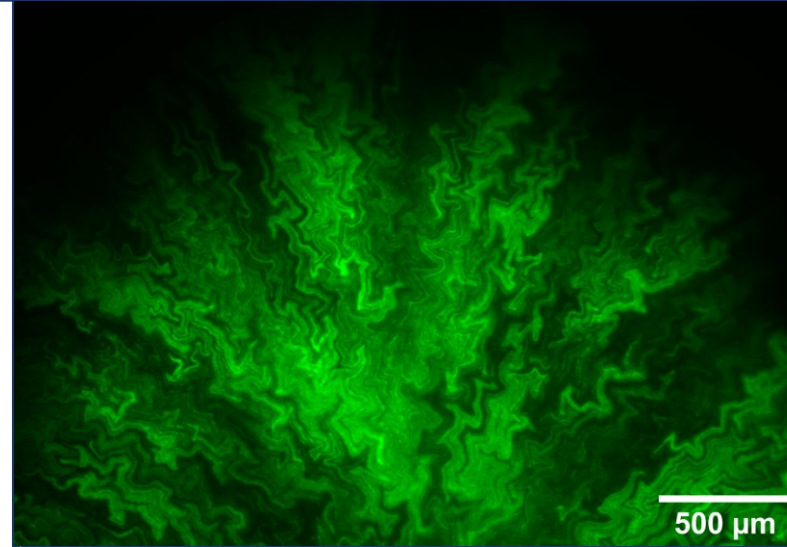
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ABSTRACT

The morphology of bacterial colonies depends on **nutrient availability**. We use the **Mesolens**, which can image a 100 mm³ volume with subcellular resolution throughout, to investigate the internal structure of colonies grown on agar substrates with different glucose and ammonia concentrations. We observe **intra-colony channels** in both nutrient-deprived and nutrient rich colonies, with channel widths dependent on the nutrient availability.

PROJECT DESCRIPTION

This project aims to investigate the effect of nutrient availability on the structure of mature ***E. coli* biofilms**, with a particular focus on intra-colony channels. We have used the Mesolens, which has a unique combination of low magnification (4x) and high numerical aperture (0.47), for imaging of whole mature biofilms (up to 5 mm diameter) with subcellular resolution [1]. Substrate nutrient concentration affects both shape and size of mature bacterial colonies [2], but the changes in **internal structure at depth** remain unknown.



KEY RESULTS

- We showed the presence of intra-colony channels in both nutrient-deprived and nutrient-rich colonies
- Channels are proportionally wider in nutrient-deprived colonies
- Nutrient concentrations were chosen from a growth curve as those providing minimum and maximum values for growth rate (for nitrogen) or biomass (for carbon)
- Glucose-deprived colonies have a small, irregular shape typical of nutrient scavenging

FUTURE WORK

- Investigate the effect of substrate agar stiffness on colony morphology
- Characterise channel structure using fractal geometry analysis tools

REFERENCES

- [1] McConnell, G. et al. (2016). *Elife*, 5, e18659.
- [2] Lacasta, A.M. et al. (1999). *Phys. Review E* 59(6)