

Exploring Bacterial Coaggregation in Aquatic Systems Using Advanced Physicochemical and Imaging Techniques

Ana Afonso^{1,2,3}, Jack Botting^{4,5}, Inês Gomes¹, Maria José Saavedra², Lúcia Simões³, Jun Liu^{4,5}, Manuel Simões¹

¹ALICE-LEPABE, Faculty of Engineering, University of Porto, Porto, Portugal

²CITAB, Department of Veterinary Sciences, University of Trás-os-Montes e Alto Douro, Vila Real, Portugal

³CEB-LABELLS, University of Minho, Braga, Portugal

⁴Department of Microbial Pathogenesis, Yale School of Medicine, New Haven, United States

⁵New Haven Microbial Sciences Institute, Yale University, West Haven, United States

INTRODUCTION & AIM

Coaggregation is a specific mechanism where genetically distinct bacteria recognize and adhere to each other through complementary adhesins and polysaccharide receptors. However, it remains **poorly understood in aquatic systems**.

Understanding coaggregation is crucial because of its significant implications for:

Multispecies biofilm formation

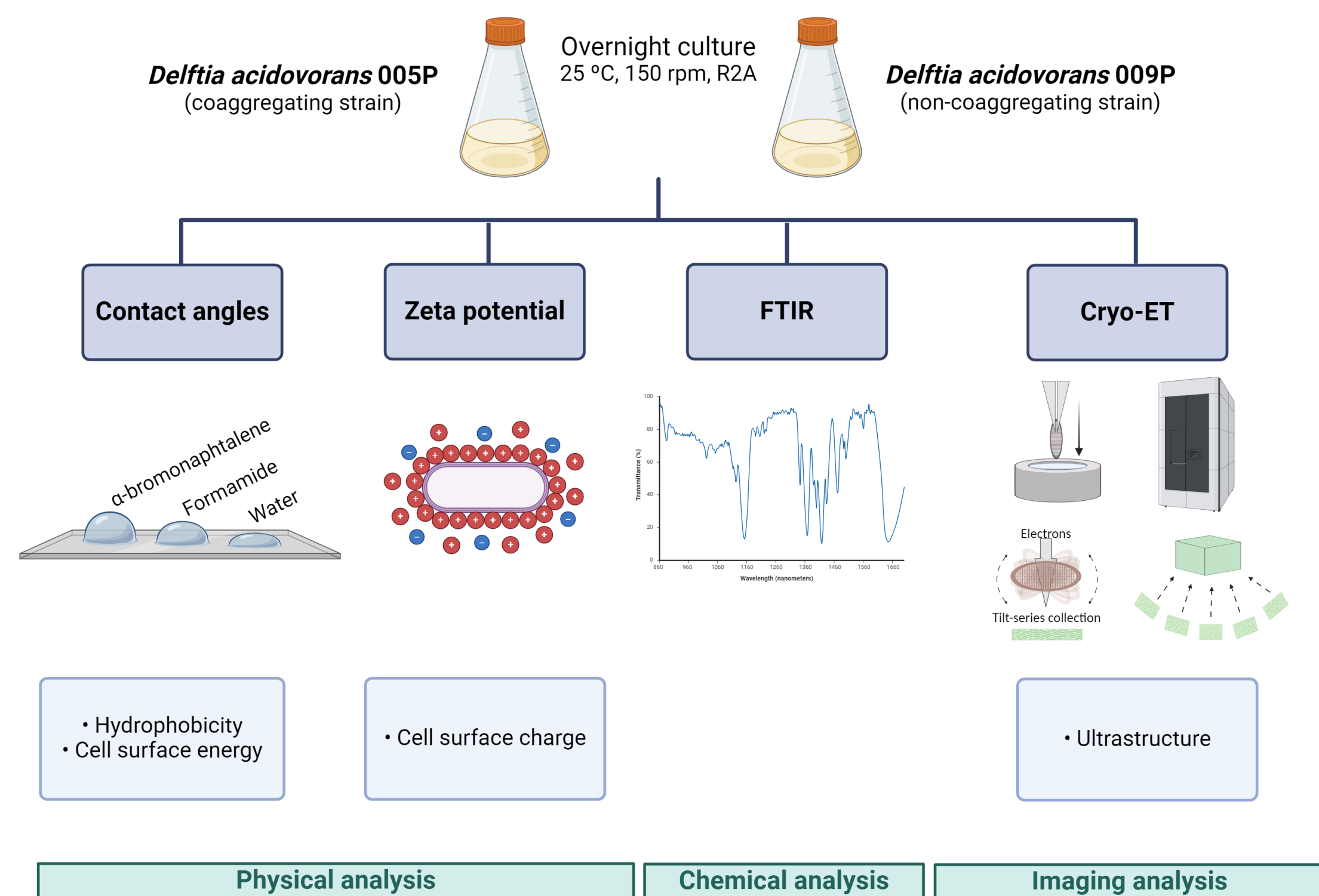
Water quality

Biotechnological applications

Performance of engineered systems

This study offers an in-depth characterization of the cell surface properties of *Delftia acidovorans* isolated from drinking water. Two strains with different coaggregation abilities were studied (005P – coaggregating and 009P – non-coaggregating).

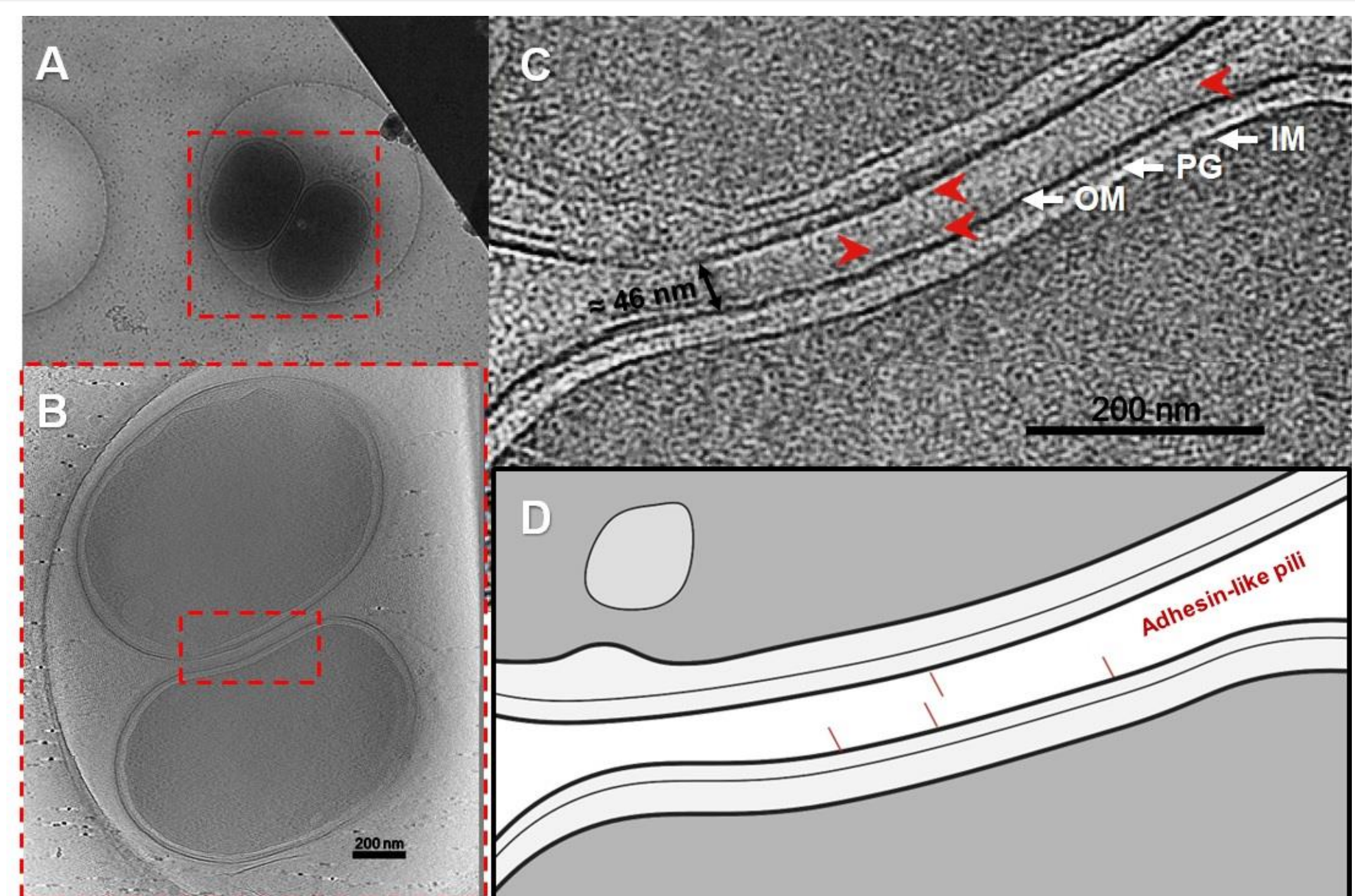
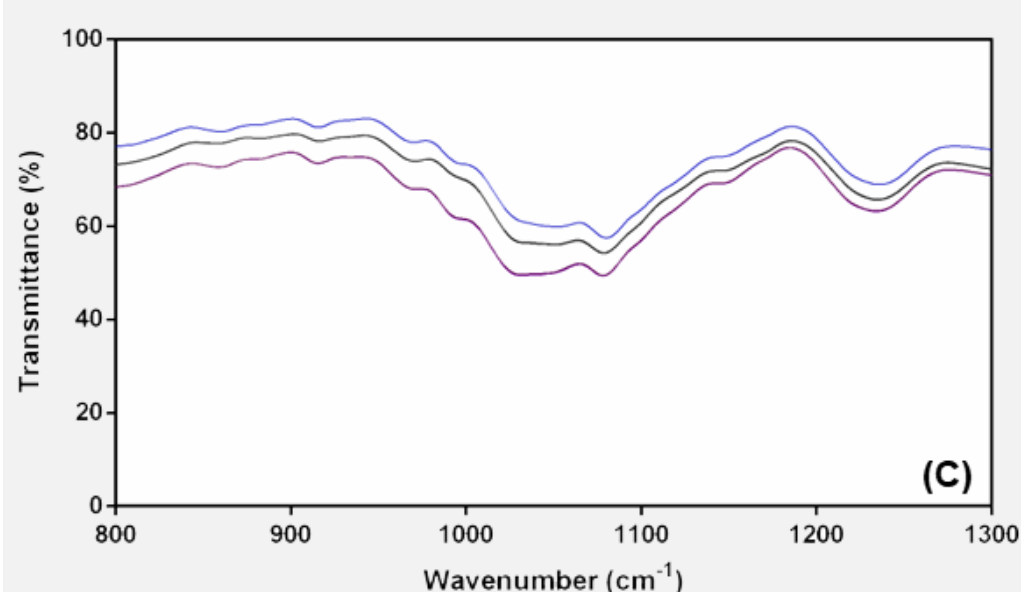
METHODS



RESULTS & DISCUSSION

Coaggregating strain (005P) compared to non-coaggregating strain (009P):

- ✓ Higher surface hydrophobicity (36.6 ± 0.6 mJ/m²; 29.0 ± 0.6 mJ/m²)
- ✓ More negative surface charge (-46.8 ± 0.2 mV; -44.6 ± 0.2 mV)
- ✓ Higher cell surface energy (125.7 mJ/m²; 118.7 mJ/m²)
- ✓ FTIR revealed small differences in spectral regions linked to carbohydrates and phosphodiester/amide III of proteins ($860-930$ cm⁻¹ and $1212-1240$ cm⁻¹, respectively)



Ultrastructure from 3-D reconstruction of *D. acidovorans* 005. (A) Cryo-EM grid montage; (B) Tomogram slice; (C) Enlarged view of the boxed region in (B); (D) Adhesin-type pili scheme. [1]

CONCLUSIONS

- Key differences in the cell surface properties, particularly in hydrophobicity, surface charge, and pili structure, which affect coaggregation.
- Cryo-ET revealed pili-like adhesins in the coaggregating strain, concentrated in areas near other cells, suggesting their expression is triggered by cell-cell contact.

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References: [1] Afonso, A. C., et al. (2024). *J. Hazard. Mater.*, 480, 135948.