



Potential of *Akkermansia muciniphila* DSM 22959 and *Faecalibacterium duncaniae* DSM 17677 as live biotherapeutics for intestinal infections

Machado, D.^{1*}, Vedor, R.¹; Fonseca, M.¹; Bento, M.¹; Barbosa, J.C.¹; Almeida, D.¹; Andrade, J.C.²; Gomes, A. M.¹

¹Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 4169-005 Porto, Portugal

²TOXRUN – Toxicology Research Unit, University Institute of Health Sciences, CESPU, CRL, 4585-116 Gandra, Portugal

* Presenting author: dmachado@ucp.pt

Introduction

In the last years, human intestinal bacteria, including *Akkermansia muciniphila* and *Faecalibacterium duncaniae*, have emerged as next generation probiotics to be incorporated in foods or delivered in pharmaceutical forms. Despite their multiple health benefits, the **inhibitory** properties of these probiotics against **pathogenic colonization** remain poorly studied, mainly due to difficulties in their culture and handling, as consequence of their anaerobic nature.

Objective

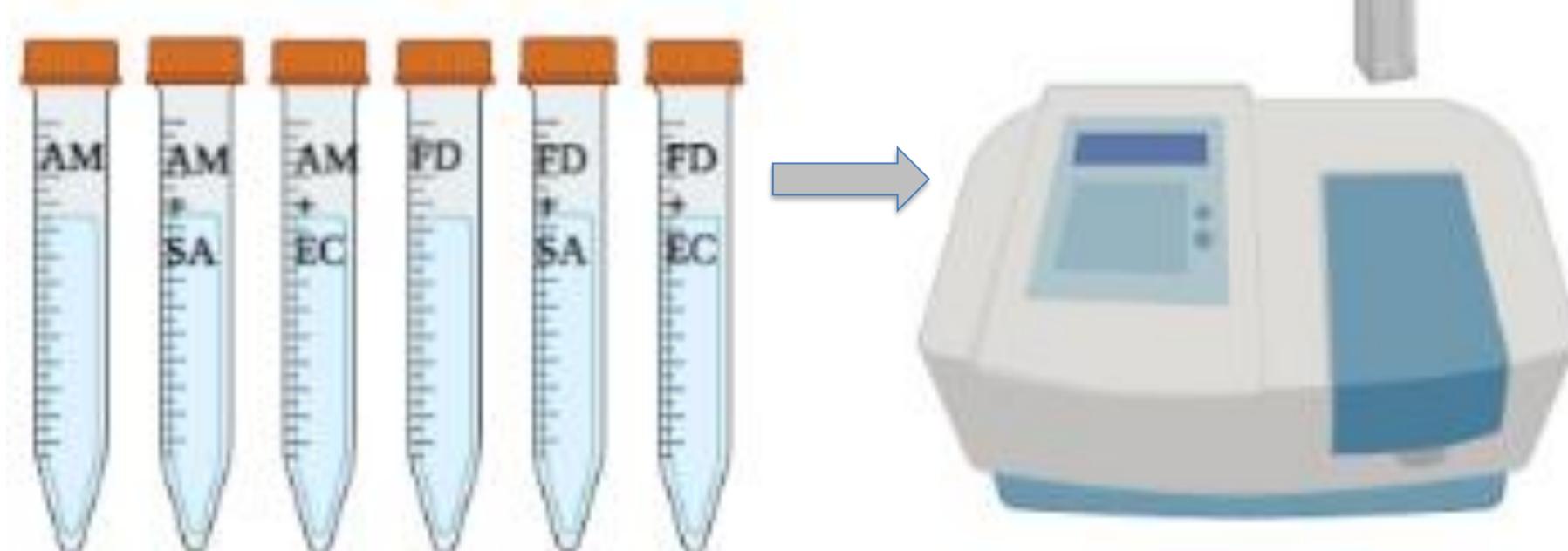
Evaluate the potential of type strains *A. muciniphila* DSM 22959 and *F. duncaniae* DSM 17677 to prevent pathogenic colonization.

Methodology

i) Auto- aggregation and co-aggregation with pathogens

Spectrophotometry

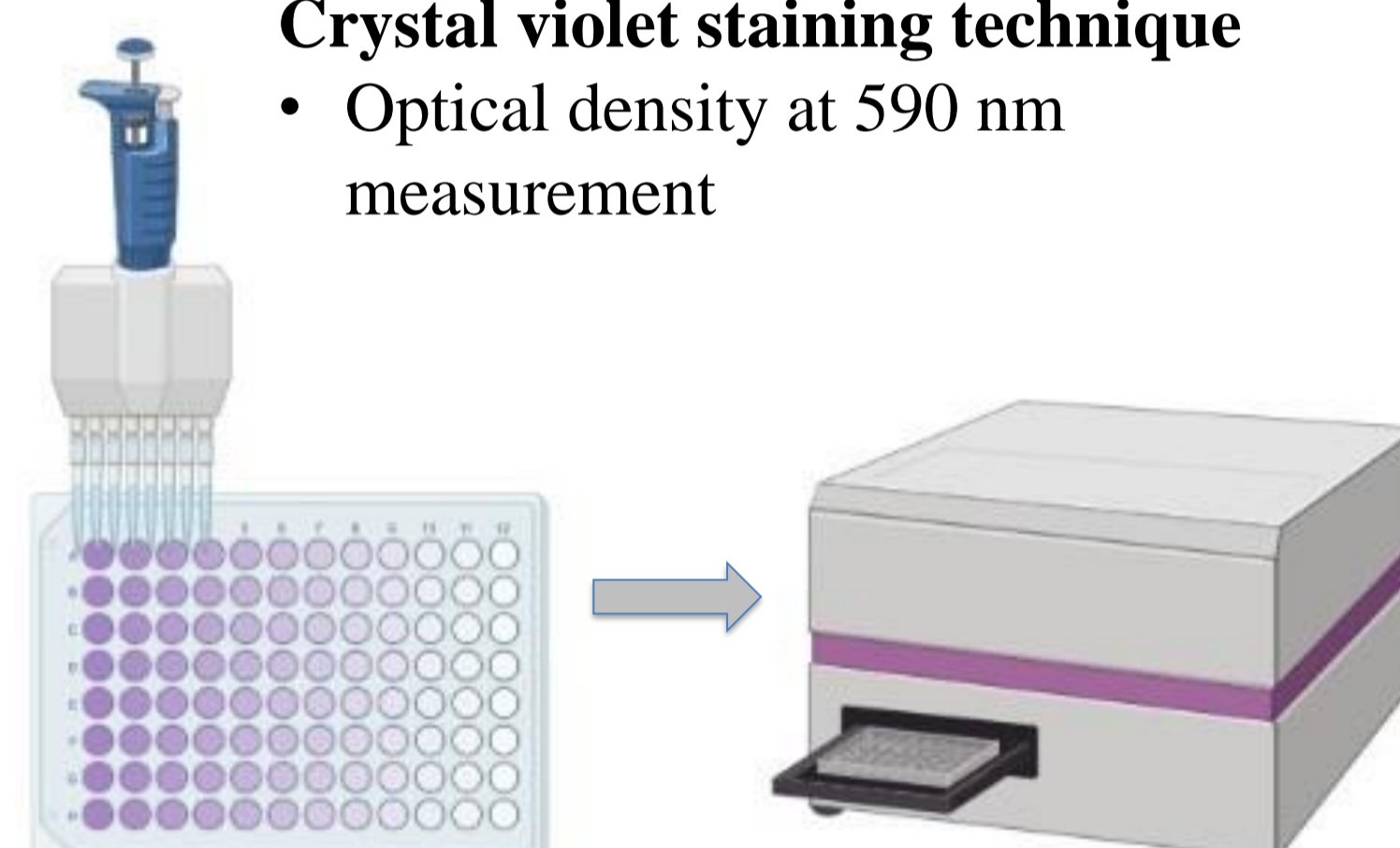
- Absorbance at 600 nm measurement



ii) Biofilm-forming ability

Crystal violet staining technique

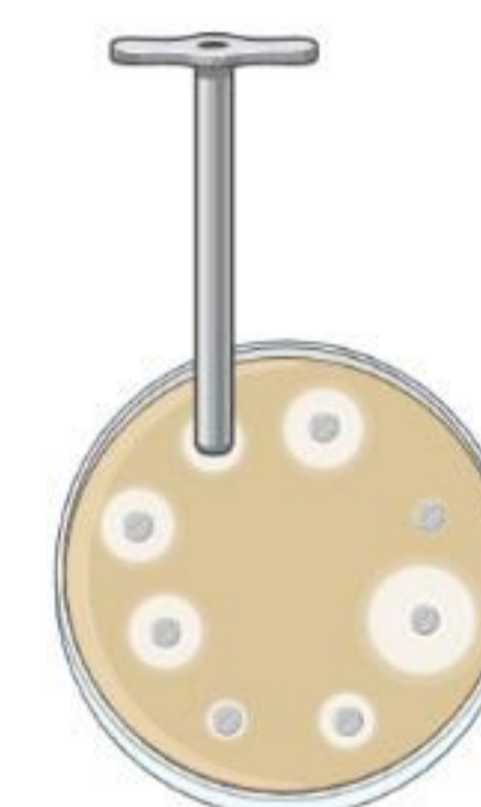
- Optical density at 590 nm measurement



iii) Antimicrobial activity potential

Phenotypic

- Agar well diffusion



In silico analysis

- BAGEL4
- antiSMASH



Main findings

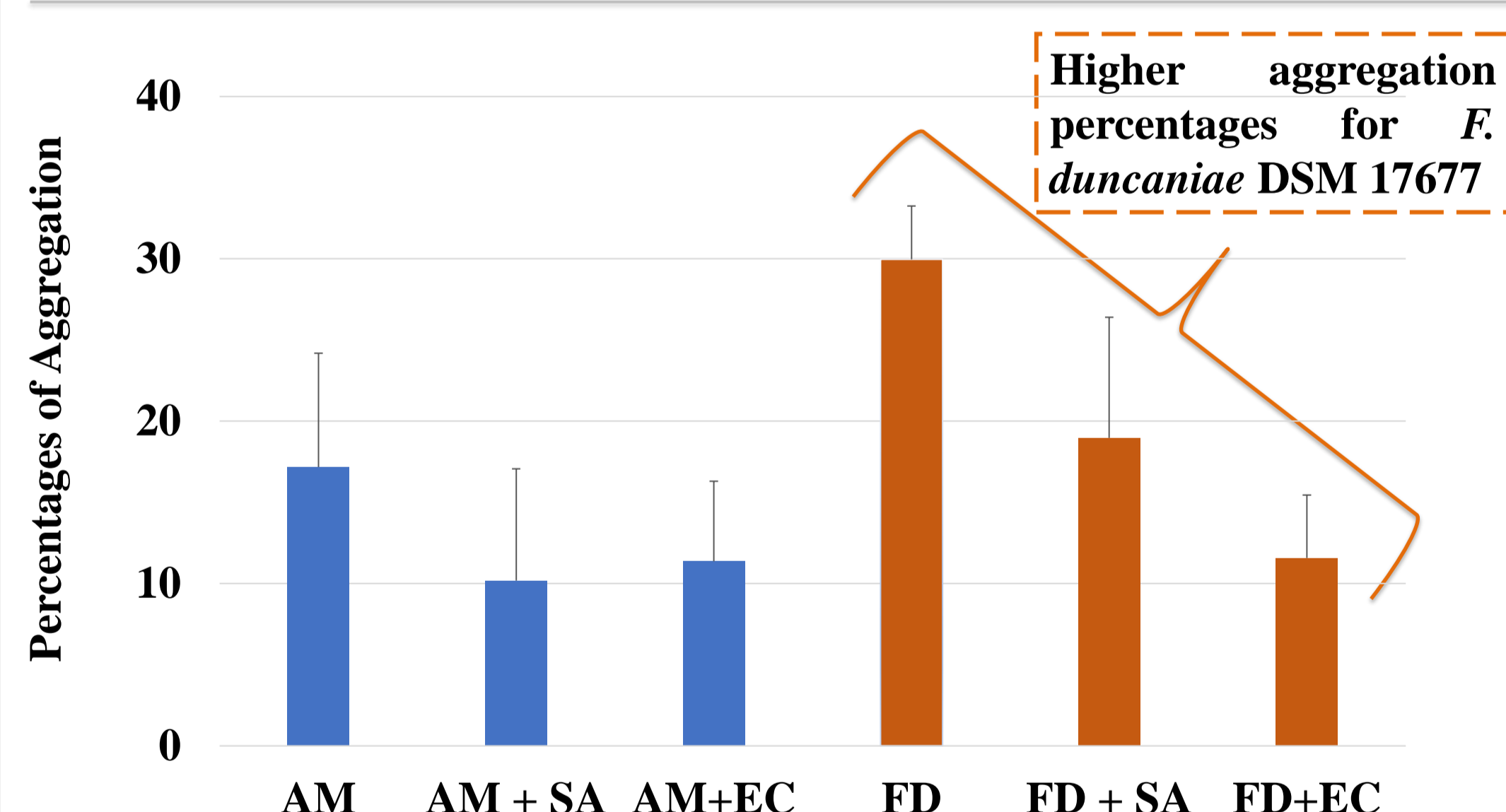


Figure 1. Aggregation percentages of *A. muciniphila* DSM 22959 (AM – blue bars) and *F. duncaniae* DSM 17677 (FD – orange bars) measured after 2 hours of anaerobic incubation [auto-aggregation: only AM and FD and co-aggregation with *Staphylococcus aureus* DSM 11729 (+SA); or with *Escherichia coli* O157:H7 (+EC)]

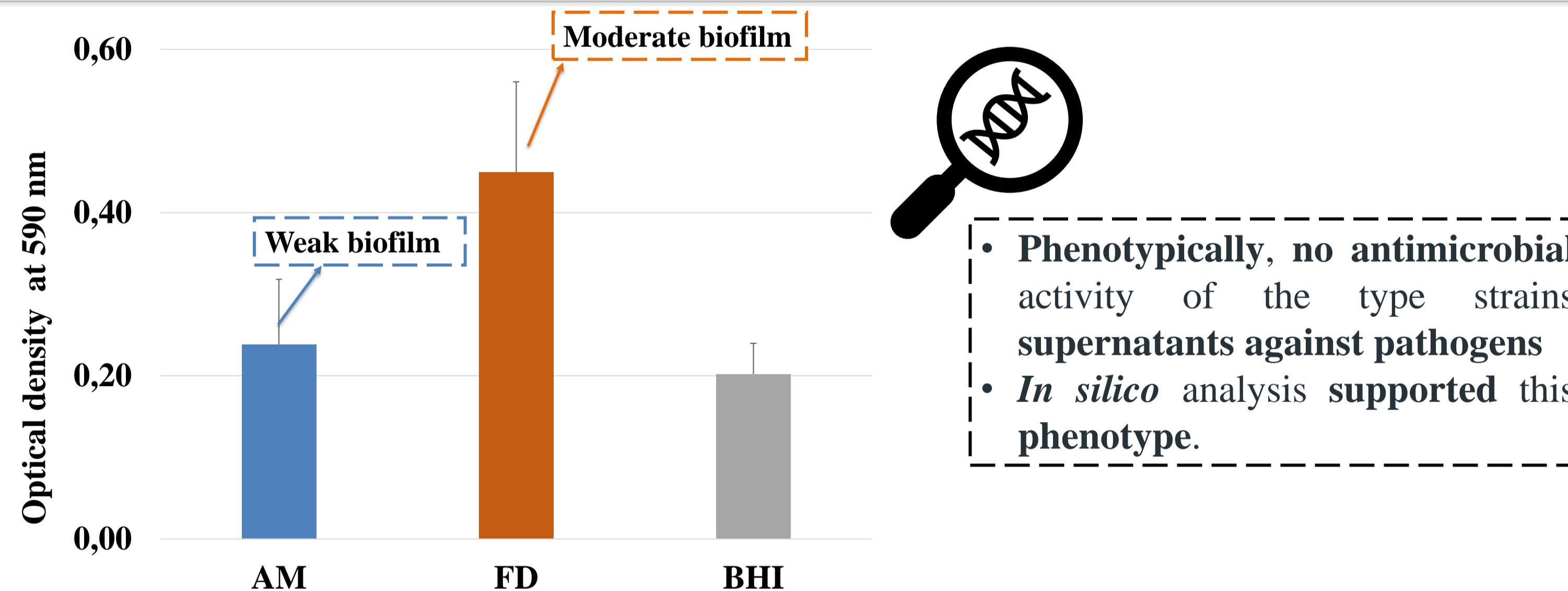


Figure 2. Biofilm-forming ability of *A. muciniphila* DSM 22959 (AM – blue bar) and *F. duncaniae* DSM 17677 (FD – orange bar) performed in Brain Heart Infusion broth (BHI-negative control).

- Phenotypically, no antimicrobial activity of the type strains supernatants against pathogens
- In silico analysis supported this phenotype.

Conclusion

Both type strains, *A. muciniphila* DSM 22959 and *F. duncaniae* DSM 17677, presented key features for their persistence in the intestinal ecosystem and possible prevention of pathogenic colonization and subsequent infection. Therefore, these findings highlight the potential of these human intestinal commensals, mainly *F. duncaniae* DSM 17677, to be used successfully as live biotherapeutic agents against intestinal infections.

Acknowledgements

This work was supported by the project PROBIOCARE (EXPL/BIA-MIC/0258/2021), financed by national funds through Foundation for Science and Technology, I.P. (FCT).

We would like to thank the scientific collaboration of CBQF (UIDB/50016/2020) and the Scientific Employment Stimulus—Individual Call (CEEC Individual—CEECIND/00520/2017/CP1404/CT0001).