

TEMPLATE RICHIESTA ATTIVAZIONE TOPIC AGGIUNTIVI SU FONDI PNRR

D.M. 9 aprile 2022 n. 351

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| Project title/Titolo del Progetto | Investigating the role of extracellular DNA in the formation and clinical impact of biofilm streamers |
| Principal Investigator | Prof. Roberto Rusconi |
| Main field of interest/Ambito principale di ricerca | Biophysics and computational biology |
| Abstract | Biofilms are complex communities of surface-attached microorganisms surrounded by extracellular polymeric substances (EPS), which shields cells from antimicrobials and the host immune response (Caldara et al. 2022). This protected environment makes biofilm bacteria a major cause of persistent and chronic infections in clinical settings. Previous data highlighted the usually neglected influence of fluid flow on microbial colonization of surfaces (Secchi et al. 2020) and on suspended filamentous biofilm structures known as streamers, which occurrence is promoted by the release of bacterial extracellular DNA after antibiotic treatment (Secchi et al. 2022). This project aims at investigating how the mechanical, chemical, and biological microenvironment influences biofilm streamers formation from clinically relevant pathogens. To achieve this goal, a high-throughput microfluidic platform (Savorana et al. 2022) will be exploited to dissect the contributing role of flow conditions and extracellular DNA availability on streamers development and in geometries representative of common medical devices. The effect of different antibiotic treatments and of immune cells will be also investigated. |
| Type of Co-funding | <ul style="list-style-type: none"> ○ D.M. 351/2022 - Borse di dottorato per la transizione digitale |
| Lab name and address | Applied Physics, Biophysics and Microfluidics, Humanitas University, Pieve Emanuele (MI), Italy |
| Brief description of the coherence of the Project in relation to the PNRR objectives ³ | This project is fully aligned with the PNRR objectives in terms of emergent infective diseases, which include the problem of antimicrobial resistance and biofilm-associated infections. |
| N. of months abroad (min. 6, max. 18) [compulsory] | 6 |
| Name of the research institution/company abroad | Dep. of Civil, Env. and Geomatic Eng., ETH Zurich, Switzerland (Prof. Eleonora Secchi). |
| N. of months of internship (min. 6, max. 18) [compulsory only for D.M. 352/2022] | - |
| Name of the company ³ | - |
| Scientific references | Caldara, M., Belgiovine, C., Secchi, E. & Rusconi, R. Environmental, Microbiological, and Immunological Features of Bacterial Biofilms Associated with Implanted Medical Devices. Clin Microbiol Rev 35, e00221-20 (2022). |



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Savorana, G., Slomka, J., Stocker, R., Rusconi, R. & Secchi, E. A microfluidic platform for characterizing the structure and rheology of biofilm streamers. *Soft Matter* (2022) doi:10.1039/d2sm00258b.

Secchi, E., Savorana, G., Vitale, A., Eberl, L., Stocker, R & Rusconi, R. The structural role of bacterial eDNA in the formation of biofilm streamers. *PNAS* 119, e2113723119 (2022).

Secchi, E., Vitale, A., Miño, G. L., Kantsler, V., Eberl, L., Rusconi, R. & Stocker, R. The effect of flow on swimming bacteria controls the initial colonization of curved surfaces. *Nat Commun* 11, 2851 (2020).