RESEARCH TOPIC DASMEN8

A MACHINE LEARNING APPROACH TO STUDY ANTIMICROBIAL RESISTANCE IN CLINICALLY IMPORTANT BIOFILMS

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Abstract

Bacteria, despite being traditionally studied in the planktonic phase, are often found within sessile communities known as biofilms. Biofilms grow on implanted devices such as stents, prosthetic cardiac valves and catheters, posing serious health threats and reducing the lifetime of these devices, and represent the most common cause of persistent and chronic infections given their dramatically increased resistance to antimicrobial agents1.

Recent works have started to reveal the great potential of microfluidics in investigating aspects of biofilm formation, motivated by the flexibility and high-throughput nature of this technology2,3. In particular, microfluidic allows to assess the efficacy of multiple antibiotic treatments under physiological conditions4. By taking advantage of machine learning-based image processing tools5, this project aims at understanding the response of clinically relevant biofilms to a wide range of antimicrobial agents.

Main technical approaches

The research activity will be primarily experimental and based on modern microfluidic methods, which enable exquisite control of fluid flow, direct observation of microorganisms down to single-cell resolution, and the spatiotemporal modulation of the chemical environment. Advanced imaging techniques and tracking algorithms will be implemented to directly visualize and precisely quantify bacterial response within a biofilm to different antibiotic treatments.

Type of contract

PhD scholarship of € 18.000 gross per year or equivalent contract.

Borsa di dottorato di € 18.000 annui lordi o forme di sostegno finanziario equivalenti.

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