Università degli Studi di Napoli Federico II

PhD in Biotechnology - 34th cycle

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In silico identification, production and characterization of novel bioactive peptides with antimicrobial, anti-biofilm and anti-inflammatory activity.

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The rapid increase in drug-resistant infections emphasizes the urgent need to develop new antimicrobials. A class of very interesting molecules that could help solve the resistance problem are antimicrobial peptides (AMPs) which, in addition to antimicrobial activity, show pharmacologically relevant activities like anti-biofilm and anti-inflammatory activity [1]. Among them, cationic AMPs (CAMPs) are widespread and hundreds of them have been characterized. They have applications in agriculture, in cosmetic and in food industry but also in biomaterials industry and in the manufacturing of medical devices which are frequently the cause of bacterial infections.

The main goal of the present PhD project is the development of antimicrobial tools (antimicrobial surfaces and particles) based on cryptic human CAMPs. In particular CAMPs will be used to functionalize nanoparticles of magnetite, a mixed iron(II,III) oxide. These particles, being magnetic, can be easily extracted from solutions using a magnet. Once functionalised with CAMPs they could be used to remove not only bacterial cells but also endotoxins like LPS and LTA from aqueous solutions.

The project is divided into four tasks: 1) the identification of a library of promising human cryptic CAMPs obtained through an *in silico* analysis method; 2) chemical or recombinant synthesis of particularly interesting selected CAMPs; 3) structural and functional characterization of the most promising cryptic CAMPs; 4) development of efficient strategies to immobilize human cryptic CAMPs on surfaces.

References

1- Hancock RE, Haney EF, Gill EE, The immunology of host defence peptides: beyond antimicrobial activity, Nat. Rev. Immunol. 16 (2016) 321–334.