RESEARCH TOPIC MECM_14

Processes and mechanisms of innate immunity at the host-pathogen interface in bacterial osteomyelitis

Curriculum
MECM Standard

Research Area
Other

Laboratory name
Laboratory of Cellular and Humoral Innate Immunity Lab

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Abstract
Osteomyelitis (OM) is an infectious disease of the bone primarily caused by the gram-positive bacterium Staphylococcus aureus (SA). Endowed with an extraordinary ability to recognize bone cells and extracellular matrix (ECM), SA has a remarkable tropism for the musculoskeletal tissue. The SA-colonized bone microenvironment (BME) undergoes pathological alterations that favor antibiotic resistance and chronic infection, whose eradication poses a largely unmet medical challenge. Here we propose a program of translational research into the pathogenetic mechanisms of OM, with a focus on the SA/BME interface and the long pentraxin 3 (PTX3), a humoral component of the innate immune system with host protective functions towards selected pathogens and emerging roles in bone physiopathology. Major tasks of the study proposal are:
Task 1 (in vivo) - To study OM pathogenesis and the role of PTX3 in a murine model of SA-OM;
Task 2 (in vitro) - To investigate bone biology and ECM remodeling in a 3D model of SA-OM;
Task 3 (clinical studies) - To identify novel genetic and protein profiles with diagnostic and prognostic potential in the clinical management of OM.
Based on these activities, we therefore seek to identify BME factors that are associated with susceptibility to and severity of OM, and exploitable for diagnosis and therapy.

Main technical approaches
Animal experimentation, Flow Cytometry, Cell cultures, Microbiology, Extraction and Characterization of Nucleic Acids and Proteins (RT-PCR, ELISA), Biostatistics

Scientific references
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2. Loppini, M. et al. J Clin Med 12(3):1055, doi:10.3390/jcm12031055 (2023)

3. Granata, V. et al. Int J Mol Sci 24(23):16648, doi: 10.3390/ijms242316648 (2023)

4. Granata, V. et al. Genes (Basel) 15(5):596, doi: 10.3390/genes15050596 (2024)

5. Campodoni, E. et al. ACS Appl Mater Interfaces 17(50):68440-68456, doi: 10.1021/acsami.5c18437 (2025)

Type of contract

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