RESEARCH TOPIC MEM21
Precision Human Organs-on-chip for Enhanced Neuro-muscular and Cardiac Studies
(PHOENIX)
MECM standard

Research Area
Cardiology

Laboratory name
Cardiovascular Stem Cell Biology Lab

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Abstract
This project aims to develop next-generation human-based Organs-on-Chip (OoC) platforms for the comprehensive study of cardiac and neuromuscular diseases. By integrating induced pluripotent stem cells (iPSCs), electrical recording, force sensing, and mechanical stimulation, and leveraging the bioengineering expertise of Politecnico di Milano and an international multidisciplinary team, two platforms will be developed: µHeart, for generating functional myocardial tissues as cardiac disease models, and µNMC, a bi-compartmental chip to reconstruct neuro-muscular circuitry for modeling neuromuscular conditions. These platforms will be applied to LMNA-related cardiomyopathy (LMNA-CMP), a rare genetic disorder caused by LMNA mutations, leading to diverse phenotypes affecting theheart and the skeletal muscle. Patient-specific LMNA mutations will be modeled to investigate functional disease traits and uncover novel molecular pathways, addressing disease heterogeneity and establishing genotype-phenotype correlations, often lacking in LMNA-CMP.
By more accurately recapitulating human physiology, these OoC models aim to improve our understanding of disease mechanisms, support therapeutic development, reducing reliance on animal testing, and enhancing prediction, prevention, and personalized treatment strategies.

Main technical approaches
Cell biology and culture methods basics (experience with iPSC will be considered a plus) and basic molecular biology techniques.
Previous laboratory experience in the cardiac field is appreciated.

Scientific references
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Type of contract

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