

Regulation of Cardiac Rhythm and Contraction

Group leader

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Research technicians

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DESCRIPTION

The Cardiac Rhythm and Contraction Group has, since its creation, focused on identifying molecular and cellular electrophysiological mechanisms that contribute to the development of cardiac arrhythmias, in order to improve risk prediction and identify novel disease-specific therapeutic targets. We are one of a few groups that use human atrial myocytes to study pathological alterations in cardiomyocyte function. Our primary goal is to identify key mechanisms underlying the alterations in calcium homeostasis and abnormal electrical activity that occur in atrial myocytes from patients with atrial fibrillation.

MAIN LINES OF RESEARCH

- Biomarkers and molecular targets of vascular remodelling in atherosclerosis progression, thrombosis, and subsequent ischemic events (Proteomic-based studies). (Padró Capmany, Teresa; García Arguinzonis, Maisa Inés).
- Functional epigenomics (plasma and total blood non-coding RNAs): Novel biomarkers in cardiovascular diseases and special groups at high CVD risk (Familial Hypercholesterolemia, morbid obesity). (Padró Capmany, Teresa; Escate Chávez, Oscar Rafael).
- Lipidome and metabolome regulation in cardiovascular disease prevention. (Padró Capmany, Teresa).
- Functional epigenomics of myocardial infarction and post-infarction outcomes (heart

failure, cardiogenic shock). (Padró Capmany, Teresa; Escate Chávez, Oscar Rafael).

- Extracellular matrix and cardiac remodelling post- myocardial infarction. (Padró Capmany, Teresa).
- Circulating extracellular vesicles (microvesicles /exosomes) in subclinical and clinical cardiovascular diseases. (Padró Capmany, Teresa).

SCIENTIFIC CHALLENGES

The association of more than 140 single-nucleotide polymorphisms (SNPs) with increased risk of atrial fibrillation over the past decade affords one of the most significant recent opportunities to make a substantial advance in risk stratification and personalised treatment of atrial fibrillation. The challenge lies in the vast number of SNPs, each associated with a modest increase in risk and an unknown impact on function. Our opportunity is to identify SNP combinations that cause synergistic derangements in human atrial myocyte function and a corresponding increase in the risk of atrial fibrillation.

ACTIVE & AWARDED GRANTS

- Hove-Madsen, Leif. Impact of Genetic and Clinical Risk on Molecular Signaling and Electrophysiological Dysfunction in Atrial Fibrillation (GenRiskAF) (2 sub-project). PID2020-116927RB-C21. Duration: 2021-2024. 181.500,00 € (CSIC-IIBB).
- Hove-Madsen, Leif. Genetic Modulations of Cyclic AMP signaling and calcium homeostasis as biomarkers for personalized treatment in atrial fibrillation (MioCitos). PID2023-152160OB-C21. Duration: 2024-2025. 275.000,00 € (CSIC-IIBB).

SCIENTIFIC PRODUCTION

- Aceituno C, Revuelta D, Jiménez V, Ginel A, Molina CE, Hove-Madsen L. Impact of Overnight Storage of Human Atrial Myocytes on Intracellular Calcium Homeostasis and Electrophysiological Utility. *Biomolecules*. 2024; 14(11):1415. DOI:10.3390/biom14111415. PMID:39595591. IF:4,800 (Q1/3D). Document type: Article.
- Babini H, Jiménez V, Stogova E, Arslanova A, Butt M, Dababneh S, Asghari P, Moore EDW, Claydon TW, Chiamvimonvat N, Hove-Madsen L, Tibbits GF. hiPSC-derived cardiomyocytes as a model to study the role of small-conductance Ca^{2+} -activated K^{+} (SK) ion channel variants associated with atrial fibrillation. *Frontiers in Cell and Developmental Biology*. 2024; 12:1298007. DOI:10.3389/fcell.2024.1298007. PMID:38304423. IF:4,600 (Q1/2D). Document type: Review.
- Linz D, Andrade JG, Arbelo E, Boriani G, Breithardt G, Camm AJ, Caso V, Nielsen JC, De Melis M, De Potter T, Dichtl W, Diederichsen SZ, Dobrev D, Doll N, Duncker D, Dworatzek E, Eckardt L, Eisert C, Fabritz L, Farkowski M, Filgueiras D, Goette A, Guasch E, Hack G, Hatem S, Haeusler KG, Healey JS, Heidbuechel H, Hijazi Z, Hofmeister LH, Hove-Madsen L, Huebner T, Kääb S, Kotecha D, Malaczynska K, Merino JL, Metzner A, Mont L, Ng GA, Oeff M, Parwani AS, Puererfellner H, Ravens U, Rienstra M, Sanders P, Scherr D, Schnabel R, Schotten U, Sohns C, Steinbeck G, Steven D, Toennis T, Tzeis S, van IC, van RH, Vernooy K, Wadhwa M, Wakili R, Willems S, Witt H, Zeemering S, Kirchhof P. Longer and better lives for patients with atrial fibrillation: the 9th AFNET/ EHRA consensus conference. *EUROPACE*. 2024; 26(4):euae070. DOI:10.1093/europace/euae070. PMID:38591838. IF:7,900 (Q1/1D). Document type: Article.