

Regulation of Cardiac Rhythm and Contraction

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DESCRIPTION

The Cardiac Rhythm and Contraction Group has since its creation focused on identifying molecular and cellular electrophysiological mechanisms contributing to the development of cardiac arrhythmia, 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 in patients with atrial fibrillation.

MAIN LINES OF RESEARCH

- Neuro-hormonal regulation of intracellular calcium homeostasis in cardiac myocytes.
- Impact of genetic variants on electrophysiological and contractile function in cardiac myocytes.
- Impact of clinical factors and circulating biomarkers on human atrial myocyte function.
- Development of computational tools for automated analysis of live-cell imaging experiments or protein distribution in large confocal image stacks.
- Development of detailed high-resolution mathematical myocyte models.

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 biggest recent opportunities to make a substantial advance in risk stratification and personalized treatment of atrial fibrillation.



05.1.1 Cardiovascular Diseases Area

The challenge is the vast number of SNPs, each associated with a modest increase in risk and unknown impact on function.

Our opportunity is to identify SNP combinations causing synergic derangements in human atrial myocyte function and a corresponding increase in the risk of atrial fibrillation.

ACTIVE 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).

DOCTORAL THESES DEFENDED

- Casabella Ramón, Sergi. Alteraciones en la homeostasis del calcio y la actividad eléctrica que se asocian con la fibrilación auricular en miocitos auriculares humanos y un modelo porcino de infarto auricular. 01/12/2023. Universitat Autònoma de Barcelona. Supervisors: Hove Madsen, Leif; Jiménez Farrerons, Marcel.

SCIENTIFIC PRODUCTION

- Amorós G, Casabella S, Company G, Arzamendi D, Jorge E, García A, Macías Y, Sánchez D, Rosell J, Guerra JM, Cinca J. Electrophysiological and histological characterization of atrial scarring in a model of isolated atrial myocardial infarction. *Frontiers in Physiology*. 2023; 13:1104327. DOI:10.3389/fphys.2022.1104327. PMID:36714312. IF:4,000 (Q2/3D). Document type: Article.
- Amorós G, Casabella S, Moreno Z, Ivorra A, Guerra JM, García T. Dynamics of High-Density Unipolar Epicardial Electrograms During PFA. *Circulation-Arrhythmia and Electrophysiology*. 2023; 16(9):e011914. DOI:10.1161/CIRCEP.123.011914. PMID:37577822. IF:8,400 (Q1/2D). Document type: Article.
- Franco D, Hove L, Daimi H. Editorial: Molecular, structural and electrophysiological remodeling in atrial fibrillation. *Frontiers in Physiology*. 2023; 14:1303328. DOI:10.3389/fphys.2023.1303328. PMID:37900957. IF:4,000 (Q2/3D). Document type: Editorial Material.
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- Jimenez V, Casabella S, Llach A, Gich I, Casellas S, Ciruela F, Chen SRW, Guerra JM, Ginel A, Benitez R, Cinca J, Tarifa C, Hove L. Beta-blocker treatment of patients with atrial fibrillation attenuates spontaneous calcium release-induced electrical activity. *BIOMEDICINE & PHARMACOTHERAPY*. 2023; 158:114169. DOI:10.1016/j.biopha.2022.114169. PMID:36592495. IF:7,500 (Q1/1D). Document type: Article.
- Ni MK, Li YH, Wei JH, Song ZP, Wang H, Yao JJ, Chen YX, Belke D, Estillore JP, Wang RW, Vallmitjana A, Benitez R, Hove L, Feng W, Chen J, Roston TM, Sanatani S, Lehman A, Chen SRW. Increased Ca²⁺ Transient Underlies RyR2-Related Left Ventricular Noncompaction. *CIRCULATION RESEARCH*. 2023; 133(2)DOI:10.1161/CIRCRESAHA.123.322504. PMID:37325910. IF:20,100 (Q1/1D). Document type: Article.
- Puertas L, Alonso J, Hove L, Martínez J, Rodríguez C. PDE4 Phosphodiesterases in Cardiovascular Diseases: Key Pathophysiological Players and Potential Therapeutic Targets. *INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES*. 2023; 24(23):17017. DOI:10.3390/ijms242317017. PMID:38069339. IF:5,600 (Q1/3D). Document type: Review.
- Tarifa C, Jimenez V, Franco R, Montiel J, Guerra J, Ciruela F, Hove L. Expression and Impact of Adenosine A(3) Receptors on Calcium Homeostasis in Human Right Atrium. *INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES*. 2023; 24(5):4404. DOI:10.3390/ijms24054404. PMID:36901835. IF:5,600 (Q1/3D). Document type: Article.
- Tarifa C, Serra SA, Herraiz A, Lozano E, Benitez R, Aranega A, Franco D, Hove L. Pitx2c deficiency confers cellular electrophysiological hallmarks of atrial fibrillation to isolated atrial myocytes.



05.1.1 Cardiovascular Diseases Area

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- Wei JH, Guo WT, Wang RW, Estillore JP, Belke D, Chen YX, Vallmitjana A, Benitez R, Hove L, Chen SRW. RyR2 Serine-2030 PKA Site Governs Ca²⁺ Release Termination and Ca²⁺ Alternans. *CIRCULATION RESEARCH*. 2023; 132(2):e59-e77. DOI:10.1161/CIRCRESAHA.122.321177. PMID:36583384. IF:20,100 (Q1/1D). Document type: Article.