Biomarkers for Cardiovascular Disease

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DESCRIPTION

The group's research focuses on identifying and characterising molecular and cellular biomarkers of atherosclerosis and ischaemic heart disease, with applications in prevention, diagnosis, risk stratification, and treatment. Research covers various cardiovascular diseases at both subclinical and clinical stages, including studies on tissue remodelling, inflammation, lipoproteins, cardiovascular risk factors, and disease prevention. Biomarkers and therapeutic targets are investigated using animal models, clinical samples (from both patients and healthy subjects), and mechanistic cell culture studies.

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

- Apply omics and in silico approaches to identify and characterise circulating biomarkers of cardiovascular disease in biological fluids (serum, plasma, urine) and those carried by lipoproteins or microvesicles. This includes proteomics using liquid chromatography, 2D electrophoresis, and mass spectrometry; lipidomics via UPLC-mass spectrometry and NMR; and transcriptomics (mRNA, non-coding RNA) through arrays, next-generation sequencing, and real-time PCR.
- Generate new knowledge on circulating non-coding RNAs and extracellular vesicles (microvesicles/exosomes), which transport non-coding RNAs (e.g., miRNAs, lncRNAs) and proteins derived from parental cells. Their capacity to reflect defined pathophysiological states makes them promising biomarker candidates for disease monitoring and evolution.
- The use of omic data for more accurate stratification of patients regarding disease progression and outcome.
- To identify and characterise novel extracellular matrix components involved in tissue remodelling of atherosclerotic vessels and cardiac tissue following myocardial infarction, to advance the pathophysiological understanding of the disease and uncover biomarkers predictive of disease progression.
- Characterisation at the cellular level of molecular and functional mechanisms (gene and protein expression regulation, epigenetic regulation, subcellular distribution of proteins, paracrine effects, cell functions) for selected biomarkers/molecular targets in cardiovascular pathology and myocardial remodelling.

ACTIVE & AWARDED GRANTS

- Padró Capmany, Teresa. Identificación en la matriz extracellular post-infarto de moléculas estimulantes de regeneración cardiaca (MATRI-REG). PI22/01930. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2025. 171.820,00 €
- Padró Capmany, Teresa. TRANSBIOLINE: Translational Safety Biomarker Pipeline (TransBioLine): Enabling development and implementation of novel safety biomarkers in clinical trials and diagnosis of disease. TRANSBIOLINE 821283. Unión Europea. Duration: 2019-2025. 182.600,00 €
- Padró Capmany, Teresa. Impact of lipoprotein molecular and functional composition and inflammation on ACVD clinical event presentation in familial hypercholesterolemia (LipoComp). 202329-10. Fundació La Marató de TV3. Duration: 2024-2027. 199.997,50 €
- Padró Capmany, Teresa. Insuficiencia cardiaca con función de eyección preservada en la obesidad: Estudio transcripcional y epigenético para determinar biomarcadores no invasivos de disfunción ventricular en obesidad" (Estudio TRANSEPIGEN). SEC 2024-3. Sociedad Española de Cardiologia (SEC). Duration: 2024-2028. 15.000,00 €
- Padró Capmany, Teresa. Medicina de Precisión en Hipercolesterolemia Familiar y enfermedad cardiovascular prematura mediante la integración de tecnologías ómicas y de imagen (MedPreHF). PMP22/00108. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2025. 1.469.930,00 €

DOCTORAL THESES DEFENDED

- Muñoz García, Natalia. Lipoproteínas, inflamación y antioxidantes dietéticos en la enfermedad cardiovascular. 02/12/2024. Universitat de Barcelona. Supervisors: Badimon Maestro, Lina; Padró Capmany, M.Teresa; Sabaté Tenas, Manuel. http://hdl.handle.net/10803/693876.

SCIENTIFIC PRODUCTION

- Arnold N, Blaum C, Gossling A, Brunner FJ, Bay B, Ferrario MM, Brambilla P, Cesana G, Leoni V, Palmieri L, Donfrancesco C, Padró T, Andersson J, Jousilahti P, Ojeda F, Zeller T, Linneberg A, Söderberg S, Iacoviello L, Gianfagna F, Sans S, Veronesi G, Thorand B, Peters A, Tunstall H, Kee F, Salomaa V, Schnabel RB, Kuulasmaa K, Blankenberg S, Koenig W, Waldeyer C, BiomarCaRE I. C-reactive protein modifies lipoprotein(a)-related risk for coronary heart disease: the BiomarCaRE project. EUROPEAN HEART JOURNAL. 2024; 45(12). DOI:10.1093/eurheartj/ehad867. PMID:38240386. IF:37,600 (Q1/1D). Document type: Article.
- Borrell-Pagès M, Luquero A, Vilahur G, Padró T, Badimon L. Canonical Wnt pathway and the LDL receptor superfamily in neuronal cholesterol homeostasis and function. Cardiovasc Res. 2024; 120(2):140-151. DOI:10.1093/cvr/cvad159. PMID:37882606. IF:10,400 (Q1/1D). Document type: Article.
- de Isla LP, Vallejo AJ, Watts GF, Muñiz O, Alonso R, Díaz JL, Arroyo R, Aguado R, Argueso R, Mauri M, Romero MJ, Álvarez P, Mañas D, Cepeda JM, González P, Casañas M, Michan A, Muñoz JFS, Faedo C, Barba MA, Dieguez M, de Andrés R, Hernández AM, González A, Padró T, Fuentes F, Badimon L, Mata P, SAFEHEART I. Long-term sex differences in atherosclerotic cardiovascular disease in individuals with heterozygous familial hypercholesterolaemia in Spain: a study using data from SAFEHEART, a nationwide, multicentre, prospective cohort study. Lancet Diabetes & Endocrinology. 2024; 12(9). DOI:10.1016/S2213-8587(24)00192-X. PMID:39098315. IF:44,000 (Q1/1D). Document type: Article.
- Devaux Y, Zhang L, Lumley AI, Karaduzovic K, Mooser V, Rousseau S, Shoaib M, Satagopam V, Adilovic M, Srivastava PK, Emanueli C, Martelli F, Greco S, Badimon L, Padró T, Lustrek M, Scholz M, Rosolowski M, Jordan M, Brandenburger T, Benczik B, Agg B, Ferdinandy P, Vehreschild JJ, Lorenz B, Dorr M, Witzke O, Sánchez G, Kul S, Baker AH, Fagherazzi G, Ollert M, Wereski R, Mills NL, Firat H. Development of a long noncoding RNA-based machine learning model to predict COVID-19 in-hospital mortality. Nature Communications. 2024; 15(1):4259. DOI:10.1038/s41467-024-47557-1. PMID:38769334. IF:14,700 (Q1/1D). Document type: Article.
- Escate R, Padró T, de Isla LP, Fuentes F, Alonso R, Mata P, Badimon L. Circulating miR-6821-5p levels and coronary calcification in asymptomatic familial hypercholesterolemia patients. ATHEROSCLEROSIS. 2024; 392:117502. DOI:10.1016/j.atherosclerosis.2024.117502. PMID:38513437. IF:4,900 (Q1/2D). Document type: Article.
- Escate R, Padró T, Suades R, Sans J, Devaux Y, Lakkisto P, Harjola VP, Sionis A, Badimon L. miR-619-5p and cardiogenic shock in patients with ST-segment elevation myocardial infarction. EUROPEAN JOURNAL OF CLINICAL INVESTIGATION. 2024; 54(8). DOI:10.1111/eci.14186. PMID:38376079. IF:4,400 (Q1/2D). Document type: Article.
- López A, Muñoz N, Villaplana VD, Padró T, Badimon L. Effect of Moderate Beer Intake on the Lipid Composition of Human Red Blood Cell Membranes. Nutrients. 2024; 16(20):3541. DOI:10.3390/nu16203541. PMID:39458535. IF:4,800 (Q1/2D). Document type: Article.
- Ministrini S, Padró T. MicroRNA in cardiometabolic health and disease: The perspectives of sex, gender and personalised medicine. EUROPEAN JOURNAL OF CLINICAL INVESTIGATION. 2024; 54(7). DOI:10.1111/eci.14223. PMID:38623918. IF:4,400 (Q1/2D). Document type: Review.
- Muñoz N, Cordero A, Padró T, Mendieta G, Vilahur G, Flores E, Badimon L. First time ACS in patients with on-target lipid levels: Inflammation at admission and re-event rate at follow-up. EUROPEAN JOURNAL OF CLINICAL INVESTIGATION. 2024; 54(12). DOI:10.1111/eci.14305. PMID:39159006. IF:4,400 (Q1/2D). Document type: Article.
- Padró T, Santisteban V, Huedo P, Puntes M, Aguiló M, Espadaler J, Badimon L. Lactiplantibacillus plantarum strains KABP011, KABP012, and KABP013 modulate bile acids and cholesterol metabolism in humans.

CARDIOVASCULAR RESEARCH. 2024; 120(7). DOI:10.1093/cvr/cvae061. PMID:38525555. IF:10,200 (Q1/1D). Document type: Article.

- Santisteban V, Muñoz N, López A, Puntes M, Badimon L, Padró T. Efficacy of Food Industry By-Product ß-Glucan/Chitin-Chitosan on Lipid Profile of Overweight and Obese Individuals: Sustainability and Nutraceuticals. Nutrients. 2024; 16(19):3420. DOI:10.3390/nu16193420. PMID:39408385. IF:4,800 (Q1/2D). Document type: Article.
- Suades R, Greco MF, Padró T, de Santisteban V, Domingo P, Benincasa G, Napoli C, Greco S, Madè A, Ranucci M, Devaux Y, Martelli F, Badimon L. Blood CD45⁺/CD3⁺ lymphocyte-released extracellular vesicles and mortality in hospitalized patients with coronavirus disease 2019. EUROPEAN JOURNAL OF CLINICAL INVESTIGATION. 2024; DOI:10.1111/eci.14354. PMID:39548690. IF:4,400 (Q1/2D). Document type: Article.
- Suades R, Greco MF, Prieto P, Padró T, Devaux Y, Domingo P, Badimon L. CD66b⁺/CD68⁺ circulating extracellular vesicles, lactate dehydrogenase and neutrophil-to-lymphocyte ratio can differentiate coronavirus disease 2019 severity during and after infection. Journal of Extracellular Vesicles. 2024; 13(7):e12456. DOI:10.1002/jev2.12456. PMID:39007437. IF:15,500 (Q1/1D). Document type: Article..
- Suades R, Greco MF, Prieto P, Padró T, Devaux Y, Domingo P, Badimon L. CD66b⁺/CD68⁺ circulating extracellular vesicles, lactate dehydrogenase and neutrophil-to-lymphocyte ratio can differentiate coronavirus disease 2019 severity during and after infection. Journal of Extracellular Vesicles. 2024; 13(7):e12456. DOI:10.1002/jev2.12456. PMID:39007437. IF:15,500 (Q1/1D). Document type: Article.
- Sutelman P, Radike M, Vilahur G. Seeing is believing: pathway strategies for a personalised non-invasive diagnosis of coronary artery disease. Internal and Emergency Medicine. 2024; 19(2). DOI:10.1007/s11739-023-03526-y. PMID:38315383. IF:3,200 (Q1/2D). Document type: Article.
- Tesoro L, Hernández I, Saura M, Badimón L, Zaragoza C. Novel cutting edge nano-strategies to address old long-standing complications in cardiovascular diseases. A comprehensive review. EUROPEAN JOURNAL OF CLINICAL INVESTIGATION. 2024; 54(7). DOI:10.1111/eci.14208. PMID:38622800. IF:4,400 (Q1/2D). Document type: Review.
- Triska J, Maitra N, Deshotels MR, Haddadin F, Angiolillo DJ, Vilahur G, Jneid H, Atar D, Birnbaum Y. A Comprehensive Review of the Pleiotropic Effects of Ticagrelor. Cardiovasc Drugs Ther. 2024; 38(4):775-797. DOI:10.1007/s10557-022-07373-5. PMID:36001200. IF:3,100 (Q2/4D). Document type: Review.
- Vilahur G, Radike M, Sutelman P, Ben S, Gutiérrez M, Casaní L, Hovdal D, Ongstad EL, Gabrielsen A, Hidalgo A, Fjellström O, Carlsson L, Badimon L. Recombinant human soluble domain of CD39L3 and ticagrelor: cardioprotective effects in experimental myocardial infarction. EUROPEAN HEART JOURNAL. 2024; 45(17). DOI:10.1093/eurheartj/ehae107. PMID:38486376. IF:37,600 (Q1/1D). Document type: Article.