

Center for Genetic Cardiomyopathies

Director: Prof. Lia Crotti (Scientific and Clinical Advisor: Prof. Franco Cecchi)

Specialised Research Centre afferent to the Cardiology Research Laboratory

Research group members

- Prof. Franco Cecchi (consulente)
- [Dott.ssa Valeria Rella](#)
- Dott.ssa Sabrina Salerno
- Dott. Davide Mariani
- [Dott.ssa Silvia Castelletti](#)
- Dott. Paolo Cerea
- Dott. Martino Meda
- Dott.ssa Silvia Ravaro

RESEARCH ACTIVITIES

The research activity of the Cardiomyopathy Center at the Istituto Auxologico Italiano is primarily focused on studying the genetic basis of the disease and the clinical and genetic factors that can influence arrhythmic risk and disease progression. The Center is involved in national and international networks that have led to important collaborative studies as well as consensus documents. Furthermore, the center is engaged in randomized clinical trials of new drugs and may potentially initiate the testing of new genetic therapies in the near future.

DISEASES ON WHICH RESEARCH IS FOCUSED

- Hypertrophic cardiomyopathy
- Cardiac amyloidosis
- Arrhythmogenic cardiomyopathy
- Dilated cardiomyopathy
- Non-compaction of the left ventricle
- Restrictive cardiomyopathy

RESULTS OF PARTICULAR IMPORTANCE ACHIEVED (list of publications accessible from the website with a hyperlink, approved projects, awards and recognitions - to be updated annually)

- [Fish M, Shaboodien G, Kraus S, Sliwa K, Seidman CE, Burke MA, Crotti L, Schwartz PJ, Mayosi BM. Mutation analysis of the phospholamban gene in 315 South Africans with dilated, hypertrophic, peripartum and arrhythmogenic right ventricular cardiomyopathies. Sci Rep. 2016 Feb 26;6:22235. doi: 10.1038/srep22235. Erratum in: Sci Rep. 2016 May 18;6:25863. PMID: 26917049; PMCID: PMC4808831.](#)
- [Mayosi BM, Fish M, Shaboodien G, Mastantuono E, Kraus S, Wieland T, Kotta MC, Chin A, Laing N, Ntusi NB, Chong M, Horsfall C, Pimstone SN, Gentilini D, Parati G, Strom TM, Meitinger T, Pare G, Schwartz PJ, Crotti L. Identification of Cadherin 2 \(CDH2\) Mutations in Arrhythmogenic Right Ventricular Cardiomyopathy. Circ Cardiovasc Genet. 2017 Apr;10\(2\):e001605. doi: 10.1161/CIRCGENETICS.116.001605. PMID: 28280076.](#)
- [Castelletti S, Vischer AS, Syrris P, Crotti L, Spazzolini C, Ghidoni A, Parati G, Jenkins S, Kotta MC, McKenna WJ, Schwartz PJ, Pantazis A. Desmoplakin missense and non-missense mutations in arrhythmogenic right ventricular cardiomyopathy: Genotype-phenotype correlation. Int J Cardiol. 2017 Dec 15;249:268-273. doi: 10.1016/j.ijcard.2017.05.018. Epub 2017 May 10. PMID: 28527814.](#)
- [Crotti L, Kotta MC. The role of genetics in primary ventricular fibrillation, inherited channelopathies and cardiomyopathies. Int J Cardiol. 2017 Jun 15;237:45-48. doi: 10.1016/j.ijcard.2017.03.119. PMID: 28532586.](#)
- [Girolami F, Frisso G, Benelli M, Crotti L, Iascone M, Mango R, Mazzaccara C, Pilichou K, Arbustini E, Tomberli B, Limongelli G, Basso C, Olivotto I. Contemporary genetic testing in inherited cardiac disease: tools, ethical issues, and clinical applications. J Cardiovasc Med \(Hagerstown\). 2018 Jan;19\(1\):1-11. doi: 10.2459/JCM.0000000000000589. PMID: 29176389; PMCID: PMC5732648.](#)
- [Olivotto I, Finocchiaro G, Maurizi N, Crotti L. Common presentation of rare cardiac diseases: Arrhythmias. Int J Cardiol. 2018 Apr 15;257:351-357. doi: 10.1016/j.ijcard.2018.01.004. PMID: 29506731.](#)
- [Castelletti S, Crotti L, Dagradi F, Rella V, Salerno S, Parati G, Cecchi F. Partial Pericardial Agenesis Mimicking Arrhythmogenic Right Ventricular Cardiomyopathy. Clin J Sport Med. 2020 Sep;30\(5\):e159-e162. doi: 10.1097/JSM.0000000000000733. PMID: 30893123.](#)
- [Maurizi N, Rella V, Fumagalli C, Salerno S, Castelletti S, Dagradi F, Torchio M, Marceca A, Meda M, Gasparini M, Boschi B, Girolami F, Parati G, Olivotto I, Crotti L, Cecchi F. Prevalence of cardiac amyloidosis among adult patients referred to tertiary centres with an initial diagnosis of hypertrophic cardiomyopathy. Int J Cardiol. 2020 Feb 1;300:191-195. doi: 10.1016/j.ijcard.2019.07.051. Epub 2019 Jul 17. PMID: 31371117.](#)
- [Forte M, Schirone L, Ameri P, Basso C, Catalucci D, Modica J, Chimenti C, Crotti L, Frati G, Rubattu S, Schiattarella GG, Torella D, Perrino C, Indolfi C, Sciarretta S; Italian Society of Cardiology Working group on Cellular and Molecular Biology of the Heart. The role of mitochondrial dynamics in cardiovascular diseases. Br J Pharmacol. 2021 May;178\(10\):2060-2076. doi: 10.1111/bph.15068. Epub 2020 May 19. PMID: 32294237.](#)
- [Rella V, Parati G, Crotti L. Sudden Cardiac Death in Children Affected by Cardiomyopathies: An Update on Risk Factors and Indications at Transvenous or Subcutaneous Implantable Defibrillators. Front Pediatr. 2020 Apr 3;8:139. doi: 10.3389/fped.2020.00139. PMID: 32318526; PMCID: PMC7146705.](#)
- [Caravita S, Baratto C, Perego GB, Cecchi F, Crotti L, Parati G. Invasive Hemodynamics of Hypertrophic Cardiomyopathy: Exercise Versus Isoproterenol. Circ Heart Fail. 2020 Jun;13\(6\):e007000. doi: 10.1161/CIRCHEARTFAILURE.120.007000. Epub 2020 Jun 2. PMID: 32482090.](#)

- [Limongelli G, Crotti L. COVID-19 pandemic and inherited cardiomyopathies and channelopathies: a short term and long term perspective. Orphanet J Rare Dis. 2020 Jun 22;15\(1\):157. doi: 10.1186/s13023-020-01444-2. PMID: 32571376; PMCID: PMC7307806.](#)
- [Ghidoni A, Elliott PM, Syrris P, Calkins H, James CA, Judge DP, Murray B, Barc J, Probst V, Schott JJ, Song JP, Hauer RNW, Hoorntje ET, van Tintelen JP, Schulze-Bahr E, Hamilton RM, Mittal K, Semsarian C, Behr ER, Ackerman MJ, Basso C, Parati G, Gentilini D, Kotta MC, Mayosi BM, Schwartz PJ, Crotti L. Cadherin 2-Related Arrhythmogenic Cardiomyopathy: Prevalence and Clinical Features. Circ Genom Precis Med. 2021 Apr;14\(2\):e003097. doi: 10.1161/CIRCGEN.120.003097. Epub 2021 Feb 10. PMID: 33566628; PMCID: PMC8284361.](#)
- [Merlo M, Porcari A, Pagura L, Cameli M, Vergaro G, Musumeci B, Biagini E, Canepa M, Crotti L, Imazio M, Forleo C, Cappelli F, Favale S, Di Bella G, Dore F, Lombardi CM, Pavasini R, Rella V, Palmiero G, Caiazza M, Albanese M, Guaricci AI, Branzi G, Caponetti AG, Satri G, La Malfa G, Merlo AC, Andreis A, Bruno F, Longo F, Sfriso E, Di Lenno L, De Carli G, Giacomini E, Spini V, Milidoni A, Limongelli G, Autore C, Olivetto I, Badano L, Parati G, Perlini S, Metra M, Emdin M, Rapezzi C, Sinagra G. A national survey on prevalence of possible echocardiographic red flags of amyloid cardiomyopathy in consecutive patients undergoing routine echocardiography: study design and patients characterization - the first insight from the AC-TIVE Study. Eur J Prev Cardiol. 2022 May 5;29\(5\):e173-e177. doi: 10.1093/eurjpc/zwab127. PMID: 34499711.](#)
- [Mascia G, Crotti L, GropPELLI A, Canepa M, Merlo AC, Benenati S, Di Donna P, Della Bona R, Soranna D, Zambon A, Porto I, Olivetto I, Parati G, Brignole M, Cecchi F. Syncope in hypertrophic cardiomyopathy \(part I\): An updated systematic review and meta-analysis. Int J Cardiol. 2022 Jun 15;357:88-94. doi: 10.1016/j.ijcard.2022.03.028. Epub 2022 Mar 15. Erratum in: Int J Cardiol. 2023 Feb 1;372:150. PMID: 35304190.](#)
- [Wilde AAM, Semsarian C, Márquez MF, Shamloo AS, Ackerman MJ, Ashley EA, Sternick EB, Barajas-Martinez H, Behr ER, Bezzina CR, Breckpot J, Charron P, Chockalingam P, Crotti L, Gollob MH, Lubitz S, Makita N, Ohno S, Ortiz-Genga M, Sacilotto L, Schulze-Bahr E, Shimizu W, Sotoodehnia N, Tadros R, Ware JS, Winlaw DS, Kaufman ES; Document Reviewers; Aiba T, Bollmann A, Choi JI, Dalal A, Darrieux F, Giudicessi J, Guerchicoff M, Hong K, Krahn AD, MacIntyre C, Mackall JA, Mont L, Napolitano C, Ochoa JP, Peichl P, Pereira AC, Schwartz PJ, Skinner J, Stellbrink C, Tfelt-Hansen J, Deneke T; Developed in partnership with and endorsed by the European Heart Rhythm Association \(EHRA\), a branch of the European Society of Cardiology \(ESC\), the Heart Rhythm Society \(HRS\), the Asia Pacific Heart Rhythm Society \(APHRS\), and the Latin American Heart Rhythm Society \(LAHRS\).. European Heart Rhythm Association \(EHRA\)/Heart Rhythm Society \(HRS\)/Asia Pacific Heart Rhythm Society \(APHRS\)/Latin American Heart Rhythm Society \(LAHRS\) Expert Consensus Statement on the state of genetic testing for cardiac diseases. Europace. 2022 Sep 1;24\(8\):1307-1367. doi: 10.1093/europace/euac030. Erratum in: Europace. 2022 Aug 30; PMID: 35373836; PMCID: PMC9435643.](#)
- [Wilde AAM, Semsarian C, Márquez MF, Sepehri Shamloo A, Ackerman MJ, Ashley EA, Sternick EB, Barajas-Martinez H, Behr ER, Bezzina CR, Breckpot J, Charron P, Chockalingam P, Crotti L, Gollob MH, Lubitz S, Makita N, Ohno S, Ortiz-Genga M, Sacilotto L, Schulze-Bahr E, Shimizu W, Sotoodehnia N, Tadros R, Ware JS, Winlaw DS, Kaufman ES; Document Reviewers; Aiba T, Bollmann A, Choi JI, Dalal A, Darrieux F, Giudicessi J, Guerchicoff M, Hong K, Krahn AD, MacIntyre C, Mackall JA, Mont L, Napolitano C, Ochoa JP, Peichl P, Pereira AC, Schwartz PJ, Skinner J, Stellbrink C, Tfelt-Hansen J, Deneke T. European Heart Rhythm Association \(EHRA\)/Heart Rhythm Society \(HRS\)/Asia Pacific Heart Rhythm Society \(APHRS\)/Latin American Heart Rhythm Society \(LAHRS\) Expert Consensus Statement on the](#)

[State of Genetic Testing for Cardiac Diseases. Heart Rhythm. 2022 Jul;19\(7\):e1-e60. doi: 10.1016/j.hrthm.2022.03.1225. Epub 2022 Apr 4. PMID: 35390533.](#)

- [Wilde AAM, Semsarian C, Márquez MF, Sepehri Shamloo A, Ackerman MJ, Ashley EA, Sternick Eduardo B, Barajas-Martinez H, Behr ER, Bezzina CR, Breckpot J, Charron P, Chockalingam P, Crotti L, Gollob MH, Lubitz S, Makita N, Ohno S, Ortiz-Genga M, Sacilotto L, Schulze-Bahr E, Shimizu W, Sotoodehnia N, Tadros R, Ware JS, Winlaw DS, Kaufman ES, Aiba T, Bollmann A, Choi JI, Dalal A, Darrieux F, Giudicessi J, Guerchicoff M, Hong K, Krahn AD, Mac Intyre C, Mackall JA, Mont L, Napolitano C, Ochoa Juan P, Peichl P, Pereira AC, Schwartz PJ, Skinner J, Stellbrink C, Tfelt-Hansen J, Deneke T. European Heart Rhythm Association \(EHRA\)/Heart Rhythm Society \(HRS\)/Asia Pacific Heart Rhythm Society \(APHRS\)/Latin American Heart Rhythm Society \(LAHRS\) Expert Consensus Statement on the state of genetic testing for cardiac diseases. J Arrhythm. 2022 May 31;38\(4\):491-553. doi: 10.1002/joa3.12717. PMID: 35936045; PMCID: PMC9347209.](#)
- [Merlo M, Pagura L, Porcari A, Cameli M, Vergaro G, Musumeci B, Biagini E, Canepa M, Crotti L, Imazio M, Forleo C, Cappelli F, Perfetto F, Favale S, Di Bella G, Dore F, Girardi F, Tomasoni D, Pavasini R, Rella V, Palmiero G, Caiazza M, Carella MC, Igoren Guaricci A, Branzi G, Caponetti AG, Satri G, La Malfa G, Merlo AC, Andreis A, Bruno F, Longo F, Rossi M, Varrà GG, Saro R, Di Lenno L, De Carli G, Giacomini E, Arzilli C, Limongelli G, Autore C, Olivetto I, Badano L, Parati G, Perlini S, Metra M, Emdin M, Rapezzi C, Sinagra G. Unmasking the prevalence of amyloid cardiomyopathy in the real world: results from Phase 2 of the AC-TIVE study, an Italian nationwide survey. Eur J Heart Fail. 2022 Aug;24\(8\):1377-1386. doi: 10.1002/ejhf.2504. Epub 2022 May 10. PMID: 35417089.](#)
- [Castelletti S, Zorzi A, Ballardini E, Basso C, Biffi A, Brancati F, Cavarretta E, Crotti L, Contursi M, D'Aleo A, D'Ascenzi F, Delise P, Dello Russo A, Gazale G, Mos L, Novelli V, Palamà Z, Palermi S, Palmieri V, Patrizi G, Pelliccia A, Pilichou K, Romano S, Sarto P, Schwartz PJ, Tiberi M, Zeppilli P, Corrado D, Sciarra L. Molecular genetic testing in athletes: Why and when a position statement from the Italian Society of Sports Cardiology. Int J Cardiol. 2022 Oct 1;364:169-177. doi: 10.1016/j.ijcard.2022.05.071. Epub 2022 Jun 1. Erratum in: Int J Cardiol. 2023 Jan 1;370:476. PMID: 35662561.](#)
- [Brignole M, Cecchi F, Anastasakis A, Crotti L, Deharo JC, Elliott PM, Fedorowski A, Kaski JP, Limongelli G, Maron MS, Olivetto I, Ommen SR, Parati G, Shen W, Ungar A, Wilde A. Syncope in hypertrophic cardiomyopathy \(part II\): An expert consensus statement on the diagnosis and management. Int J Cardiol. 2023 Jan 1;370:330-337. doi: 10.1016/j.ijcard.2022.10.153. Epub 2022 Oct 26. PMID: 36309161.](#)
- [Sinagra G, Emdin M, Merlo M, Vergaro G, Aimo A, Biagini E, Imazio M, Porcari A, Limongelli G, Cipriani A, Canepa M, Musumeci B, Cameli M, Crotti L, Di Bella G, Di Lenarda A, Cappelli F, Chimenti C, Obici L, Iacoviello M, Perlini S, Pieroni M, Metra M, Oliva F, Perrone Filardi P, Colivicchi F, Indolfi C. Razionale e valore fondamentale della Rete Italiana integrata dell'Amiloidosi Cardiaca \[Rationale and significance of the Italian Network for Cardiac Amyloidosis\]. G Ital Cardiol \(Rome\). 2023 Feb;24\(2\):93-98. Italian. doi: 10.1714/3963.39416. PMID: 36735307.](#)
- [Castelletti S, Orini M, Vischer AS, McKenna WJ, Lambiase PD, Pantazis A, Crotti L. Circadian and Seasonal Pattern of Arrhythmic Events in Arrhythmogenic Cardiomyopathy Patients. Int J Environ Res Public Health. 2023 Feb 7;20\(4\):2872. doi: 10.3390/ijerph20042872. PMID: 36833593; PMCID: PMC9956986.](#)
- [Tini G, Milani P, Zampieri M, Caponetti AG, Fabris F, Foli A, Argirò A, Mazzoni C, Gagliardi C, Longhi S, Satri G, Vergaro G, Aimo A, Russo D, Varrà GG, Serenelli M, Fabbri G, De Michieli L, Palmiero G, Ciliberti G, Carigi S, Sessarego E, Mandoli GE, Ricci Lucchi G, Rella V, Monti E,](#)

- [Gardini E, Bartolotti M, Crotti L, Merli E, Mussinelli R, Vianello PF, Cameli M, Marzo F, Guerra F, Limongelli G, Cipriani A, Perlini S, Obici L, Perfetto F, Autore C, Porto I, Rapezzi C, Sinagra G, Merlo M, Musumeci B, Emdin M, Biagini E, Cappelli F, Palladini G, Canepa M. Diagnostic pathways to wild-type transthyretin amyloid cardiomyopathy: a multicentre network study. Eur J Heart Fail. 2023 Mar 12. doi: 10.1002/ejhf.2823. Epub ahead of print. PMID: 36907828.](#)
- [Girolami F, Gozzini A, Pálincás ED, Ballerini A, Tomberli A, Baldini K, Marchi A, Zampieri M, Passantino S, Porcedda G, Calabri GB, Bennati E, Spaziani G, Crotti L, Cecchi F, Favilli S, Olivotto I. Genetic Testing and Counselling in Hypertrophic Cardiomyopathy: Frequently Asked Questions. J Clin Med. 2023 Mar 24;12\(7\):2489. doi: 10.3390/jcm12072489. PMID: 37048573; PMCID: PMC10095452.](#)
 - [Tini G, Cappelli F, Biagini E, Musumeci B, Merlo M, Crotti L, Cameli M, Di Bella G, Cipriani A, Marzo F, Guerra F, Forleo C, Gagliardi C, Zampieri M, Carigi S, Vianello PF, Mandoli GE, Ciliberti G, Lichelli L, Mariani D, Porcari A, Russo D, Licordari R, Ponziani A, Porto I, Perfetto F, Autore C, Rapezzi C, Sinagra G, Canepa M. Current patterns of beta-blocker prescription in cardiac amyloidosis: an Italian nationwide survey. ESC Heart Fail. 2021 Aug;8\(4\):3369-3374. doi: 10.1002/ehf2.13411. Epub 2021 May 14. PMID: 33988312; PMCID: PMC8318433.](#)
 - [Girolami F, Gozzini A, Pálincás ED, Ballerini A, Tomberli A, Baldini K, Marchi A, Zampieri M, Passantino S, Porcedda G, Calabri GB, Bennati E, Spaziani G, Crotti L, Cecchi F, Favilli S, Olivotto I. Genetic Testing and Counselling in Hypertrophic Cardiomyopathy: Frequently Asked Questions. J Clin Med. 2023 Mar 24;12\(7\):2489. doi: 10.3390/jcm12072489. PMID: 37048573; PMCID: PMC10095452.](#)

MAIN COLLABORATIONS WITH NATIONAL AND INTERNATIONAL RESEARCH NETWORKS

The Laboratory is part of the European network ERN-GUARD Heart ([link](#)) and participates in the Italian network on cardiac amyloidosis, which has resulted in numerous scientific publications. The Laboratory also collaborates with leading Italian centers specializing in cardiomyopathies, and this collaboration has also led to scientific publications in the field of hypertrophic cardiomyopathy. Furthermore, the collaboration with globally renowned reference centers has resulted, on the one hand, in the identification and subsequent validation of the CDH2 gene as a novel gene underlying arrhythmogenic cardiomyopathy, and on the other hand, in the development of international consensus documents, such as the one on the management of syncope in patients with hypertrophic cardiomyopathy and the consensus on the use of genetics in genetically determined cardiac diseases, including cardiomyopathies.