BIOC 5001 ***Special Topics in Biochemistry and Molecular Biology:***
Concepts and Methods in Cardiovascular biology, function and pathology

Coordinators: Dr. Thomas Pulinilkunnil & Dr. Petra Kienesberger

13-week course of directed readings; **Weekly on Friday from 11.30 am- 12.30 am (DMNB Room 218)**

Join the meeting now
Meeting ID: 230 229 970 923 4
Passcode: KY3Hn2Aw

Course Details (Requires prior reading of listed resources in one week and in-person discussion of proposed topics on the underlined date)

Week 1 (Sep 19– Sep 26, 2025):
Concept: Overview of cardiac energy metabolism (Kolwicz SC Jr, et al. Circ Res. 2013. PMID: 23948585)

Week 2 (Sep 26 – Oct 03, 2025):
Method: Assessment of glucose and fatty acid metabolism ex vivo (Manual of Research Techniques in Cardiovascular Medicine, Chapters 37)
Stable Isotopes for Tracing Cardiac Metabolism in Diseases (Front. Cardiovasc. Med. 8:734364. doi: 10.3389/fcvm.2021.734364)

Week 3 (Oct 03 – Oct 10, 2025):
Concept: Physiological and pathological mechanisms in Cardiac Hypertrophy (Nat Rev Cardiol. 2023 May 26. doi: 10.1038/s41569-023-00887-x.)

Week 4 (Oct 10 – Oct 17, 2025):
Method: Murine models of cardiac hypertrophy (Manual of Research Techniques in Cardiovascular Medicine, Chapters 20 and 21)

Week 5 (Oct 17 – Oct 24, 2025):
Concept: Pathobiology of cardiac ischemia-reperfusion and immunometabolism (Cell Physiol Biochem 2018;46:1650-1667; Am J Physiol Heart Circ Physiol. 2022 Dec 1;323(6): H1221-H1230; J Am Coll Cardiol Basic Trans Science 2023;8:884–904)

Week 6 (Oct 24 – Oct 31, 2025):
Method: Rodent models of Ischemia-Reperfusion (Journal of Molecular and Cellular Cardiology 50 (2011) 940–950; J. Vis.Exp. (101), e52908, doi:10.3791/52908 (2015); Molecular and Cellular Biochemistry 249: 97–103, 2003)

Week 7 (Oct 31 – Nov 07, 2025):
Concept and method: Principles, guidelines and techniques of myocardial cell death (Am J Physiol Heart Circ Physiol 317: H891–H922, 2019.)

Week 8 & 9 (Nov 07 – Nov 21, 2025): (No classes in the reading week for Nov 14, 2025)
Concept: Metabolic underpinning of heart failure: Focus on HFpEF (Cardiovasc Res. 2023 Feb 3;118(18):3556-3575. doi: 10.1093/cvr/cvac166; PMID: 36504368; Circulation Research. 2022;130:1965–1993. DOI: 10.1161/CIRCRESAHA.122.320334; Nat Rev Cardiol. 2021. PMID: 33432192)

Method: Comparison of animal models of HFpEF versus HFrEF (Circulation Research. 2022;130:1906–1925. DOI: 10.1161/CIRCRESAHA.122.320257; Circulation Research. 2022;130:1888–1905. DOI: 10.1161/CIRCRESAHA.122.320246)

Week 10 (Nov 21 – Nov 28, 2025): (Thomas away, Petra will coordinate the lecture)
Concept and method: Calcium signaling in cardiomyocyte function (CSH 2019, doi: 10.1101/cshperspect.a035428; Experimental model of CVD, Chapter 7, page 93)

Week 11 (Nov 28 – Dec 05, 2025): (Thomas away on Dec 05, Petra will coordinate the lecture)
Concept and method: Uncovering biomarkers in heart failure and application of Single Cell RNA Seq in CV health and disease (Heart Fail Rev.2022 Mar;27(2):625-643. doi: 10.1007/s10741-021-10105-w; European Heart Journal (2022) 00, 1–14; Nature Cell Biology | VOL 22 | 108 January 2020 | 108–119)

Week 12 (Dec 05 – Dec 12, 2025): (Thomas away, Petra will coordinate the lecture)
Concept and method: Sex differences in CV health and disease (Circulation Research. 2022;130:1747–1762. DOI: 10.1161/CIRCRESAHA.122.320259; J Mol Cell Cardiol. 2021. PMID: 34166708; Cardiovascular Research (2017) 113, 711–724)

Week 13 (Dec 19, 2025): (Seminar-style presentation)
Seminar-style presentation of a topic in cardiac signaling, metabolism and disease (10 min)

Allocation	Topics	Timeline
40%	Participation in weekly discussions of directed reading (journal club style)	
30%	Term paper in a review article format (3 pages single-spaced)	December 01, 2025
30%	Seminar-style presentation of the review article topic (10 min presentation and 5 min Q & A)	December 19, 2025
	Final Grade posted	Dec 20, 2025