



**Study program:** Doctoral Academic Studies in Biomedical Sciences

**Name of the subject:** CURRENT ISSUES IN THE EVALUATION OF THE CARDIOVASCULAR SYSTEM

**Teacher(s):** Otto F. Barak

**Status of the subject:** elective

**Number of ECTS points:** 20

**Condition:** -

**Goal of the subject**

The aim of the course is to get students acquainted with current trends in the field of cardiovascular research. Within this course, state-of-the-art methods and current issues in the physiology of regulatory mechanisms of cardiac functions, endothelial function of blood vessels, endothelial microparticles will be discussed and current research in the field of cardiovascular system and exercise will be reviewed.

**Outcome of the subject**

Students will gain new knowledge in the field of cardiovascular regulation and learn new techniques to test the functions of the cardiovascular system.

**Content of the subject**

*Theoretical lectures*

**Assessment of the state of the autonomic nervous system**

1. Autonomic control of heart rate and blood pressure
2. Non-invasive assessment of the autonomic control of heart rate - Heart rate variability (HRV)
3. Baroreflex sensitivity
4. Autonomic dysfunction (especially in chronic heart failure, stroke, diabetes, tetraplegia)
5. Parasympathetic reactivation after physical exertion

**Assessment of peripheral blood vessels**

1. Intrinsic blood flow control
2. Bioavailability of NO
3. Assessment of the endothelial function of arteries – Flow-mediated dilation, FMD
4. Endothelial microparticles (EMP) and vascular function
5. Retrograde blood flow and atherogenesis
6. Assessment of the elasticity of blood vessels – Pulse-wave velocity, PWV

**Cardiovascular system under extreme conditions**

1. Cardiovascular limits to maximal exertion
2. Adverse effects of exercise on the CVS
3. Adaptation of the CVS to exercise
4. Vascular changes in SCUBA diving
5. Hyperoxia and the CVS

*Labwork:*

1. Heart rate variability (HRV)
2. Baroreflex sensitivity
3. Parasympathetic reactivation after physical exertion
4. Assessment of the endothelial function of arteries – Flow-mediated dilation, FMD
5. Evoking retrograde blood flow
6. Assessment of the elasticity of blood vessels – Pulse-wave velocity, PWV

**Recommended literature**

*Compulsory*

1. Colombo J, Arora R, DePace NL, Vinik AI. Clinical Autonomic Dysfunction. Springer, Switzerland 2015
2. Gernot E. Heart rate variability. Springer-Verlag, London, 2014
3. Lemos De Luz P. Endothelium and Cardiovascular diseases: Vascular Biology and Clinical Syndromes, Elsevier, London, 2018
4. Pappano AJ, Wier WG. Cardiovascular Physiology, 11<sup>th</sup> edition, Elsevier, Philadelphia, 2019
5. Bell C. Cardiovascular Physiology in Exercise and Sport, Churchill Livingstone Elsevier, London, 2008
6. Draghici AE, Taylor JA. The physiological basis and measurement of heart rate variability in humans. J Physiol Anthropol.

2016;35(1):22

7. Schreuder TH, Green DJ, Hopman MT, Thijssen DH. Acute impact of retrograde shear rate on brachial and superficial femoral artery flow-mediated dilation in humans. *Physiol Rep*. 2014;2(1):e00193. doi: 10.1002/phy2.193.
8. Chiu JJ, Chien S. Effects of Disturbed Flow on Vascular Endothelium: Pathophysiological Basis and Clinical Perspectives. *Physiol Rev*. 2011;91:327–387.

*Supplementary*

student will be provided with literature along with each methodical unit of theoretical lectures

**Number of active classes**

**Theory: 60**

**Practice: 45**

**Methods of delivering lectures**

Lectures, seminars, labworks

**Evaluation of knowledge (maximum number of points 100)**

activity during lectures: 10

labwork: 10

seminars: 30

written exam: 50