Circulation

**Laboratory exercise and seminar in medical physiology**

Home preparation, study materials and learning objectives

**Learning objectives – what you should learn?**

• Describe the general principles affecting blood flow and their relationships

• List the factors determining capillary filtration

• Explain the causes and effects of blood distribution across different types of blood vessels

• Understand the meaning and mechanisms of regulation of interorgan distribution

• Describe the effect of static and dynamic exercise on circulation in relation to tissue perfusion

**Study materials**

* Lecture
* Textbook L. Constanzo – Physiology, 6th or 7th edition
  + Pages 119-131, 170-177

**Home preparation**

**Prepare answers to the following questions:**

If you increase the resistance of the vessel, what must be done to maintain flow?

Find out where the change of laminar and turbulent flow is practically used in medicine.

If you use a pressure band to limit blood flow through a limb, what signs you would use to verify that you have stopped only arterial or venous flow? How flow attentuation through different parts of the circulation will affect the limb. Would you find examples of specific situations where you can encounter these flow changes in practice?

**Presentation topics**

Mechanisms and regulation of interorgan distribution of cardiac output

Capacitance x resistance flow

**Bonus task**

A group of 2 students will prepare a brief presentation on the topic Specifics of pulmonary circulation (possibility of obtaining bonus credit)

Focus on the following points:

• what is the flow rate per unit of time compared to the system flow rate - explain

• characterize the pulmonary circulation in terms of its resistance, how these parameters are reflected in the pressures inside the pulmonary circulation

• describe the specifics of the pulmonary compared to the systemic accompanying the transition from the prenatal to the postnatal state (range max. 10 minutes)

**Background to the practical measuremets**

**Monitoring of reactive hyperemia**

If the blood flow to a tissue is stopped for a certain period of time, the tissue suffers from a lack of oxygen and nutrients, and vasodilator substances are released from it into the blood, and the precapillary sphincters expand and the number of new capillaries increases. After the restoration of blood flow for some time increased and vessels remain dilated, unless the concentration of these vasodilators is reduced. This phenomenon, which is called reactive hyperemia, can be easily observed on the skin. First, we compare the color of the skin on both hands of the examined person, who is sitting with his hands placed in front of him on the table. Then we attach the manometer cuff to the left arm. The examinee raises his arm above his head and clenches his fist with all his strength. This will reduce the blood content in the arm. Then we quickly inflate the cuff to 170 mmHg and the flow stops distal to the cuff. The examinee places his hand back on the table. We compare the color of the skin on both hands again. We leave the cuff inflated for a minute, then deflate it and observe the changes in skin color on the left hand. We observe how long it takes for the difference in the color of the skin on both hands to disappear.