Transport of gases in the blood

**Laboratory exercise and seminar in medical physiology**

Home preparation, study materials and learning objectives

**Learning objectives - what you will be able to do**

• The partial pressure of the gas in the mixture and the partial pressure of the gas in the solution

• Perfusion and diffusion limited O2 transport

• Binding properties of the dissociation curve of Hb for oxygen

• Factors influencing the binding of O2 to Hb (Bohr effect)

• Transport of CO2 in the blood, influence of pO2 on transport of CO2 (Haldane effect)

• Types of hypoxia

**Study materials**

• Lecture Transport of gases

(the recording of the lecture from 2020 can be found here:

 https://youtu.be/-f5NdbwZ5Zg)

• Textbook L. Constanzo – Physiology, 6th or 7th edition

o Chapters Gas Exchange (p. 209- 216), Oxygen transport in blood (p. 216-223), Carbon dioxide transport in blood (p. 223-225)

• Additional resources:

o Guyton AC, Hall JE: Textbook of Medical Physiology. Elsevier, 2020. (Chapter 40: Transport of Oxygen and Carbon Dioxide in Blood and Tissue Fluids)

**Preparing a presentation**

• Pulse oximetry - principle of measurement and interpretation of results (max. 10 minutes).

• Acute methemoglobinemia - a clinical case (max. 10 minutes).

Recommended source: <https://www.uptodate.com/contents/methemoglobinemia>

<https://haz-map.com/Diseases/210>

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5402826/

**Homework - print and bring to the seminar**

**Dalton's law of partial pressures**

**The wording of the law:**

**Calculation:** Calculate the partial pressure of O2 in dry inspired air and in humidified air in the trachea. Barometric pressure is 760 mm Hg, partial pressure of water vapor at 37°C is 47 mm Hg.

**Henry's law for dissolved gas concentration**

**The wording of the law:**

**Calculation:** If the PO2 of arterial blood is 100 mm Hg, what is the concentration of dissolved oxygen in the blood? The solubility of O2 is 0.003 ml O2/100 ml blood per mm Hg.

**O2-hemoglobin Dissociation Curve**

Draw the O2-hemoglobin dissociation curve, label the x-axis in two ways - as hemoglobin saturation (%) and as the amount of O2 in ml/l of blood.

**Carbon Dioxide Transport in Blood**

What is the most important mechanism of CO2 transport from the tissues to the lungs.