

PRACTICAL LESSONS WITH PRESENTATIONS OF STUDENTS- SUMMER SEMESTER, week 9

1. Membrane receptors and their signalization. Cytokines and growth factors (erythropoietin, insulin, VEGF, EGF)

2. Inborn and acquired defects of signal molecules and oncological diseases

Whom to contact – MUDr. Marek Hilšer, Ph.D.

Literature that is to be studied by ALL STUDENTS attending the seminar:

Membrane receptors and their signalization. Cytokines and growth factors

Rodwell V.W. et al., *Harper's Illustrated Biochemistry 30th ed, 2015: str. 500-501, 526-528, 532, 692,736.*

Signalization and oncological diseases

Alberts B. et al., *Molecular Biology of the Cell, 6th ed., 2014: Chapter 20 - Cancer, str. 1106 - 1107, 1113-1115, 1123-1124, 1135-1137.*

Rodwell V.W. et al., *Harper's Illustrated Biochemistry 30th ed., 2015: Chapter 56 - Cancer: An Overview;*

In addition, 6 students will prepare a presentation on one of the topics below. Recommended literature is listed for each of the topics separately. Up to 2 points (which will be added to the points gained in the tests) can be obtained for high quality presentations. Maximum points obtained in this way are 2 per semester.

- **Case 1 – Insulin signalization and its defects**

Aim: To demonstrate negative regulators of insulin signalization and mechanism of insulin resistance

Boucher J., Kleinridders A. and Kahn A. Insulin receptor signaling in normal and insulin-resistant states. Cold Spring Harb. Perspect. Biol. 6: a009191, 2014.

- **Case 2 – Signalization directed by vascular endothelial factors (VEGFs) and its dysfunction**

Aim: To demonstrate VEGF signalization and its defects in origin of many diseases

Smith G.A., Fearnley G.W., Harrison M.A., Tomlinson D.C., Wheatcroft S.B. and Ponnambalam S. Vascular endothelial growth factors: multitasking functionality in metabolism, health and disease. J. Inherit. Metab. Dis. 38 (4): 753-763, 2015.

- **Case 3 – Signalization directed by receptor of erythropoietin (EPOR) and its role in erythropoiesis, cytoprotection and regulation of energetic metabolism**

Aim: To demonstrate mechanisms of EPOR signalization and its regulatory function in organism

Chateauvieux S., Grigorakaki C., Morceau F., Dicato M. and Diederich M. Erythropoietin, erythropoiesis and beyond. Biochem. Pharmacol. 82 (10): 1291-1303, 2011.

Broxmeyer H.E. Erythropoietin: multiple targets, actions, and modifying influences for biological and clinical consideration. J. Exp. Med. 210 (2), 205-208, 2013.

Wang L., Di L. and Noguchi C.T. Erythropoietin, a novel versatile player regulating energy metabolism beyond the erythroid system. Int. J. Biol. Sci. 10 (8): 921-939, 2014.

- **Case 4 – Signalization directed by EGFR and its defects in oncological diseases**

Aim: To demonstrate signalization by EGFR and its dysregulation in transformed tumorous

Ceresa B.P. and Peterson J.L. Cell and molecular biology of epidermal growth factor receptor. Int. Rev. Cell Mol. Biol. 313: 145-178, 2014.

Lindsey S. and Langhans S.A. Epidermal growth factor signaling in transformed cells. Int. Rev. Cell Mol. Biol. 314: 1-41, 2014.

Guo G., Gong K., Wohlfeld B., Hatanpaa K.J., Zhao D. and Habib A.A. Ligand-independent EGFR signaling. Cancer Res. 75 (17): 3436-3441, 2015.

- **Case 5 - Postreceptor signal molecules (Ras a B-Raf) and their defects in oncological diseases**

- **Case 6 - Postreceptor signal molecules (PI3-kinase a PTEN) and their defects in oncological diseases**

Aim: To demonstrate involvement of selected signal proteins in signal pathways of receptor-tyrosinkinases and their dysregulation in transformed cancer cells.

Sun C. and Bernards R. Feedback and redundancy in receptor tyrosine kinase signaling: relevance to cancer therapies. Trends Biochem. Sci. 39 (10): 465-474,2014.

Maik-Rachline G. and Seger R. The ERK cascade inhibitors: towards overcoming resistance. Drug Resist. Updat. 25:1-12,2016.

Rodgers S.J., Ferguson D., Mitchell C. and Ooms L. Regulation