PhD School of Biology and Molecular Medicine
PhD Courses in Biochemistry & Life Sciences

SAPIENZA UNIVERSITÀ DI ROMA — DIPARTIMENTO DI SCIENZE BIOCHIMICHE A. ROSSI FANELLI

SPHINGOLIPID SIGNALING IN MITOCHONDRIAL APOPTOSIS

CFU: 1 (8 hours of theoretical lectures)

Teacher: **Prof. Johnny Stiban PhD**
Department of Biology and Biochemistry
Birzeit University
Birzeit, Ramallah, Palestine
jstiban@birzeit.edu

Location: Department of Biochemical Sciences "A. Rossi Fanelli" (building CU010, see map)

Calendar:

Monday July 9, 4-6 pm	Aula A
Tuesday July 10, 4-6 pm	Aula A
Wednesday July 11, 4-6 pm	Aula A
Thursday July 12, 4-5 pm	Aula A
Friday July 13, 4-5 pm	Aula C

Application guidelines:
Registration to the Course is free. The interested Student should write an email to francesco.malatesta@uniroma1.it indicating in the subject line "Sphingolipid signalling in mitochondrial apoptosis", and in the body of the message "Surname, Name, and PhD Course.

Aim of the Course:
The goal of this short advanced course is to introduce cell biology, biotechnology, life sciences, molecular biology and biochemistry students to the role of mitochondria in programmed cell death apoptosis. In addition, the sphingolipid effectors of mitochondrial apoptosis will be emphasized. The various pathways of ceramide synthesis and breakdown will be discussed focusing on the activities of some key enzymes, namely ceramide synthases (CerS). The pathways that lead to mitochondrial permeabilization and initiation of apoptosis will be discussed and elaborated.

Detailed program:
Basic aspects of mitochondrial physiology ◊ Mitochondrial outer membrane and permeability ◊ The electron transport chain and cytochrome *c* ◊ Initiation of apoptosis, the role of cytochrome *c* ◊ Sphingolipids synthesis and breakdown ◊ Ceramide(s) chemistry ◊ Ceramide-induced permeabilization of mitochondrial outer membrane ◊ Other pathways of mitochondrial outer membrane permeability.

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Suggested readings:

1. Nelson, D.L. and Cox, M.M. Lehninger Principles of Biochemistry. 6th ed. (Chapter 19).
2. Galluzi *et. al*. Molecular mechanisms of cell death: recommendations of the Nomenclature Committee on Cell Death 2018. Cell Death Differ. 2018. 25(3):486-541.
3. Molecular mechanisms of cell death: recommendations of the Nomenclature Committee on Cell Death 2018.
4. Gault, C.R., Obeid, L.M. and Hannun, Y.A. An overview of sphingolipid metabolism: from synthesis to breakdown. *Adv Exp Med Biol.* 2010. 688:1-23.
5. Ogretmen, B. Sphingolipid metabolism in cancer signalling and therapy. *Nat Rev Cancer.* 2018. 18(1):33-50.
6. Mullen, T.D., Hannun, Y.A. and Obeid, L.M. Ceramide synthases at the centre of sphingolipid metabolism and biology. *Biochem J.* 2012. 441(3):789-802.
7. Stiban, J., Tidhar, R. and Futerman, A.H. Ceramide synthases: roles in cell physiology and signaling. *Adv Exp Med Biol.* 2010. 688:60-71.
8. Laviad, E.L. *et. al.* Modulation of ceramide synthase activity via dimerization. *J Biol Chem.* 2012. 287(25):21025-21033.
9. Xu, R. *et. al.* Tumor suppressor p53 links ceramide metabolism to DNA damage response through alkaline ceramidase 2. *Cell Death Differ.* 2018. 25(5):841-856.
10. Ferreira, N.S., *et. al*. Regulation of very-long acyl chain ceramide synthesis by acyl-CoA-binding protein. *J Biol Chem*. 2017. 292(18):7588-7597.
11. Tidhar, R. and Futerman, A.H. The complexity of sphingolipid biosynthesis in the endoplasmic reticulum. *Biochim Biophys Acta.* 2013. 1833(11):2511-2518.
12. Colombini, M. Ceramide channels and mitochondrial outer membrane permeability. *J Bioenerg Biomembr.* 2017. 49(1):57-64.
13. Abou-Ghali, M. and Stiban, J. Regulation of ceramide channel formation and disassembly: Insights on the initiation of apoptosis. *Saudi J Biol Sci.* 2015. 22(6):760-772.