

Course description

Informing students on course requirements

Program: PhD full-time training, elective PhD course
Course: Features, mechanisms and medical importance of cell death subroutines
Course code: IODI_MEDMI-06
Academic year/Semester: II.
Educator and contact details (e-mail): Dr. Klara Megyeri megyeri.klara@med.u-szeged.hu
Type of course: <u>lecture/seminar/practice/laboratory</u>
Weekly hours of the course: 2
Credit vale of the course: 6
Type of examination: <u>final exam at the end of semester</u> , practice exam, other:.....
Preliminary requirements (preliminary academic performance or completed course required to fulfill the purposes and requirements of the course): -
Purpose of course: Overview of the characteristics of different forms of cell death. Overview of the molecular mechanisms involved in the development of different forms of cell death. Overview of the role of cell death forms in physiological and pathological processes.
Outcome requirements of the course (specific academic results to be established by the course): Knowledge: Basic knowledge of the characteristics, mechanisms, and importance of cell death subroutines. Attitude: Developing abilities for deepening basic knowledge of cell death forms and being committed to applying them in future research work. Responsibility/Autonomy: Following new scientific discoveries regarding the molecular mechanisms of cell death forms and their role in disease processes using scientific literature sources. Utilizing comprehensive knowledge on cell death subroutines at a skill level in the design and evaluation of future experiments.
Topics: Cell death plays an important role in the pathogenesis of many diseases. Knowledge of the characteristics and mechanisms of cell death is important for a better understanding of the symptoms of various diseases and also for the development of new therapeutic options. The course discusses the features and mechanisms of necrosis, apoptosis, necroptosis, pyroptosis, anoikis, autophagy, and parthanatos. Methods for the detection and characterization of cell death types, such as

immunofluorescence, ELISA, TUNEL, cell cycle analysis, Western blot, DNA agarose gel electrophoresis, electron microscopy, are summarized. The course also describes the importance of cell death in bacterial, viral infections, cardiology, neurology, dermatology and immunological processes.

1. Causes and main features of cell death
2. The main features and medical significance of necrosis
3. Main features and medical significance of apoptosis
4. Elements and molecular mechanism of the intrinsic apoptotic pathway
5. Elements and molecular mechanism of the extrinsic apoptotic pathway
6. Main features and medical significance of necroptosis
7. Main features and medical significance of pyroptosis
8. Main features and medical significance of anoikis
9. Main features and medical significance of autophagy
10. Main features and medical significance of the parthanatos
11. Mechanism and role of cell death in bacterial and viral infections
12. Mechanism and role of cell death in diseases with complex ethiopathogenesis
13. Methodology for the detection of cell death forms

Supporting methods to achieve learning outcomes:
Review articles downloadable via PubMed search

Evaluation of the acquisition of expected learning outcomes:
Requirements: Attendance at lectures is mandatory. Up to two absences are permitted; any additional absences must be justified. Make-up sessions are not available. To complete the course, students must prepare a short PowerPoint presentation on a specific topic.

Examination requirements: The course concludes with a written multiple-choice test.

Grading: passed / failed

Mandatory reading list:

1. D'Arcy MS. Cell death: a review of the major forms of apoptosis, necrosis and autophagy. *Cell Biol Int.* 2019;43(6):582-592. doi: 10.1002/cbin.11137. PMID: 30958602.
2. Tait SW, Ichim G, Green DR. Die another way--non-apoptotic mechanisms of cell death. *J Cell Sci.* 2014 May 15;127(Pt 10):2135-44. doi: 10.1242/jcs.093575. PMID: 24833670.
3. Bialik S, Dasari SK, Kimchi A. Autophagy-dependent cell death - where, how and why a cell eats itself to death. *J Cell Sci.* 2018 Sep 20;131(18):jcs215152. doi: 10.1242/jcs.215152. PMID: 30237248.
4. Jiang L, Poon IKH. Methods for monitoring the progression of cell death, cell disassembly and cell clearance. *Apoptosis.* 2019 Apr;24(3-4):208-220. doi: 10.1007/s10495-018-01511-x. PMID: 30684146.
5. Sekerdag E, Solaroglu I, Gursoy-Ozdemir Y. Cell Death Mechanisms in Stroke and Novel Molecular and Cellular Treatment Options. *Curr Neuropharmacol.* 2018;16(9):1396-1415. doi: 10.2174/1570159X16666180302115544. PMID: 29512465; PMCID: PMC6251049.

Recommended reading list:

- scientific publications downloadable via PubMed search

Indicating course requirements on Coospace scene (summary)

Description (public): Overview of the characteristics of different forms of cell death. Overview of the molecular mechanisms involved in the development of different forms of cell death. Overview of the role of cell death forms in physiological and pathological processes.
Requirements: Basic knowledge of the characteristics, mechanisms, and importance of cell death subroutines.
Topics: 1. Causes and main features of cell death 2. The main features and medical significance of necrosis 3. Main features and medical significance of apoptosis 4. Elements and molecular mechanism of the intrinsic apoptotic pathway 5. Elements and molecular mechanism of the extrinsic apoptotic pathway 6. Main features and medical significance of necroptosis 7. Main features and medical significance of pyroptosis 8. Main features and medical significance of anoikis 9. Main features and medical significance of autophagy 10. Main features and medical significance of the parthanatos 11. Mechanism and role of cell death in bacterial and viral infections 12. Mechanism and role of cell death in diseases with complex ethiopathogenesis 13. Methodology for the detection of cell death forms Supporting methods to achieve learning outcomes: Review articles downloadable via PubMed search Mandatory reading list: 1. D'Arcy MS. Cell death: a review of the major forms of apoptosis, necrosis and autophagy. <i>Cell Biol Int.</i> 2019;43(6):582-592. doi: 10.1002/cbin.11137. PMID: 30958602. 2. Tait SW, Ichim G, Green DR. Die another way--non-apoptotic mechanisms of cell death. <i>J Cell Sci.</i> 2014 May 15;127(Pt 10):2135-44. doi: 10.1242/jcs.093575. PMID: 24833670. 3. Bialik S, Dasari SK, Kimchi A. Autophagy-dependent cell death - where, how and why a cell eats itself to death. <i>J Cell Sci.</i> 2018 Sep 20;131(18):jcs215152. doi: 10.1242/jcs.215152. PMID: 30237248. 4. Jiang L, Poon IKH. Methods for monitoring the progression of cell death, cell disassembly and cell clearance. <i>Apoptosis.</i> 2019 Apr;24(3-4):208-220. doi: 10.1007/s10495-018-01511-x. PMID: 30684146. 5. Sekerdag E, Solaroglu I, Gursoy-Ozdemir Y. Cell Death Mechanisms in Stroke and Novel Molecular and Cellular Treatment Options. <i>Curr Neuropharmacol.</i> 2018;16(9):1396-1415. doi: 10.2174/1570159X16666180302115544. PMID: 29512465; PMCID: PMC6251049. Recommended reading list: - scientific publications downloadable via PubMed search