

Course description
Informing students on course requirements

Program: PhD full-time training, elective course
Course: Molecular techniques in clinical microbiology
Course code: AOKDI-ASZV-16
Academic year/Semester: 2 or 3
Educator and contact details (e-mail): Dr. Somogyvári Ferenc somogyvari.ferenc@med.u-szeged.hu
Type of course: lecture/ <u>seminar</u> /practice/laboratory
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): no
Purpose of course: Introduction to molecular methods. Theory and implementation of the methods, description of the problems that can be solved with them. Their application in research and clinical practice.
Outcome requirements of the course (specific academic results to be established by the course): Theoretical knowledge of individual molecular methodologies. Knowledge of the " <i>in silico</i> " design and verification of methods. Knowledge of their areas of application and mastery of their technical implementation. Application possibilities of the methods through specific clinical examples.
Topics: 1. Molecular tests in the clinical practice, minimum requirements, financing 2. Preparation techniques 3. Molecular techniques without amplification (electrophoresis, SSCP, capillary, Pulse-field, Blott) 4. Signal amplified systems (Hybride capture, bDNA, LCR) 5. Target amplification: PCR, multiplex PCR 6. RFLP, restriction enzymes, ASA 7. Real-time PCR, aspecific dyes, HRM

8. Hybridization probes (Taqman, FRET, molecular beacon, heteroduplex, Scorpions)
9. Relative and absolute quantitation
10. Primer design, BLAST, optimization, PCR tricks
11. Controls, internal controls, contamination control
12. Population genetics
13. Epigenetics, methylation
14. Alternative amplification and detection systems (Rolling-circle, Lipa-CNS, NASBA)
15. Sequencing, new generation sequencers (Sanger, Capillary, Pyro-, Roche/Illumina/ABI)
16. MALDI-TOF, haplotyping
17. "Biochip"

Supporting methods to achieve learning outcomes:

Literature (Ph.D. dissertations accepted in the program so far and publications downloadable via PubMed search)

Modeling the implementation and control of certain molecular techniques with computer programs.

There is an opportunity to demonstrate some molecular methods in practice.

Evaluation of the acquisition of expected learning outcomes:

Attendance at lectures is mandatory.

2 absences are allowed, in case of more than two absences, the absence must be justified. No make-up is possible.

The condition for completing the course is to create a short powerpoint presentation related to a given topic of the course.

The course ends with an oral colloquium.

Mandatory reading list:

1. Baker GC, Smith JJ, Cowan DA. Review and re-analysis of domain-specific 16S primers. *J Microbiol Methods*. 2003 Dec;55(3):541-55. doi: 10.1016/j.mimet.2003.08.009. PMID: 14607398.
2. Miller SA, Dykes DD, Polesky HF. A simple salting out procedure for extracting DNA from human nucleated cells. *Nucleic Acids Res*. 1988 Feb 11;16(3):1215. doi: 10.1093/nar/16.3.1215. PMID: 3344216; PMCID: PMC334765.
3. Somogyvári, F. (2020). Molecular techniques. In K. Burián (Ed.) *Medical Microbiology and Immunology Practical Notes* (pp. 118-132). University of Szeged, Faculty of Medicine, Institute of Medical Microbiology and Immunobiology: University Press
4. Szekeres M., Somogyvári F.: Optimalization of the Mastermixes. ICoSTAF'14 : International Conference on Science and Technique Based on Applied and Fundamental Research, Szeged, Hungary 2014. Konferenciafüzet p.44
5. Tsuchida S, Umemura H, Nakayama T. Current Status of Matrix-Assisted Laser Desorption/Ionization-Time-of-Flight Mass Spectrometry (MALDI-TOF MS) in Clinical Diagnostic Microbiology. *Molecules*. 2020 Oct 17;25(20):4775. doi: 10.3390/molecules25204775. PMID: 33080897; PMCID: PMC7587594.

Recommended reading list:

Ph.D. theses accepted so far in the program,
 - scientific publications downloadable with a targeted PubMed search
 - notes and lecture materials on the institute's website.

Indicating course requirements on Coospace scene (summary)

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 Introduction to molecular methods.
 Theory and implementation of the methods, description of the problems that can be solved with them.
 Their application in research and clinical practice.

Requirements:
 Theoretical knowledge of individual molecular methodologies.
 Knowledge of the "*in silico*" design and verification of methods.
 Knowledge of their areas of application and mastery of their technical implementation.
 Application possibilities of the methods through specific clinical examples.

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1. Molecular tests in the clinical practice, minimum requirements, financing
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3. Somogyvári, F. (2020). Molekuláris technikák. In K. Burián (Ed.) *Orvosi Mikrobiológia és Immunológia Gyakorlati jegyzet* (pp. 118-132). Szegedi Tudományegyetem Általános Orvostudományi Kar Orvosi Mikrobiológiai és Immunbiológiai Intézet: Egyetemi Kiadó
4. Szekeres M., Somogyvári F.: Optimalization of the Mastermixes. ICoSTAF'14 : International Conference on Science and Technique Based on Applied and Fundamental Research, Szeged, Hungary 2014. Konferenciafüzet p.44

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