

BIO1403: Μοριακή Οργάνωση Ζωής

"Molecular organization of life"

Οκτώβριος-Νοέμβριος /Διάρκεια: 4 εβδομάδες

A. Origin and diversification of life

When and how did the life originate? E.Ladoukakis

a. Probiotic synthesis

b. Methods for looking for the Last Universal Common Ancestor (LUCA)

c. How did LUCA look like?

d. How many times did life originate?

e. What are the evolutionary relationships of the three domain of life (bacteria-archaea-eukaryotes)

B. Transcriptional, Post-transcriptional and Epigenetic regulation of gene expression

Eukaryotic transcription D.Tzamarias

a. Eukaryotic promoter structure: core promoters and enhancers

b. Sequence specific DNA-binding proteins: Structural motifs, DNA binding domains and activation domains

Eukaryotic transcription D.Tzamarias

The Mediator complex, structure and function

"Long non-coding RNAs and RNA modifications in regulation of gene expression" E.Ntini

Keywords: LncRNAs, pervasive transcription, enhancers, eRNAs, RNA modifications, epitranscriptomics

Genome instability, transcription and replication G.Garinis

a. Genome Instability and replicative stress

b. Genome Instability and transcriptional blockage

RNA mediated gene regulation K.Kalantidis

a. RNA mediated phenomena in the cell: prokaryotes vs eukaryotes

b. RNA silencing pathways in fungi, plants and animals

c. miRNA mediated gene regulation

Nuclear dynamics. C.Spilianakis

a. Chromosome packaging and structure.

b. Trans-allelic phenomena. (Transvection, Paramutation, Repeat-induced point mutation, Parental Imprinting, X-chromosome inactivation, interchromosomal interactions).

c. Chromosome territories, Sub-nuclear compartments.

d. Imaging techniques to study gene localization and expression.

Epigenetic regulation J.Papamatheakis

a. Nucleosomes and histone tail modifications. Histone variants, chromatin & gene expression

b. Co-activators and co-repressors: Subunit composition and enzymatic activities

c. Epigenetic pathology.

d. Epigenetic Evolution. Epigenetics of the Non coding Genome

C. Signal-dependent gene expression in development, differentiation and pathogenesis

Signal transduction mechanisms. A.Kretsovali

a. Cytokine signaling: Jak-Stat pathway

b. Ser/Thr kinase receptors the TGFbeta pathway and SMAD factors

c. <i>The wnt pathway</i>
The TRK/Ras/Erk pathway.G.Mavrothalassitis
a. Ligands and receptors
b. Diversity of signaling outcomes
c. <i>Quantitative and qualitative transcriptional control by signaling pathways</i>
Signaling network integration. The MEK hub. G.Mavrothalassitis
Genetic and epigenetic regulation of stem cell fate A. Kretsovali
a. <i>Embryonic stem cells. Self renewal versus differentiation.</i>
b. Transcription factors of pluripotency and reprogramming.
c. <i>Signaling pathways</i>
d. <i>Epigenetic regulation of the differentiation status.</i>
The Notch pathway-communication by touch. C.Delidakis
Nuclear receptors (NRs): from basic biology to clinical exploitation D.Kardassis
Historical overview and milestones of 40 years of NR research and innovations
- Classification, domain structure/functions, mechanisms of regulation of NRs
- NRs as drug targets: Focus on metabolic diseases
Deregulation of signal transduction in cancer Γ. Μόσιαλος ΑΠΘ
Paper discussion Tzamaras
Paper discussion Garinis
Paper discussion papamatheakis
Paper discussion Ntini
Paper discussion Kretsovali
Paper discussion Delidakis
Paper discussion Kalantidis
Paper discussion Mavrothalassitis
Round table
EXAMS