Scuola Superiore di Catania

Corso Specialistico

a.a. 2023-2024

Approcci biochimici, proteomici e genomici per lo studio delle neurodegenerazioni acute e croniche

Obiettivi formativi

The main objective of the course is to address students to multidisciplinary approaches in the study of neurodegeneration and the relative use of experimental data with the aim to improve knowledge in this intricate field. With the term "neurodegeneration" scientific panorama includes a widespread plethora of events "concluding" in evident loss (mild o severe) of neuronal functionality. Timing of diagnosis in neurodegeneration could be fundamental to approach in the right way patients in terms of hospitalization and therapies, but molecular markers in this field are very hard to detect because symptoms do not show immediately evident and specific. Matching different pilot approaches and methodologies addressed to define new molecular networks in acute and chronic neurodegenerations seems to be ideally suited for drive into new early diagnosis parameters of neurodegeneration. Research based on metabolomics, coding/non-coding RNAs expression profiles, image and visual analyses, proteomic investigations, either from animal experimental models of neurodegeneration or from specific clinical monitoring or in vitro cellular investigations, will be discussed with students to explain the link between laboratory works and clinical utilization.

Contenuti del corso

The organization of the course is articulated in the explanation of results from different research lines: the biochemical panel is referred to TBI in rats following Marmarou weight drop mild and severe model. It will be shown, by means of a specific HPLC technique, analyses of purine, pyrimidine and amino acid profiles in injured brain, to detect a metabolic network of "dysfunctionality" and a molecular correlation between the mitochondrial failure parameters, the time course and the different grade of injury. Moreover it will be discussed about an experimental cellular model of head injury, using organotypic hippocampal cell cultures of rats, where a specific instrumentation (Stretch Injury Device) causes a biaxial stretching to reproduce the various degrees of severity of TBI. Utilizing this model it is intriguing to follow gene expression of time markers of tissue injury (GFAP, S100B, cytokines), to apply the technique of mRNA-microarray for semiquantitative evaluation of the spectrum of mRNAs also related to the energy metabolism, to track the mechanism of apoptosis. A further approach will be the explanation of genetically monitoring of saliva in injury from concussion-related

agonist and non-agonist players, with the attempt to discover reliable early markers of injury in sports. To complete the picture, we will proceed toward proteomic outlook in neurodegeneration, performing description of several high-impact papers in which mass spectrometry (MS)-based proteomic investigation has been used in the field of brain-related disorders. In this way we will detail the experimental procedures including samples treatment (for example neuroblastoma cell lines), and analysis (chromatographic separation of the peptide content and MS detection) to finally match main bioinformatic tools to the analysis of overall experimental data.

Metodologia didattica

Frontal lessons

Modalità della verifica finale di apprendimento

Interviews (total: 3 hours)