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About

Dr Valentina Di Pietro is a Molecular Neuroscientist with experience in genetics, Biochemistry and Molecular Biology. During her Ph.D. at the Catholic University of Rome (Italy), she specialised in molecular mechanisms and identification of markers for the diagnosis of mild and repeated traumatic brain injury in vivo and in the diagnosis of Inborn errors of Metabolism.

In 2008, she joined the School of Medicine of the University of Southampton, Division of Clinical Neurosciences, to work on the development of rats' organotypic slice cultures as an in vitro model of acute neurodegenerative diseases. This model is now recognised as some of the most applicable alternatives to the use of in vivo experiments.

In 2012, Dr Di Pietro joined the School of Clinical & Experimental Medicine at the University of Birmingham and where she is studying gene controlled neuroprotective adaptation following in vitro mild traumatic brain injury.

She is also testing calcium blockers on the in vitro model of organotypic hyppocampal slice cultures as neuroprotective drugs after mild TBI.

Qualifications

- Clinical Molecular Geneticists (4 years training scheme), University of Catania, Italy, 2010.

  Thesis: Clinical, biochemical and molecular diagnosis of a compound homozygote for the 254 bp deletion-8 bp insertion of the APRT gene suffering from severe renal failure.

- Ph.D. in Biochemical Studies of Proteomics, Sacro Cuore, Catholic University of Rome, Italy, 2007.

  Thesis: N-Acetyleaspartate (Naa) Metabolism in Acute and Chronic Neurodegenerative Diseases.

- M.Sc. in Molecular Biology (full marks and honours), University of Catania, Italy, 2003.

  Thesis: Biological effects of Proton and Photon Beams.

- Member of the Italian Council of Biology (since 2004).

Postgraduate supervision

Supervisor of undergraduate 4th-year Medical students at the University of Southampton (2008-2011)

Research

Project title: Gene controlled neuroprotective adaptation following in vitro mild Traumatic brain injury

Aim of this study is to investigate the similarities between mild traumatic brain injury (mTBI) and hibernation, potentially representing the pathological and physiological aspect, respectively, of the same process. In rat organotypic hyppocampal slice cultures, mTBI is induced by applying 10% stretch injury. A stretch injury device produces an equi-biaxial strain field subjecting the cultures to a single stretch injury at a specified Lagrangian strain of 10% and a constant strain rate of 20 sec^{-1}. After 24 hours from injury, propidium iodide staining, HPLC analysis of metabolites and microarray analysis of cDNA are performed to evaluate, respectively, cell viability, cell energy state and gene expression. The scientific hypothesis is to demonstrate that following mTBI a hibernation-type response is activated in non-hibernating species. This adaptive gene program is aimed to obtain maximal neuroprotection through a control of mitochondrial functions, optimization of cellular ATP production and demand, recovery of ionic homeostasis, protection from apoptosis and is similar to the gene strategy adopted by hibernators.

These studies are performed as part of a long standing international collaboration with Prof. Giuseppe Lazzarino, University of Catania and Prof. Barbara Tavazzi, Catholic University of Rome.

Project title: In vitro characterisation of mild traumatic brain injury (TBI).

This project develops a reliable and reproducible platform for testing drugs and other neuroprotective strategies using an in vitro model of organotypic hippocampal slice cultures.

The cultures, stretched on a silicone membrane, mimic an in vivo tissue deformation experienced during TBI.

The aim of the project is to compare gene expression profiles (using microarray analysis) of stretched cultures incubated with calcium blockers, which are used as neuroprotective drugs.

Project title: Biochemical evaluation and microarray gene expression analysis of in vivo and in vitro model of mild, severe and repetitive traumatic brain injury.

Different approaches (HPLC to analyse biochemical alterations of energy metabolism and Oxidative/Nitrosative stresses, microarray to analyse gene expression profile) in in vivo and in vitro models of the mild and severe TBI were investigated.

It was demonstrated that:

1. A temporal window of brain vulnerability following mild TBI exists.
2. A second mild injury inside the window of vulnerability could lead to cumulative and deleterious effects.

Other activities

Clinical Molecular Genetics consultant for diagnosis of Inborn Error of Metabolisms Diseases – Catholic University of Rome (Italy).

Experiments to test the efficacy of Escozul Drug (Blue Scorpion Poison) in Cancer cells

Publications

Prieto, R., Tavazzi, B., Taya, K., Barrios, L., Amorini, A.M., Di Pietro, V.et al., (2011), Brain energy depletion in a rodent model of diffuse traumatic brain injury is not prevented with administration of sodium lactate, **Brain Res**., 2;1404:39-49.

Lazzarino, G., Amorini, A.M., Di Pietro, V.,Tavazzi, B., (2011), HPLC analysis for the clinical-biochemical diagnosis of inborn errors of metabolism of purines and pyrimidines. **Methods Mol Biol.** 708:99-117.

Lazzarino, G**.**, Amorini, A.M., Eikelenboom, M., Killestein, J., Belli, A., Di Pietro, V.et al. (2010), Cerebrospinal fluid ATP metabolites in multiple sclerosis. **Mult Scler**.,16(5):549-54.

Di Pietro V.et al., (2010),Transcriptomics of traumatic brain injury: gene expression and molecular pathways of different grades of insult in a rat organotypic hippocampal culture model., **J Neurotrauma**, 27(2):349-59.

Signoretti, S., Di Pietro V.et al., (2010), Transient alterations of creatine, creatine phosphate, N-acetylaspartate and high-energy phosphates after mild traumatic brain injury in the rat., **Mol Cell Biochem**., 333(1-2):269-77.

Amorini, A.M., Petzold, A., Tavazzi, B., Eikelenboom , J., Keir, G., Belli , A., Giovannoni, G., Di Pietro V. et al. (2009), Increase of uric acid and purine compounds in biological fluids of multiple sclerosis patients. **Clin Biochem**., 42(10-11):1001-6.

Vagnozzi, R., Signoretti, S., Tavazzi, B., Floris, R., Ludovici, A., Marziali, S., Tarascio, G., Amorini, M.A., Di Pietro, V.et al. (2008), Temporal window of metabolic brain vulnerability to concussion: a pilot 1H-magnetic resonance spectroscopic study in concussed athletes--part III, **Neurosurgery**, 62(6):1286-95.

Di Pietro, V. (2008) et al. A new T677C mutation of the aspartoacylase gene encodes for a protein with no enzymatic activity, **Clin Biochem**., 41(7-8):611-5