NENS stipend report

Master student: Thanou Irini

Home institution: Hellenic Institute Pasteur, labor

Host institution: Neuroscience Institute Cavalieri Ottolenghi (NICO), University of Turin, Turin, Italy

Supervisor: Dr. Federico Luzzati

Duration of stay: From 21 September 2015 to 6 November 2015

My training stay, which lasted for 7 weeks, in the laboratory of Adult Neurogenesis in NICO was a great scientific experience. The aim of my project is to unmask the possible neurogenic activity of non-neurogeninc brain regions, namely the cortex and striatum following disturbance of the SVZ-NSC niche by a combined mechanical trauma-Ara C protocol. Indeed our data have indicated that the infliction of mechanical trauma followed by intraventricular infusions of Ara-C SVZ triggers the production of significant numbers of doublecortin+ (DCX+) neural progenitors in “non-neurogenic regions” such as the striatum. To this end, aim of my visit was to explore with 3D reconstruction analysis the cyto-architectural features of the co-localisation of DCX neural progenitors with the internal capsule fiber bundles lying in the striatum and perform qualitative and quantitative morphological and immunocytochemical analysis of the brain regions.

Over this period of time, I made serial, 50μm thick, coronal brain sections of the mouse brains in cryostat which I preserved in an antifreeze medium. The free floating sections were stained in the host lab with different antibodies in order to further characterize the DCX+ cells of the Ara-C neurodegeneration model we are currently using in the lab. With the confocal images acquired we performed the 3D reconstruction and analysis. I was trained in the use of TrakEM2 FIJI plugin (Cardona et al., 2012) in order to align the serial section and segment the myelin bundles of the striatum. Further, I got familiar with state of-the-art software, such as Vaa3D (Peng et al., 2014), Neuronstudio and Neutube for the tracking and segmentation of DCX cells. I was also trained in the use of Neurolucida 9 software which allows me to perform quick measurements of cells and brain volumes of regions adjacent to SVZ, such as the striatum and septum in order to evaluate the extend of neurodegeneration in our SVZ lesion model.

During my stay besides learning new techniques, I also had the chance to attend the lecture series "The Aging Brain: Cellular Mechanisms Interfacing Human Pathology" that took place between 28 September and 2 October in the framework of PhD Program in Neuroscience Doctoral School in Life and Health Sciences of the University of Turin. Attending this few-day specialized course helped me to expand my knowledge in experimental neurodegeneration.

Importantly, Dr. Luzzati shared with me interesting ideas and gave me advice about the future of my project and moreover introduced me to the multiple possibilities of image analysis software and the hot topic of management big volume data. He also gave me useful directions and experimental tips to perform lab fate mapping analysis using our recombinant viral vectors back in my home lab.

Right after my return I immediately started to apply my new acquired knowledge to performing image analysis of the myelin bundles pattern of the striatum with Imaris software, the Microscopy and Image Analysis Unit of my home institute has just acquired. So I am trying to combine the capabilities of those programs, while I am also transferring this newly acquired expertise to the members of the Microscopy and Image Analysis Unit.

Overall, the NENS exchange grant gave me one of the most valuable experiences in my scientific career so far. I obtained data and feedback to continue my research project and was a great chance for me and my laboratory to begin a new fruitful collaboration.