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2:30 P.M.
ROOM U8-04

SCHOOL OF MEDICINE AND SURGERY
MILANO-BICOCCA UNIVERSITY
VIA CADORE, 48 – MONZA (MB), ITALY

PhD in Neuroscience Day – 2019

PLENARY LECTURE

PROF. SILVIA DI ANGELANTONIO*, PHD

Next generation of neuronal cultures: modelling the brain with human iPSCs derived neurons in self assembled organoids and 3D bioprinted constructs

In the drug development process only one molecule in 10,000 completes the cycle and becomes a marketable drug. This is at least partially due to the fact that pre-clinical studies are carried out mainly on laboratory animals, which in many cases are not representative of human diseases. Lack of appropriate in vitro models of the human nervous system hampers the development of effective drugs for neurological disorders. Conventional 2D cell cultures fail to represent the complexity of the brain and novel 3D systems are emerging as more realistic and representative models. Organoids and tumoroids derived from human cells reproduce in vitro, to some extent, the architecture of real organs and tumors. While not completely replacing animal experimentation, they provide valid pre-screening systems for potential drugs, reducing the number of candidate molecules to be tested in the subsequent phases.

At the same time, by allowing preliminary laboratory analyses on organoids derived from the patient himself, this technology represents a promising tool for personalized medicine, leading to potential advantages in terms of drug efficacy and patient safety.

To date, organoids from iPSCs have been generated by allowing them to self-organize in tridimensional structures during differentiation. This approach is greatly limited by batch issues, as self-organized organoids greatly differ one from the other in terms of size and internal architecture, affecting the reproducibility of the results. We are trying to overcome this problem by taking advantage of the three-dimensional printing of biological material (3D Bioprinting), to produce iPSC-derived organoids in a more controlled and reproducible way. The procedure is based on the robotic manipulation of cellular material and organic encapsulation matrices, which are organized in space in an extremely controlled manner, similar to the ink of a conventional 3D printer. Combining the two technologies, iPSCs and 3D Bioprinting, We are currently developing cerebral organoids from iPSC-derived neurons that will allow testing potential drugs in terms of efficacy, dosage and toxicity. We developed and functionally characterized a 3D culture of iPSCs derived cortical neurons to provide novel disease models of brain pathologies and to assess whether they can be used for drug testing and for developing new diagnostic tools.

*Prof. **Silvia Di Algelantonio** holds a degree in Physics (Sapienza University, Rome) and a PhD in Biophysics (SISSA, Trieste). Currently she works as Assistant Professor in Physiology at Sapienza University in Rome and is an affiliated researcher at the Italian Institute of Technology (Genoa).