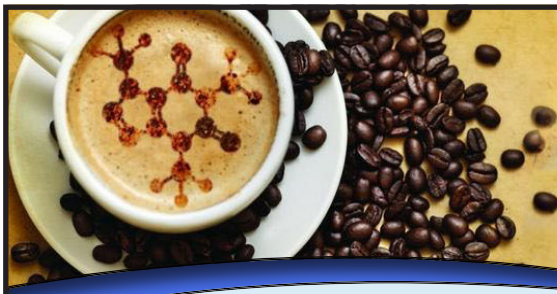

CoffeeTalk@ISOF

EXTENDED EDITION

Development and validation of biomaterials for neural repair: not just a matter of materials!

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Biomimetic materials are designed to stimulate specific cellular responses at the molecular level. In order to improve the soundness of in vitro testing of the biological impact of new materials, appropriate cell systems and technologies must be standardized also taking regulatory issues into consideration. In this talk, different aspect of the interaction between cellular systems and biomaterials will be discussed, starting from a brief discussion about the extracellular matrix composition and the impact of the 3D structure in different tissue compartments, having fibroblasts [1] and embryonic stem cells as the cell system [2]. Moreover, the influence of physical signals (such as electromagnetic fields) will be discussed [3,4,5,6]. Then, the biological and molecular effects of different scaffolds on three neural systems, i.e. the neural cell line SH-SY5Y, primary cortical neurons and neural stem cells, will be compared. The effect of poly(L-lactic acid) (PLLA) scaffolds having different surface geometry (conventional 2D flat surface, random or aligned fibres as semi3D structure) and chemical functionalization (laminin or ECM extract) will be discussed. The end-points defined for efficacy (i.e. neural differentiation and neurite elongation) and for safety (i.e. cell death/survival) will be discussed, such as the soundness of the statistical approaches comparing conventional biochemical and morphological techniques with high-content analysis. We will discuss that (i) the definition of the biological properties of biomaterials is profoundly influenced by the test system used; (ii) the definition of the in vitro safety profile of biomaterials for neural repair is also influenced by the test system; (iii) cell-based high-content screening may well be successfully used to characterize both the efficacy and safety of novel biomaterials, thus speeding up and improving the soundness of this critical step in material science having medical applications.

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She was a graduate Fellow at University of Milan, then Associate Professor of Human Physiology at the University of Cagliari, and, since 1999, Associate Professor of Veterinary Anatomy at the University of Bologna.

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