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Polymeric membrane platform for testing the neuroprotective effect of molecules in Alzheimer's disease

A wide range of polymeric membranes have been synthesised for creating suitable biomaterials to provide topographic, chemotactic, and haptotactic cues to improve neuronal regeneration. Polymeric membranes thanks to their selective structural, physico-chemical, mechanical and transport properties, are able to drive neurite outgrowth and branching, network connectivity, and synaptic plasticity leading to the successful *in vitro* reconstruction of neuronal tissue. Indeed, membranes can be employed to create an *in vitro* neuronal tissue model for studying neurobiological events, for pharmacological screening, and as investigational platforms for neurodegenerative diseases. Within this scenario, the approach was to synthesize microporous polymer membranes combining the intrinsic properties of the polymer as well as the geometry and configuration of the membranes with the perfusion conditions of a bioreactor, in order to develop a well-controlled microenvironment able to trigger neuronal differentiation. The selective permeability of the membranes and the optimized fluid dynamic conditions created by the membrane bioreactor provide a 3D low-shear stress environment fully controlled at molecular level with enhanced diffusion of nutrients and waste removal that successfully develops neuronal-like tissue. The membrane platform was used to reproduce an *in vitro* model of Amyloid beta (Abeta)-induced toxicity associated to Alzheimer's disease to test the neuroprotective effect of molecules such as crocin and glycitein. Using this approach, we showed the neuroprotection of the administered molecules that inhibit the cytotoxic event triggered by β-amyloid while maintaining high cell viability, reduces the number of cells in apoptosis by inactivating specific protein markers and protects against ROS production by highlighting an antioxidant action. Thus, the membrane is an innovative investigational platform that could be used to study neurodegenerative disorders as well as neurobiological phenomena in order to gain new insights on neurological functions and protection.

Speaker Biography

Loredana De Bartolo, PhD. in Chemical Technologies and New Materials, is research director at the Institute on Membrane Technology of the National Research Council of Italy (ITM-CNR). Her research expertise is in the field of membrane bioartificial organs, membrane bioreactors, membrane separation processes in life science. She is scientific responsible of several European, national and international projects. She is involved in several international committees and in editorial board of prestigious scientific journals. She is author of over 150 papers published in international journals/books and encyclopaedia and has made numerous invited and keynote lectures to scientific meetings. She was named International Fellow in World Federation on Preventive and Regenerative Medicine and Alexander von Humboldt Fellow.

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