

RESEARCH ACTIVITY

Prof. Grazia Paola Nicchia

The research activity is focused on the cellular and molecular physiology and biophysics of water channel proteins called Aquaporins (AQPs). The main interest is the Central Nervous System (CNS) Aquaporin-4 (AQP4) but the lab is also involved in studies on the endothelial Aquaporin-1 (AQP1) both sharing many common features in assisting blood vessel formation and functioning in the CNS (AQP4) and outside the CNS (AQP1).

Research activities are focused on the molecular mechanisms, by which AQPs are able to promote cell volume regulation, changes in cell morphology and calcium signalling, working in concert with TRP and Connexin ion channels. At molecular level, the aim is understanding how AQP4 tetramers are able to spontaneously aggregate into well-ordered structures called Orthogonal Arrays of Particles (OAPs). After the discoveries that 1) OAPs are the target of autoantibodies in Neuromyelitis Optica, a severe form of Multiple Sclerosis, and 2) the transition from AQP4 tetramers to OAPs is able to influence cell behaviour in glioma cells, the research is aimed at elucidating the molecular mechanisms at the root of AQP4 spontaneous aggregation into OAPs.

Studies are performed on 1) cell cultures for biophysical analysis; 2) mammalian brain and retina to analyse the role for AQP4 at gliovascular interface in the CNS; 3) animal models of tumours to analyse the role for AQPs in tumour biology 4) transgenic mice for the study of AQP4/OAPs aggregation/disaggregation dynamics. To fulfil this aim AQP4-null mice are currently used and the first OAP-null mouse model has been recently generated by Prof Nicchia using the CRISPR/Cas9 technology.