Young investigator seminar

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GLYCOSPHINGOLIPIDS-PROTEIN INTERACTION AT PLASMA MEMBRANE: THE SWITCH TO TURN ON SPECIFIC INTRACELLULAR SIGNALING

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Plasma membrane defines the cell border and represents the communication platform between cells; here signals are received and processed both from external and internal environment. This can occur thanks to the fine interplay between two main membrane components: glycosphingolipids and proteins.

The chemical conformation of glycosphingolipids makes them ideal players as mediators of information across plasma membrane: the hydrophilic portion provides recognition sites for interaction with the soluble portion of other molecules, while the hydrophobic portion allows them to interact with other components of plasma membrane.

In this presentation, I will detail two examples of interaction between glycosphingolipids and proteins, which depends on the hydrophobic rather than hydrophilic portion of specific glycosphingolipids and represents a key event in the immune response and in the maintenance of neuronal homeostasis. In particular, the long-chain lactosylceramide, present on the outer side of the membrane, was found to be able to directly modulate a cytosolic protein, stimulating a cascade of events involved in neutrophils response upon bacteria's infection.

On the other hand, we have demonstrated that GM1 oligosaccharide chain is able alone to replicate numerous functions of GM1 ganglioside thanks to a direct interaction with plasma membrane receptors leading to the activation of specific cellular signaling. These findings open a new perspective on the ganglioside mediated signaling across the plasma membrane, where the oligosaccharide represents the real mediator of intracellular signal transduction. Additionally, losing the amphiphilicity of the entire ganglioside, GM1 oligosaccharide gains the possibility to efficiently cross blood brain barrier and to reach target neurons, thus opening novel therapeutic perspectives.

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