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seminar

Wednesday, 14th October, 9.30am, Seminar Room

Host: Dr. Maurizio Prato

Conjugated polymers for neural stimulation and their application for vision restoration in retinal dystrophies

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Optical technologies allowing modulation of neuronal activity at high spatio-temporal resolution are becoming paramount in neuroscience. We synthesized a novel light-sensitive azobenzene flanked by an azepane and two alkyl chains terminated with a pyridinium salt (Ziapin2). We demonstrate that Ziapin2 stably partition into the plasma membrane with affinity for lipid rafts, and causes thinning of the bilayer through trans-dimerization in the dark, resulting in an increased membrane capacitance at steady state. In neurons loaded with the compound, millisecond pulses of visible light induce a transient hyperpolarization followed by a delayed depolarization that triggers action potential firing. The fast hyperpolarization is attributable to a light-dependent decrease in capacitance due to membrane relaxation that follows azobenzene isomerization. The physiological effects are persistent and can be evoked *in vivo* up to 7 days after initial labelling of the mouse somatosensory cortex. The data demonstrate the possibility to trigger neural activity *in vitro* and *in vivo* by modulating membrane capacitance in the millisecond time scale, without directly affecting ion channels or local temperature.