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### Cellular stress, apoptosis and autophagy

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(Organisers: [T. Pozzan](#), [M. Piacentini](#))

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#### **Toxicity of manganese on embryos of the sea urchin, *Paracentrotus lividus***

*A. Pinsino*<sup>1</sup>, *V. Matranga*<sup>2</sup>, *R. Chiarelli*<sup>1</sup>, *M.C. Roccheri*<sup>1</sup>

<sup>1</sup>Dip. Biologia Cellulare e dello Sviluppo "A.Monroy", Univ. Palermo (Palermo); <sup>2</sup>Istituto di Biomedicina ed Immunologia Molecolare "A. Monroy" Consiglio Nazionale delle Ricerche (Palermo)

Manganese (Mn) is one of the most abundant metals in nature, represents a trace element that is accumulated and utilized by all forms of life. It plays a multitude of roles ranging from bone mineralization to cellular protection. Although Mn is an essential nutrient, exposure of cells/organisms to high levels of Mn induces toxicity. In the marine environment, increased concentrations of bio-available Mn often result from anthropogenic activities, consequently, Mn represents a new important factor in environmental contamination. In this study we investigated on effects of Mn on *P. lividus* embryos continuously cultured in the presence of the MnCl<sub>2</sub>. Mn showed inhibitory effects on embryo development, producing specific malformation in a time/dose-dependent manner. Mn was found accumulated into the embryos from the beginning of development while Calcium (Ca) concentration was reduced (AAS). The Mn/Ca interaction/competition could explain the inhibition of spicules formation (gastrula-pluteus stage) and perturbation of the PMC migration into the blastocoel. A direct correlation has been observed between malformations, Mn-accumulation and stress response of embryos exposed to toxicant.