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Cellular stress, apoptosis and autophagy

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

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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 MnCl₂. 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.