

Sea urchin immune cells activation in response to TiO₂ nanoparticles

A. Pinsino, V. Matranga

Istituto di Biomedicina e Immunologia Molecolare “Alberto Monroy” CNR, Palermo Italy

pinsino@ibim.cnr.it

Sea urchins are phylogenetically related to vertebrates and have been proven to possess a sophisticated, robust and sensitive immune system. Their immune cells carry out functions similar to those of their vertebrate's immune system homologues, such as clot formation, phagocytosis, encapsulation, clearance of pathogens. Four different morphotypes have been described in the sea urchin *Paracentrotus lividus*, with the phagocytes as the most abundant type, accounting for approximately 80% of the total population (Matranga et al 2006, Pinsino et al 2008). The coelomic fluid, in which the immune cells reside and move, is governing the immunological capabilities of sea urchin, as it contains essential trophic and activating factors probably produced by immune cells themselves (Matranga et al 2005). In the last years, we demonstrated that sea urchin immune cells activate their immune response machinery in reply to different kinds of physical and chemical stresses, such as temperature shocks, pH drops, exposure to heavy metals, UV-B radiation and, recently tannum dioxide (SnO₂), cerium dioxide (CeO₂) and iron oxide (Fe₃O₄) nanoparticles (NPs) (Matranga et al 2000, 2005, 2006; Pinsino et al 2008; Falugi et al 2012). We established the utility of HSCP70/HSC70 as a general stress response marker to use for both acute and chronic environmental stresses: in fact it has been found an increase in HSP70/HSC70 levels in all cases, except for NPs exposure (Falugi et al 2012). Currently, in our laboratory, the interaction mechanisms between TiO₂NPs and sea urchin immune cells are under study at the cellular and biochemical levels. Preliminary results will give insights on the putative activation of sea urchin immune cells and provide a new tool for marine nano-ecosafety investigations.

References:

- Matranga V, Toia G et al (2000) Cellular and biochemical responses to environmental and experimentally induced stress in sea urchin coelomocytes. *Cell Stress Chaperones* 5:158–165
- Matranga V, Pinsino A et al (2005) Monitoring chemical and physical stress using sea urchin immune cells. *Prog Mol Subcell Biol* 39: 85–110
- Matranga V, Pinsino A et al (2006) Impacts of UV-B radiation on short term cultures of sea urchin coelomocytes. *Mar Biol* 149:25–34
- Pinsino A, Della Torre C et al (2008) Sea urchin coelomocytes as a novel cellular biosensor of environmental stress: a field study in the Tremiti Island Marine Protected Area, Southern Adriatic Sea, Italy. *Cell Biol Toxicol* 24:541–552
- Falugi C, Aluigi MG et al (2012) Toxicity of metal oxide nanoparticles in immune cells of the sea urchin. *Mar Environ Res* 76:114-21