

## Silver nanoparticle toxicity in sea urchin

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Nanoparticles and especially Silver nanoparticles (AgNPs) are used already in many kind of applications e.g. in medicine and medical equipment and other everyday products (dishwashers, socks, computer keyboards). It is important to study health and safety issues associated with nanomaterials in the environment. We use the embryonic normogenesis of the sea urchin *Paracentrotus lividus* to investigate the impacts of nanoparticles on the development of a marine organism.

AgNPs causes dose dependent developmental defects. The AgNPs are accumulated around the oral region and very likely on the ectoderm of the sea urchin. It has been observed that AgNPs are more toxic than their equivalent Ag<sup>+</sup> ion dose.

To detect the subtle changes in the chemistry of AgNPs due to their agglomeration in sea water, within the sea urchin and on the ectoderm we apply a multi-technique sub-micro imaging (TWIN microscopy).

A decrease of calcite and excess of sulphur compounds within sea urchin as a result of AgNPs toxicity has been observed. The excessive sulphur compounds, concentrated around the oral region, are correlated with AgNPs concentration. The observed AgNPs agglomeration of AgNPs on the ectoderm is due to a biogenic process (i.e. agglomeration after cellular uptake in endosomes) by the excess production of the compounds in the sea urchin which involves sulphur/oxygen-containing substances.