EFFECTS OF GOLD NANOPARICLES ON THE MEDITERRANEAN CLAMS *RUDITAPES DECUSSATUS* (LINNAEUS, 1758)

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Abstract
Mediterranean clam (*R. decussatus*), were exposed for seven days to different amount of Au nanoparticles (AuNP1 = 0.05 mg/L and AuNP2 = 0.1 mg/L). Iron level and enzyme activities (SOD, CAT) were analyzed in the gills. Results proved that AuNP increased significantly Iron level showing toxicity of AuNPs. Additionally, SOD and CAT activities increased in concentration dependent manner indicating defense against oxidative stress. This study provides original data on the interactions between AuNPs and marine organisms and confirms that Mediterranean *R. decussatus* is model species for monitoring aquatic pollution by nanoparticles.

Keywords: Ecotoxicology, Mediterranean Sea, Bivalves

Introduction
Aquatic bivalves have been used as environmental indicators since they may reflect the ecosystem contamination. An example is the Mediterranean clam *Ruditapes decussatus*, which have been used as pollution indicators due to its tolerance against contaminants [1,2]. *Ruditapes decussatus* is an economically important bivalve species, very abundant and well commercialized around the Mediterranean Sea [1]. It is also relatively resistant to a wide variety of pollutants and environmental stressors, making it suitable for marine biomonitoring. its was considered as prime candidates for uptake of pollutants from environmental releases. Aquatic environment especially coastal systems are likely to be the ultimate sink for nanomaterials, deliberately or purposely discharged into the environment. Bivalves can filter large volumes of pollutants and may represent a significant target for NPs [3].To this fact, rigorous identification of environmental hazard and full risk assessments of nanoparticles are needed more precisely, the ecotoxicity of these nanomaterials in coastal systems, in which ecologically significant organisms are affected, is starting to drive research by many groups. The present paper aims at describing the effects of gold nanoparticle (AuNPs) on clams *Ruditapes decussatus*.

Materials and Methods
Adult clams (*Ruditapes decussatus*) of between 2.5 and 3 cm shell length (maximum axis) were purchased from a site in Bizerte lagoon (37°13'18.54''N, 9°55'59.61''E). For the course of the experiment, 5 individuals were placed in each tank with 3 L of sea water obtained from the sampling site containing 0.5 and 1 mg/L of AuNPs respectively. A control series without AuNPs was run in parallel. After 7 days Gill were homogenised by a polytron homogenizer and supernatants were collected by centrifugation at 20,000 × g (4°C for 30 min). Antioxidant enzymatic activities (SOD and CAT) and Iron level were measured in the cytosolic fraction of 15 clams from control groups and exposed to AuNPs.

Results and discussion
Ecotoxicological effects of gold nanoparticles still lacking. This review focuses on the impact of AuNPs on health and particularly on antioxidant biomarkers and addresses potential risks of exposure to this nanoparticle on non target species *R. decussatus*. SOD and CAT GST are involved in the defense against oxidative stress. In the present study, mean values of Iron level and antioxidant enzymes in control and treated clams with AuNP1 and Au2NPs for 7 days are displayed in Fig.1. Thus, AuNPs induced an overall increase in the antioxidant enzymes and Iron level in gills on concentration dependent manner. This result showed the sensibility of gills to AuNPs and we can hypothesize that reactive oxygen species are produced as a result of AuNPs uptake by this organ even at low concentrations (0.05 mg/L) since it is known that NPs are capable of crossing cell membranes, leading to oxidative damage [4]. Oxidative stress results confirmed with SOD and CAT activities are supported by the free iron measurement. These biochemical damages may bring consequences that can damage macromolecules such as proteins, DNA and lipids, finally leading to the damage of different cellular organelles.Considering the increase of nanotechnology, the present study provides valuable information regarding the interaction between AuNPs and molecular status giving potential risk for mollusks bivalves. Thus several questions remain incompletely answered and further investigations focusing on the mechanism of nanomaterial bio-transformation on marine organisms are needed.

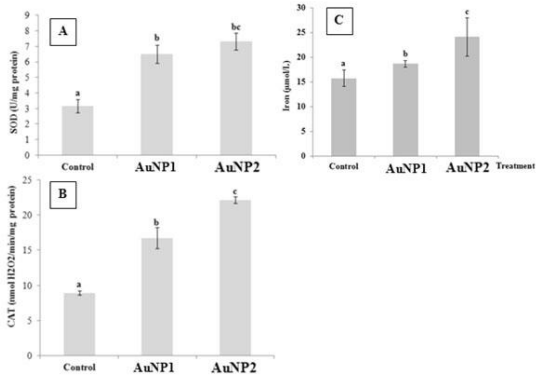

Fig. 1. Figure 1. Superoxide dismutase (A), Catalase (B) activities and Iron level (C) in gill of untreated (Control) and treated *R. decussatus* after 7 days of exposure to AuNPs.

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