Study of the toxicity and penetration of mesoporous silica nanoparticles in the model insect *Blattella germanica*

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Abstract

Nanotechnology is considered as one of the key technologies of the 21st century and promises revolution in our world. Studies have revealed that the same properties that make nanoparticles (NPs) so unique could also be responsible for their potential toxicity [1]. Nanotoxicology is a branch of bionanoscience which deals with the study of toxicity of these nanomaterials. Nanotoxicological studies are intended to determine whether and to what extent these properties may pose a threat to the environment and to human beings. Mesoporous silica NPs are made of an inert material, but their toxicity as NPs has not been investigated. In the present study we investigated the toxicity of mesoporous silica NPs in order to use them as carriers for drug delivery. The NPs have been applied to a model animal, the insect *Blattella germanica*, analysing the extent of NPs penetration in the insect. The synthesis of silica NPs was based on a modification of a previously reported protocol [2], using shorter reaction times and including the addition of the fluorophore rhodamine B [3]. The synthesized NPs were administered to the insects using the Potter Tower. Mortality rates were recorded after 72 hrs and survivors were frozen at -80ºC until use. Finally, the insects were dissected; the tracheae and the fat tissue were analysed using an Olympus FV1000 fluorescence confocal microscope with a 60x objective. Although no toxicity was observed after NPs application, the results confirmed the presence of the silica nanoparticles on the fat tissue and inside and outside the trachea. It was also observed that they could pass through the walls of the tracheae.

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References

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Figures

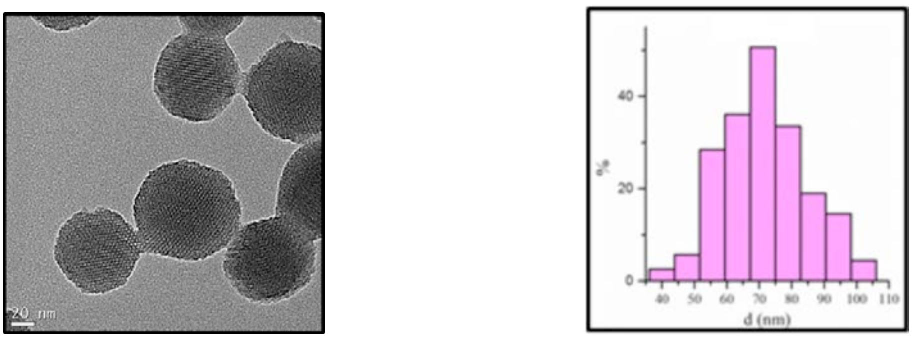

Fig.1. TEM characterization and frequency of size distribution of silica nanoparticles marked with rhodamine B.

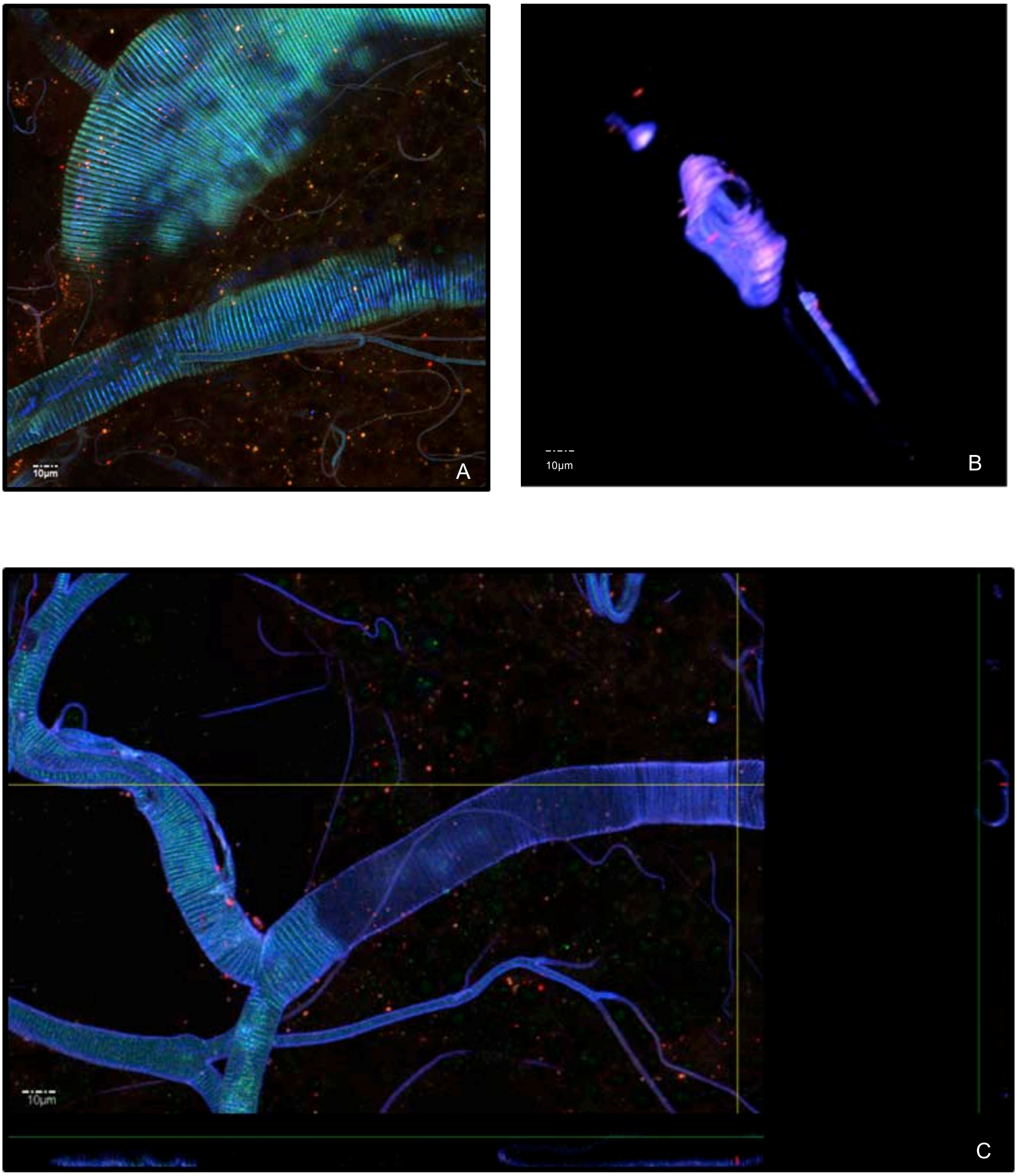

Fig.2. Confocal microscope image: (A) NPs at the tracheae and fat tissue; (B) Dimensional image of the trachea with nanoparticles inside and outside; (C) Cross-section of trachea showing how the nanoparticle go through it.