

Quantum dots as new guests in the body: structural and functional data

Paolo F. Fabene, Beatrice Salvetti, Flavia Merigo, Donatella Benati, Cristina Tognoli, Beatrice M. Radu, Mihai Radu, Giuseppe Bertini, Francesco Osculati

Dept of Neurological and Movement Sciences, Section of Anatomy and Histology, University of Verona, Italy

Many promising applications of quantum dots (QDs) in nanomedicine and *in vivo* imaging for further diagnostic are being developed. Despite the immense potential for the medical applications of QDs, little is known about the bioavailability and health consequences of QDs in animals and humans. Although some investigators reported that QDs do not appear to cause toxicity, others demonstrated a variety of cytotoxic effects. In this study, QDs800 (InVitrogen) have been used. Previous data from our group evaluated the bio-distribution by optical imaging, transmission electron microscopy, inductively coupled plasma mass spectroscopy analysis in mice, and the effects on novel object recognition memory, EEG activity, and some histopathological analysis on mice in different organs (liver, spleen, lungs, testis, brain).

Here, we studied the systemic inflammation caused by QDs in different organs, and then focussed our attention to the brain. It is known that brain inflammation leads to microglia and astrocyte activation, which in turn are sensitive to the changes in the CNS microenvironment and rapidly activated in all conditions that affect normal neuronal functions. We demonstrated that the presence of QDs could impair synaptic response and neuronal excitability; secondly, we are currently investigating whether the electrical changes are induced by QDs by themselves or by the inflammation induced by their presence.

Keywords

Nanomedicine, patch-clamp, endothelial cells, neurons, synapse, IL-1B, inflammation.