P014-F | Cellular uptake and cytotoxicity of unmodified Pr^{3+}:LaF3 nanoparticles

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Background: Rare earth doped fluoride nanoparticles (NPs) are widely used in biology and medicine. Particularly Pr^{3+}:LaF3 (CPr=7%) NPs demonstrate temperature sensitivity into 20–50°C range (band-shape of the luminescent spectrum strongly depends on temperature). These NPs can be applied in local thermogenesis of living cells and/or in hypothermia. For these applications toxicity of the NPs and features of interaction between the NPs and living cells should be studied thoroughly.

Materials and methods: Pr^{3+}:LaF3 (CPr = 7%) NPs have an average diameter 15 ± 3 nm. Cellular uptake was studied via transmission electron microscopy (Hitachi HT7700 Exalens) at 0·1 g/L NPs concentration using SW 837, A 549, MDCK, LEK, and HuTu 80 cell lines. Toxicity was estimated via MTT assay.

Results: After 1 hour of NPs exposure A 549 and HuTu 80 cells internalized the NPs via micropinocytosis and 100–200 nm agglomerates of the NPs packed into vesicles were found into the cytoplasm. LEK and SW 837 cells did not internalize the NPs which were located onto the external part of the cellular membrane. For MDCK cell culture the NPs were found apart from the cells and internalization did not take place. MTT assay revealed that the NPs are nontoxic into the 0·05–0·5 g/L range. The toxic threshold was found at 1·0 g/L where LEK and A 549 cell cultures demonstrated survivals 68% and 78% respectively.

Conclusions: Pr^{3+}:LaF3 (CPr = 7%) NPs are internalized by some cell cultures. They are nontoxic into the 0·05–0·5 g/L range and hence can be applied in local thermogenesis of living cells and/or hypothermia.

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P015-F | Changes in the redox status of the brain after low level light therapy

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Low level light therapy (LLLT) that uses light energy with a near infrared wavelength has received great attention as a new scientific approach with applications in neurology and psychiatry. Currently, there is great uncertainty about the mechanisms of action of LLLT in the brain at the molecular and cellular levels, as well as its possible cytotoxic effects. The objective of this work was to study the alterations related to oxidative stress on different cerebral structures involved in cognitive and emotional functions.

Sixteen adult Wistar rats were divided into four experimental groups and exposed to laser stimulation (20s-long laser pulses, 40s resting time, during 1 hour) with different wavelengths for ten days: Without laser stimulation (Control group), 1064 nm, 905 nm and 650 nm. We evaluated the lipid peroxidation and the total antioxidant activity as tools for assess the redox state after the different exposures in prefrontal, striatum and hippocampus.

We observed that the wavelength of 1064 nm increased lipid peroxidation in the striatum and reduced oxidative damage to lipids in the prefrontal area. Furthermore, this wavelength increased the total antioxidant activity in the striatum and the hippocampus. On the other hand, the wavelength of 905 nm was able to significantly increase lipid peroxidation in the striatum. Finally, the wavelength of 650 nm only impacted on the hippocampus, reducing the total antioxidant activity.

The three types of LLLT produced different changes in the redox status of the brain, in a region-dependent manner. While 1064 nm affected the three regions studied, 905 nm only altered the redox status of the striatum and 650 nm only affected redox status of hippocampus. Our results may support the possible involvement of redox signaling in the LLLT-induced cognitive and emotional effects.

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