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## Cerium oxide nanoparticles: An emerging class of UVA filter

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Generation of reactive oxygen species is well accepted phenomenon in the skin exposed to Ultraviolet radiations. Ultraviolet radiations initiate an acute cascade of photochemical reactions culminating in the generation of reactive oxygen species such as superoxides. The downstream effects of these acute changes are directly involved in various cutaneous changes such as sunburn erythema, phytocarcinoma and photoaging. The risk and exposure of UV radiations varies dramatically over time, space and topology across the globe suggesting the clinical relevance of identifying efficient UV protective agents. Based on the prior understanding from our lab and other studies cerium oxide has emerged as one of the promising antioxidants due to its superoxide dismutase and catalase mimetic activity. In this study we evaluated the UV protective efficiency of custom synthesized cerium oxide nanoparticles tagged with Poly Ethylene Glycol (PEG-CNPs). The internalization of nanoparticles was successfully evaluated using DiD florescent tags (Fig1a). Preliminary studies were conducted on primary keratinocyte culture (HAEK cell line) using standard flow cytometry and microscopy. Significant reduction in ROS was observed in UV irradiated cells pretreated with 25  $\mu$ M PEG-CNPs for 6 hours with concomitant reduction in protein modification such as carbonylation and nitrosylation and eventually the cell death (Fig1b). Moreover, on gaining confidence in cell culture model the hypothesis was tested in rat skin exposed to known doses of UV the PEG-CNPs showed significant reduction in clinical cutaneous parameters such as erythema. Histopathological examination and basic biochemical indicators of oxidative stress including 8-OHdG, protein carbonyl, nitrosylation was significantly reduced on topical application prior to UV exposure. Apart from evaluating the minimum effective dose we also evaluated basic toxicological assessment and developed a topical formulation with hydrophobic solvents. In conclusion, the PEG-CNPs were highly efficient in protein skin from UV damage therefore providing a promising cosmaceutical application of this novel class of antioxidants.

### Biography

Aditya Arya has been doing active research on biological activity of cerium oxide nanoparticles for the past 6 years and significantly contributed towards the biological applications both in therapeutics and diagnostics. His current research focus is on the UV protective abilities of cerium oxide which have emerged as excellent clinical promise. Beyond this, his past work has been on the benefits of nanomolar and micromolar suspensions of artificially synthesized nanoceria for amelioration of various ROS dependent perturbations arising from the hypoxic insult.

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