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Assessment of mechanism of nanoparticles synthesized from Centella asiatica Linn. on paracetamol induced immune modulatory changes in in vitro and in vivo systems

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Stress induced due to Inflammation and reactive oxygen species impose toxicity to different kinds of cells. Human body is also prone to develop toxicity due to the exposure to several toxic substances. The study was aimed to assess the toxicity induced by paracetamol on brain, spleen and liver and the protective role of *Centella asiatica* nanoparticles (CANP) against this damage (toxicity). Oxidative stress (reactive oxygen species) and nitrosative stress (reactive nitrogen species) were also studied to determine the free radical production. Interestingly, paracetamol caused severe damage to the brain and liver which was evident from deleterious alterations in various parameters. The study included synthesis and characterization of carbohydrate encapsulated CANP by using XRD diffraction patterns, transmission electron microscope (TEM) and dynamic light scattering (DLS), zeta potential, DSC, TGA, DTA, gel permeation chromatography analysis and assessment of inflammatory mechanism by evaluating the expression pattern of immune modulatory cytokine mediators using real time PCR. Paracetamol treatment (1 mM) resulted in increased mRNA expression of cytokines like tumor necrosis factor-beta, interleukin 6, interleukin 1, interferon gamma, mitogen-activated protein kinase gene-14 and decreased interleukin 10 mRNA expression. These changes were normalized by administration of different concentrations (or doses) of CANP. Flow cytometry analysis using Annexin V apoptosis assay kit will be carried out using isolated splenocytes to assess apoptosis and necrosis. This study is first of its kind to assess inflammatory toxicity induced by paracetamol. Consequently, the study depicts that paracetamol induced inflammatory toxicity could be attenuated by CANP treatment as evident by the decreased levels of the pro-inflammatory cytokines, immune reactions and free radical production.

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Excellent performance of photo detector based on $CsPbBr_3$ films with ZnO nanoparticles decoration

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Hybrid perovskites are considered to be promising candidates for the optoelectronic devices because they have the advantages of large absorption coefficients, ultrafast charge generation, and photon-generated carries with long lifetime and high mobility. These materials can be, however, thermally unstable, which is related to the organic constituents. The stability problem, fortunately, can be solved by replacing the organic cation $CH_3NH_3^+$ with the inorganic cation Cs^+, which results in all-inorganic perovskites ($CsPbX_3$, X=Cl, Br, I) with significantly enhanced thermal stability. The particularly stable $CsPbBr_3$ has been widely applied in solar cells, laser and LEDs. In addition, $CsPbBr_3$ has also been investigated for its remarkable optoelectronic properties including the balanced electron and hole mobility-lifetime product, high electron mobility and small exciton binding energy. The remarkable properties of CsPbBr3 evoke our interest in developing novel photo detectors by using this material as the light absorber. In this paper, we demonstrate enhanced performance of solution-processed photo detectors composed of all-inorganic $CsPbBr_3$ perovskite films with ZnO nanoparticles (NPs) decoration. Introducing ZnO NPs into $CsPbBr_3$ precursor solution results in a film with more uniformly and compactly distributed crystalline grains. ZnO NPs can also promote the transport of photon-generated carriers from the central $CsPbBr_3$ absorption layer to the lateral electrodes. Compared to the photo detectors without ZnO decoration, the fabricated all-inorganic $CsPbBr_3$:ZnO photo detectors achieved comparable rise time of 0.409 s, fall time of 19.72 ms and on/off ratio of 12.86 without additional power source.

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