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Editorial

Nanoerythropoietin

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Editorial

This singular subject emphasis on erythropoietin nanoparticles including original research articles on cytoprotective effects of Nanoerythropoietin and its advantages. Moreover, the special issue includes papers on the action of Nanoerythropoietin as a chemo protective agent. In the following, we present the original papers published in this special edition.

XIAOLI ZHANG et al. deal with erythropoietin loading chitosan-tripolyphosphate nanoparticles. This paper presents the result of an *in vitro* study investigating the effect of Erythropoietin (EPO) loading Chitosan-Tripolyphosphate (CS-TPP) nanoparticles on an Immunoglobulin a Nephropathy (IgAN) rat model. They prepared and characterized EPO-CS-TPP nanoparticles and administered to the IgAN rat models. XIAOLI ZHANG et al analyzed Hemoglobin (Hb), Blood Urea Nitrogen (BUN) and Creatinine (Cr) levels as hallmarks of nephropathy. They report significant improvement in the therapeutic effects in the IgAN model CS-TPP-EPO group.

Ghassemi-Barghi N et al. Investigate the role of recombinant human erythropoietin loading chitosan-tripolyphosphate nanoparticles in busulfan-induced Genotoxicity. This paper presents the result of an *in vitro* study investigating the genoprotective effects of CS-TPP-EPO nanoparticles on busulfan induced Genotoxicity and oxidative stress. CS-TPP-EPO nanoparticles reduced the Genotoxic effects of busulfan significantly by reduction of the level of DNA damage via blocking ROS generation.

Ting Wang et al. deal with Erythropoietin-loaded oligochitosan nanoparticles. This article presents the result of an *in vitro* study investigating erythropoietin-loaded oligochitosan nanoparticles for treatment of periventricular leukomalacia. Ting Wang et al. analyzed the results of Histology experiments, GAP-43, MRI experiments and Behavior tests. They report that Nanoparticles prolonged the time course of EPO metabolization in the liver and the stable release of EPO from the nanoparticles kept the plasma concentration of EPO at around 100IU/ml during the 8-12 h post-injection. And suggest that oligochitosan based nanoparticles are an effective vehicle for drug delivery.

Fayed BE et al., design and characterized another type of erythropoietin nanoparticles. They prepare EPO-loaded poly (DL-lactide-co-glycolide) nanoparticles using double emulsion method (w/o/w) with least process-related stress on the encapsulated drug. The bioassay results showed that EPO-loaded nanoparticles were able to maintain the physiological activity of EPO for 14 days after single subcutaneous injection compared with pure and marketed EPO formulae (EPREX®).

In me and my colleges previous study Erythropoietin was reported to have a range of cytoprotective actions beyond stimulation of erythropoiesis. EPO exerts its cytoprotective effects through different pathways. EPO exerts its anti-apoptotic effects through PI3K/Akt, ras-MAP kinase pathways and modulation of pre and anti-apoptotic proteins like BAX، BCL2. EPO exerts its anti-inflammatory effects through modulation of inflammatory cytokines like NFκB, TNF-α،IL-6 and ICAM. EPO shows anti-oxidant effects by suppressing the production of reactive oxygen species (ROS) via hem oxygenase and glutathione peroxidase activity. Besides EPO has been shown anti-aging effects through NRF2-ARE pathway. In several *in vitro* and *in vivo* studies EPO has been protected Genotoxicity, cardiotoxicity, nephrotoxicity and neurotoxicity result from chemotherapy agents. The short half-life of EPO can limit its use for the protection of chemotherapy induced DNA damage. Moreover, overtreatment with EPO results in uncontrolled proliferation of red blood cells and increase in blood viscosity and increase the risk of high blood pressure and thrombosis.

Lessening the adverse effects of EPO treatment is a crucial concern in clinical studies. Because of improvement in nanotechnology, the half-life of the polypeptide drug may be increased and the side-effects reduced. It has been formerly confirmed that chitosan-TPP nanoparticles containing EPO may considerably extend its activity. It has also been verified in the treatment of hypoxia and anemia in a newborn rat model, that the effect of treatment with EPO nanoparticles is 10 times greater compared with regular EPO treatment, implying that nanotechnology with EPO delivery is able to significantly improve its therapeutic effects. We hope that this special issue will alert researchers to some recent development in the field of Nano medicine, particularly the association between nanotechnology alterations and pharmacology, and that a better understanding of this correlation can direct our efforts to the discovery of new therapeutic strategies for the treatment of cancer and other related disorders.

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