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Evaluation of wound healing effect of hydrogen peroxide responsive vanillyl alcohol-containing polymer *in vivo*

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Statement of the Problem: Vanillyl Alcohol (VA), a phenolic derived bioactive principle present in Gastrodia elata is known for its antioxidant, angiogenic and anti-inflammatory properties. VA incorporated polymer Poly (Vanillyl Alcohol-Co-Oxalate) (PVAX) has been evaluated for its ability in inflammatory conditions. However, no attempts have been made to explore the hydrogen peroxide (H_2O_2) scavenging capability in the excision wound.

Methodology & Theoretical Orientation: In this study, we have demonstrated the use of exogenous reactive oxygen species detoxifying PVAX nano-formulation mediated H_2O_2 scavenging in vivo model. The unique capability of the polyoxalate containing polymer PVAX is that in the physiological condition it retains its integrity, yet, in a pathophysiological condition like a wound site due to the higher level of H_2O_2, it starts to degrade and release VA at the wound.

Findings: Amplex red assay of excisional wound shows that in comparison with VA, PVAX nano-formulation treated group exhibited dose-dependent reduction of H_2O_2 levels. H&E and collagen staining studies gives a clear picture of proliferation, formation of epidermal layer and fibroblast remodeling. Western blotting results have confirmed that nano-formulation scavenges excessive H_2O_2 thereby decrease protein expression of reactive oxygen species detoxifying enzyme Nrf-2 and HO-1 significantly.

Conclusion & Significance: PVAX nanoformulation scavenges excessively H_2O_2 at the wound site, resulting wound size reduction accompanied by reepithelization and collagen deposition. Smart polymeric nanoparticles containing small molecules in the polymer backbone could be more versatile effective nanoparticles or scafold materials that should transform regenerative medicine.

Biography

Berwin Singh S V is a PhD student at the Chonbuk National University in Republic of Korea working under the supervision of Prof. Dongwon Lee. He received his Master's in Bio Medical Science from the Bharathidhasan University, India, and then he was trained in Bio Medical technology (MPhil) at the Sri Chitra Institute of Medical Science, India. His current research is focused on smart polymer synthesis-physiochemical characterization and developing and evaluation of nano-carriers *in vitro* and *in vivo*.

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