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News & Comments

Diabetic Patients getting benefited from L-Glutamine

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The process of restoring the structural architecture of injured tissue is a dynamic and complicated one. This entailed physiological and biochemical changes aimed at wound healing, which is the process of repairing and regenerating tissue structure. Wound healing is significantly faster under normal circumstances; however, some factors such as age, microbial infection, high blood sugar levels, poor blood circulation, oedema, inadequate nutrition, and others interfere with the various stages of wound healing, compromising tissue healing. Diabetes mellitus is a life-threatening disorder that causes the healing process to be slowed, resulting in chronic Diabetic Foot Ulcers (DFUs).

Furthermore, increased production of reactive nitrogen and oxygen species, such as hydroxyl radicals, hydrogen peroxide, and superoxide, increases the inflammatory response and causes oxidative stress, which is important in the pathogenesis of DFU10. DFU, according to researchers, is primarily defined by an aggravated neutrophil granulocyte response at the wound site, which promotes proinflammatory cytokines such as TNF-" (Tumour Necrosis Factor-") and IL-1$ (Interleukin-1 Beta). The creation of MMP (Matrix Metalloprotease) by these cytokines destroys the tissue protein matrix and inhibits the generation of growth factors, hence limiting the normal wound healing process.

L-glutamine, a non-essential amino acid that serves as a precursor for glutamine production, hence serves as a natural antioxidant source. Its glutamine-boosting capacity has been used to treat a variety of disorders, including inflammation, diabetes, ulcers, cancer, cardiotoxicity, hepatotoxicity, and nephrotoxicity.

During diabetic nephropathy, L-glutamine protects the kidneys by inhibiting enhanced oxidative stress and Transforming Growth Factor-$ (TGF-$).

The study took place at Xi'an Jiao tong University, China, from 4th November 2020 and 5th April 2021. For the experiment, Male Sprague Dawley rats were obtained from The Fourth Peoples Hospital of Shaanxi. An excision diabetic foot ulcer was generated in anaesthetized rats using a previously known approach (ketamine (75 mg kg^{-1} i.p.) and xylazine (10 mg kg^{-1} i.p.)18. The rectangular wound (25 mm) was then produced on the dorsal surface of each rat's foot.

The rats with excision wounds were randomly assigned to different treatment groups. Normal non-diabetic (ND, without wound, received double distilled water (DW, 10 mg kg^{-1}, p.o.), normal wound control (NWC, nondiabetic animals with wounds received DW (10 mg kg^{-1}, p.o.), diabetic wound control (DWC) animals either received (DW (10 mg kg^{-1}, p.o.) or treated with L-Glutamine (LG, 250, 500, and

1000 mg kg^{-1}, p. Rats were anaesthetized with ethereal anaesthesia after 22 days. A retro-orbital puncture was used to obtain blood, and serum was separated using an Eppendorf Cryo-centrifuge (model No. 5810, Germany) and centrifugation (4EC, 5200 g, 15 min) to evaluate serum insulin using a rat ELISA (Enzyme Linked Immunosorbent Assay) kit.

Wound healing is a straightforward linear process in which numerous biological substances and cells interact to cause wound contraction and re-epithelialization. Certain predisposing disorders, such as diabetes mellitus, interfere with the wound healing process, leading to more chronic and complex ulcer situations that have an impact on the disease's prognosis. The treatment of L-glutamine significantly reduced diabetes-induced increased blood glucose, insulin, and neuropathic abnormalities in the current study, potentially speeding up wound healing. Chronic hyperglycaemia has been linked to a variety of tissue damage, including cardiomyopathy, neuropathy, retinopathy, and foot ulcers, among other diabetes consequences. STZ-induced enhanced oxido-nitrosative stress was decreased by L-glutamine treatment, resulting in faster wound healing. Elevated free radicals have been shown in clinical studies to generate oxidative stress, which leads to a progressive deterioration of the wound healing process. Down-regulation of the increased ROS response has thus been demonstrated to be advantageous in diabetes patients and related problems, such as DFU6. Researchers discovered that STZ causes an increase in ROS production, which depletes intracellular levels of SOD, a superoxide scavenger, and increases lipid peroxidation, as evidenced by higher MDA levels. As a result, there is a mismatch between intracellular antioxidant enzymes (SOD and GSH) and the formation of reactive oxygen species (ROS) contributes to the deterioration of wound healing.

L-glutamine speeds wound healing through a variety of processes, including reducing increased blood glucose levels, which controls the generation of reactive oxygen species and so lowers oxidative stress. Furthermore, L-down-regulation glutamine of oxidative stress at the wound site reduces the production of inflammatory mediators, which enhances angiogenesis and hence wound healing in diabetic patients.

JOURNAL REFERENCE

Pei, S., M. Li, Q. Li, H. Li and Z. Pang, 2022. L-glutamine accelerates wound healing in diabetic foot ulcers in experimental rats. Int. J. Pharmacol., 18: 153-163.

KEYWORDS

L-Glutamine, diabetic patients, wound healing, antioxidant source, diabetes, ulcers, cancer, cardiotoxicity, hepatotoxicity, nephrotoxicity