



## HEALING OF DIABETIC AND THERMAL WOUNDS BY HERBAL CREAM, IH-WH4 AND HERBERIN

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**SUMMARY:** *The wound healing efficacy of IH-WH4 and HERBERIN was evaluated in diabetic and burn wound subjects. Histopathological studies revealed that administration of these two products hastened the formation of granulation tissue alongwith angiogenesis and fibroplasia.*

### INTRODUCTION

Wound healing normally takes place physiologically by a controlled mechanism through angiogenesis, fibrogenesis, granulation tissue growth, production and cross-linking of collagen etc. IH-WH4 and HERBERIN are two polyherbal formulations used for topical and oral medication respectively, in different pathological conditions of skin. The present study was undertaken to find out the efficacy of IH-WH4 and HERBERIN to heal incision wounds in diabetic and burn wound in normal subjects.

### MATERIALS AND METHODS

This study was conducted in two different sets of experiments:

#### a) Wound healing in diabetic rats

Albino Wistar rats of either sex (125-150 gm) were used in the first set. The rats were made hyperglycaemic by injecting Streptozotcin (65 mg/kg, intraperitoneally) dissolved in citrate-phosphate buffer (pH 4.5). The rats exhibited stable hyperglycaemia within 48 hours of injection.

These rats were divided randomly into two groups of eight rats each. An incised wound (30mm long) was made in the subscapular area under pentobarbitone anaesthesia (30mg/kg, intraperitoneally). The wound edges were approximated by three equally spaced interrupted sutures. One group of rats served as control. The rats of the other group were treated with IH-WH4 cream (twice daily, topically) and HERBERIN (10 mg/kg, orally) for seven days. Sutures were removed on 5th day and the animals were sacrificed on 8th

post operative day. A section of skin containing the healing wound was preserved in 10% formalin for histological examination.

#### b) Thermal injury wound healing

Adult male rats of Wistar strain (175-200 gm) were used in this study. The rats were divided into two groups of six each and both groups were subjected to partial thickness second/third degree burn wounds (1). Wounds were produced by pouring melted chemiwax into a 2x2 cm metal cylinder placed on the shaven back of the anaesthetized rats for 45 seconds to produce a circular shaped wound. One group of rats was treated with IH-WH4 and HERBERIN as stated in the first set of experiment. The second group of rats served as control. They were sacrificed on 7th post wounding day. A piece of healing skin tissue was removed from each rat and preserved in 10% formalin. Healing was assessed by histological examination.

### RESULTS

In the present study, the incised skin of diabetic control rats showed an ulcerated wound containing necrotic debris invaded by irregularly arranged fibroblasts admixed with dense accumulation of leucocytes comprising mostly of dead and degenerating neutrophils and few mononuclear cells with clumps of bacteria signifying infection. There was poor angiogenesis without any clear evidence of granulation tissue. Incised skins of IH-WH4 and HERBERIN treated rats showed ulcerated wounds containing leucocytes and necrotic debris, the underlying tissue showed development of well formed granulation tissue

with plump/oval fibroblasts having fine collagen fibres at either poles of nuclei and well vascularised newly formed capillaries arranged parallel to the fibroblasts suggesting healthy granulation tissue with normal angiogenesis and fibrogenesis.

The skin sections of the control rats subjected to burn wound revealed precipitation of proteinaceous homogeneous eosinophilic mass with loss of fibrillar appearance of loose connective tissue in dermis. The dermoepidermal junction showed hydropic degeneration, bullae formation and vesiculation. The fibroblasts were arranged irregularly with scanty collagen fibres.

The blood vessels were congested. The epithelial cells of hair follicles showed necrobiotic changes. There was diffuse infiltration of dead, degenerated and intact polymorphonuclear cells admixed with bacterial colonies at the junction of the incinerated tissue and its underlying dermis suggesting vascular injury followed by invasion of potentially threatening bacteria. However, the superficial surface of wound had single fibroblast cell layer.

The burnt skin sections from the rats treated with IH-WH4 and HERBERIN also showed characteristic coagulation of eosinophilic proteinaceous materials. But there were multilayered fibroblasts with development of collagen fibres at the surface of the wound. Underneath this layer the newly formed sprouting capillaries engorged with blood and regularly arranged fibroblasts with development of collagen fibres at either poles of nuclei were seen uniformly distributed throughout the incinerated tissue suggesting a healthy granulation process. In deeper layers, the fibroblasts remained perpendicular to the sprouting capillaries. There was also regeneration of the epithelial cells of hair follicles. In general there appeared to be increased vascularity in the incinerated areas. All these are suggestive of healthy healing process with normal angiogenesis and fibroblastic cells proliferation. Moreover, there was no sepsis as seen by the virtual absence of infiltrating polymorphonuclear leucocytes and bacterial colonies.

## DISCUSSION

Diabetes mellitus produces profound changes in the metabolism and properties of connective tissues. Different collagenolytic enzymes are reported to be increased in diabetic subjects<sup>2</sup>. Moreover, it is also known that insulin plays a vital role in the process of wound healing<sup>3</sup>. Insulin stimulates the proliferation of fibroblasts in culture

by potentiating the action of fibroblast growth factor and epidermal growth factor etc<sup>4</sup>. Tissue hyperglycaemia also predisposes to infection. So, in diabetic subjects wound healing is difficult due to multiple causes. In such cases, exogenous application of some agent and administration of systemic medication, promoting wound healing may be helpful.

Histological examination of skin tissues is an important tool to know the status of healing as the involvement of different types of cells in the regeneration or repair can be studied histologically.

The importance of topical agents in burn wounds is decreasing the fluid loss and depletion of extracellular fluid from the denuded skin and to prevent infection and thus promote healing. Oral medication helps in preventing infection by attaching to pathogenic bacteria, which cause local and systemic sepsis. In the cases of diabetic and burn wounds, topical application of some wound healing agent working through immune modulation and anti-microbial actions may be helpful. Simultaneous oral administration of systemic medication which may support wound healing from inside can be of great value for prompt recovery.

Our present study with HERBERIN and IH-WH4 is in agreement with the earlier reports. Looking at the results of the present study it can be concluded that application of IH-WH4 and oral administration of HERBERIN will certainly prove beneficial in the prompt and uncomplicated healing of burn wounds and diabetic skin wounds.

The considerable morbidity and mortality associated with diabetic or burn wounds is well established. The requirement of tight hyperglycaemic control and control of sepsis for management of diabetic wound have posed many practical problems. Hence medication that promotes wound healing in diabetic subjects is a welcome addition. Similarly quick and efficient healing of burn wounds with minimal scarring is also a welcome addition to the various available treatments of thermal injury.

## References

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