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Histopathological Changes during Infected Wound Healing in Cow Calves by the Use of Silver Nano Particle Gel and Povidone Iodine

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Abstract

The present study was conducted on 12 cow calves with infected wounds, irrespective of sex and breed, divided into two groups having 6 cow calves each. The animals of group I were treated with silver nano particle gel and the animals of group II were treated with povidone iodine dressing for 7 consecutive days. Histopathological changes were recorded at different time interval in both the groups. Studies revealed that there was marked re-epitheliazation and hyperplasia with considerable thickening of epidermis and large amount of collagen deposition in granulation tissue in group I as compared to group II. Histopatathological findings clearly suggest that the group treated with silver nano particle gel showed better and faster healing of wound as compared to povidone iodine treated group. Therefore clinical use of silver nano particle gel can be advocated for wound dressing in cow calves.

Key Words: Histopathological changes, Cow calves, Infected wounds, Silver nano particle (AgNPs), Povidone iodine.

Introduction

Wound healing is a complex, but orderly process involves both epithelial regeneration and the formation of connective tissue scar. However, each different tissue in the body has specific cells that provide some organ specificity to the healing response (Vegad, 2007). Before the beginning of antibiotic therapy, silver was used for its antiseptic activity, specifically for the treatment for open wounds and burns. Recent studies have suggested that topical application of silver nano particles promotes the proliferation and migration of keratinocytes and leads to the differentiation of fibroblast into myofibroblast which ultimately leads to the wound contraction. Wounds treated with silver nano particle gel dressing had a poor signs of inflammatory response, provided proper basis for emigration and proliferation of epithelial and connective tissue cells, synthesis of extracellular matrix and remodeling of parenchymal elements and connective tissue which leads to restoring the tissue function and achieving wound strength (Habiboallah *et al.,* 2014).

Materials and Methods

The study was conducted on 12 cow calves with infected wounds, irrespective of sex and breed, divided into two groups having 6 cow calves each. The animals of group I were treated with silver nano particle gel and the animals of group II were treated with povidone iodine dressing for 7

consecutive days. If required dressing was continued till healing.

For histopathological studies a tissue of 3 mm in size was harvested from the wound area by punch biopsy on 0, 7th and 14th day. The tissue was preserved and fixed in 10% formal saline and was processed, sectioned and stained with haematoxiline and eosine (H & E) and a special stain Van Gieson's stain to study the histological changes and for demonstration of collagen fibers respectively as per standard procedure of Lillie (1954).

Results and Discussion

In group I and II where the silver nano particle gel and povidone iodine were applied topically in open infected wounds, on day 0 did not reveal minimal extend of healing histopathologically. Tissue sections revealed haemorrhage, heavy infiltration of inflammatory cells mainly neutrophils and oedema.

In group I on day 7, neovascularization and well organized granulation tissue along with re-epithelialization and thickened epidermis denoted hyperplasia and collagen deposition was observed. Our result is in agreement with the findings of Wright *et al.* (2002), Tian *et al.* (2007) and Marcato *et al.* (2015), who reported antibacterial activity and mitogenic effect of silver nano particles on fibroblast and blood vessels. On day 14, in group 1, Van Geison staining revealed collagen deposition on the wound surface with mature non leaky granulation tissue. Result showed that AgNPs improved the tensile properties led to better fibril alignment in repaired skin with close resemblance to the normal skin similar to the finding of Kwan *et al.* (2011).

In group II on day 7 though there was decrease in the inflammatory cells at oedematous granulation tissue however, re-epithelialization was not complete and deposition of collagen was also mild as compared to considerable amount of collagen in group I. On day 14, re-epithelialization was completed with minimal amount of collagen, indicated low tensile wound strength as compared to group I.

Conclusion

Histopathological findings revealed better healing of wounds with silver nano particle gel. The application of silver nano particle gel showed good healing pattern by increasing wound contraction, wound re-epithelialization in infected wounds without any side effects as compared to povidone-iodine dressing. Therefore clinical use of silver nano particle gel can be advocated for wound dressing in cow calves.

Conflict of Interest: All authors declare no conflict of interest.

References :

Habiboallah, G., Mahdi, Z., Majid, Z., Nasroallah, S., Taghavi, A. M., Forouzanfar, A., and Arjmand, N. (2014). *Modern Research in Inflammation*,**3:** 128-138.

Kwan, H.L.K., Liu, X., To, M.K.T., Yeung, K.W.K., Ho, C. and Wong, K.K.Y. (2011). Online http:// www.ncbi.nlm.nih.gov /pubmed/ 21272666.

Lillie, R.D. (1954). Histological Technique and Practical Histochemistry.4th Edn. The Blakistan Dir. Machraw Hills Book Co., Torranto, pp 121-123.

Marcato, P. D., De Paula, L. B., Melo, P. S., Ferreira, I. R., Almeida, A. B. A., Torsoni, A. S., & Alves, O. L. (2015). *Journal of Nanomaterials*, **3**: 91.

Tian, J., Wong, K.K.Y., Ho, C.M., Lok, C.N., Yu, W.Y., Che, C.M., Chiu, J. F. and Tam, P. K.H. (2007). *J. Chem. Med. Chem.*, **2**: 129.

Vegad, J.L. (2007). A textbook of Veterinary general pathology, 2nd Edn., International Book Distribution Co., New Delhi, pp 183-215.

Wright, J.B., Lam, K., Buret, A.G., Olson, M.E. and Burrell, R. E. (2002). *Wound Repair and Regeneration*, **10**(3): 141–151.

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