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# Comparative evaluation of wound healing in mice treated with betadine ointment and collagen granules

**Analisha Debbarma, Indramani Nath, Sidhartha Sankar Behera, Smruti Ranjan Mishra, Susen Kumar Panda and Ritun Patra**

**Abstract**
The study was conducted on 18 Swiss albino mice to determine the potency of betadine and collagen granules in wound healing. Two groups were made, i.e., Group-I (treated with betadine ointment) and Group-II (treated with collagen granules), each group containing 9 mice. An intraperitoneal injection of a mixture of 12.5 mg/kg of xylazine hydrochloride and 80 mg/kg of ketamine hydrochloride was used to induce anaesthesia, and a wound was created with the help of a 5mm biopsy punch on the dorsal area. On average, 17.8 ± 0.43 days in Group-I and 17.5 ± 0.42 days in Group-II were required for complete healing. The wound contraction area was 5.03 ± 0.06 mm, 4.40 ± 0.09 mm, and 3.88 ± 0.05 mm in Group-I and 4.85 ± 0.06 mm, 3.98 ± 0.06 mm, and 2.93 ± 0.04 mm in Group-II, respectively, on the 3rd, 7th, and 14th days. And collagen granules supplement show a faster healing process than betadine-treated wounds.

**Keywords:** betadine, collagen granules, wound, mice

## Introduction
Povidine-iodine (brand name: Betadine) is a broad-spectrum microbicide composed of a polyvinylpyrrolidone and elemental iodine chemical combination. It is widely used in daily clinical practise for any kind of injury or damage. Nowadays, it is also found that many synthetic substances, other than betadine, are available on the market and are used in treating wounds. One of the common available synthetic substances used for wound healing are collagen granules. Collagens are the most abundant proline-rich proteins (Stadelmann *et al.*, 1998) [6], mainly released by fibroblasts. Direct supplementation of the wound with synthetic collagen will thus aid in inducing the healing process by enhancing cellular infiltration and the formation of granulation tissue. This present topic was studied in order to determine the potency of betadine and collagen granules in wound healing and wound evaluation in terms of days required for complete healing after each treatment.

## Materials and Method
This work was taken place in the Department of Veterinary Surgery and Radiology, C.V.Sc. & A.H., OUAT, Odisha with the permission from the Institutional Animal Ethical Committee (IAEC) of College of Veterinary Science and Animal Husbandry. 18 Swiss albino mice of either sexed were used for this research and divided into two groups: Group-I (treated with betadine ointment) and Group-II (treated with collagen granules), each group containing 9 mice. Mice were anaesthetized individually through the intraperitoneal route with a combination of injections of xylazine hydrochloride @ 12.5 mg/kg and ketamine hydrochloride @ 80 mg/kg (Tranquilli *et al.*, 2007) [7]. Following anaesthesia, mice were positioned in a dorso-ventral position, and the necessary standard aseptic protocol was followed for the creation of a wound. A 5mm biopsy punch was used to create a wound in the dorsal region. In Group I, betadine ointment was applied to the wound, whereas in Group II, collagen granules were applied to the wound. Number of days required for complete healing was recorded (Bigbie *et al.*, 1991) [1] and wound contraction was evaluated on 3rd, 7th and 14th postoperative days (Parameshwaraiah and Shivakumar, 1998) [4] and was measured by Image J Soft Ware and average was taken.

## Results and Discussion

Collagen fibres are the strongest protein fibres and are abundantly found in the connective tissue. Collagen acts as a substrate for fibroblasts (Smith *et al.,* 1996) [5], enhancing cellular infiltration and thereby promoting early wound epithelialization and subsequently increasing wound contraction. Wound was seen to be completely healed with significant difference ($p<0{\cdot}05$) within 17.8 ± 0.43 days in Group-I and 17.5 ± 0.42 days in Group-II without no sign of presence of exudates or any secondary infection. On day 0, the average wound area was almost similar in both the group-I & group-II i.e., 5.63 ± 0.06 mm and 5.82 ± 0.07 mm, respectively. By the 3rd, 7th, and 14th days, the wound area was gradually decrease in area and significance difference ($p<0{\cdot}05$) were observed between the groups. On 3rd, 7th, and 14th days, the wound area was 5.03 ± 0.06 mm, 4.40 ± 0.09 mm, and 3.88 ± 0.05 mm in Group-I and 4.85 ± 0.06 mm, 3.98 ± 0.06 mm, and 2.93 ± 0.04 mm in Group-II, respectively. Collagen deposition and remodelling contribute to the increased tensile strength of the wound (Desmouliere *et al.,* 1995) [2]. Moreover, collagen promotes platelet aggregation, triggers clotting cascades, and produces growth factors, all of which are crucial contributors to the faster healing of wounds when compared to those treated with betadine ointment. Several researchers discovered that leukocytes reduced povidone *in-vitro* iodine's microbicidal effectiveness and that clinical doses of povidone iodine (0.1–20%) were toxic to granulocytes and monocytes. This finding may explain why some wounds take longer to heal (Van Den Broek *et al.*, 1982) [8]. In the majority of cases, wound healing with povidone iodine did not efficiently promote excellent wound healing; instead, it retarded wound healing, reduced wound strength, and increased the risk of infection (Kramer, 1999) [3].

## Conclusions

Collagen, as an additional supplement to the wound, induces granulation tissue formation and angiogenesis, which ultimately results in quicker healing of the wound. Although Betadine may have microcidal properties, it can also cause some adverse effects like metabolic acidosis, which can delay wound healing in some cases. Collagen-supplemented wounds heal faster than Betadine-treated wounds. Collagen granules may therefore be used for wound healing in the future more successfully and without any additional issues.

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