The Therapeutic Efficacy of *Aloe vera* Cream (Dermaide Aloe®) in Thermal Injuries: Two Case Reports

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It is generally accepted that in the canine species with a 50% or more partial or full thickness burn over the body surface area (BSA), recovery is remote and euthanasia is recommended.

We present two case histories where a therapeutic modality employing an Aloe vera *cream (*Dermaide Aloe®*) and tablets, reversed the dermal ischemia of burns due to prostaglandins and abrogated a* Pseudomonas aeruginosa *infection in animals with over a 35% burn.*

Both bacteriological and immunohistochemical data presented confirms the bactericidal and antiprostaglandin effect of Aloe vera *cream (*Dermaide Aloe®*) and substantiates its efficacy in the management and treatment of thermal injuries in the canine species.*

Since thermal injuries in pet animals are relatively uncommon, comparatively little information is available on the subject. Modalities of treatment vary with severity of the burn, area involved and individual species variation. However, it has been generally accepted, that in the canine species, if partial or full thickness burns are present on 50% or more of the skin surface, chances of recovery are remote and euthanasia is recommended. In patients with 15% of the body surface affected by severe burns, the prognosis is guarded. Deep burns, even when healed without systemic complications, may present problems by impairing function because of excessive scar formation.[2]

Management of the burned patient after assessment of the injury has usually involved anesthesia if the injury is very painful or severe, careful washing and debriding of the area, application of hydrophilic topical ointments and application of a dressing to prevent the animal from self-mutilating and also to keep the area clean. "Open" treatment with maximal air exposure has been found to be difficult to manage with many animals.

It is generally accepted that the occurrence of wound infection is almost inevitable. The nature of the lesion, *ie*, edema, microvascular blockage and eschar, present a favorable medium for bacterial growth. Poor penetration of systemic antibiotics into the area complicates the situation. Streptococci, micrococci and *Psuedomonas aeruginosa* are reported to be the most common organisms recovered from postburn infections.[2]

The Ebers Papyrus and the writings of Hippocrates and Alexander the Great contain a plethora of information on the beneficial effects of the topical cactus plant *Aloe vera*. The topical application of the plant

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or its juices was considered curative for infections, open wounds, burns, minor abrasions and all other maladies of the skin.[4,8,13]

The miraculous results in the topical treatment of burned patients with the Mexican cactus—*Aloe vera*—seem more like myth than fact. Not unlike the tonics of the early American medicine man, *Aloe vera* has been used as a panacea for all ills. However, it has maintained its status as a folk lore remedy, while its curative tonic counterparts have fallen into disrepute.[4,7,10,13]

In 1963 a group of investigators tested the *in vitro* effects of a 20% concentration of an *Aloe vera* extract. Their findings were that it was an ineffectual antimocrobial at that concentration.[3] However, another group of investigators tested the *in vitro* effects of a freshly concentrated extract of *Aloe vera* juice and found it had a marked antimicrobial effect.[7] Heggers and his co-workers[5] recently showed that a commercially prepared extract of *Aloe vera* (*Dermaide Aloe®*) at concentrations as low as 60% had a remarkable bactericidal *in vitro* effect when compared to another standard *Aloe vera* product at the same concentration.

DelBeccaro and his co-workers[1] showed that antiprostaglandins have a reversible effect on dermal ischemia in the burn wound. These investigators demonstrated that pharmacological manipulations reduced edema, maintained microcirculation and the integrity of the dermal surfaces. It is now a well documented fact that thromboxane, a metabolite of arachidonic acid is one of the major mediators of dermal ischemia and that the equilibrium between prostaglandin E_2 and $F_2\alpha$ maintains not only the normal permeability in the vasculature but all tissue cells.

The technique of determining the presence of prostaglandins in tissues was devised by Heggers, *et al.*[6] They employed a rabbit antibody to prostaglandins E_2 and $F_2\alpha$ (PGE_2 and $PGF_2\alpha$) and thromboxane B_2 (T_xB_2) which is then reacted with a goat anti-rabbit antibody, complexed with a peroxidase-antiperoxidase (PAP) antibody, thus creating a sandwich effect. When this complex is stained with diammobenzidine, a brown stain is observed microscopically, when the reaction is positive for any of the prostaglandins or thromboxanes. Therefore the treated animals above showed the presence of PGE_2 and $PGF_2\alpha$ and no T_xB_2 whereas the untreated controls showed T_xB_2; consequently confirming the deliterious effects of T_xB_2 and the importance of stabilizing effects of PGE_2 and $PGF_2\alpha$. Recently, Robson *et al*[10] reported on the antiprostaglandin-like effect of *Aloe vera* in experimentally burned animals, showing that the dermal vasculature remained intact in treated animals whereas in the control animals the integrity of the dermal vasculature was lost.

Therefore, since *Aloe vera* has antibacterial and antiprostaglandin properties, two animals presented at Carlson Animal Research Facility with thermal injuries were treated with an 80% *Aloe vera* in cream base[a] (*Dermaide Aloe®*).

Materials and Methods

Laboratory Animals

Animal No. 1—An adult male mixed-shepherd was presented with postsurgical heating pad burn complications. Approximately 18 hours after surgery the animal was showing evidence of dorsal full thickness burns involving approximately 50% of his trunk, extending from the anterior aspect of the shoulder, and posteriorly on the trunk and both lateral aspects of the trunk, or approximately a 40% full thickness burn. Tissue damage was extensive, with apparent extension into the trapezius muscles and bilateral exposure of the dorsal aspects of both scapulae. The animal was agitating the damage by rubbing the burned area on the side of the cage. Owing to the extensive tissue necrosis a poor prognosis was given. The animal had been subjected to extensive intestinal surgery and his situation would be compromised further by systemic administration of "floral" altering antibiotics. The area was cleaned, debrided and dressed prior to consultation with staff members from the Burn Center. The dog was started on accepted supportive therapy including IV fluids (one-third—5 percent dextrose/two-thirds lactated Ringers, IV, 10-20 ml/kg/hr).

Approximately 72 hours post trauma, the area began to show further necrosis [Figure 1] and *Pseudomonas Aeruginosa* was cultured from the area. The area was biopsied for quantitative bacterial analysis and immunihistological determination of prostaglandins. The burned area was irrigated with sterile saline, debrided and topical *Aloe vera* cream (*Dermaide Aloe®*), approximately one-fourth inch thick was applied. *Aloe vera* cream (*Dermaide Aloe®*) was topically applied every six hours and biopsies continued every 12 hours until the quantitative counts indicated no infectious process and the immunohistological samples demonstrated the blockage of T_xB_2 by its absence on the histological specimen. *Dermaide Aloe®* tablets were adminis-

Figure 1 (Above)— Animal No. 1, burn wound 72 hours postburn pre-therapy.

Figure 2 (Right)— Animal No. 1, burn wound four days post-Dermaide-therapy.

tered two tablets every six hours to prevent systemic effects of liberated thromboxane. (Note: *Dermaide Aloe*® tablets contained 4 mg of 95.5% concentration of *Aloe vera*.)

Animal No. 2—The second dog, also a mixed-German shepherd, was presented to the animal clinic approximately four hours postsurgery. The injury was similar to animal No. 1, involving portions of the shoulder and trunk, and complicated by urine scalding of muscle tissue. The area was cleaned, debrided and the injury assessed to be an approximately 35% full thickness burn. Supportive therapy including one-third—5 percent dextrose/two-thirds lactated Ringers (10 to 20 ml/kg/hr) IV and one million units of penicillin G, was given IV every 24 hours for three days.

The affected area was biopsied, irrigated with sterile saline, debrided and topical *Aloe vera* cream (*Dermaide Aloe*®) was applied to the injured area. *Dermaide Aloe*® tablets were also administered every six hours P.O.

Immunohistological Evaluation

Biopsies were collected every 12 hours before, during, and after therapy to evaluate the presence of prostaglandins and thromboxanes in tissue by the peroxidase-antiperoxidase (PAP) technique, previously described,[6,12] using rabbit antibodies to thromboxane B_2(T_xB_2), prostaglandins $F_2\alpha$ and E_2.

Results

Clinical Course

Animal No. 1—Four days postburn the animal appeared less agitated as evidenced by less self-mutilation (Figure 2). Six days postburn remarkable healing was observed; re-epithelialization of the periphery of the burn was noted at this time. On the seventh day postburn re-epithelialization of the central area was observed and the dog was showing minimal discomfort. Eight through eleven days postburn topical and oral medication continued *bid*. At this time (11 days) peripheral healing was complete by re-epithelialization and contraction. The central lesion was almost entirely epithelialized. Seventeen through 26 days postburn hair growth was apparent; healing nearly complete through re-epithelialization and contraction. Twenty-three days after thermal injury, the wound had healed by contraction so that minimal scar formation was evident. Figure 3 shows the results after 65 days postburn. Topical applications of *Dermaide Aloe*® apparently prevented the metabolic acidosis and sepsis generally associated with severe burns. Subsequent bacteriologic cultures of the burn wound were negative after seven days postburn.

Animal No. 2—The healing process of this animal proceeded at a more rapid pace than the first

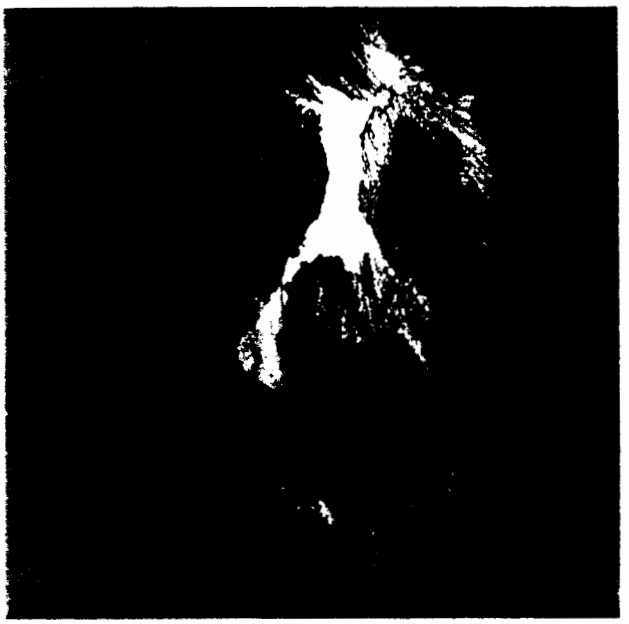

Figure 3— Animal No. 1, burn wound 65 days post-Dermaide-therapy.

animal. This we feel was primarily due to shorter delay time between the thermal injury and treatment. "Open" treatment with minimal agitation on the part of the dog was achieved. Approximately 17 hours post-treatment superficial re-epithelialization and contraction of the area was observed. Progress was remarkable and during the next 25 days healing by re-epithelialization and contraction progressed more rapidly than that of animal No. 1. Ten days postburn, the wound had healed without evidence of a scar. Complete recovery was noted by day 25, as determined by supple healed skin with areas of hair growth throughout the previously injured area.

Immunohistological Assay

Pretherapeutic bx's showed marked presence of T_xB_2 and some PGE_2 and $PGF_2\alpha$ [Figures 4, 5]. Biopsies taken during and post-therapy showed T_xB_2 diminishing in intensity and finally disappearing, while PGE_2 and $PGF_2\alpha$ appeared to increase and maintain an apparent equilibrium [Figures 6, 7].

Discussion

The cases presented here have documented the therapeutic efficacy of *Dermaide Aloe*® (80% concentration of *Aloe vera* Gel) in thermal injuries, in animals whose prognosis was initially poor. The alteration of dermal ischemia by antiprostaglandins-like substances corroborates the earlier experimental findings that T_xB_2 is the initiator of dermal ischemia as demonstrated by the PAP technique. The inhibition of T_xB_2 production promotes healing and prevents total dermal ischemia in the burned tissues.[1,9,11] The rigid therapeutic regime totally reversed the otherwise poor prognosis. Concommitantly the bactericidal effects abrogated the effects of the potential pathogen *Pseudomonas aeruginosa*.

*Dermaide Aloe®, Dermide Research Corp. Chicago, IL 60611

Figure 4— Wound biopsy, stained by the PAP method showing T_xB_2 response, 72 hours postburn, pre-therapy.

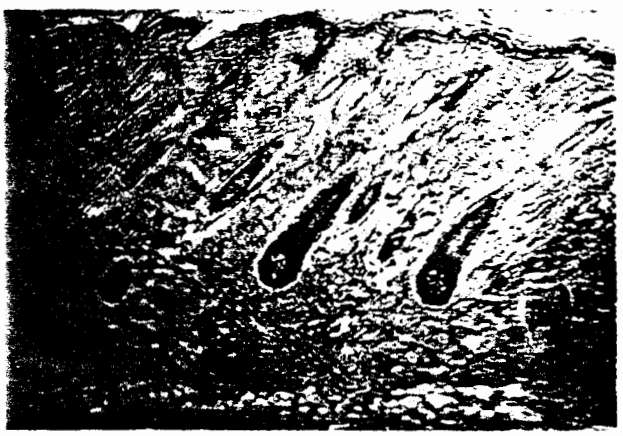

Figure 5— Wound biopsy, stained by the PAP method showing animal PGE_2 and $PGF_2\alpha$ response 72 hours postburn, pre-therapy.

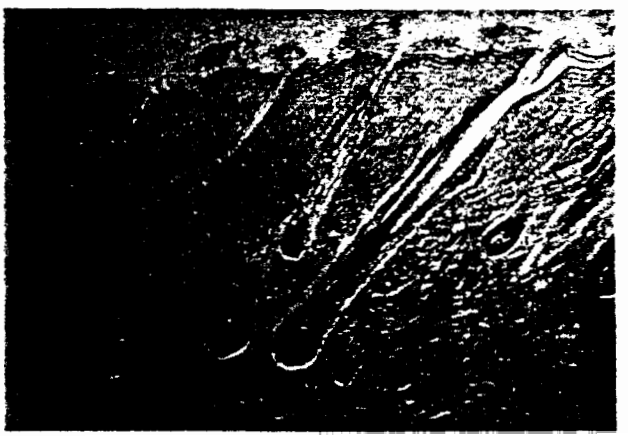

Figure 6— Wound biopsy stained by the PAP method showing minimal T_2B_2 response, four days post-therapy.

Figure 7— Wound biopsy stained by the PAP method, showing increase in intensity in PGE_2 and $PGF_{2\alpha}$ response, four days post-therapy.

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