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Scientific contribution

# Treating Burns in Cats and Dogs Using Medical Honey

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## Abstract:

Common causes of burns in small animals are household accidents or iatrogenic burns in veterinary clinics (electric heating pads...). Burns are usually treated as open wounds, where honey can be used as a dressing, that creates a moist healing environment, promotes tissue debridement, eliminates infections, has a deodorizing effect, and reduces inflammation, edema, and exudation. Honey also stimulates angiogenesis, promotes granulation tissue and epithelialization, and reduces scarring. It is important to minimise the potential contamination of burns. The high viscosity of honey acts as a physical barrier against external contaminants and the effectiveness of the barrier is enhanced by the antibacterial properties of honey. In general, antibiotics are not necessary but they are indicated in septic animals. In early stages of burn healing excessive exudate occurs, requiring dressings to be changed up to twice daily. In later stages, they are usually changed every 2-3 days. For uneventful healing, the primary layer should not adhere to the wound, which is not achieved by the application of honey. Therefore, after the application of honey we covered wounds with low-adherent absorbent dressing. We describe the treatment of a chemical burn from an iodine dressing in a cat, a thermal burn from spilled boiling soup in a cat, and a thermal burn from a heating pad in a dog with medical honey. All wounds were treated as open wounds and healed completely by second intention healing.

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## 1. Introduction

Burns are painful injuries with partial or complete damage to the skin, and the degree of injury depends on the depth and size of the affected body surface (Tello LH, 2011). Burns are caused by heat (i.e., thermal and steam burns), mechanical friction (rope running across the skin), chemicals (acids, lye), radiation, and/or electricity. Common causes of burns in small animals are either **domestic accidents** (scalding water, caustic chemicals, stoves, fires) or **iatrogenic burns in veterinary clinics** (electric heating pads, dryers, microwaveable devices, hot-water bottles) (Tello LH, 2011; Lagutchik MS and Ford A, 2012).

The classification of burn depth in veterinary medicine differs from the classical classification in human medicine and is based on the layers involved. Superficial burns which correspond to first-degree human burns involve only the outer layer of the epidermis. Sunburns are examples of superficial burns and are common in animals with white coats and in animals with large nonpigmented scars. The skin is red, painful, and hyperaesthetic (Tello LH, 2011). Partial thickness burns correspond to second degree burns in humans and involve the epidermis and superficial layer of the dermis. Blisters, epidermal sloughing, and edema may be seen, and hair is well attached and mixed with yellow exudate. The animals show extreme pain. Full thickness burns, corresponding to third degree burns involve the epidermis, dermis, and subcutaneous tissue. The skin is black, dry, and bloodless, the hair coat is easily epilated, and there is no sensation of pain. Animals with extensive full thickness burns are presented in shock (Tello LH, 2011; Lagutchik MS and Ford A, 2012).

Depending on the body surface area affected, burns are classified as local when less than 20% of the total body surface area is affected and severe when more than 20% of the total body surface area is affected (Johnson RM and Richard R, 2003; Vaughn L and Beckel N, 2012; Vigani A and Culler CA, 2017).

Partial and full thickness burns are more severe due to their extent and their potential life-threatening nature from the development of shock and systemic imbalances (Tello LH, 2011, Lagutchik MS and Ford A, 2012, Gomes P, 2019).

Because of systemic imbalance in patients with severe burn injuries, immediate intervention with treatment of severe metabolic problems (i.e., hypovolemic shock, hyperkalemia, albumin losses, acidosis, anemia, renal failure, etc) and hospitalization is required (Doyle R, 2012). Initial emergency first aid is aimed at applying cold to the burn area with towels soaked in cold tap water or submersion in cold but not iced water. Ice is not appropriate because it causes vasoconstriction and impedes wound healing. Cooling helps limit pain and possibly progression of the burn (Lagutchik MS and Ford A, 2012). Superficial and partial thickness burns are treated either by open wound treatment or, in rare cases where closure is possible, by definitive closure (Tello LH, 2011, Lagutchik MS and Ford A, 2012).

It is important to treat patients with care and administer adequate analgesia to relieve pain, stress, and anxiety. Patients should be heavily sedated or anesthetized before wound treatment (Tello LH, 2011, Lagutchik MS and Ford A, 2012). Pain should be treated with strong opioids such as morphine, fentanyl and buprenorphine (Tello LH, 2011).

Hair must be clipped and lavaged with cold water or saline. Clearly devitalized areas in full thickness burns should be excised. The aim is to maintain a moist wound surface, remove necrotic tissue, and keep the wound clean to promote re-epithelialization from surviving adnexal structures (Doyle R, 2012; Lagutchik MS and Ford A, 2012). Honey has wound healing properties, anti-inflammatory and antioxidant properties, and the ability to scavenge free radical. Honey as a wound dressing provides a moist healing environment, promotes rapid tissue debridement, rapidly eliminates infection, deodorizes, and reduces inflammation, edema, and exudation. It increases the rate of healing by stimulating angiogenesis, promoting granulation tissue and epithelialization, and reducing excessive scarring (Molan PC, 2001; Pavletic MM, 2010), therefore honey is effective in healing burns in dogs and cats (Tashkandi H, 2021).

## 2. Methods

On the day of presentation of the animal to the clinic, the wound was protected with a sterile swab and the hair was clipped. The wound was irrigated with 500-1000 ml of cold isotonic 0.9% sterile saline. The wound was dried with sterile swabs. The dressing was applied once a day for 7 days, then every other day until the wound healed. The wound was rinsed again before each dressing. For the treatment of the wounds, we used L-Mesitran Soft, wound gel medical honey (Theo Manufacturing BV, Maastricht, The Netherlands), which was applied to the entire wound area and covered with a low-adherent absorbent dressing Melolin (Smith & Nephew Medical Limited, Hull, UK). Melolin was covered with sterile swabs, rolled cotton pad Soffban Natural (BSN Medical, Inc., Charlotte, USA), and a self-adherent elastic wrap Coban™ (3M, St. Paul, USA).

Case 1: A 4-year-old, neutered domestic shorthaired cat weighing 4 kg was presented to the Small Animal Clinic of the Veterinary Faculty, University of Ljubljana, with a wound on the right hind leg of unknown origin. The wound was infected and was treated with iodine dressing.

Case 2: A 3-year-old, neutered domestic shorthaired cat weighing 5.5 kg was presented with an infected and dirty burn in the dorsal thoracic region caused by spilling a boiling soup 3 days earlier.

Case 3: A 1-year-old whippet weighing 11.5 kg was presented for castration. During the procedure, the dog was in a dorsal position on a heating pad. A few days later, the dog was presented with a burn along the entire back.

The areas of wounds in cases 1 and 2 were determined using the Image J programme. All three cases were treated with dressings as described above.

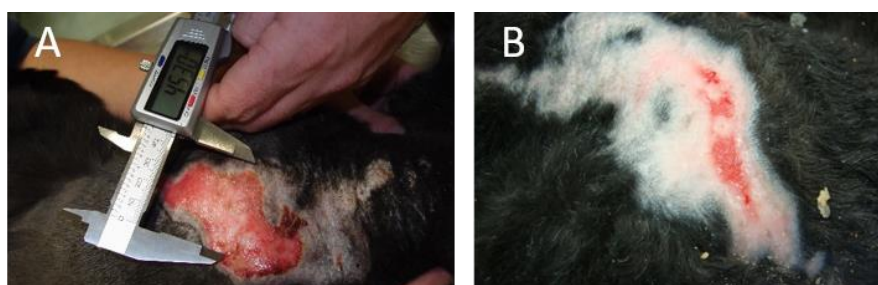
## 3. Results

Case 1: Iodine dressings caused a severe burn on the entire lower part of the hind leg, most of the skin was sloughed off the following week (Figure 1A) and the cat became septic, which was the reason for not anaesthetizing it and amputating the leg. The wound was classified as a full thickness burn and was 53.4 cm<sup>2</sup> in size. Using medical honey, the wound healed completely within 108 days with minimal scarring (Figure 1B).



**Figure 1:** A: full thickness chemical burn in a cat 5 days after iodine dressing; B: leg after complete healing 108 days later.

Case 2: The wound was classified as a superficial burn, was 60.4 cm<sup>2</sup> in size and healed completely after 37 days without complication (Figure 2)



**Figure 2:** A: Superficial burn in a cat; B: the same area 27 days after presentation to the clinic.

Case 3: The wound was covered with black necrotic skin and was classified as a full thickness burn. The necrotic tissue sloughed off the wound in 13 days, and the wound healed in 31 days (Figure 3)



**Figure 3.** Full thickness burn in a dog, A: when the animal was presented to the clinic, B: 4 days later, C: 31 days later.

#### 4. Discussion

Burns can cause in metabolic disturbances and secondary infections of the burn site and systemic infections can occur due to decreased neutrophil and immune system function (Tello LH, 2011, Lagutchik MS and Ford A, 2012, Gomes P, 2019). Honey is effective for the prevention burn site infections. Its antibacterial activity is attributed to the synergy of several factors, such as high sugar concentration, low pH, low water content, and the presence of methylglyoxal, hydrogen peroxide, flavonoids, phenolic acids and defensin 1 (Pereira RF and Bartolo PJ, 2013). Systemic antibiotics in burns are generally not recommended except in septic animals, which was the case in our cat with chemical burn.

In the early stages, burns produce a high amount of exudate. Honey applied to the wound does not cause maceration due to its ability to absorb excess exudate. However, the antibacterial efficacy of honey decreases significantly when diluted with wound exudate (Pereira RF and Bartolo PJ, 2013), which is why the dressing must be changed at least once a day in early stages of healing and every 2-3 days in older wounds (Zbuceha A, 2014). According to our previous experience with wound healing using honey and gauze, we found that the gauze adheres to the viable tissue and causes pain and irritation when removed (Lukanc B, et al., 2018; Lukanc B, et al., 2020). In the current study medical honey was applied to the wounds and covered with low-adherent absorbent dressing Melolin. When Melolin was used we observed no pain and no adherence of the dressing to the wound. This is due to the fact that the plastic film prevents the dressing from adhering and the perforations in the plastic film allow the exudate to pass from the wound to the body of the pad. The dressing must be applied correctly and not rub or slip mechanically which would cause additional injury to the burn (Lagutchik MS and Ford A, 2012).

#### 5. Conclusion

Honey for the treatment of burns was successful in cleaning wounds, it inhibited bacterial growth and improved the rate of healing.

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