

Burn Wounds in Animals

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ABSTRACT

Burn is one of the most common types of wounds seen all over the world. Burn wounds occur due to thermal, chemical, electric exposure or many other causes. It leads toward many other linked abnormalities like loss of skin or tissue function, immune system depression, metabolic changes, shock and even death. Severity of burn depends on site or area under damage. Wounds heal naturally by main four events hemostasis, inflammation, proliferation and maturation. Some herbal products like honey, MEBO (Moist Environment Burn Ointment) and *Aloe vera* have excellent wound healing properties. Currently many synthesized ointments are also available which prove super effective like silver sulfadiazine and ZnO ointment.

1. Introduction:

Burn is an injury to the skin or organic tissues caused by some chemicals, radiation, high temperature and electricity exposure. Severity of the burn wounds depends on the size and depth of the burn. In burn injuries, inflammatory and vasoactive mediators like cytokines, histamines, serotonin and prostaglandins etc. are released. They increase the permeability of capillaries and cause hemodynamic instability, capillary leakage, and intravenous fluid loss. This further increases vascular resistance by plasma drainage from vascular bed and its accumulation in the surrounding tissues. As a result, different hormones like adrenaline, noradrenalin and catecholamine are released and cause vasoconstriction. This decreases the cardiac output, peripheral blood flow and leads to hypovolemic shock. Burn wounds along with fluid and proteins loss also cause sepsis and decreases the immunity of patients by providing exposure to pathogens. Recently the most common drug of choice for burn wounds is silver sulfadiazine ointment because of its bactericidal effect. The first line of treatment of burn wounds must be use of analgesics, immunostimulants, antimicrobials, fluid therapy and detoxification therapy [1].

2. Degree, Severity and Types of Burn:

There are mostly four degrees of burn. Mild burns involve only epidermis while full thickness burns involve both epidermis and dermis and in most severe cases even bones are also involved [2] (Table 1).

Table 1: Degrees of burn and their characterization [3]

Degree of burn	Characteristics
1 st degree	Swelling and redness of skin
2 nd degree	Exudate filled blisters formation
3 rd degree	Pus accumulation and necrosis of entire thickness of skin
4 th degree	Charring of tissues

Severity of the burn wound depends on the depth and area involved. In the case of severe deep burns more than 20% of the body area is involved and requires almost 7-10 days (about 1 and a half weeks) for full care to differentiate between viable tissue and eschar. A common method used to check area of burn is "rule of nines" (Table 2).

Table 2: Parts of body involve and burn area % [4]

Sr. No	Body parts involved in burn injury	Area of burn wound (%)
1.	Neck and head	9
2.	Chest	9
3.	Abdomen	9
4.	Trunk	18
5.	1 forelimb	9
6.	1 thigh	9
7.	1 shin along with the foot	9
8.	External genitals and perineum	1

Burns mostly of head, genitals, groin, udder, limbs and chests are severe burns because it can respectively lead to complications like asphyxia, shock, difficult urination, mastitis, suppurative, deep cracking, sepsis, contractures, partial or complete immobility, pleurisy and pneumonia. Severity of burn and degree of damage are also linked with many factors like animal age, diseased animal, breed, immunity, contact time, pregnancy etc. (Table 3).

Table 3: Types of burn and their etiology [5]

Type of burn	Medium
Physical/Thermal burn	Hot water pads or bags, boiling water
Chemical burn	Acid, alkali or different chemicals

Electric burn	Electricity by conducting medium, lightning
Radiation burn	Ultraviolet and infrared radiations

3. Phases of burn wound healing:

Healing of wounds is divided into four stages (hemostasis, inflammation, proliferation, and remodeling) [6]. In hemostasis stage, vasoconstriction occurs, platelets aggregate, and fibrin formation starts. It results in clot formation and as a result bleeding stops. The phase of inflammation starts almost 24 hours after injury. It is the phase in which bacteria die, debridement occurs, and wounds become ready for new tissue formation. It is the most painful phase of all phases and in this phase, patients feel pain, redness and heat. After the wounds become clean proliferation occurs. In this phase different events occur like firstly filling of the wound with connective tissues and blood vessels. The main processes are granulation, contraction, angiogenesis, fibroblast and collagen deposition and epithelialization of the wound. It takes months to years to complete this stage. The tissues formed in previous phases get strengthened and gain flexibility in remodeling or maturation phase [7]. This phase takes more time, even years for complete recovery.

4. Common Herbal and synthesized medicines:

The use of traditional herbal medicines is always effective due to its low cost, easy availability, less side effects and moderate benefits [8].

4.1 Honey:

Honey is produced by the bees (*Apis mellifera*) and it is a thick or viscous sugary solution. It is one of the most well-known, oldest, effective and traditional medicines [9]. It provides a soothing effect to wounds. It has good antioxidants, anti-inflammatory and analgesic. It provides debridement, reduces edema, kill bacteria and improve wound nutrition. It is preferred to use in immunocompromised animals [10].

4.2 Aloe Vera:

It promotes healing by fast epithelialization. It provides a soothing effect and has no adverse effect [11]. Acemannan and Allatonin are extracted from *Aloe vera* gel. Acemannan activates macrophages to release cytokines (growth factor), tumor necrosis factor and interleukin 1. They promote angiogenesis and so epithelialization and healing. It also gives anti-inflammatory and analgesic effect in mild to moderate wounds [12].

4.3 MEBO (Moist Environment Burn ointment):

It is a Chinese herbal product and used mostly in immunocompromised patients. It is available in ointment form and applied topically. With the use of MEBO the soft dry scab form and it is to debride it [13]. MEBO provides better and faster re-epithelialization and inhibits the entry of bacteria to the deep wounds. It works better than honey [14].

4.4 Zinc oxide and Ag nanoparticles mixed ointment:

This ointment containing nanoparticles improves the time of healing, recovery and restoration of skin or wound. This ointment is very effective and prevents cells from adverse enzymatic and bacterial actions [15]. This ointment doesn't show any allergic and irritating effects. This ointment proves effective because of its osmotic activity, anti-inflammatory, antibacterial and regeneration action. This ointment has good oxygen penetration ability so that's why results in improved circulation and regeneration of damaged area [16].

4.5 Silver sulfadiazine cream:

It has a broad spectrum of antibacterial property and inhibits burn infections. It produces free radicals, increases cell wall permeability and modifies lipid cell membrane that's why acts as superb bactericidal and also prevent sepsis. It is mostly used in second- and third-degree burns [17].

5. Conclusion:

Burns wounds are one of the biggest problems worldwide so effective management of burn wound will reduce the complications and fasten the recovery. Chlorhexidine is the best antiseptic solution used for wounds. Proper routine cleaning and medication is essential for recovery. Complete assessment of the degree and severity of burn is important to provide treatment accordingly. Different herbal and synthesized preparations are now available in the market which shows magnificent results. In future new advancements must be made to further facilitate the patients with burn injuries.

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