How to Manage Open Wounds in Wildlife

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Do what you can,
with what you have,
where you are.

Theodore Roosevelt

INTRODUCTION

Open wounds in wildlife are associated with predation and vehicle trauma. Other causes include entrapment (such as barb wire), fighting with conspecifics or accidental injury. Knowledge of how to treat wounds will improve the rate at which wounds heal, and thus reduce the length of time spent in care. Without understanding how wounds heal, complications such as untreated infections, delayed wound healing can occur. This talk will describe the stages through which wounds heal, factors that affect healing, treating wounds and complications of wound healing.

HOW DO WOUNDS HEAL?

We can describe healing as occurring over several stages.

Inflammatory stage occurs immediately after the injury.
Initially constrict blood vessels to allow clotting of blood. Then blood vessels dilate to allow healing cells to enter the wound. White blood cells enter the area to remove foreign material. So we see redness, swelling, and heat. This lasts up to 5 days.

Debridement stage

This stage begins 6 – 8 hours after injury and also lasts 5 days. Macrophages eat dead tissue and promote blood vessel formation. The macrophages transform into fibroblasts.

Repair stage

Repair happens as quickly once necrotic tissue, blood clots and debris are removed from the wound. Macrophages are essential for deposition of collagen.
The stage begins 2 – 3 days later and lasts up to 3 weeks.
Granulation tissue forms from fibroblasts and capillaries. It makes a bed over which skin cells migrate.

Fibroblastic (scar) phase

Fibroblasts move into area to act in clotting blood and as framework for further repair. They move until they meet another fibroblast and then link edges. The stage lasts 2 – 4 weeks and possibly longer.

Epithelization phase (skin regrowth)
Skin cells on edge of wound begin to migrate in response to chemicals released.
The skin cells move along the fibrin framework. They stop when they reach another skin cell. This takes as little as 48 hours in a clean wound. When the wound is large, the process is much slower.

Contraction phase
The size of the wound is reduced independent of epithelization. It is caused by the fibroblasts pulling the skin edge with them as they move toward the middle of the wound.

WHAT FACTORS AFFECT WOUND HEALING?

Animal factors include:

- **Low dietary protein** (or loss of blood protein) – so good nutrition important. A healing animal may need twice maintenance requirements for food.
- **Shock** – blood supply is constricted and diverted away from the skin. So the healing cells are unable to enter the wound. Warmth is required.
- **Temperature** – wounds heal faster at 30º C than at 20º C or 12º C. This is due to constriction of vessels – making keeping an animal warm even more important for healing. This applies to reptiles as well. Activation of the immune system white blood cells is dependent on temperature.
- **Cortisone** – as released in chronic stress slows healing.
- **Dehydration** delays healing, again as blood supply is diverted away from the skin to the core. Dehydration prevents the absorption of food.
- **Infection** slows healing as bacteria produce chemicals that kill the fibroblasts.

Human factors include:

- Use of antiseptic cleaning solutions past the initial phase where debridement is required. If you have a healthy granulation bed present – do not continue to apply antiseptic or debriding solutions. Debridement only occurs in the initial stages.
- Vigorous wiping of the wound – and thus wiping off the healing cells such as the macrophages and fibroblasts.
- Not identifying that infection is present and so the animal does not receive antibiotics.
- Application of inappropriate products. Some examples are tabled below
  - Alcoholic solutions – kill skin cells and delay healing
  - Cetrimide products are toxic at low concentrations
  - Crystal Violet is a carcinogenic dye
  - Topical antibiotics – particularly powders, act as a foreign body in the wound.

HOW SHOULD WE TREAT OPEN WOUNDS IN WILDLIFE?

Control the bleeding. Bleeding from most small wounds will stop following the application of a wound dressing. Veterinary attention should be sought if there is excessive, uncontrolled bleeding.

Remember the patient! Treat shock with warmth and fluids.

Debride the wound. In a first aid/triage setting, a short time spent flushing with wound with saline may be able to remove the worst of the debris. Remove the hair around the wound, the feathers or scales. Ideally, to reduce stress and pain involved and to provide a better opportunity to appreciate the extent of the wound, veterinary involvement and the use of anaesthesia or sedation should be used whenever possible. Be wary of wetting a large amount

of small animals such as birds or possums as you may cool the body. Suitable antiseptics include Povidone iodine at 0.1% and Chlorhexidine at 0.05%. Clean boiled water or saline (1 teaspoon of salt to 1 metric cup of cooled boiled water) are the best agents to use – as they DO NO HARM.

Apply a dressing to the wound.

For heavily contaminated wounds, the use of saline dressings changed daily for 1 – 5 days is a good place to start. Some wounds may be able to be sutured at this point. As the wound becomes less exudative (less muck coming off the dressings), the use of antibacterial dressings is appropriate. Antimicrobial dressings may containing povidone iodine/iodine (e.g. Iodosorb/Iodoflex) or silver (e.g. Acticoat, Actisorb Silver).

Use systemic antibiotics

Antibiotics are indicated in open wounds for the following reasons:

- bird skin has few natural barriers to bacteria,
- reptile skin contains bacteria such as Salmonella which are pathogenic (able to cause disease) to the reptile,
- many of our marsupials will only present once the wound is several days old

A short course, 5 days in a bird or marsupial, 10 days in a reptile is appropriate. Antibiotics that are suitable against the likely pathogens include: enrofloxacin (Baytril), or Amoxicillin/ &/or Amoxil clavulanic acid (Amoxil, Clavulox).

Protect the wound from drying out.

Maintaining a moist wound surface may bathe nerve endings in fluid and reduce their stimulation. Use hydrogels (e.g. Intrasite, Solusite, Duoderm gel, Silvazene, honey) which may or may not have antibacterial action. Cover the wound with a vapour permeable dressing (e.g Opsite flexigrid) will allow oxygen into the wound without the healing cells such as fibroblasts drying out.

- For reptiles, Opsite and Duoderm extra thin will adhere to the skin.
- For birds, dressings may be applied to wings using a Figure of 8 bandage, or sit under a Vetrap bandage.
- For marsupials: a light bandage where able to be applied is suitable. Dressings may also be able to be sutured to the surrounding skin.

HOW DOES THE TIME PRINCIPLE WORK?

The TIME principle provides a systematic approach to the management of wounds, by focussing on each stage of wound healing and therefore by removing these barriers allows the wounds to heal. TIME is an easy way to remember the stages of healing. It reminds us that the goal is a well vascularised wound bed.

T- Tissue is dead or absent

Does the wound contain non viable or dead tissue?

The first step in local wound assessment is to evaluate the level of tissue viability present in the wound.

Viable tissue is bright red (granulation tissue) or pink (new skin) and represents an environment conducive to normal wound healing.

Non-viable tissue may be black (necrotic) or yellow (sloughy) and if left in the wound, creates the ideal conditions for bacterial growth and infection.

I - Infection or Inflammation

Does the wound indicate signs of increasing bacterial contamination or inflammation?
Infected wounds display particular characteristics, such as increased exudate (wound fluid), redness, smell, inflammation, increased tenderness and fragile, irregular tissue that bleeds easily. The infection is removed by debridement of dead tissue, saline dressings to remove the exudates and by applying antiseptic or antimicrobial products designed to kill bacteria (Iodosorb, honey, Silvazene).

M – Moisture Imbalance

Is the wound too wet or too dry?
Wounds heal better in a moist environment. Nerve endings are protected - reducing pain - and skin layers repair at a faster rate producing less scarring than in dry wounds. As part of the normal healing process wounds release fluid (or exudate), too much exudate (maceration) or too little exudate (desiccation) can interfere with wound healing, therefore it is important to manage moisture levels, particularly in chronic wounds.
Products are available to manage wounds with different exudate levels.

- Dry wounds – use hydrogels *Intrasite*,Solosite* Gel*, honey, Duoderm gel
- Large amounts of exudates - use Algisite* M or the Allevyn* range

E - Edge of wound not advancing or undermined

Are the edges of the wound undermined and is the epidermis failing to migrate across the granulation tissue?

WHAT DIFFERENT PRODUCTS ARE AVAILABLE?

The following list is by no means exhaustive.

Cleaning agents:

- Povidone Iodine – used initially to disinfect the wound
- Chlorhexidine – used to clean and disinfect the wound
- Saline – warm salty water used to clean wounds and flush dead tissue away

Gels that assist in wound healing:

- Solusite – a gel that keeps the wound moist.
- Duoderm gel – keeps wound moist
- Silvazene – a silver/antibiotic cream useful in treating infection in burns
- Honey - hydrates wounds, has antibacterial action and antioxidants

Dressings that may assist healing:

- Melonin – dressing with plastic film to prevent dressing to adhering to wound.
- Allevyn – absorbs exudates
- Iodosorb – contains iodine to treat infection.
- Acticoat – silver impregnated dressing for infected wound that can be left for up to 7 days

Semi-permeable membranes

- Opsite flexigrid – semi-permeable flexible membrane
- Duoderm extra thin

HOW CAN WE TREAT SPECIFIC WOUNDS?

WOUNDS IN BIRDS

Crop wounds
Cause: bird of prey grabs crop of a pigeon/dove or orphaned bird fed food that is too hot and thus the crop is burned.
Clinical signs: wound on skin, matted feathers, food on feathers, thin bird
Treatment: this requires a surgical two layer closure after debridement
The bird is usually severely debilitated by the time it arrives in care.

Wing Membrane wounds
Cause: barb wire injury, predation or vehicle trauma
Clinical signs: the leading edge of the wing membrane has a tendon which is required for flight. There is also a small muscle and nerve which also need to be intact for full flight. Damage to any of these structures may cause inability to fly.
Treatment: simple wounds can be treated with Hydroactive gels and covered with Opsite/Duoderm under a figure of 8 bandage to promote the regrowth of skin as quickly as possible.

Bumblefoot
Cause- is an infection of the sole of the foot. It is caused by inappropriate perches, nutritional deficiencies, lameness, poor hygiene.
Clinical signs: lameness, ulcer on foot, redness, swelling
Treatment: The foot needs to be cleaned and an antibacterial cream placed under a foot dressing. Ball dressings often are used. Pad the perches to prevent the other foot from developing a similar lesion.

WOUNDS IN REPTILES

Skin wounds from predation
Cause: predation injury by cats/dogs/humans
Clinical signs: break in skin, bleeding.
Treatment: systemic antibiotics, Silvazene under duoderm flexigrid.

Turtle shell injury
Cause: vehicular trauma or human interference
Clinical signs: grade injury from 1 (crack) to 6 (lost pieces, depressed fracture).
Treatment: debride with iodine, begin systemic Baytril at 5mg/kg once daily, place Iodosorb over injury and cover with Duoderm extra thin to permit a 1 hour swim daily.

WOUNDS IN MARSUPIALS

Burns
Cause: thermal injury as a consequence of fire.
Clinical signs: singed hair, loss of skin, blisters, swelling.
Treatment: worthy of a talk in itself! Adequate rehydration, cool bathing of wounds initially to remove burnt debris. Creams such as Silvazene are suitable. There is a role for Acticoat once past the initial phase of debridement to reduce the frequency of dressings while maintaining an antibacterial presence.

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