**Factors Affecting Wound Healing**

**1. INFECTION**

Often signalled by red, angry-looking tissue that exudes pus or has a foul odour, infection is the most common reason that wounds don’t heal, but it’s one of the easiest to remedy if you go about it in the right way.

Wounds become infected for a reason, and you must figure out why as you begin treatment, or you aren’t going to be successful with medications alone.

A good example is the pH of the wound. Infection loves a very high pH wound. If you can make the wound slightly more acidic, no bacteria can survive that. What you’ve got to do is find out why the wound is alkaline. A veterinarian experienced in wound healing will know to check for this and how to correct it.

Systemic antibiotics aren’t very effective against wound infections. We all give horses antibiotic injections as we are treating wounds as a preventive, but if infection sets into a wound, the treatment needs to be very localized. Antibiotics circulating in the blood aren’t likely to make it to the wound site in sufficient levels to be effective at that stage.

Grabbing a tube of antibiotic cream isn’t always the answer either. Antibiotics on the surface of wounds. For starters, they can be damaging to tissues, destroying the very cells you are trying to protect, a thorough cleaning of an infected wound to remove debris, dead tissue and reduce the number of bacteria.

**2. FOREIGN BODIES**

Anything inside a wound that shouldn’t be there counts as a foreign body, including wood splinters, dirt, grass and bone fragments. The horse’s body will try to expel the material over time, and may ultimately be successful, but wound healing can’t continue until that happens.

Some foreign bodies in wounds cause more problems than others. For starters, not all materials appear on an x-ray, so a visual inspection or surgical exploration of a wound is sometimes necessary to rule out foreign body contamination. And some materials are more likely to wreak havoc within the tissue. Some foreign bodies simply delay healing until the body can eject them; others can lead to a cascade of infection and greater complications. But regardless of what it is, once the material is removed or expelled from the wound, the healing starts right back up again.

**3. TISSUE DEFICITS**

Without adequate healthy tissue within the wound to serve as a foundation, however, one or more phases may be delayed or never occur.

If you’ve got a tissue deficit, there may not be enough of a biological foundation for new tissue to form over. And, if you’ve got a huge wound left to heal by second intention (without stitches) it may stay open forever. The solution, is to provide what the body cannot.

There are new high-tech wound dressings that create a biologic scaffold of sorts, using collagen or amnion or intestines from other animals, that provide the missing foundation and allow tissue to begin to fill in and eventually develop a very normal appearance. These can be incredibly helpful with larger wounds that might not ever close on their own.

**4. MOVEMENT**

Tissue that doesn’t remain still cannot repair itself, so wounds on a high-motion area of the body may be slow to heal or not heal at all.

If the wound is over a fetlock, it’s easy to see how it will move with each step but the same thing can occur with a deep wound on the back from the movement of the muscles underneath it. You may not see it on the surface, but it’s just as damaging.

The solution is to immobilize the area, which can be done through a variety of methods. Keeping the horse in a stall might be enough, but oftentimes you need to do more. We do a lot of casts for wounds on the feet. If a horse cuts his heel bulb, tissue in that area is going to move with every step. So, a cast on the limb to address that movement and when we take the cast off 10 days later, it’s staggering how well it has done. Some areas of the body are very difficult or impossible to keep still---but stall rests and splints can solve the problem for many locations.

 **5. NECROTIC TISSUE**

Dead tissue within a wound will bring healing to a standstill, typically by inducing infection. A veterinarian dealing with a fresh wound will debride it during the initial treatment, removing tissue that is already dead or likely to die quickly. In smaller wounds, you can do the same thing with copious flushing with water or saline solution. But that initial clean-up is not always enough.

Tissue can die within a wound day, weeks or even months after the initial injury. It doesn’t mean the wound was treated poorly. The death of tissues is sometimes a natural part of the healing process. The only solution at that point is to visually inspect the wound, identify the dead tissue and flush or cut it away.

Typically cut it back until we see bleeding. Tissue with a blood supply is alive, so we assume that’s where the necrotic tissue ends. Do this a few times before the wound heals.

**6. REDUCED BLOOD SUPPLY**

Blood brings to the wound site the constituents essential to healing. Without adequate circulation, tissue repair fails. If an artery is occluded [blocked], everything down the line to that can be affected, adding that bleeding is an indicator of an adequate blood supply and a veterinarian making a close visual inspection can usually identify poor circulation.

**7. POOR OXYGENATION**

Wounds require oxygen to heal, and they receive that through two routes: The air surrounding the wound and haemoglobin in the blood supply. Leaving a wound uncovered can expose it to more oxygen, of course, but covering it may be better. A semi-occlusive dressing over a wound, cuts off the oxygen it receives from the air but the bloodstream will begin to bring in more oxygen to compensate for that and it gets delivered to the deepest healing tissues, not just those on the surface, and in a higher concentration.

Anaemic horses or those who are otherwise ill, may not have the red blood cell volume to deliver enough oxygen, even with this technique, and a veterinarian might try something a bit more dramatic. Hyperbaric chambers have been used as a means of delivering concentrated levels of oxygen to slow-healing wounds. The horse is placed in a chamber full of concentrated oxygen for a length of time each day. These chambers do seem to increase the rate of healing, but it’s unclear by just how much.

 **8. CONTINUED TRAUMA**

A wound that is continually aggravated--by rubbing tack, chewing by the horse or tight bandages, for instance---will not heal. This is very common with foot wounds, particularly wounds to the heel bulb, where the horse may step on it with another foot, reopening the entire area. Even thick, strong grass can cause enough trauma to wounds on the lower limb to keep them from healing.

The solution is simple enough: Identify and stop the repeated trauma and the wound will heal. This may mean giving the horse some time off from under-saddle work, using a neck cradle to keep him from fussing with the wound or using a different bandaging technique. Once you stop the trauma, these wounds tend to heal very quickly.

**9. LOCAL FACTORS**

This category of healing interrupters includes conditions immediately in and around the wound. A wound may not heal in a very cold or a very hot environment--cells don’t function well in either of these. Very wet or a very dry condition can affect healing. A wound may not heal if there is pocketing in the tissues.

Protect the wound with bandaging---most do well with moist, warm dressings---or you may need to move the horse to a less severe environment. Or, the veterinarian may have to alter the wound itself, removing tissue to eliminate pockets or uneven tissue beds.

**10. POOR OVERALL HEALTH**

The general health status of a horse can influence how his wounds heal. Cushing’s disease is the classic example. Those horses have lowered immune function, so wounds may be slow to heal or prone to infection. A horse on steroid medications or one with a disease like lymphoma could have similar issues.

In less-developed areas of the world, poor nutrition can also lead to delayed wound healing. This isn’t as much of an issue except in Third World countries but be sure that you are feeding a horse properly when he has a healing wound. Make sure he’s getting enough protein in his diet. That’s what his body will be using to create new tissue.

 **11. IATROGENIC IDIOCY**

Unnecessary commercial products to harmful homemade preparations.

Most equine wounds do just fine with a thorough flushing with warm water or saline and then being covered with a simple hydrogel bandage. For first aid treatments, hydrogel dressings, which contain a water-based gel that keeps wounds at an optimal moisture level, can be helpful, as can hydrogel preparations that protect wounds without bandages. Horses have a reputation for wounds that don’t heal and I’m certain it’s because of the ridiculous salves owners and even some veterinarians will put in the wounds.

**12. TUMOR TRANSFORMATION**

When the tissue inside a wound develops tumours, healing stops and managing the case can be very challenging.

Sarcoids can develop deep inside wounds. If the horse has a sarcoid somewhere else on his body, it’s easy for those cells to be transferred to the wound by flies. Then you have a sarcoid in the wound and it’s a very serious situation that must be recognized and dealt with quickly. Oftentimes, the forming sarcoid is mistaken for proud flesh and owners delay calling the veterinarian or attempt to treat it themselves, making the situation worse.

If you compare two wounds, one with proud flesh and one with a sarcoid, they can look identical, but the treatments are diametrically opposite. You need to treat the tumour with cancer drugs; if you try to cut it out like proud flesh, you’re going to make it worse.