

SKIN Deep

Your horse's skin is a huge and complex organ that serves as a barometer for his inner health

BY KAREN BRIGGS

That shiny coat is an indicator of more than just a good grooming job—it's a sign of good health.

ARND BRONKHORST



We tend to think of a horse's skin as just the envelope that contains all the important stuff. But the skin is an organ—the largest one your horse possesses. And its importance to his overall health is, frankly, staggering.

The skin is the first line of defense between your horse's delicate innards and the hostile environment surrounding them. It protects the rest of the body from physical injury and invasions from insects, microorganisms, and poisons.

It helps regulate the horse's body temperature. Too hot and the sweat glands activate, exuding moisture that evaporates on the skin to cool the horse. Too cold and the millions of individual hair shafts all over the animal's body raise to fluff up the coat and help trap warm air between the shafts, improving his comfort and reducing the risk of hypothermia.

Skin DEEP

Skin also prevents the body from dehydrating, helps excrete waste products through sweat, manufactures vitamin D from sunlight, and even emanates pheromones that function as sexual attractants to other horses.

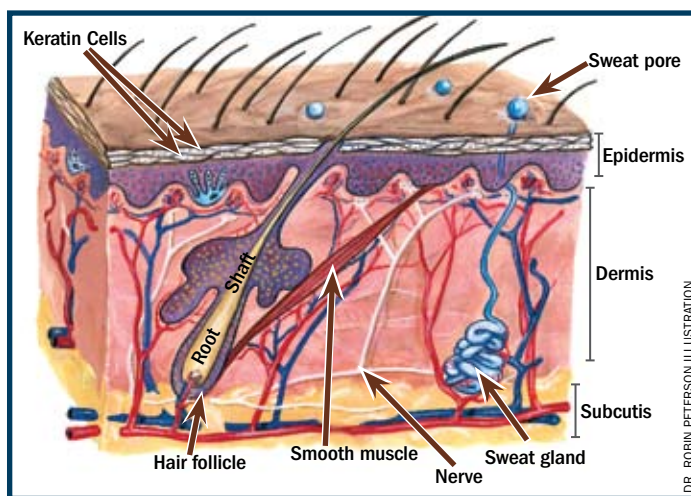
The skin is the principle organ of touch, containing an array of nerve endings that take in data from the environment and relay it to the brain. When it's healthy, it's elastic and secretes oils that contribute to a shiny haircoat. Horses also have the unique ability to "shiver" their skin to get rid of unpleasant sensations (such as flies landing somewhere on their bodies).

The Equine Epidermis

Equine skin consists of two distinct layers. The layer we see is the epidermis, a barrier of stratified (layered) squamous epithelial cells. Keratinocytes, cells that synthesize keratin (the main fibrous component of hair and hooves), originate at the bottom of the epidermal layer and migrate toward the surface over the course of three to four weeks, gradually becoming a layer of enucleated (contents removed), flattened cells with concentrated keratin. The keratinocytes on the surface are constantly

being shed as new cells make their way up from the deeper layers.

A basement membrane seals the whole epidermal sandwich to the underlying dermis, which provides a connection between the epidermis and the horse's subcutaneous tissues. The dermis is a densely woven network of collagen, elastic, and connective tissue fibers, interspersed with glycosaminoglycans and glycoproteins, almost like felt. The dermis supports the epidermis and gives it tensile strength, as well as feeding the outer skin with nutrients.



Hair follicles and sweat glands originate in the dermis, as do sebaceous glands (which emit the oils that help keep the coat shiny and healthy). Tiny arrector pili muscles, which move the hair shafts upright or lay them flat against the skin, are also found here. So are a wide network of blood vessels, lymph vessels, and nerves.

Coat Tales

A healthy horse's haircoat is sleek, smooth, and has a natural sheen. (This is, of course, assuming the horse isn't covered in mud and isn't a Bashkir Curly!)

Even in winter, the haircoat should feel "strookable," although the individual hairs might be standing on end for warmth. In summer, horses in glowing good health look almost metallic, so well do the natural oils in the coat reflect the light. A haircoat that is dull or dry is often a sign of ill health.

A horse's winter coat has a "pile" that traps an insulating layer of air next to the skin. It is also naturally greasy, which helps it repel snow, ice, and sleet. This haircoat provides a weather shield so complete that horses can stand in a storm until ice forms on their backs without the skin becoming chilled.

Regular grooming throughout the year helps stimulate skin glands to discharge oils, which give the coat a glossy sheen. It also gently massages the skin and helps it shed dead

skin cells and hair. In addition, it gives you a chance to examine your horse's skin and coat for wounds or signs of ill health.

The only time daily grooming isn't ideal is in the depths of winter, if your horse is unblanketed and living outside. In this case overgrooming can remove the natural grease and leave him clean, but chilly.

Likewise, be cautious about using soaps and shampoos on your horse too often, as they can strip the oils from the coat and

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FEEDING THE SKIN

Your horse's hooves are an extension of his whole skin system (hooves are just overgrown, very specialized "fingernails," after all), so the nutrients that tend to benefit hoof growth will also help stimulate healthy skin and a shiny haircoat.

A diet with supplemental fat from vegetable sources, such as corn oil, soy oil, rice bran, ground flaxseed, or black-oil sunflower seeds, will encourage the coat to shine and the skin to retain its elasticity. Nutrients such as vitamin A, biotin, magnesium, zinc, and sulphur are important for the integrity and function of the epidermis.—Karen Briggs

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— The Horse-Journal.com, November 2007

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leave it looking dull. Bathe your horse with just water most of the time, and limit shampooing to once a week if you're showing, and bathe your horse even less if he isn't going to be in the public eye.

Damage Control

It has often been observed that horses are accidents looking for a place to happen. That's because, comparatively speaking, a horse's skin is fairly delicate compared to other livestock species, such as cattle or pigs. In addition, horses are active and curious, so they have a propensity for getting into trouble.

It's a given that nearly every horse will suffer a regular barrage of minor dings, scrapes, rubs, cuts, and tears to his epidermis over the course of his lifetime. Fortunately, equine skin is well-prepared to repair itself, whether the wound is open (one that penetrates through the skin to the subcutaneous tissues) or closed (one that does not penetrate all the layers of the skin, such as contusions, hematomas, and shallow abrasions).

Wound healing is a series of events that begins immediately when the body registers it has been compromised. In the first 60 minutes after the injury, the skin retracts and the wound enlarges. Blood vessels in the immediate area first contract to slow the rate of blood loss, then dilate, which floods the wounded area with enzymes and clotting factors. Within 30 minutes, white blood cells are called to battle, contributing to inflammation while they begin to battle bacteria that might have invaded. By the time an hour has passed, a clot has usually formed, providing the initial framework for a protective scab.

In the next few hours, a cleanup crew of white blood cells begins the process of debridement, digesting foreign particles and dead cells in the wound bed.

As the wound reaches the 24-hour mark, inflammation reaches its peak. Inflammation is something of a double-edged sword; it is essential for fighting bacterial invaders, but it also triggers heat, pain, and swelling that can sometimes be quite debilitating.

Over the next one to seven days the body forms new blood vessels around the wound to bring in healing factors and

help sweep away damaged and dead cells, and granulation tissue starts to fill in the wound. Cells called fibroblasts are attracted to the wound site and begin laying a framework so rapidly proliferating epithelial cells can migrate across the wound from its edges.



Excessive bathing with soaps and shampoos can strip the oils from your horse's coat and leave it looking dull.

Unfortunately, the formation of granulation tissue can be problematic, since horses have a strong tendency to overdo it. What is sometimes called "exuberant" granulation tissue is better known to most of us as proud flesh. This highly vascularized new tissue not only fills in the wound, but it grows beyond its margins and beyond the level of the surrounding skin. Proud flesh is more likely to form on the horse's lower limbs than the rest of his body.

As the collagen synthesized by the fibroblasts begins to mature, one to two weeks after the initial insult fibroblasts and macrophages gradually begin to migrate away, and the body does away with some of the excess blood vessels. The wound gains tensile strength by collagen cross-linking, aka scar tissue. In some cases it can take up to a year for the skin to completely remodel and regain its tensile strength.

Helping the Healing Process

When you discover a fresh wound on your horse, first stop the bleeding (should it not have clotted on its own by the time you find it). Direct pressure applied with the heel of your hand over a clean towel is the best approach; resist the urge to peek

until several minutes have gone by.

Once the bleeding has stopped, make sure the wound is as free of debris and contaminants as possible. Irrigating the wound with sterile isotonic saline solution is the best method, but trickling cold tap water from a hose positioned above the wound is a close second.

Eric Witherspoon, DVM, operates a mixed equine and small animal veterinary practice in Carlton, Ore., and he is also the president of Healing Tree, a company that manufactures topical wound treatments and skin care products combining natural and pharmaceutical ingredients. He notes, "The most important thing you can do for a wound is clean it. The amount of pressure coming out of a trigger sprayer is just about ideal when you're cleaning a wound—about 15 pounds per square inch. If you're using less than that, you probably won't splash all the bacteria and debris out of the wound; if you use more than that, you'll further damage the tissues."

Witherspoon stresses that many of the topical treatments horse owners are accustomed to using for wound care, including nitrofurazone, hydrogen peroxide, and iodine-based paints and ointments, are actually worse than using nothing at all. "People confuse 'antibacterial' with 'healing,'" he says. "These treatments may be antimicrobial, but that doesn't mean they aid healing. In fact, all of these topical preparations have been shown to be cytotoxic—that is, they damage tissues and inhibit healing instead of helping it."

If you choose to use a topical treatment on a healing wound, Witherspoon says, "Avoid products with a wax, petroleum jelly, or alcohol base. You want the ingredients to be noncytotoxic, anti-inflammatory, and pH neutral."

Why pH neutral? "The horse's skin is normally in the range of pH 7.0 to 7.4," he notes, "but many products designed to be antibacterial or antifungal are highly alkaline, which is hydrophobic (repels water) and doesn't rinse off. Also, the more alkaline the skin, the more susceptible it is to bacterial and fungal infections like rain rot and ringworm."

Witherspoon says researchers in the U.K. and Australia have shown that essential oils, such as tea tree oil, oregano oil, and eucalyptus oil, can kill methicillin-resistant *Staphylococcus aureus* (MRSA, although veterinary dermatologists note that most horse wounds don't get secondary MRSA infections). He describes this as the "gold standard" by which antibiotic effectiveness is measured in this age of increasing antibiotic resistance. In the appropriate concentrations, these oils are antimicrobial as well as noncytotoxic, making them a good alternative for topical treatment.

"Just because it's natural doesn't mean it's harmless," he says. "In higher concentrations essential oils can be irritating to the tissues. More is not necessarily better."

As for proud flesh, Michelle Courtemanche, DVM, who practices in Campbellville, Ontario, says, "Typically, we deal with it by getting on top of it early. As soon as the granulation tissue begins to protrude beyond the wound borders, that's a red flag."

"We've found that applying a steroid ointment such as Panalog (which also has antimicrobial properties), combined with covering and wrapping the wound,

gives really good results," she adds. "The steroids suppress healing, so you want to strike a balance between suppression and healing. You can either apply a derma-gel for three days, then Panalog for three days, and continue alternating like that, or you can mix the derma-gel with the steroid and apply the two together."

Witherspoon notes, "Proud flesh is highly vascularized tissue, but it has no nerves. When it's newly formed, that extra blood can help aid healing, but as proud flesh gets older, it becomes rubbery and prevents the wound from closing, so it needs to be removed. Because it has no feeling, sometimes (your vet) can just trim it away with a scalpel—it will bleed like a stuck pig, but there's no harm in that. You can also use caustic agents (to stop the bleeding), such as silver nitrate or even meat tenderizer ... or you can apply a catabolic steroid topically, such as hydrocortisone or prednisone, which are vasoconstrictive. They shrink the blood vessels so that the proud flesh gradually erodes away."

Because steroids are cytotoxic, they should never be used on an open wound,

Witherspoon emphasizes. They're appropriate only for healed or nearly healed wounds with proud flesh issues. "If the wound is open, stick to anti-inflammatory products, or just continue cold hosing to reduce inflammation," he says.

Take-Home Message

The complexity of your horse's largest organ—his skin—demands good care for optimal function as protector, insulator, and eliminator of waste. Wound repair is impeded by infection, proud flesh, repeated dressing changes, excessive drying, and other factors that inhibit the formation of a scab. You can accelerate healing by keeping the area clean and moist, using a noncytotoxic antimicrobial, and keeping proud flesh in check. 🐾

ABOUT THE AUTHOR

Karen Briggs is the author of six books, including the newly revised *Understanding Equine Nutrition*, published by Eclipse Press and available at ExclusivelyEquine.com or by calling 800/582-5604. She's written a few thousand articles on subjects ranging from guttural pouch infections to how to compost your manure. She is also a Canadian-certified riding coach, an equine nutritionist, and works in media relations for the harness racing industry.

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