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STRANGLES

Many horses with strangles develop a creamy discharge from one or both nostrils.

Streptococcus equi bacteria cause strangles, a highly contagious disease that affects lymph nodes and potentially other organs in the horse

BY NANCY S. LOVING, DVM

Strangles is hardly a new disease, having been recognized as a contagious bacterial problem in horses for centuries. Yet it still remains a troublesome and persistent issue, and it is identified worldwide. Research has been directed toward developing effective vaccines to control its spread through the horse population, but management strategies are even more important in limiting its presence.

What is Strangles?

Strangles is the colloquial name given to an infection caused by the bacterial organism *Streptococcus equi*. This bacterial infection invades the respiratory tract of horses, donkeys, and mules and causes

swelling of the lymph nodes around the head and neck. In some cases, the swelling around the pharynx might become so severe as to obstruct the airway; the audible respiratory effort and potential for suffocation spawned the name "strangles."

Fortunately, most cases of strangles do not become this extreme. Very few strangles cases result in death today. An affected horse might stand listlessly in the paddock and be off his feed; he feels poorly due to fever and discomfort. Many horses sick with this disease eventually develop a creamy nasal discharge from one or both nostrils. If a cough develops, it is usually mild. The lymph nodes under the jaw (submandibular) and/or the throatlatch

(retropharyngeal) swell to varying degrees. There might be some edema (fluid swelling) around the face, and breathing might be labored.

At the onset, the lymph nodes can feel firm, yet the horse resents your touch on them long before they soften and break open with a creamy drainage. Typically, lymph node abscesses rupture within a couple of weeks after a horse shows initial signs of infection.

In only half the cases do draining lymph

Editor's Note

This is the seventh in a 12-part series of articles on vaccinations for horses.

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nodes culture positive for *Streptococcus equi* since following rupture, the bacteria are quickly cleared and cultures become negative. Identification of the disease is based on clinical signs and probabilities since few other illnesses infect the lymph nodes, but bacterial culture swabs and a blood test for antibody titers help confirm the diagnosis.

Who Is At Risk?

Horses of any age can be affected by strangles, but it is the very young ones that usually suffer the worst. John Timoney, MVB, MRCvS, MS, PhD, DSc, Keenel and Association Chair in Equine Science, is a leading authority on equine strangles, basing his research out of the Gluck Equine Research Center at the University of Kentucky in Lexington. His experience finds that the most susceptible horses are those at the weaning through yearling ages; these young horses might not have yet developed sufficient immunity through natural exposure in their short lives.

Incubation takes from three days to two weeks from the time a horse is exposed until he shows clinical signs of infection. Not all infected horses develop obvious signs of disease; asymptomatic individuals can serve as carriers and shed the organism through their respiratory secretions and saliva to spread it to susceptible horses. Older horses might show nothing more than nasal discharge, but they could be more likely to harbor *S. equi* infection in the guttural pouches. The immune system of a geriatric horse might not be working properly due to age-related decline, and there might be age-related scar tissue around the openings to the guttural pouches, which could inhibit drainage and facilitate disease.

Strangles is a highly contagious disease, particularly in conditions of stress. This includes situations where horses are housed in crowded areas, or with poor hygiene, or with inadequate nutrition. Transmission occurs by direct contact with nasal secretions or saliva. Flies also spread the disease, as do contaminated vectors (fomites) such as feed buckets, rakes, and human

hands and clothing.

Timoney remarks, "A water source is the main culprit for temporary persistence in the environment. The bacteria survive for three to four weeks in water in tanks contaminated by discharges. Soil contamination does not seem to be a factor in persistence in the environment since soil bacteria appear to kill off *S. equi*. However, in wintertime, pus and contaminated discharges that freeze can persist to infect others when the ground thaws."



This bacterial infection invades the respiratory tract of horses, donkeys, and mules, and it causes swelling and abscessation (seen above) of the lymph nodes around the head and neck.

Once the bacteria are established on a property, another outbreak can occur on that farm a year or two later. A strangles infection can keep cycling through a herd to become a persistent, frustrating management issue. Once a horse has been infected with strangles, he might continue to shed the organism intermittently for months through nasal secretions. In a small percentage of horses, the bacteria remain resident in the guttural pouch for prolonged periods, with the potential to carry the infection to others despite the horse appearing to be fully recovered. However, most horses stop shedding within about three weeks.

Timoney notes, "Carriers only shed intermittently. Even though the carrier state occurs and is a problem from time to time, the disease does not persist on most farms. Young horses are less likely to be chronic carriers than older horses."

In suspected carriers, nasal washes or culture swabs of nasopharyngeal or gut-

tural pouch contents help identify inapparent shedders of *S. equi* organisms. Reports from one study found that the average period of shedding from carriers was 9.2 months, with one horse shedding for 42 months. Shedding persisted in 68% of horses for at least four weeks following resolution of clinical signs.

Timoney noted that 75% of horses that recover from strangles develop immunity for at least two years and possibly as long as five years.

Treatment

This disease is labor-intensive, requiring supportive nursing care. The disease must run its course, but hot packs applied to the swollen glands can help an abscess come to a "point" for drainage. Surgical lancing of affected lymph nodes hastens drainage and speeds a horse to recovery. An opened abscess should be irrigated daily with an antiseptic solution made by mixing 10-30 mL of povidone iodine per liter of salt water. Supportive care is essential: The horse should be encouraged to eat by providing pelleted gruels, and food and water should be accessible where he can reach comfortably.

Timoney has advice that is pertinent to both treatment and prevention: "It is important to feed in a head-down position. The act of feeding and swallowing adds pressure to open up the guttural pouches to facilitate drainage."

Non-steroidal anti-inflammatory medications improve comfort, help control swelling and fever, and encourage eating and drinking by reducing pain and inflammation.

The use of antibiotics has sparked much controversy. Antibiotics can, in fact, be counter-productive. Timoney notes, "Antibiotics suppress bacteria for a time, but infection may flare up when the antibiotics are discontinued." Treated horses might become re-infected because they do not develop protective immunity.

He continues, "Once an abscess forms in the lymph nodes, antibiotics won't penetrate to reach the organism, so when antibiotics are withdrawn, there is recrudescence (reappearance) of disease."

Antibiotic therapy might be indicated when an affected horse remains persistently off feed and is depressed despite other supportive care, or if the fever remains elevated (greater than 104°F), or if the



IANIS TREMPER

Rectal temperatures of new farm arrivals should be checked twice daily. If strangles is suspected, a bacterial culture should be taken to identify a potentially sick horse.

airway is obstructed by lymph node swelling (contributing to difficulty in breathing). In these cases, bacterial culture and antibiotic sensitivity can be determined in the lab to help choose antimicrobial therapy.

Complications

Besides the frustration experienced in dealing with horses affected by acute disease, strangles is not without its set of complications that arise subsequent to infection. About 20% of horses infected with strangles develop problems other than the basic upper respiratory signs. Some of the complications might be life-threatening, so an infected horse should be monitored closely following initial clinical signs. As an example, a *Streptococcal* organism can seed itself within lung tissues and cause bacterial pneumonia.

One of the complications that is difficult to identify is called bastard strangles. In these horses, bacteria spread to other internal lymph nodes (particularly those of the gastrointestinal tract) or to organs such as the spleen, liver, kidney, lungs, or even the brain. A horse with bastard strangles might appear relatively normal until infection wears him down. His hair coat appears dull and ragged, he might lose weight in the presence of ample food and good dental care, his performance might suffer, and his listless demeanor suggests an underlying problem that cannot be explained by an obvious cause.

Lab results of a complete blood count and fibrinogen level might identify a systemic infection. A rectal exam, an abdominal ultrasound exam, or an abdominal tap

might identify the location of an internal abscess. These are hard cases to treat, requiring long-term antibiotic therapy.

Another complication that isn't immediately apparent is infection of the guttural pouch with the development of empyema (accumulation of pus) or chondroids (hardened concretions of pus). This can be a life-threatening problem if the infection erodes through large blood vessels that course through the guttural pouches. Major nerve branches can also be affected in this area, creating neurologic problems. Pus debris that accumulates within the laden guttural pouch is often swallowed as it drains into the pharynx, but it is sometimes visible as a nasal discharge from one or both nostrils.

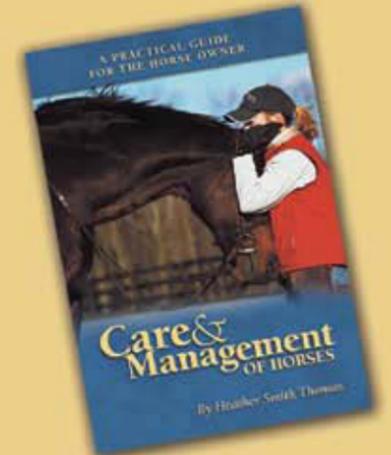
An endoscopic exam and radiographs of the head are useful diagnostic tools to detect this problem. Most asymptomatic carrier horses harbor *S. equi* within their guttural pouches.

The *Streptococcus* bacteria can also create an immune-mediated syndrome known as purpura hemorrhagica, which leads to hives and edema in the abdomen, limbs, head, and scrotum. This is an emergency situation; contact your veterinarian if you see these signs. Protein antigens of the bacterial organism combine with antibodies to set up an allergic response in the horse, causing vasculitis (leakage of blood vessels). This occurs in less than 1% of infected horses, but it is noted that this condition has been reported after a second natural exposure or following vaccination of animals that previously had strangles.

A horse that had a case of strangles might seem to be well on the mend, only

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to suffer a severe setback one to four weeks following strangles infection. Gravity-dependent areas (such as the legs, abdomen, and head) will swell. The horse is depressed, off feed, and pinpoint blood spots (petechiations) are present on the mucous membranes of the gums, conjunctiva, and nasal lining.

Pronounced limb edema often causes serum leakage and skin sloughing from swollen limbs. If a similar event occurs in internal organs, the horse might demonstrate colic, respiratory disease, or muscle problems. Since this syndrome arises due to an immune-mediated complex stimulated by components of the bacteria, aggressive treatment requires corticosteroids and systemic antibiotics for a lengthy period of time.

Myositis (muscle inflammation) is another potentially fatal complication of infection with *S. equi* that might involve an immune-mediated process.

Prevention and Control

It is good management to isolate newcomers to a farm for two to three weeks in case they are carrying a bacterial infection or virus to which resident horses have not been previously exposed. This allows new horses to incubate and break with disease before they've had a chance to mingle with and infect other horses on the farm. The cause of the infection is identified and controlled before too much damage is done. This strategy is especially important for foals, weanlings, and yearlings.

Rectal temperatures of new arrivals should be checked twice daily. If *S. equi* is suspected or is a concern based on a horse's past history or exposure, Timoney suggests that bacterial culture of nasopharyngeal washes or guttural pouch swabs be done; this is the gold standard to identify a sick or carrier horse. Ideally, a horse is considered not to be a carrier if it has three negative nasopharyngeal swabs for *S. equi* over a two- to three-week period.

Nasopharyngeal bacterial cultures detect 60% of carrier horses. Combining this test with PCR (polymerase chain reaction)

blood testing increases detection of carriers to 90%. The PCR test detects DNA from both living and dead *S. equi* bacteria and is as much as three times more sensitive than bacterial culture. Active infection should be confirmed by bacterial culture of the swab. If either test shows a positive result, endoscopic exam of the guttural pouches might be used to screen for carriers. Samples taken from the guttural pouches can be tested with PCR and cultured for final confirmation.



John Timoney, MVB, MRCVS, MS, PhD, DSc, of Gluck Equine Research Center in Lexington, Ky., says it is important to feed horses with strangles in a head-down position to open up the guttural pouches to facilitate drainage.

Once a horse is identified as having a fever, it should be isolated until shedding has ceased. Timoney remarks, "Shedding of the organism does not begin until 24-48 hours following onset of a fever, thereby giving time to separate sick horses from well ones. It would be nice to have a stall-side diagnostic test to give immediate confirmation that the fever is related to *S. equi* infection. However, during an outbreak, a horse with a fever is presumed to have strangles."

Excellent sanitation and good common sense are important to control spread of the disease. Fly control measures are important. Contaminated bedding should be composted beneath a layer of plastic so flies cannot access the bedding. Use separate halters, water and feed buckets, cleaning utensils, wheelbarrows, and brushes to

manage sick horses. Always handle a sick horse last, taking care of the healthy horses first. Change clothing after contacting any sick horses, wash your hands with antiseptic soaps, and wear boots that can be immersed in a footbath to decontaminate the soles of your shoes.

Also, scrub down fences, stall walls, and anything that might have been contaminated by respiratory secretions, using materials known to kill the *Streptococcal* organisms. These include phenolic products, iodophors, chlorhexidine, or glutaraldehyde disinfectants. Contaminated pastures should be kept free of horses for at least a month. And, Timoney encourages, "Clean and disinfect water tanks daily."

In the face of an outbreak, it has been demonstrated that vaccinating healthy animals might aid in the prevention of disease. However, this strategy can have limited usefulness in horses that have never before been vaccinated against strangles since in order to ensure the maximum protective effect, healthy horses need to receive the full protocol of two vaccines spaced two to three weeks apart at least four weeks before exposure. Discuss the risks and rewards of vaccinating during an outbreak with your veterinarian.

Corinne Sweeney, DVM, Dipl. ACVIM, professor of medicine at the University of Pennsylvania veterinary school, has devoted her efforts to studying the epidemiology of strangles infections. She comments, "Vaccination during an outbreak is of no value to horses already infected. During an outbreak, only horses with no known direct contact with strangles cases or the exudates from these cases should be promptly vaccinated. It is known that following vaccination, immunity will take a minimum of two to four weeks and the highest titers are usually obtained by eight weeks. Thus during an outbreak, if a horse is vaccinated and is then exposed to the infected horses before he has developed adequate immunity, he may contract strangles."

Horses that have been on a previous strangles vaccine program can be "boosted" with one dose of vaccine, and this should stimulate some immunity to limit the severity of the infection. However, keep in mind that it might be difficult to determine which horses in a herd are

incubating disease, and which have not yet been infected.

Timoney expresses concern that it might be inappropriate to handle and immunize horses that haven't shown clinical signs in a herd during an outbreak for fear of spreading disease from those that are shedding bacteria to those not yet exposed.

With regard to the intranasal vaccine, Timoney says, "There is risk in administering a live attenuated organism in a horse which may already be incubating disease. If disease develops, there can be confusion as to whether it is caused by a natural infection or by the vaccine strain."

The risk of developing a serious complication such as purpura hemorrhagica is more likely when using intramuscular products in horses that already have high antibody titers. Horses that have existing high antibody titers from a previous infection or vaccination need not be immunized again.

Sweeney comments, "Because of some of these issues associated with vaccination, it seems inappropriate that boarding stables should require horses housed in their facilities to be vaccinated for strangles. In fact, there are some instances when vaccinating a horse is contraindicated. When? If a horse's natural antibody titer is high (a titer of 1:1,600 or greater in the ELISA test), that horse should not be vaccinated. This has less to do with the disease strangles and more to do with the disease purpura hemorrhagica. The risk of your horse developing immune-mediated purpura

hemorrhagica will increase if the horse already has good immunity (as determined by the ELISA test) to *Streptococcus equi* and then is subsequently vaccinated. Should your horse have a high titer, you may need to have your veterinarian notify the farm manager that it is ill advised to vaccinate your horse and that your horse should be allowed to be stabled without vaccination. Because of these many issues with the strangles vaccine, it is best that the farm does not require vaccination prior to boarding."

Vaccination

About 75% of horses that recover from a strangles infection will be immune from exposure for up to five years. However, strangles infections are not always definitively diagnosed in a mildly sick animal. As a consequence, many barns with large numbers of mobile horses give strangles vaccinations as a matter of course.

In earlier years, all vaccination strategies against strangles relied on intramuscular injections (extract vaccines) that elicited a systemic immune response. Those vaccines have had limited efficacy, only curtailing disease in 60-70% of those horses challenged by the organism. They do not prevent infection. In addition, intramuscular injections often create sore muscles, malaise, and fever, with adverse reactions lasting as long as a week.

Although those complications occur in only a small percentage of horses, many horse owners weighed the risks and

concluded that the intramuscular vaccine was not for their horses. For that reason, horse owners have practiced limited use of the strangles vaccine until the advent of the intranasal form.

Timoney notes, "Protective immunity is expressed in the tonsil, so we need to get the tonsil to respond. It may need an intranasal presentation to achieve that."

However, despite "protection" derived from the available intranasal vaccine (Pinnacle I.N. by Fort Dodge), some vaccinated horses challenged with the organism still develop clinical signs of disease, although at a much lower rate than unvaccinated horses. Extent of illness is decreased in vaccinated horses, and of those that do get sick, clinical signs are reduced by 65% compared to unvaccinated horses.

Just as with the intramuscular vaccines, no horse can receive complete protection from the strangles organism when he is challenged. Timoney wonders if perhaps the intranasal vaccine attenuated organism does not completely penetrate into the tonsils, thereby resulting in incomplete efficacy. Nonetheless, the intranasal vaccine might reduce the number of horses affected and the severity of an infection if it occurs.

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Streptococcus equi bacteria can survive for three to four weeks in water in tanks that are contaminated by discharges.

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The intranasal strangles vaccine is given as a series of two doses spaced two to three weeks apart. After an initial series of two immunizations, a horse should receive a booster annually. Pregnant mares should be vaccinated with approved products about a month prior to foaling so a newborn foal will receive protective antibodies in the colostrum.

The material in the intranasal vaccine is a live, avirulent *S. equi* organism that is freeze-dried and reconstituted with sterile water just prior to administration. The 2-mL dose is squirted through a nasal canula into a nostril to reach the upper nasal cavity. This provides the best protective response since it stimulates local production of antibodies at the site of invasion in the upper respiratory tract. The objective is to prevent attachment of "wild" *S. equi* to tonsil receptors, and thereby prevent invasion.

There is some concern that an attenuated live *S. equi* organism could pass from vaccinated individuals to those that have not been vaccinated. Safety studies indicate that slight shedding occurs only during the first day. However, it is recommended that the intranasal strangles vaccine be administered with care after immunizing a horse with other intramuscular products during routine inoculations. Ideally, it should not

be administered on the same day as other injections are given. This strategy helps prevent inadvertent contamination of intramuscular inoculation sites with the live vaccine.

Timoney concludes, "Bacteria are a lot more complicated than viruses. Although we have made progress, vaccine efficacy is not easily improved. Why is this so difficult? First, the genomic sequence of *S. equi* has revealed an extensive set of new proteins involved in the horse's immune response and in virulence. Only a few of these proteins stimulate protective immune responses, and these must be identified

Even with vaccines, no horse can receive complete protection from the strangles organism when challenged.

by experiment in the horse. Furthermore, we need to understand which combinations, and which aspects of the immune system, must be stimulated. Do they need to be presented to the respiratory tract by intranasal administration or systemically via intramuscular injection? The research

potentially will improve vaccine efficacy and safety."

Take-Home Message

Management techniques are key in preventing a strangles outbreak on your farm, or in curtailing the number of horses that become ill during a strangles outbreak. Recognize that some horses show no clinical signs, but shed the *S. equi* organism, especially during times of stress. Young horses are most susceptible. Quarantining new arrivals is the first step. Vaccination can help prevent or reduce the number of horses that become ill and can reduce the severity of clinical signs in horses that do become ill. Thorough disinfection and good horse management during an outbreak can help break the cycle of contamination.

Treatment with antibiotics isn't always advised, so seek the advice of a veterinarian. Above all, don't try to "hide" cases of strangles from boarders, neighbors, or those at competitions or trail rides. Even though strangles isn't a reportable disease in a legal sense, horse owners owe it to one another to be honest about a disease outbreak. ♣

ABOUT THE AUTHOR

Nancy S. Loving, DVM, owns Loving Equine Clinic in Boulder, Colo., and has a special interest in managing the care of sport horses. An enthusiastic endurance rider, Loving is also a veterinary judge for the American Endurance Ride Conference and for FEI (international) endurance events. She authored the books *Go the Distance: The Complete Resource for Endurance Horses, Conformation and Performance* (both available at www.ExclusivelyEquine.com or by calling 800/582-5604), and *Veterinary Manual for the Performance Horse*.

ONE COMPLICATION OF STRANGLES—PURPURA HEMORRHAGICA



COURTESY DR. JOHN TIMONEY

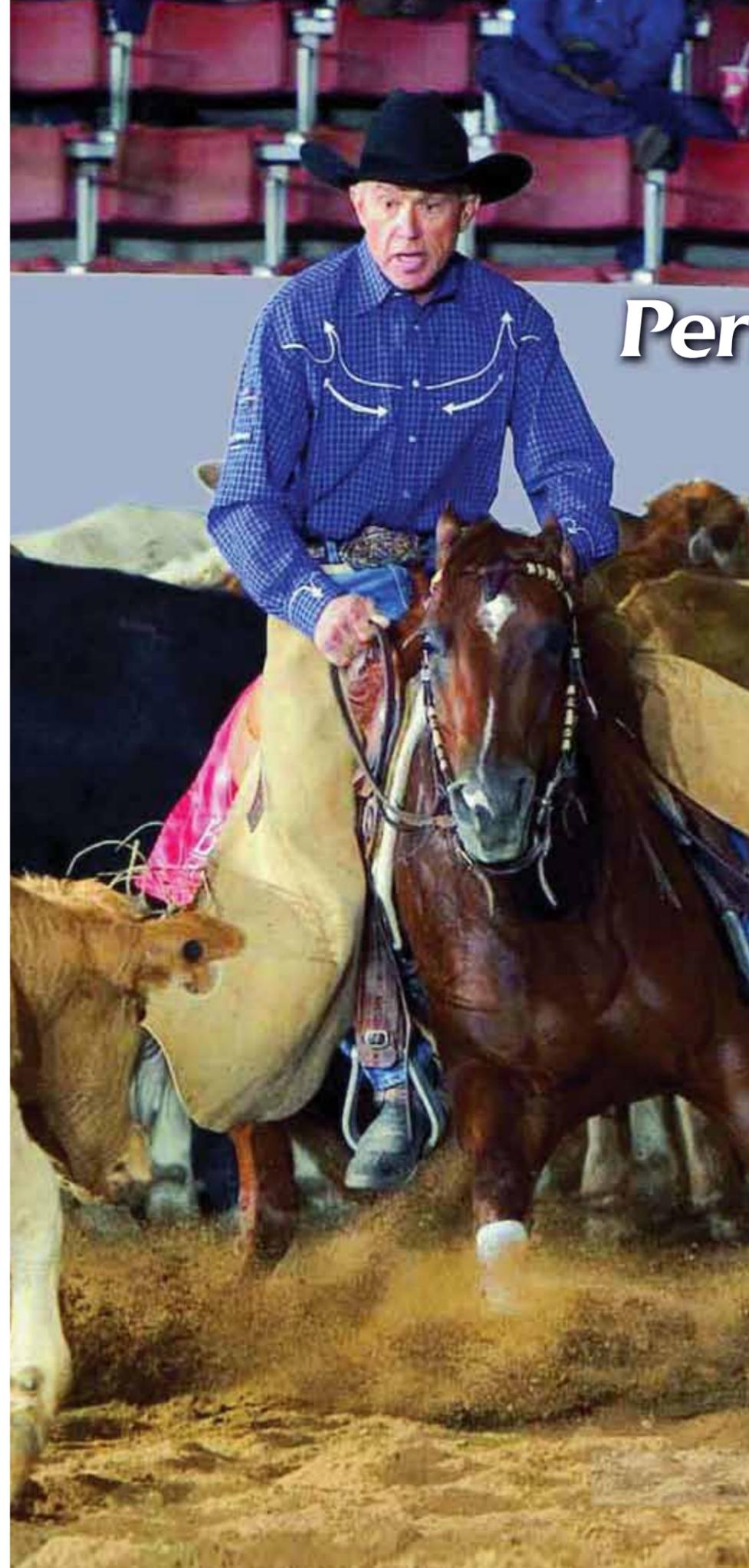


COURTESY DR. MARIANNE SLOET



STAFF PHOTO

Strangles can also create an immune-mediated syndrome known as purpura hemorrhagica that leads to edema in the abdomen, limb, head, and scrotum, as seen in the photos above.



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