

**E**quine Arteritis virus causes EVA. The virus has recently been reclassified into its own newly proposed taxonomic family. Unlike other similar RNA viruses, only one serotype of EAV has been identified so far. However, evidence suggests antigenic variation

**Infection** is occurring between isolates from different regions, and different strains of the virus vary in their ability to produce disease.

EAV can spread among horses in one of two ways:

- By aerosol droplets expelled from the lungs of an acutely infected animal. The aerosol route is important at sales, shows, tracks and events, where animals are concentrated.

- Through the semen of either an acutely or chronically infected stallion. Venereal infection has played an important role in maintaining and spreading infection in horse populations. There's no evidence the virus can spread venereally from mares to stallions.

Following respiratory exposure, the virus grows in the lungs and bronchia, moves to the lymph system, and then is widely disseminated through the tissues and fluids of the body.

Overt signs of EVA are similar to numerous other diseases of the horse, so a definitive diagnosis cannot be made without running

**Diagnosis** laboratory tests to detect the virus, antibody levels in the blood or characteristic tissue changes in suspect animals. The carrier state in the stallion is confirmed by finding the virus in a semen sample.

## Your Horse's Health

**Q**'d like to administer vaccinations to my horses without relying on a

### Question

veterinarian to do it. Any advice?

**A** significant number of horse owners—some working together with their veterinarian—give their own shots. Consider this:

- Injection should be taken seriously. If you don't know how, learn first. Discuss

### Answer

the decision with your veterinarian

and use the vet as a knowledgeable resource.

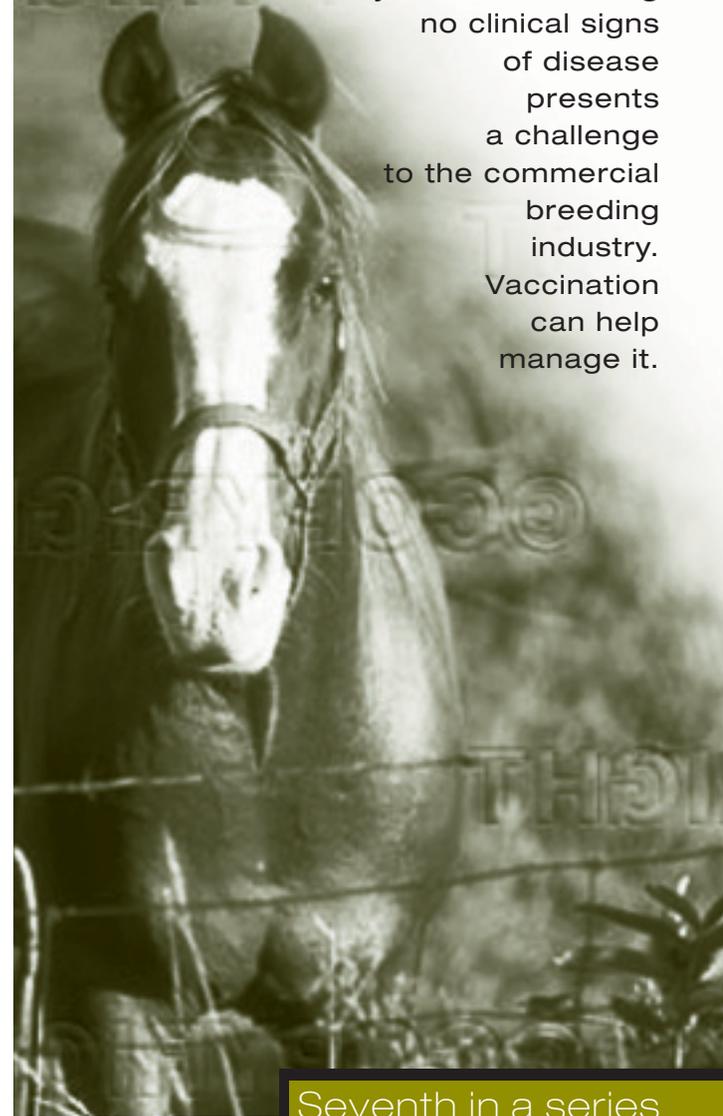
- Learn about any possible side effects, and be prepared to spot them.
- Prepare all the necessary supplies beforehand.
- Pay attention to hygiene of your equipment and the horse.
- Do not neglect the importance of restraint—for your safety and the horse's. A skilled handler to assist you is always prudent, regardless of the animal's temperament.

Ask your local store's equine health specialist or your veterinarian for more details.

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## Your Horse's Health

The spread of this virus by stallions showing no clinical signs of disease presents a challenge to the commercial breeding industry. Vaccination can help manage it.



Seventh in a series

# Equine Viral Arteritis

**E**ven though most horses infected by the virus that causes equine viral arteritis (EVA) show no symptoms, the Equine Arteritis virus is an important pathogen. Certain strains can cause abortion in susceptible mares and a significant percentage of stallions

### Viral Arteritis

may become silent carriers. Researchers believe persistent infection of stallions with the virus is more widespread among all breeds than previously thought, and it can be passed both through natural service and artificial insemination. This presents significant economic challenges for the commercial breeding industry.

**M**ost cases of acute infection are subclinical. Clinical signs vary widely in range and severity.

### Symptoms

Any combination of the following can be seen:

- Fever
- Swelling of the legs
- Loss of appetite
- Depression
- Swelling of the stallion's external genitalia or the mare's mammary glands
- Eye inflammation resembling pinkeye
- Nasal discharge
- Skin rash, either around the head and neck, or across the body
- Abortion in pregnant mares

Infection in very young foals can cause severe pneumonia and sometimes death.

**O**ther than newborn foals affected by pneumonia, most horses showing

### Treatment

clinical signs of EVA inevitably recover without medical therapy.

No specific treatment aimed at controlling or eliminating the virus is available. Because most affected horses recover completely, many find treating symptoms with fever-reducing drugs, anti-inflammatories and diuretics should only be necessary in severe cases. Treatment should be used to reduce stubborn fever and excessive scrotal swelling that can bring on temporary infertility in stallions. Provide good nursing care and rest from exercise before easing animals back into activity and use.

Once the virus settles in the reproductive glands of the stallion and creates the persistently infective state, no currently known therapy is capable of eliminating it, and stallions will remain shedders. However, the persistent state does not appear to affect the fertility of infected stallions. Mares infected after service by a carrier stallion or its semen appear to suffer no related fertility problems.

**E**VA is manageable. Prevention involves management practices to control viral transmission, including vaccination.

■ Mares should be vaccinated against EVA at least three weeks before insemination. That window gives them an opportunity to build an effective immune response to the virus in the event of exposure.

### Prevention

Vaccinated mares bred with infected semen should be separated from negative animals for three weeks to avoid spreading the virus.

■ Stallions that blood-test negative should be vaccinated to help prevent development of the carrier state. The American Association of Equine Practitioners recommends all young colts first be blood tested, certified free of the virus, and then vaccinated, particularly if it's of a breed in which the virus is widespread.

Because blood testing cannot distinguish antibodies produced by vaccination from those created by wild infection, it's important to obtain certification that a horse has tested negative before its first vaccination. Not all positive stallions are persistent shedders, but stallions known to be persistently infected should only service mares that have either been previously infected or vaccinated.

Although the vaccine has been demonstrated to be safe in animals of any age and pregnant mares, the manufacturer recommends against using it in pregnant mares, particularly in the last two months of gestation, unless the risk of natural infection is extreme. Colts younger than 6 weeks shouldn't be vaccinated unless facing a similar emergency situation.

**The West Nile virus** responsible for disease in horses is a “vector-borne” virus—meaning it depends on an intermediate insect to carry it between hosts.

Mosquitoes are the only vectors believed to be associated with outbreaks of U.S. West Nile

### Infection

cases since the virus appeared in 1999. At

least 30 different mosquito species have tested positive for the virus, even though experts suspect only a portion are responsible for spreading the disease.

Mosquitoes become infected by feeding on birds carrying the virus in their blood. During blood feeding, they transmit the virus to other birds, which remain infected for four to five days after the virus is initially transmitted. Meanwhile, the infected mosquito can also pass the virus to horses—as well as people—by the same process of blood feeding. Horses and humans, however, are considered “dead-end” hosts. The virus cannot move back to mosquitoes from horses or humans, nor can it be spread from horse to horse.

Because West Nile virus infects birds, migration patterns are believed to have played a role in its rapid spread across the continental United States in just a few years.

West Nile virus causes signs of central nervous system disease, so it can mimic a number of

### Diagnosis

different neurological diseases in the horse.

Contact your veterinarian for testing if your horse displays any signs connected with West Nile virus.

## Your Horse's Health

**Q** Why are some vaccines recommended to protect my horse against

### Question

common diseases only available

through a veterinarian?

**A** Vaccines may be restricted to sale and administration through a

veterinarian either because of regulation or a decision on the part of the product manufacturer. Typically those decisions are made because:

- The vaccine—or failure to control a disease’s spread through full and effective administration

### Answer

of vaccines—poses a potential threat to

public health. The public-health importance makes transparent record-keeping and tight control on the vaccine paramount. Veterinary clinics are the natural control point.

- A judgment is made that a legitimate doctor-client-patient relationship significantly improves the chance a particular vaccine will be administered, stored and used properly, and thus, becomes an effectiveness issue.

Remember, providing restricted vaccines is only one of many excellent reasons to take advantage of regular veterinary exams.

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## Your Horse's Health

Unknown in the United States before 1999, this often-fatal brain infection spreads between carrier migratory birds and horses via mosquito bites.



Tenth in a series

# West Nile Virus Disease

**U**ntil it was first detected on the east coast of the United States in 1999, West Nile virus was not present in the Western Hemisphere. The mosquito-borne virus that causes an often-fatal inflammation of the brain in horses and humans had previously been found in Africa, western Asia, the Middle East, and Mediterranean Europe. Following its detection here, it spread rapidly through the horse population, reaching the west coast just four years later. Although all exposed horses do not become ill, West Nile kills about one-third of the animals that do become infected.

## West Nile

**C**linical signs of West Nile virus disease in horses vary widely and may not be expressed at all. They include:

## Symptoms

- Shaking, trembling
- Staggers
- Stumbling and loss of coordination
- Depression or apprehension
- Muscle twitching
- Weakness in the legs, advancing to partial paralysis to full paralysis, and inability to stand
- Death

Fever is not a common sign. Advanced cases will progress to an inability to stand and death within two to nine days.

**M**any horses that become infected with West Nile virus never develop any signs of disease. Of those that do grow ill, about one out of three either die or have to be euthanized. Your veterinarian will typically counsel humane euthanization

## Treatment

only after it's clear the infection has become so severe the horse will not recover. Horses that survive usually go on to make a full recovery.

There is no specific treatment for West Nile encephalitis once a horse becomes infected. Treatment is generally limited to supportive veterinary care, including fluids if the horse is unable to drink, careful use of anti-inflammatory drugs, and anticonvulsants to control seizures, if necessary. Good nursing care to optimize comfort is critical.

Remember, West Nile virus is only one of many possible causes of central nervous system disease—some more treatable than others. (For more information, see *Your Horse's Health: Rabies, Your Horse's Health: Equine Protozoal Myeloencephalitis, and Your Horse's Health: Sleeping Sickness*.)

If your horse shows signs associated with West Nile virus infection, you should contact your veterinarian immediately. Bear in mind vaccines designed to protect against eastern equine encephalitis, western equine encephalitis and Venezuelan equine encephalitis in horses do not protect against West Nile virus.

**E**ffective control of West Nile virus aims at interrupting the life-cycle of the vector mosquito, as well as boosting the horse's immune response through timely vaccination. Timing is critical. Preventive steps should come before the mosquito season begins.

■ Vaccinate. The first vaccine developed to help prevent disease caused by West Nile virus in horses, West Nile—Innovator™ received licensing shortly after the disease entered the United States.

## Prevention

The product is a killed vaccine—meaning it has been rendered incapable of causing the disease in vaccinated animals—and is available only through licensed veterinarians.

In order for vaccination to protect horses, they must receive two initial doses of the vaccine. The second of the two doses must be administered at least two weeks before the onset of mosquito season. In subsequent years, a booster is required. In some areas of the country, veterinarians recommend more than one booster. Check with your veterinarian to determine the risk level in your area.

■ Reduce mosquito breeding sites to help prevent contact with infected mosquitoes. Remove any possible sources of standing water that present mosquito breeding grounds, including old tires, watering troughs, bird baths, clogged roof gutters, wading pools, wheelbarrows, and low spots in landscaping or barnyards. Aerate ornamental ponds. Clean and chlorinate unused swimming pools.

■ Consider screening horse housing, stabling horses inside at night, and using insect repellent during periods of mosquito activity.

**T**he anaerobic bacterium that causes tetanus, *Clostridium tetani*, is a common inhabitant of the soil and the gut of animals—more so in warmer climates.

In most cases, it is introduced into body tissue through a deep puncture wound,

**Infection** where the sealed-over wound provides the ideal anaerobic environment. If cellular death of the nearby tissue begins, the organism begins to multiply at the site of infection.

As the bacterial cells naturally die off, they release the potent neurotoxin. The toxin is usually then absorbed by the nearby nerves. Moving up the spinal cord, the neurotoxin interrupts the normal electrical function of muscles, causing uncontrollable muscle contractions that show up as spasms.

Once the spasming reaches the larynx and diaphragm, respiratory failure may lead to death. Likewise, involvement of the autonomic nervous system causes heart failure. The death rate averages about 80 percent in infected horses.

The characteristic clinical signs accompanying a recent wound usually make for a definitive

**Diagnosis** diagnosis of tetanus. Your veterinarian can confirm the diagnosis through a blood test. Where the wound is still obvious, isolation of the bacterium can also confirm infection.

## Your Horse's Health

**Q**How often should I vaccinate my horse to maintain sufficient protection from disease? Is it possible to over-vaccinate?

### Question

**A**The ideal vaccination schedule depends on several factors which must be customized to your horse or farm. Consider these points:

- Seasonal diseases may only need vaccination immediately before or during the active infection season.
- How you use your horse affects vaccination frequency. Performance horses and horses

### Answer

frequently taken to events and shows will probably benefit from more frequent vaccination. Broodmares may need to be vaccinated based around their foaling schedules.

- You may wish to increase vaccination frequency as risk of the target disease goes up.

It is possible — and can be detrimental — to vaccinate too often. Always read labels carefully and consult with a veterinarian if necessary. Remember: Consider all the antigens in multi-component vaccines. The frequency for one may not be appropriate for another. Use a single antigen vaccine in that case.

Ask your local store's equine health specialist or your veterinarian for more details.

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## Your Horse's Health

This often-fatal result of an infected wound can be easily prevented through timely vaccination.



Fourth in a series

# Tetanus

**W**ith the exception of humans, horses are the most sensitive of all species to systemic blood poisoning caused by a specific neurotoxin produced by the common bacterium *Clostridium tetani*. Produced in dead or dying tissue caused by a wound,

## Tetanus

disease or gangrene, the toxin can cause the characteristic “lockjaw” and kill a horse at a fraction of the dose—on a bodyweight basis—required to harm other species. It is easily controlled through timely vaccination.

Following an incubation period of 10 to 14 days after the organism is introduced into the body tissue, signs may include:

## Symptoms

- Localized stiffness, often involving neck muscles, hind legs, and the area around the infected wound first
- Pronounced general stiffness about a day later
- “Sawhorse” stance caused by leg stiffness
- Sweating
- Continuous muscle spasms
- Excessive sensitivity of the skin to touch
- Increasing intensity in reflex reaction, leading to more pronounced general spasms caused by reaction to movement or noise
- Spasms in the head muscles causing extension of the head and neck, as well as difficulty in chewing
- Erect ears, stiff and extended tail, flaring of the nostrils, third eyelid prolapse
- Difficulty walking, turning and backing

**B**ecause spasms can become so severe when an infected horse is startled, they may actually break bones. It is

## Treatment

important to sedate the infected animal in the early stages of the disease. Veterinarians typically use barbiturates, curariform agents or tranquilizers.

Meanwhile, injection with 300,000 units of tetanus antitoxin is generally effective in treating clinical signs. Results have also been reported by injecting a smaller amount of antitoxin directly into the spinal fluid.

Veterinary therapy should also be supported by:

- Cleaning the original wound, if it is still identifiable. Drain it if necessary.
- Giving penicillin or another broad-spectrum antibiotic.
- Stabling the horse in a dark and quiet box stall. Raise feed and water high enough so the horse can reach them without ducking.
- Arranging to provide close attention and careful nursing care during the acute spasms to improve comfort and prevent injury.
- Slings horses that can no longer stand or rise of their own accord.

**H**orses should be immunized yearly against tetanus. The available tetanus toxoids are inexpensive, safe and effective at producing active immunity to protect the horse in case of infection.

Booster yearly. Some veterinarians also recommend more frequent boosters for mares and foals—mares during their final six weeks of gestation and foals at 5 to 8 weeks old. In areas known to be at high risk for tetanus, foals may be dosed with antitoxin at birth and then every 2 or 3 weeks until they reach 3 months old. Then they can be immunized with toxoid.

Because the initial immunization requires two doses spaced 4 to 8 weeks apart, horses may be vulnerable if they are infected after the first injection but before the second.

## Prevention

If a horse sustains a wound after the first injection or is not current on its booster, 1,500 to 3,000 units of antitoxin should protect for up to 2 weeks. Give a dose of toxoid at the same time and then a second according to label directions for the initial course, to return the animal to its regular vaccination schedule.

**S**trangles is caused by the bacterium *Streptococcus equi equi*, which is easily passed from infected to susceptible horses by the pus discharged from abscessed nodes. It passes not only through nose-to-nose contact, but also through shared water tanks, bedding and clothing. An infected animal can infect others for at least four weeks after onset of the disease. In a group of horses with no previous exposure to strangles, the infection incidence may approach 100 percent.

A chronic state results in some recovered horses when the bacteria persist in the guttural pouches. Those carrier animals can remain a source of infection for an extended period.

If a weak immune response or failed treatment permits the abscess to spread to the lymph nodes of the abdomen or thorax, resulting peritonitis can create sometimes-fatal “bastard strangles.” Other complications can include acute swelling and pinpoint bleeding in the mucous membranes, heart inflammation, wasting of the muscles, and paralysis of the throat muscles that leads to roaring.

An epidemic of high fever and rapid abscessing in the lymph nodes of the throat almost always defines strangles.

**Diagnosis** Occasionally, another form of *Strep.*, *S. equi zooepidemicus*, will mimic strangles by following a case of viral respiratory disease like influenza (For more information, see *Your Horse's Health: Equine Influenza*.) A definite diagnosis requires your veterinarian to identify *S. equi equi* from a pus sample taken while draining a mature abscess.

## Your Horse's Health

**Q**How does vaccination work to protect my horse against the organisms that cause common diseases?

Question

**A**When a healthy animal absorbs a dose of a disease organism, or “antigen,” via vaccination, it naturally responds as if it were an infection by the wild organism.

The body's immunologic defenses respond by producing antibodies, specialized cells that recognize, respond to and remember the specific organism, in a process called “active immunization.” Active immunization often

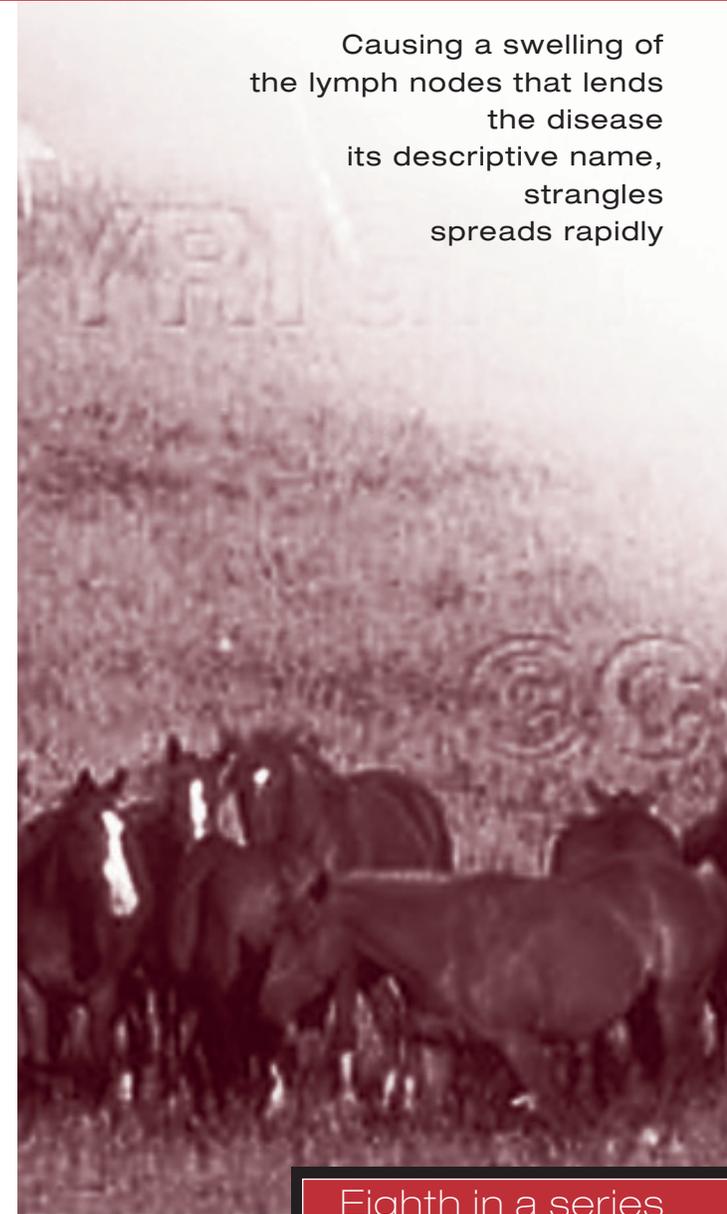
has two distinct avenues of function: humoral immunity, which produces antibodies circulating in the bloodstream, and cell-mediated immunity, which is localized within the body. The best immune response stimulates both avenues at the same time, to establish a first line of defense at the infection site and a follow-up response to fight infection should it spread beyond the initial site. Horses can also be protected through “passive immunization,” in which antibodies produced outside the body are injected for immediate—though shorter—protection.

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## Your Horse's Health

Causing a swelling of the lymph nodes that lends the disease its descriptive name, strangles spreads rapidly



Eighth in a series

# Strangles

**A**ffecting horses for more than four centuries, strangles causes upper respiratory disease, as well as abscesses and swelling of the lymph nodes in the neck. The resulting pain and difficulty swallowing and breathing lends the disease its

## Strangles

descriptive name. It spreads easily from

horse to horse in contact with one another. Unless the infection spreads to other lymph nodes in the body that then rupture and cause complications—a rare occurrence—strangles is seldom fatal and runs its course in about two weeks.

**S**igns of strangles begin to appear within about three to six days of exposure. Although any age animal can be affected

## Symptoms

if their immunity wanes, strangles is

typically a disease of weaned horses and yearlings. Signs include:

- Loss of appetite
- Fever up to 106° F
- Swelling of the mucous membranes in the upper respiratory tract and the lymph tissue of the mucosa and lymphoid tissue of the throat, causing difficulty and pain when swallowing
- A discharge from both nostrils that can range from thin and watery to mucus and pus-filled
- Discharge from the eyes
- As the infection spreads to the lymph nodes between the jawbones, the nodes fill with pus, making them hard and painful to the touch. Absent any complications, the abscessed nodes will swell, burst and drain in 10 days to two weeks. Complications that can be fatal include central nervous system infection, organ abscesses or asphyxiation.

**H**orses affected by strangles should be offered complete rest, dry

## Treatment

and comfortable stabling, and careful attention during their convalescence.

- If you find it practical, applying hot packs or poultices on the swollen nodes can help speed up the progression of the disease. When the abscesses mature to the point where the skin is stretched tight and thin, lancing them will permit drainage, relieving the pain and stress on breathing and swallowing.
- Give soft, moist and palatable feed to horses that have trouble or pain in swallowing .
- Should breathing or eating become too difficult, your veterinarian can surgically insert a breathing tube, or feed the animal via stomach tube or IV fluid therapy.
- Although penicillin is effective against the *Strep.* organism, the role of antibiotics in effective treatment is still in question. Some veterinarians, believing antibiotics may actually prolong the condition by delaying the disease's natural course, discourage their use initially. They may withhold antibiotics until the fever won't come down, the horse suffers severe depression or lethargy, or the abscesses spread beyond the upper throat. Others suggest antibiotics like penicillin and some sulfas are unquestionably valuable, provided they are used long enough and at high enough doses. Both sides of the debate suggest the worst form of treatment is to only give small or intermittent doses that stop short of wiping out the infection, which only tends to create resistance to the antibiotics.

**I**n a group of horses not previously exposed to *Strep equi*, strangles can spread easily. Because infected animals continue to shed the bacteria for at least four weeks after signs of the disease disappear, an important aspect of any control program is to be careful about mixing recently infected horses with horses that have not had strangles.

■ New additions to a herd should be stabled separately for several weeks before mingling with the group. Any nasal discharge that develops should be cultured for the presence of the infective organism.

## Prevention

■ If they test positive, those infected horses should be isolated until they test free from infection.

■ Stalls, water troughs, tack, and grooming tools should be disinfected and left unused for at least four weeks. *Strep* is highly susceptible to dehydration, sunlight and disinfectants.

Effective control of strangles using killed, injectable vaccines used to be a challenge and was not always reliable. The introduction of a stable, live strain of *S. equi equi*, rendered incapable of causing disease but able to stimulate local mucosal immunity when administered intranasally, has made vaccination more reliable and less stressful.

**T**he three forms of equine encephalomyelitis—Eastern (EEE), Western (WEE) and Venezuelan (VEE)—are spread by the blood feeding activity of carrier mosquitoes and occasionally some other blood-feeding insects. In temperate regions of

### Infection

the country, a distinct transmission season can be defined, concurrent with the appearance of mosquitoes. Typically, the virus isn't seen until midsummer and then remains active until the first frost—usually peaking between late August and November. In subtropical areas of the country, such as Florida and other Southeast regions, transmission occurs throughout the year and peaks in the summer.

Although mosquitoes are considered the most important source of the diseases' spread, it is possible, under some conditions, to pass the virus from animal to animal via fluids from the eyes and nose.

Once introduced into the horse, the virus travels via the lymph system to the nodes, where it begins replicating itself in the macrophages and white blood cells. After it enters the bloodstream, further replication occurs in other organs.

Although a presumed diagnosis can be made based on the clinical signs, your geographic location and the time of year, encephalomyelitis can be confused with other neurological

### Diagnosis

diseases like rabies and EPM. A specific

diagnosis is possible only by isolating the virus from the spinal fluid of acutely infected horses. Comparing the antibody levels in the blood before and after infection is also used to confirm diagnosis.

## Your Horse's Health

**Q** Who regulates the effectiveness, safety and other quality controls on my horse's vaccinations?

### Question

**A** In addition to the individual manufacturers' quality-assurance standards, most countries also regulate manufacturing of vaccines through government oversight. In this country, that responsibility falls to the U.S. Department of Agriculture. USDA helps ensure safety and efficacy by regulating the following aspects of production:

### Answer

- Licensing the establishments that produce vaccines, including regular inspections of facilities and methods.
- Licensing the individual products involves overseeing research to demonstrate vaccines are potent, safe and effective when used as directed.
- Overseeing safety testing, including confirming the organism being used is correctly identified, the vaccine is free from other organisms that may interfere or be dangerous, and the vaccine is not toxic.

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## Your Horse's Health

Spread by mosquitoes in endemic areas, this often fatal disease can be easily prevented through vaccination.



Third in a series

# Equine Encephalomyelitis

**The “mosquito diseases,”** Eastern, Western and Venezuelan equine encephalomyelitis, are different forms of clinically similar disease, also called sleeping sickness. They can lead to central-nervous system failure and moderate to high death rates in infected horses. The arboviruses

**EEE, WEE, VEE** that commonly cause equine encephalomyelitis are transmitted by mosquitoes or other blood-feeding insects and infect a variety of hosts, sometimes including man.

The most dependable method for preventing the disease is to maintain annual vaccination.

**Until infected horses begin** showing characteristic neurological signs about five days after infection, the only

**Symptoms** initial sign may be depression and fever. Once neurological signs appear, they can mimic other diseases affecting the nervous system and brain, and may include:

- Altered mental state
- Impaired vision
- Aimless wandering
- Circling
- Pressing the side of the head against walls and other solid surfaces
- Difficulty in or inability to swallow
- Unsteady gait, shakiness, difficulty walking
- Muscular weakness and eventual paralysis
- Convulsions
- Death. Most deaths occur within two to three days after clinical signs appear.

**Because no specific treatment** to cure viral encephalomyelitis is available, prevention is critical. If the infection

**Treatment** progresses to the point the horse begins showing neurological signs, the animal can be expected to die in 20 to 50 percent of WEE cases, 50 to 90 percent of EEE cases, and 50 to 75 percent of VEE cases. A high percentage of those that recover will display residual neurological damage. Euthanization may be the humane option if it's obvious the infection has become so severe the horse will not recover.

Treatment is generally limited to supportive veterinary care, including fluids if the horse is unable to drink, careful use of anti-inflammatory drugs, and anticonvulsants to control seizures if necessary. Good nursing care to optimize comfort is critical.

If your horse shows any of the signs associated with neurological infection, contact your veterinarian immediately.

**The most reliable method** for managing equine encephalomyelitis is to vaccinate all susceptible horses at least annually. Vaccination is economical, easy to administer and highly protective against an otherwise often-fatal outcome.

Effective vaccines against all three strains of encephalomyelitis are commercially available, and can be given in combination or individually. Because the virus in the vaccine has been rendered inactive, it is incapable

**Prevention** of causing the disease and is, therefore, safe to use in any healthy horse.

Initial vaccination calls for two injections spaced two to four weeks apart. Horses should then be boosted annually, unless you live in an endemic area where threat of infection is high, such as Florida and some regions of the Southeast. In these areas, you may need to booster more often based on local recommendations.

Since the virus is spread by mosquitoes, removing mosquito breeding sites may also help prevent spread of the disease, particularly during outbreaks. Remove any possible sources of standing water that present mosquito breeding grounds, including old tires, watering troughs, bird baths, clogged roof gutters, wading pools, wheelbarrows, and low spots in landscaping or barnyards. Aerate ornamental ponds. Clean and chlorinate unused swimming pools.

**The Equine Herpesvirus** types 1 and 4—also called subtype 1 or 2 of EHV-1—are genetically different from one another and produce differing antigenic responses in the horse. Both virus types are widespread around the world.

Both forms of the virus are spread predominantly by infected horses coughing or sneezing in a shared airspace with naive animals. However, the virus has also been shown to pass between animals in infected fetuses and the placentas of mares that have aborted. Contaminated clothing, tack, equipment, and feed can also be a source of infection.

Once they infect a horse, EHV-1 and EHV-4 attack in two distinctly different manners. EHV-4 and EHV-1 invade the lining of the respiratory tract and lymph nodes. EHV-4 infection stays there. EHV-1 strains also attack the lining of the vascular system, the nasal lining, lungs, adrenal system, thyroid and central nervous system.

Clinical signs alone cannot distinguish equine viral rhinopneumonitis from diseases caused by other viral respiratory pathogens, like equine influenza (See *Your Horse's Health: Equine Influenza*) or equine viral arteritis (See

**Diagnosis** *Your Horse's Health: Equine Viral Arteritis*).

Your veterinarian can confirm infection by isolating the virus from nasal swab samples or blood collected early in infection. Matched pairs of blood samples tested for antibody levels can also indicate patterns of infection.

## Your Horse's Health

**Q** What is the difference between a killed vaccine and a modified-live vaccine?

### Question

**A** A killed vaccine differs from a modified-live vaccine in that it is unable to replicate within the horse's system. Presenting the inactivated disease will stimulate the immune system to develop immunity. Often,

**Answer** an adjuvant is added to produce a stronger response from the immune system. Killed vaccines often require two initial injections.

A modified-live vaccine is designed to establish the virus in the horse without causing the disease. The vaccine contains live organisms that are attenuated, meaning they have lost their disease-causing ability, but will still multiply. Multiplication of the disease will stimulate the immune system to produce protection. Adjuvants are typically not necessary with modified-live vaccines. Modified-live vaccines offer rapid protection and will often provide better local immunity when administered intranasal as seen with Pinnacle® and *Strep equii* protection.

Ask your local store's equine health specialist or your veterinarian for details.

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## Your Horse's Health

The complex Equine Herpes virus causes respiratory disease in young horses, abortion in mares and occasional neurological disease.



Second in a series

# Equine Viral Rhinopneumonitis

**Rhinopneumonitis**, caused by two strains of the same Equine Herpes virus, can result in upper respiratory infection in young horses, abortion in pregnant mares, and a less recognized severe neurological disease that can damage the brain and spinal cord, resulting in paralysis and death. The respiratory and abortive forms of the disease can be controlled by vaccination combined with careful horse management.

## Rhino

**Clinical signs** of Equine Herpes virus infection differ with the strain causing the infection. EHV-4 tends to cause signs of respiratory disease in young horses. EHV-1 tends to cause abortion. It's important to recognize, though, that either strain is capable of causing either condition. After an incubation period lasting 2 to 10 days, susceptible horses may develop any of the following signs:

## Symptoms

- Fever of 102° to 107°F, lasting up to a week
- Nasal and eye discharge
- Sluggishness and loss of appetite
- Sore throat, cough
- Constipation followed by diarrhea

Opportunistic infection by bacteria is common, characterized by mucous nasal discharge.

When a mare loses a foal to EHV-1, she seldom displays any signs beforehand. Abortions tend to occur between the seventh and eleventh month of gestation. The reproductive system will typically appear otherwise healthy.

Neurological signs caused by EHV tend to mimic other neurological syndromes.

**EHV is a virus**, and as with all viruses, antibiotics will have no effect on it. That

## Treatment

leaves supportive treatment as the only therapeutic alternative—typically fluids, anti-inflammatory drugs, slings to support horses that are recumbent, and extended rest during and after the period of acute fever. Should an affected horse's fever rise above 105°F, antipyretics should be used to help bring it down.

Antibiotics can and should be used at the first appearance of either mucous or pus-filled nasal discharge or lung involvement that may signify a secondary bacterial infection has moved in, taking advantage of the animal's weakened immune system.

If you can manage to keep horses infected with the neurological form of rhino on their feet—or get them back up in two to three days if you can't—they will typically experience a positive outcome. Full recovery may take months, and the recumbent animal requires intensive nursing care to avoid complications.

Foals born already infected by EHV-1 usually die shortly after birth, despite extensive efforts.

**A balanced EHV** prevention plan involves effective disease management and immunization.

■ Although highly difficult—if not impossible—to eradicate Equine Herpes virus from a farm once it's established, it is possible to avoid introducing it into a susceptible group in the first place. Horses arriving on a farm from other farms or sales, or returning from tracks, shows and events should be isolated for three to four weeks before joining resident horses, especially pregnant mares.

Should you experience an outbreak of respiratory disease or abortion, affected horses should be isolated, and

## Prevention

appropriate sanitary measures taken. No horse should leave the farm for three weeks following the recovery of the last clinical case.

■ Reduce stress. Stress appears to activate latent EHV in carriers. Horses on breeding farms or at racetracks should be maintained in small, separate groups to reduce competition. Keep pregnant mares away from weanlings, yearlings, and horses out-of-training.

■ Vaccinate. The complicated immune response to EHV makes vaccination more challenging than with other diseases. Reliable immunity to the virus tends to be short-lived, whether through vaccination or natural exposure. However, effective and safe vaccines are available, specific to the strain of EHV. Pregnant mares should be vaccinated with EHV-1 during the fifth, seventh and ninth months of gestation, and foals should receive the EHV-4 sub-type two to four times between the ages of 2 and 6 months. Booster two to four weeks before exposing them to other horses.

**The virus that causes rabies** is found in all states except Hawaii, and in many other countries around the world—including Canada and Mexico. In almost all cases the virus is transmitted between animals by introducing saliva that carries the virus

### Infection

into the tissues of the uninfected

animal—most often by a bite. The virus can also be introduced through existing wounds or by infiltrating the mucous membranes when infected saliva or fluid is swallowed. Saliva can be infective for a period of between three and eight days before clinical signs appear.

Once introduced, the virus tends to remain at the site of introduction for an extended period of time. After it reproduces itself in the muscle cells at the wound, the virus eventually travels along the peripheral nerves to the spinal cord and finally to the brain. Once clinical signs develop, it is almost always fatal.

Diagnosing a case of rabies based on clinical signs is difficult, especially in areas where

### Diagnosis

rabies isn't common and thus not

normally suspected. Signs are easily confused with other neurological diseases—or simple aggressive animal behavior.

When a definite diagnosis is necessary, microscopic laboratory tests on fresh brain tissue samples permit veterinarians to directly observe a specific antigen-antibody reaction. Properly applied, it can return a highly specific diagnosis within a few hours.

## Your Horse's Health

**Q**How can I be certain vaccination will not cause the disease it's intended to protect my horse against?

### Question

**A**Vaccine manufacturers and the agencies that regulate them observe strict precautions to ensure vaccines are not capable of accidentally causing an outbreak of the disease.

Although the most effective immune response comes when a vaccine's organisms are as similar to the living organisms as possible, vaccines typically inactivate the organisms in

### Answer

some way, in the process causing as

little damage to their ability to stimulate immunity as possible.

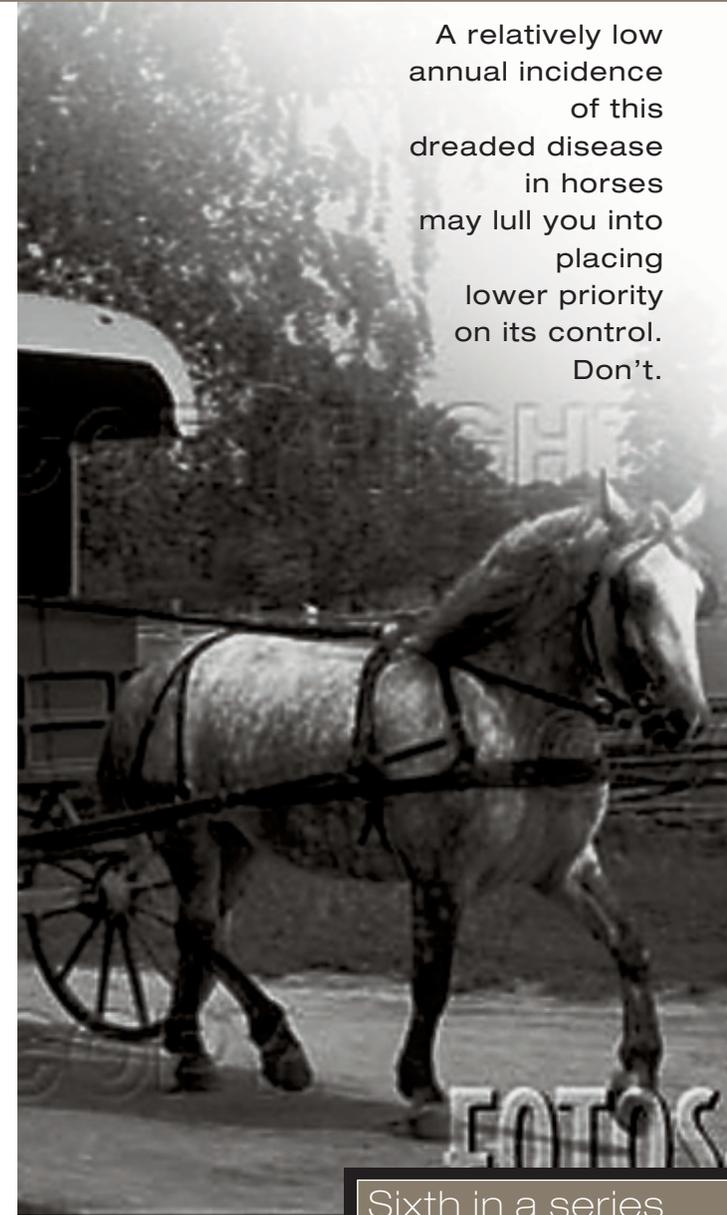
Chemical inactivation, for instance, might destroy the genetic material of the organism that permits reproduction, without damaging the proteins that cause the horse's body to illicit an immune response. Attenuation is another method that leaves the organism capable of replicating but sufficiently weakened so that it cannot cause a disease outbreak. Approved vaccines must demonstrate they are safe and cannot cause infection, as part of their licensing process.

Ask your local store's equine health specialist or your veterinarian for more details.

For more answers to your horse-health questions, visit:  
[www.mytsctest.com/healthyhorse](http://www.mytsctest.com/healthyhorse)

## Your Horse's Health

A relatively low annual incidence of this dreaded disease in horses may lull you into placing lower priority on its control. Don't.



Sixth in a series

# Rabies

**Rabies**—the acute viral infection of the central nervous system that most commonly affects carnivores and insect-eating bats, can affect any mammal. However, the relatively low number of cases reported yearly in U.S. horses may lull some horse

## Rabies

owners into putting a low priority on protecting their animals. Yet, the fact that the disease is endemic, fatal, and poses a risk to humans who come in contact with an infected horse make it important that rabies not be neglected in your horse's vaccination program.

**Clinical signs of rabies** rarely make a reliable diagnostic tool: All species of rabid animals show signs typical of any disturbance in the function of the nervous

## Symptoms

system. Whenever you find yourself dealing with inexplicable clinical neurological signs, it's prudent to consider rabies first. Those signs can include:

- Behavioral changes: Loss of appetite, unusual apprehension or nervousness, irritability and agitation, changes in temperament, solitude-seeking behavior
- Rolling, self-inflicted wounds
- Altered or unusual vocalizations
- Lethargy, depression, weakness, excessive salivation and difficulty swallowing.
- Shakiness, difficulty walking, loss of coordination, eventual inability to stand

Death usually occurs from three to five days after the onset of signs, depending on where the virus settles within the central nervous system.

**Wherever rabies is known** to be resident in native wildlife and bats, a horse that's believed to have been bitten

## Treatment

or scratched by a wild carnivore or bat should be suspected of having been exposed to rabies. Immediate cleansing of the affected wound area may help prevent infection. If you suspect a rabies infection, contact a veterinarian immediately for testing. Confirmed and suspect cases must be reported to your state veterinarian's office and public-health officials. Avoid handling the horse to prevent exposing yourself to infection.

There is currently no antiserum to treat equine rabies. Vaccinating an unvaccinated animal after exposure will not be effective; the disease will kill the horse before immunity has time to develop.

If the horse has been on a current rabies vaccination schedule, an immediate booster shot should be given. The horse should then be isolated and closely watched for 45 days. If clinical symptoms develop, the horse should be humanely destroyed to avoid further injuries to itself and to prevent human infection. The intact head should be submitted for diagnosis.

If you have inadvertently been exposed to an animal suspected of carrying a rabies infection, the risk of transmission should be evaluated carefully, considering the species of the animal, local prevalence of rabies, whether enough exposure occurred to transmit the disease, the current status of the suspect animal and whether it's available to be tested. Humans can take a series of protective shots after a bite, but they must be given before symptoms begin.

**Because vaccination** for rabies is highly effective in preventing the disease in horses, control should combine vaccination with management steps to prevent exposure to carriers.

■ Rabies vaccination is recommended for horses in areas where rabies is endemic. Administered by your veterinarian prior to exposure, vaccination should begin at three to four months of age. Horses should then receive a booster shot annually.

■ Rabies vaccination should also extend to dogs and cats on the same premises, to ensure protection for them.

Practices to help avoid contact between your horse and rabid carrier animals include:

- Don't adopt wild animals for pets.
- Be on the watch for unusual behavior and other clinical signs in wild animals. Although skunks were traditionally considered the most common rabid animal in the United States, raccoons have taken over that position since the early 1990s. Coyotes have also become an important source in some areas of the country. Rabies in bats is distributed throughout the country, and some localized outbreaks occur in foxes. Any suspect behavior in those animals, as well as in dogs or cats should be reported to your local veterinarian or animal-control office.

**H**ow the causative organism behind Potomac Fever, *Ehrlichia risticii*, is transmitted and maintained in nature is still being investigated. As the name implies, some association of the disease with aquatic habitats has been made since the disease was

**Transmission** first recognized. And because cases occur predominantly in the spring and summer months, fleas, ticks or mites were also initially blamed for transmitting the disease to horses.

Recent work has convincingly implicated freshwater snails as the primary carriers of the organism. *E. risticii* has been found in snail secretions and in aquatic insects, and the disease can be transmitted to horses by accidentally swallowing infected aquatic insects, such as caddisflies, while drinking. It is apparent horses only catch Potomac Fever by coming in contact with contaminated water sources or the unidentified secondary vector. It can't be spread from horse to horse.

Arriving at a definitive diagnosis of Potomac Fever is difficult. Symptoms often vary from case to case. Your veterinarian can test a blood

**Diagnosis** sample for antibodies against the causative organism; however, presence of antibodies may simply be due to an old infection and not a currently incubating one. A series of two paired samples taken after the first signs appear and again five to eight days later can give a more accurate picture of infection, by comparing the relative change in antibody levels.

## Your Horse's Health

**Q** What types of adverse reactions can potentially occur with vaccination?

### Question

**A** Because it is a biological process that in a small way replicates infection by a disease, vaccination does carry some slight risks. They can include:

- Host-specific allergic reactions. Vaccines, like any antigen, may cause

hypersensitivity reactions either at the site of injection or systemically.

- Although modified to prevent causing the disease, some residual virulence rarely occurs.

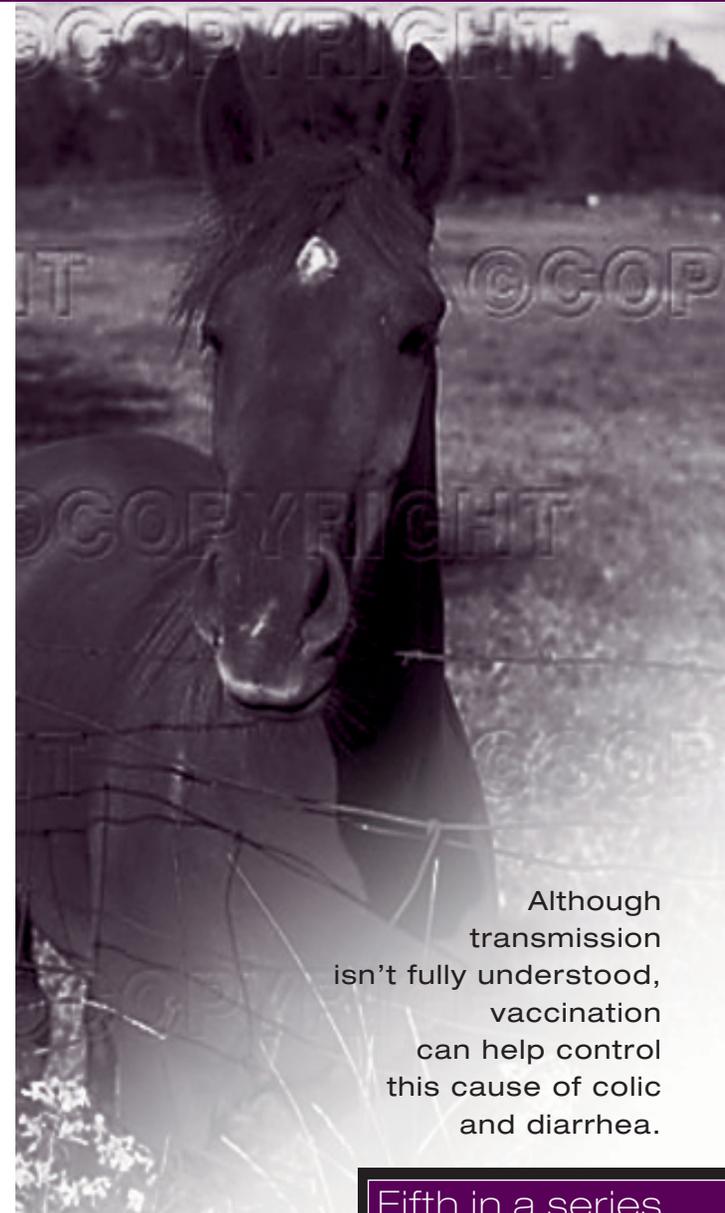
- Pain. Vaccines vary in the pain they cause at the injection site. This can be a concern not only for your horse, but also for you if the horse reacts excessively.

- Disease. Stress from vaccination, and the fact that some vaccines cause mild suppression of the immune system, may activate latent infections in an animal.

Rest assured vaccines from reputable manufacturers are extensively safety tested. When used according to label directions, the risk of adverse reactions is minimal. Ask your local store's equine health specialist or your veterinarian for more details.

For more answers to your horse-health questions, visit:  
[www.mytscstore.com/healthyhorse](http://www.mytscstore.com/healthyhorse)

## Your Horse's Health



Although transmission isn't fully understood, vaccination can help control this cause of colic and diarrhea.

Fifth in a series

# Potomac Horse Fever

**D**eriving its name from the Potomac River region of Maryland and Virginia where it was first described in 1985, Potomac Horse Fever is an acute syndrome causing diarrhea accompanied by fever. It is caused by the proteobacteria *Ehrlichia risticii*. Tests now show the natural range of that organism

## Potomac Fever

reaches far beyond the original

boundary, infecting horses throughout the United States and Canada. Potomac Fever occurs sporadically, often affecting only one horse in multiple-horse operations. It can be fatal if it progresses to systemic blood poisoning.

**C**linical signs of Potomac Fever infection may include:

- Lethargy
- Loss of appetite
- Fever
- Intestinal obstruction
- Colic
- Diarrhea
- Laminitis

Any combination of these signs may present themselves in the infected animal; only rarely will a case express most or all of them.

## Symptoms

Although inflammation of the

colon occurs in all cases, it doesn't always result in outward signs of diarrhea or colic. Diarrhea will not develop in about four in 10 infected animals. Typically, signs of intestinal blockage are the most consistently expressed.

**A**lthough the severity of the clinical signs of Potomac Fever varies

## Treatment

considerably from case to case, without treatment typically between 5 and 30 percent of affected animals will die. Death usually occurs from blood poisoning. Horses may also sometimes be euthanized because of laminitis.

Because it is not currently possible to obtain a confirming laboratory diagnosis at the time clinical signs first appear, an antibiotic with specific activity against *E. risticii* should be selected in suspected cases. Intravenous oxytetracycline is the drug of choice. Administering it will cause fever to fall and attitude and feed intake to improve within the first day in horses suffering from Potomac Horse Fever. Because the response to oxytetracycline is so dramatic when horses are infected with *E. risticii*, it is often used as a confirmation of diagnosis. Generally, treatment with oxytetracycline lasts for no more than five days.

Treatment should also include fluids given intravenously to replace electrolytes lost to diarrhea. Severely affected horses experiencing secondary infection by bacteria and colitis, or showing signs of blood poisoning, will likely be given flunixin meglumine and equine plasma containing antibodies against the endotoxin.

**A**s researchers illuminate the association between aquatic ecosystems and infection of horses by *E. risticii*, interrupting the cycle may become a more practical avenue for prevention. However, until the vector is fully identified and better understood, attempting to prevent exposure isn't likely practical.

Prevention by vaccination is the best alternative. Several inactivated, partially purified, whole-cell vaccines are approved and available. They offer protection against clinical signs of Potomac Horse Fever.

## Prevention

Because duration of immunity from vaccination is shorter than that from natural exposure, in areas where the organism is endemic, horses should be immunized in the spring and then again four months later if cases are still occurring. The primary vaccination includes two doses, spaced three to four weeks apart, about a month before the first cases usually appear in spring. This vaccination schedule should be repeated annually.

Even though Potomac Fever is not considered contagious between horses, affected horses should be isolated. Potomac Horse Fever can be confused with—or run concurrent with—diarrhea caused by *Salmonella*, which is contagious.

**A**lthough EPM was first recognized in the United States in the 1970s, it wasn't until the early 1990s that researchers discovered the cause—the protozoan *Sarcocystis neurona*. It soon became apparent *S. neurona* was a major cause of neurological disease in the U.S.

### Infection

horse population. Molecular studies

later pinned down the native Virginia opossum as the definitive host—explaining why EPM is confined to North America.

Opossums infect themselves with the protozoa when they eat muscle tissue from an infected intermediate host. The identity of the natural intermediate host is not clear, although cats, skunks, armadillos, raccoons, otters and some birds have been suggested. About 10 days later, the opossum begins passing infectious sporocysts in its feces. Horses then swallow the sporocysts when they eat or drink contaminated feed or water.

How the sporocysts cause disease in the horse is still not completely understood because the parasites' life cycle isn't completely clear. Researchers assume *S. neurona* multiplies asexually in the tissues before going on to parasitize the entire central nervous system, from the brain to the end of the spinal cord.

### Diagnosis

The disease is most common in horses

between 1 and 5 years old, but any age horse can be affected. Making a definitive diagnosis in living horses remains challenging—in part because no method is universally accepted and because infection with the parasite does not necessarily equate with disease. If a horse shows neurologic signs that would not likely be caused by other diseases, you can probably presume EPM.

## Your Horse's Health

**Q**I understand vaccination

and immunization are not always the same thing. Why do vaccines occasionally fail to immunize animals against disease?

### Question

**A**Any vaccine can fail to induce a full immunizing response, for several reasons:

- It may contain strains of organisms or antigens that are different from the ones causing the disease.
- The antigen dose may not be high enough.
- Effective vaccines are often rendered ineffective because of handling and

### Answer

- administration errors. Modified-live vaccines may be inactivated, for example, by improper storage, concurrent use of antibiotics, sterilization of syringes with disinfectants, or too much pre-injection alcohol on the skin.
- If an animal is already infected and incubating the disease when given a vaccine, the vaccine probably will not be effective.
- No vaccine is 100 percent effective.

You can improve your chances of success by always handling vaccines as the label and packaging suggests, maintaining a regular vaccination schedule, and by only using vaccines from reputable manufacturers.

Ask your local store's equine health specialist or your veterinarian for more details.

For more answers to your horse-health questions, visit: [www.mytscstore.com/healthyhorse](http://www.mytscstore.com/healthyhorse)

## Your Horse's Health

It's the most commonly diagnosed equine neurological disease in America. Yet much remains to be discovered about exactly how it infects the horse.



Ninth in a series

# Equine Protozoal Myeloencephalitis

**E**quine protozoal myeloencephalitis, or EPM, has become a more commonly reported neurologic disease of horses in America during the last decade. It has now been reported in most of the contiguous 48 United States, southern Canada, Panama

## EPM

and Brazil, and is the most commonly diagnosed infectious equine neurologic disease in this country. Because mild and severe cases require treatment for prolonged periods of time, treating EPM is expensive. In spite of the best treatment efforts, a significant portion of affected horses never return to normal athletic abilities. Many are euthanized or sold.

**S**ince the protozoa that cause EPM can infect any part of the central nervous system, almost any neurologic sign is possible.

## Symptoms

EPM typically starts slowly, but is also known to present acutely and suddenly. The most common signs include:

- Shaky gait, staggering, trembling
- Weakness of one to all four legs—symmetrically or asymmetrically
- Depression and weight loss
- Lameness
- Deterioration of the muscles
- Back soreness
- Head tilting, paralysis of the face
- Behavioral abnormalities

In the absence of effective treatment, EPM usually results in the inability to stand and ultimately death. The deterioration may be stop-and-start, and can take anywhere from several hours to several years.

**B**ecause treatment for most cases of EPM typically lasts four to five months or longer,

## Treatment

the disease is expensive. However, suspect horses should begin treatment as soon as possible after clinical signs appear.

Several treatments have been used in horses diagnosed with EPM, while others are under investigation. The focus of treatment is to try to remove the parasite from the tissues of the central nervous system. Thus, the treatment most often used combines an antibiotic with an antiparasitic drug, typically a sulfonamide and pyrimethamine. Oxytetracycline is also frequently used.

Other new drugs are continually being evaluated for their ability to clear the system of the parasite. Generalized immune stimulants and other supplement treatments have also been suggested.

Ideally, treatment should be continued until all tests for evidence of infection are negative. Practically speaking, that normally requires at least three months. If signs don't subside with therapy, your veterinarian will likely re-evaluate treatment every 30 days.

Relapses are common in horses that remain positive. Although three-quarters of horses will improve with treatment, less than a quarter recover completely.

**E**ven though many aspects of the parasite's life cycle, incubation period between exposure and disease, risk factors that leave horses vulnerable, and the mechanism of infection remain cloudy, we know the infective sporulated cysts of the parasite are passed in the feces of the opossum.

Therefore, some experts have recommended trying to reduce the risk of contamination of your horse's feed and water by limiting access by wild opossums to hay, grain, pasture, and water sources. Store horse feed and pet food in

## Prevention

closed containers, discard open feed bags, keep garbage in tightly lidded cans, get rid of bird feeders and pick up fruit that has fallen from trees.

With all that said, however, it is still not clear that eliminating direct exposure of horses to wild opossums will completely eliminate the risk of disease, as horses may be exposed through other sources. Keeping opossums out of the farm or ranch environment is also difficult, particularly if they're drawn in during times of food and water shortages. Even if you succeeded in keeping hay and grain protected from opossums, there is still no protection of grass pastures from contamination with *S. neurona* sporocysts.

Because horses injected with killed *S. neurona* merozoites develop antibodies against the parasite, vaccination is a possible alternative prevention strategy. The initial vaccination consists of two injections, given three to six weeks apart, followed by an annual booster.