



EQUINE HERPESVIRUS 1 & 4 RELATED DISEASES

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Definition

Equine herpesviruses are very common DNA viruses in horse populations worldwide. The two most significant are EHV-1, which causes respiratory disease, abortion, and neurologic disease; and EHV-4, which primarily causes respiratory disease and only occasionally causes abortion or neurologic disease.

Equine herpes viral respiratory disease is usually caused by EHV-4 and is most commonly seen in weaned foals and yearlings, often in autumn and winter. Older horses are more likely to transmit the virus without showing signs of infection. Although EHV-1 is the principal cause of outbreaks of viral abortion, some strains of EHV-4 have been associated with sporadic cases of the disease.

EHV-1 myeloencephalopathy (EHM) results from damage to the vasculature in the CNS. Certain strains of the virus are endotheliotropic and therefore, result in vasculitis, thrombosis, and areas of infarction that lead later to foci of malacia in neurologic tissue. Herpesvirus myeloencephalopathy cases occur singly or as outbreaks affecting 20-50% of the at-risk population. Occurrences may or may not be preceded by a febrile episode or signs of respiratory disease. Strains that contain aspartate (D) at amino acid position 752 in the DNA polymerase have been more strongly associated with EHM outbreaks than strains containing asparagine (N) at this position. However, neuropathogenicity is likely multifactorial and both variants can cause EHM. [See ACVIM Consensus Statement.](#)

Clinical Signs

Fever

Fever is often biphasic and can be transient. The initial febrile phase (peaking at day 1–2) precedes infection of the upper respiratory tract. The second febrile phase (6–7 days) often precedes a systemic viremia. Fever may go undetected and may be the only clinical sign noted in an infected horse. Temperature monitoring twice daily is recommended.

Respiratory disease

- Fever (body temperature is >101.5° F (38.6° C) or 1.5° F greater than the horse's normal body temperature is considered febrile.)
- Coughing
- Nasal discharge

- Variable enlargement of the mandibular and/or retropharyngeal lymph nodes
- Lethargy, anorexia
- Conjunctivitis
- Ocular disease including uveitis and keratitis
- Neonatal foals infected in utero are usually sick from birth and exhibit any combination or all of the following:
 - Fever
 - Lethargy
 - Weakness
 - Jaundice
 - Respiratory distress/stridor/pneumonia
 - CNS signs (occasionally)
 - Death commonly occurs within 3 days
- Older foals: nasal discharge is the most common sign of disease

Abortion

Most often, there are no warning signs of impending abortion in the mare. This typically occurs in late pregnancy (7+ months); very occasionally as early as 4 months.

Neurologic disease

- Incoordination of the hind (and occasionally fore) limbs
- Ataxia or wobbly gait
- Urine retention/dribbling
- Bladder atony
- Recumbency with inability to rise
- Neurologic signs are often preceded by fever and/or respiratory signs

Incubation Period

After exposure by any route, incubation period may be as short as 24 hours but is typically 4–6 days, or longer.

Note: EHV-1 abortion can occur from two weeks to several months following exposure to the virus with mares showing no clinical signs.

Risk Factors

- Evidence of transmission of EHV-1 virus
- Strain of EHV-1 virus detected
- Number of horses potentially exposed (areas of high commingling of horses such as racetracks, hospitals, show grounds, etc.)
- Immune status of exposed horses, i.e. hospitalized or geriatric, horse rescue (stress or immunosuppression: transport, hospitalization, training, showing, weaning, high doses of steroids)
- Testing results of exposed and clinically affected horses
- Movement of horses once released from restrictions/isolation



- A recent case control study of the 2011 multistate EHM outbreak found the following risk factors for EHM compared to EHV-1 cases that did not develop neurologic disease:
 - Exposure to a greater number of biosecurity risks at the event
 - Female sex
 - Increasing number of classes competed in
 - EHV-1 vaccination in the 5 weeks before the event
- Because mules and donkeys can be silent shedders of EHV-1, comingling during an outbreak could pose increased risk of transmission and disease to horses

Transmission Respiratory transmission (most common route of exposure)

- Inhalation of droplets from coughing and snorting. (Note: EHV is not believed to be spread by this route as efficiently as equine influenza virus.)
- Direct contact with virus containing respiratory tract secretions, especially mucus
- Mares which have aborted, or whose foals have died, can transmit infection via the respiratory route
- Shedding by the respiratory route typically lasts for 7–10 days, but can be much longer. Therefore, based on a thorough risk analysis of the particular outbreak or case, a period of 14 to 28 days after resolution of clinical signs may be necessary before release from movement restrictions/isolation. EHV-1 testing of horses considered exposed or infected provides increased confidence in the release of restrictions/isolation period prior to 28 days

Direct transmission

- Aborted fetuses, fetal membranes and/or fluids are significant sources of the virus
- Infected foals are highly contagious and can transmit infection to other horses via the respiratory route through shedding virus into the environment

Indirect transmission

- Virus can be viable for several weeks in the environment once it has been shed by the horse
- Virus contaminated fomites are a significant factor in EHV spread



**Diagnostic
Sampling, Testing
and Handling**

EHV-1 and -4

Sample	Test	Shipping	Handling
Nasal or nasopharyngeal swab and EDTA or citrated blood Both blood and N/NP swab should be tested together	EHV 1 or 4 qPCR; Viral Isolation	PCR testing send swab in plain red top tube; for viral isolation place swab in viral transport media or red top tube with a few drops of sterile saline	Chilled overnight
Sera	EHV 1 and 4 Serum neutralization (SN)	Leak proof container	Chilled overnight
Sera	ELISA* Differentiation of EHV 1 from 4	Leak proof container	Chilled overnight

* detects antibodies directed against viral glycoprotein gG (Svanovir™)

Virus isolation is considered the gold standard laboratory diagnostic test. It is highly specific and unequivocally confirms the presence of infectious virus. Although virus isolation should be attempted during outbreaks, it is time-consuming and can lack sensitivity. Quantitative PCR (qPCR) is more sensitive and rapid, and has become the test of choice for rapid detection during outbreaks.

Serology: Serological diagnosis using the viral neutralization test (synonym: serum neutralization [SN] test) cannot distinguish between EHV-1 and EHV-4 infection. Nevertheless, in combination with specific clinical signs, a four-fold or greater rise in antibody titer between acute and convalescent samples collected 14-21 days apart is confirmatory of a recent infection. When a single virus neutralization titer is very high (typically 1024 to 2048 or greater) this is likely to be the result of recent infection rather than vaccination.



A commercial ELISA test kit, suitable for use in practice, is available for detection and differentiation of EHV-1 and EHV-4 specific antibodies directed against viral glycoprotein gG ([Svanovir™](#)).

Contact your diagnostic laboratory for specific instructions regarding sample procurement and further information regarding sampling. Many diagnostic laboratories sell viral transport media and other products. Other sources are available from veterinary distributors.

[Nasal Swab/Transport Media Resource Option](#)

(Note: This is just one resource and is not specifically a recommended or endorsed supplier or product of the AAEP.)

Nasopharyngeal or nasal swab collection procedure for EHV 1/4 and related diseases

Supplies Needed

- Dacron swabs with plastic sticks 5–7 inches (often supplied with bacterial transport medias)
- Plain red top tube (blood tube) or viral transport media
- Few milliliters sterile saline
- Clean exam gloves
- Disinfectant material or wipe

Procedure

1. The horse should be restrained. Pass the swab(s) along the left/right ventral meatus being careful to avoid the false nostril, until you are in the horse's nasal passage. Rotate the swab to increase the collection of respiratory secretions for 5–10 seconds. Two swabs can be done at the same time if more than one sample is needed by the laboratory. Some labs request one sample for qPCR and one for viral isolation. Swabs that contain large amounts of environmental dirt after collection (from horses being kept on a dry lot or in a dusty environment) should be discarded and a new swab collected, since dirt often inhibits PCR analysis. Alternatively, clean the nostril to be collected with a disposable cloth prior to swab collection.
2. Place swab(s) into a plain red top tube and, if available, add 1–2 drops of sterile saline for qPCR/viral isolation. **DO NOT PLACE qPCR/VIRAL ISOLATION SAMPLES IN BACTERIAL TRANSPORT MEDIA.**
3. If sampling more than one horse, fresh gloves should be used for each animal.



4. The outside of tubes should be wiped down with a disinfectant wipe to prevent contamination of other samples or gloves of handlers.
5. Consider all waste materials to be infectious including gloves and swabs, etc.
6. Any restraining equipment such as twitches, nose chains, etc. must be disinfected between use.
7. Keep tubes refrigerated and ship on ice overnight to a diagnostic laboratory of your choice.

Post-mortem EHM: Fatal outcome in horses infected with EHV-1 are most often associated with the neurologic form of the disease, EHM. Definitive diagnosis of EHM in an individual horse is only possible after histological and immunohistochemical examination of CNS tissues in many cases.

- Examination of fresh CNS tissue by qPCR can also be attempted. This requires dissection of the entire spinal cord, followed by both gross and extensive histological examination of each part of the spinal cord
- This procedure is both time- and labor-intensive, and is typically only practical at a properly equipped necropsy laboratory, typically at a state diagnostic laboratory, or at a school of veterinary medicine
- In the USA, the necropsy facility should be accredited by the [American Association of Veterinary Diagnosticians](#). A full list of accredited laboratories is maintained on their website
- The complete carcass should be presented for post-mortem examination as soon as possible after death

EHV abortion: When EHV results in abortion the fetus is usually expelled while still in the placenta and within the amnionic membrane. Almost all abortions occur in the last 4 months of pregnancy. Both the placental and fetal tissues should be submitted for necropsy and specific testing to detect EHV. Biosecurity precautions are indicated when handling the placenta and fetus as both can contain high levels of infective virus. Detailed instructions for veterinarians on how to collect and submit aborted equine fetal and other diagnostic samples from the mare are available at the [Animal Health Diagnostic Center at Cornell University](#).

Shedding of Virus Following Resolution of Clinical Signs

Possibly up to a week, but may be longer in exceptional cases.

Recovered horses typically develop latent infections and are capable of shedding virus following reactivation (with or without signs of clinical disease) particularly under conditions of stress, for the remainder of their lives.

Horses with residual stable neurological signs are not considered when determining the countdown to release from isolation.



Environmental Persistence

Environmental transmission plays a minor role in the maintenance of virus in the horse population since environmental persistence of EHV-1 is short, estimated to be no more than 35 days under ideal conditions and probably less than 7 days in most practical field situations.

Specific Control Measures

Biosecurity

Please view and follow the [AAEP Biosecurity Guidelines](#).

Clinically normal horses housed within the primary perimeter may be permitted segregated exercise periods outside the perimeter. Precautions should be taken, and may include the following:

- Exercise scheduled *after* general population's exercise period to avoid potential virus transfer to unaffected horses/barns by exercise riders
- Access to starting gate or similar equipment denied
- Restricted use of ponies/outriders' horses- horses housed within the primary perimeter may only be escorted by horses housed within the same facility
- Direct horse-to-horse contact is to be avoided
- Prompt post-contact use of alcohol hand sanitizer by individuals having contact with horses during exercise. Clothing can also be a source of transmission

Vaccination

EHV-1 vaccines have been shown to reduce nasal shedding and in some cases, reduce viremia. These products may therefore have some theoretical value against EHM (by reducing viremia), and certainly against spread of the virus by reducing viral shedding in the environment. However, there is not a licensed EHV product with a label claim for prevention or control of EHM.

Booster vaccination of healthy animals in both primary and secondary contagion control perimeters may have some value.

Vaccination in these circumstances is controversial, as some authorities speculate that immunity to EHV-1 may play a role in the development of EHM. While this remains unproven, it is a possibility. The use of vaccination is therefore a risk-based decision.

If animals are unvaccinated prior to an outbreak there is unlikely to be time to administer an effective vaccination series during the risk period based on currently available EHV-1 vaccines. Do not vaccinate clinically ill animals. Please see [AAEP Vaccination Guidelines](#).

Release of animals from isolation

Maintain isolation procedures for 14–28 days after last clinical signs are detected, basing the release date on risk analysis.



Biosecurity Issues for Receiving Animals	<ol style="list-style-type: none"> 1. No horse had a fever (temperature taken at least one time every 24-hour period and without any treatment of non-steroidal anti-inflammatory drug) 2. No horse had an abortion 3. No new cases of neurologic disease (Note: Neurological clinical signs are considered to be resolved when they stabilize, i.e. residual neurological signs are not considered in determining a day 0 for countdown of release of restrictions/isolation.) 4. All exposed horses have been tested and have given a negative result based on testing nasal swabs for EHV-1 by qPCR. EHV-1 testing of horses considered exposed or infected would allow for increased confidence in the release of restrictions/isolation prior the 28-day time period. There should be compliance with requirements by state animal health officials for duration of quarantine and testing. <p>Horses having been housed within primary perimeter: Isolate from general population for 28 days.</p> <p>Horses having been housed within secondary biosecurity perimeter: After having determined its level of risk-aversion, the recipient facility may consider the following:</p> <ol style="list-style-type: none"> 1. Vaccination requirements for entrance into facility 2. Health certificate specifications 3. Test findings (a negative qPCR result on a nasal swab) <p>Update vaccination for animals at recipient facility before arrival of potentially infected/exposed animal.</p>
Zoonotic Potential	None known.

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EQUINE HERPESVIRUS MYELOENCEPHALOPATHY (EHM) & EHV-1 FREQUENTLY ASKED QUESTIONS

1. How do we handle horses returning from events where they may have been exposed to EHV-1?

For horses that may have been exposed to the risk of infection, there are some steps to mitigate the risk at their home facility. Even if these horses are returning home from events at which no disease was reported, and even if these horses appear healthy, precautions are needed as these horses could bring a contagious pathogen home and spread it at their home farm- this is the classic way EHV-1 spreads:

- These horses should be isolated from any other horses when they return to their home facility. Isolation requires housing them away from other horses, using different equipment to feed, clean and work with them than is used with non-isolated horses, and rigorous hygiene procedures for horse handlers (hand hygiene, wearing separate clothes when coming in contact with isolated horses, etc.). Please discuss this with your veterinarian.
- We strongly advise owners to call their veterinarian to discuss how long to keep the horses isolated at home, but even if they don't develop fevers this should be at least 21 days.
- These horses should have their temperature taken twice a day, as elevated temperature is typically the first and most common sign of infection. Horses with elevated rectal temperatures (greater than 101.5 F or 38.6 °C) should be swabbed by your veterinarian to determine if they are shedding EHV-1.
- If a horse develops a fever and is found to be shedding EHV-1, then the level of risk to other horses on the premises increases significantly. Affected farms should work closely with their veterinarian to manage the situation.
- The American Association of Equine Practitioners (AAEP) has an extensive set of [Equine Herpesvirus \(EHV\) Control Guidelines](#) that practitioners can use as a resource.

2. What do we do if we already have a potentially exposed horse on a farm?

- The exposed horse should still be isolated; even if it may have already been in contact with other horses, start isolation procedures to stop further exposure. It is very important to separate horses from different groups to accomplish this. Try to isolate the suspect horse without moving other horses from one group to another. Segregation of horse groups is the key, because this will help reduce spread if an outbreak starts.
- Check temperatures of all horses on the farm twice daily (fever spikes can be missed if you check once daily). If fevers are detected, then isolate the horse and test for EHV-1.
- The value of starting healthy horses on anti-viral treatment when there is no evidence of disease on the farm is questionable. The treatment is expensive, the drug (Valtrex™—valacyclovir) may have limited availability, and prophylactic therapy against EHM will only work while the drug is being administered.



Therefore, it is more likely to be effective if administered when fever is first detected (see below).

3. What anti-viral treatments can I use against EHM on a farm?

- If EHM is present on a farm, then the risk of other horses developing EHM at that farm is greatly increased. Stringent quarantine and biosecurity procedures must be implemented immediately.
- Treatment of horses with clinical neurological disease (EHM) is largely supportive—the use of anti-viral drugs is not known to be of value at this stage. Use of anti-inflammatory drugs is recommended: flunixin meglumine (0.5 to 1 mg/kg, IV, q 24 hours).
- For horses that develop fever, test EHV-1 positive, or have a high risk of exposure, anti-viral drugs may decrease the chance of developing EHM.
- Currently, the treatment of choice in a febrile EHV-1 infected horse for prevention of EHM is valacyclovir (Valtrex™), given orally. The use of oral acyclovir is unlikely to be of any value, as it is poorly absorbed from the GI tract.
- We currently recommend Valacyclovir (Valtrex™) for prophylactic therapy at a dose of 30 mg/kg q 8 hr for two days, then 20 mg/kg q 12 hr for 1–2 weeks. Maintain on higher dose rate if the horse is still febrile.
- The use of valacyclovir in horses that have already developed signs of EHM is questionable at this time. In that circumstance, the use of intravenous Ganciclovir is preferable as it may have greater potency against the disease. The dose of Ganciclovir is 2.5 mg/kg q 8 hr IV for one day then 2.5 mg/kg q 12 hr IV for one week.
- Administration of a zinc-containing supplement may be beneficial based on a recent epidemiologic study that found a decreased risk of EHM associated with owner-reported dietary zinc supplementation.

4. Is there any value to using booster vaccination against EHV-1 at this time?

- Unfortunately, there is not a licensed EHV-1 vaccination product with a label claim for prevention or control of EHM.
- EHV-1 vaccines have been shown to reduce nasal shedding and, in some cases, reduce viremia. These products may therefore have some theoretical value against EHM by reducing viremia, and certainly against spread of the virus by reducing viral shedding in the environment.
- If horses on the farm are previously vaccinated against EHV-1 then booster vaccination should quickly increase immunity, and perhaps reduce spread of EHV-1, if it is present.
- Vaccination in these circumstances is controversial, as some authorities speculate that immunity to EHV-1 may play a role in the development of EHM. While this is unproven, it remains a possibility. The use of vaccination is therefore a risk-based decision.
- Vaccination has no value as a treatment in affected horses.

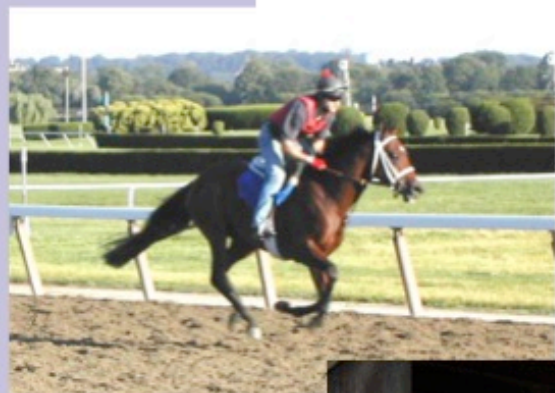
Protect Your Practice & Facility

Caution is recommended at all times during an outbreak to reduce the spread of infection. Movement of horses on and off farms should be limited whenever possible. Reducing stressful activity of the at-risk horse can assist control methods as well.



HORSE HEALTH EDUCATION: EHV

NEUROLOGICAL DISEASE



The neurological form of this disease can be fatal and is the greatest cause for concern at boarding facilities, racetracks and horse shows.



Some horses may display a fever 24-48 hours prior to onset of neurologic signs.



HORSE HEALTH EDUCATION: EHV

NEUROLOGICAL DISEASE



Stress may activate the virus to cause onset of neurologic signs.



HORSE HEALTH EDUCATION: EHV

NEUROLOGICAL DISEASE



The clinical signs commonly seen are:

- Hind-end weakness
- Incoordination
- Toe-dragging
- Dog-sitting
- Urinary/fecal incontinence



HORSE HEALTH EDUCATION: EHV

HOW IS HERAPESVIRUS TRANSMITTED?

- Transmission occurs via respiratory route with infective droplets obtained from coughing and snorting horses. Shedding of the virus in nasal secretions can occur for 14 days.
- Direct contact with virus containing respiratory tract secretions, especially mucus.
- Infection can be obtained from the aborted fetus, fetal tissues and fluids.



HORSE HEALTH EDUCATION: EHV

HOW IS HERPESVIRUS TRANSMITTED?



- Without disinfection, the virus can survive several weeks.
- All horses have the potential to be carriers of the virus whether or not they demonstrate clinical signs.
- The virus is killed by sunlight.



HORSE HEALTH EDUCATION: EHV

WHAT ARE THE METHODS TO CONFIRM A HERPESVIRUS INFECTION?

- Detection of the virus from either nasal swab or blood by virus isolation.
- Polymerase chain reactions (PCR) tests can look for the virus in nasal secretions or whole blood buffy coat or placental and fetal tissue.
- Demonstration of rising titer in serum collected two to four weeks apart.



HORSE HEALTH EDUCATION: EHV

TREATMENT

Because EHV-1 is a virus, it does not respond to antibiotics.

Supportive treatment is the only option and is tailored to the individual patient, guided by the severity and range of clinical signs.



HORSE HEALTH EDUCATION: EHV



TREATMENT

Supportive treatment usually includes anti-inflammatory drugs, fluids to maintain hydration and slinging the horse if unable to stand.

In most cases, horses that remain standing have a good prognosis, although recovery may take weeks or months. Horses that go down and are unable to stand have a poor prognosis.



HORSE HEALTH EDUCATION: EHV

VACCINATION



Vaccination for the respiratory form of EHV may not prevent the disease, but it will decrease the frequency and severity of clinical signs and, more importantly, decrease shedding of the virus to other horses.



HORSE HEALTH EDUCATION: EHV

VACCINATION

The AAEP recommends the following vaccination schedule for EHV-1 and EHV-4 in the prevention of respiratory disease:

Foals/weanlings: First dose beginning at 4-5 months.

Second dose: 4-6 weeks later.

Third dose: At 10-12 months of age.

Then at 6 month intervals



HORSE HEALTH EDUCATION: EHV

VACCINATION



Yearlings: Every 6 months

Horses in Training: Every 6 months—check with your veterinarian as he or she may recommend a more frequent vaccination schedule in these high risk animals

Also: More frequent vaccination than at 6 months intervals may be required in certain cases as a prerequisite for entry to a facility or an equine event—check with your veterinarian and/or event organizer for specific requirements.



HORSE HEALTH EDUCATION: EHV

VACCINATION



Vaccinate all broodmares at the beginning of the 5th, 7th and 9th month of pregnancy. Currently, there are two vaccinations labeled for the prevention of abortion, which are both killed vaccines containing EHV-1.

In addition to the 5, 7 and 9 month schedule, some veterinarians may recommend an additional EHV1 vaccination for broodmares beginning at the 3rd month of pregnancy.



HORSE HEALTH EDUCATION: EHV



VACCINATION

There is no vaccination currently available that is labeled to protect against the neurological form of herpesvirus.

Many veterinarians still recommend vaccination as there is data to demonstrate that some vaccines help reduce the duration and degree of viral shedding of equine herpes virus in vaccinated animals.

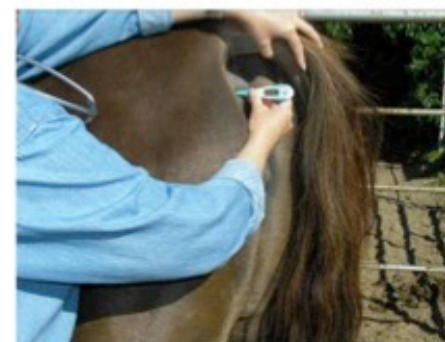


HORSE HEALTH EDUCATION: EHV

CONTROLLING AN OUTBREAK



- Isolate all new animals to the farm for a minimum of 21 days.
- Disinfect all areas of the barn and transport vehicle with either bleach (one part bleach to 10 parts water) or phenolic-based disinfectants.
- Take rectal temperatures twice daily and isolate any horse with a fever.





HORSE HEALTH EDUCATION: EHV

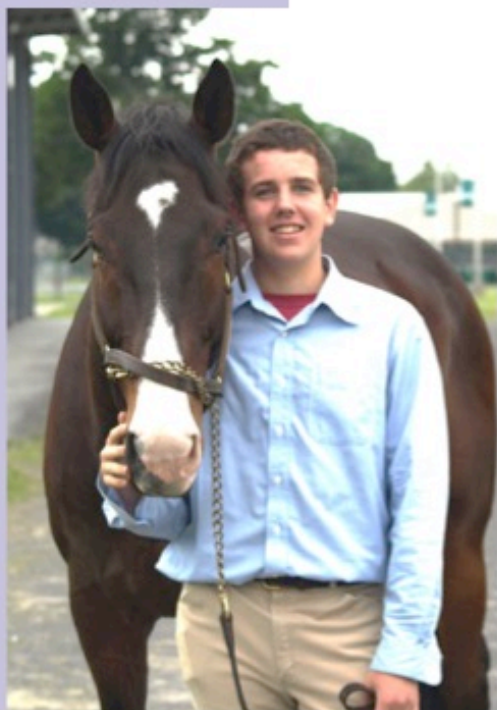
CONTROLLING AN OUTBREAK

- Disinfect after each use any equipment that is shared (ie. bridles, brushes, lead ropes, etc.)
- Keep mares that abort in isolated areas away from the rest of the broodmares.

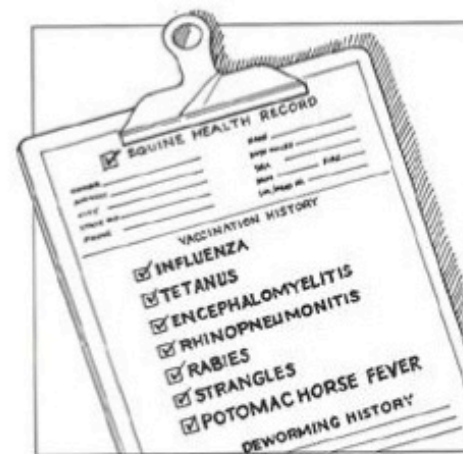


HORSE HEALTH EDUCATION: EHV

PREVENTING AN OUTBREAK



Clinical and exposed horses should not be moved. Consult your veterinarian to determine vaccination and movement requirements for horses which have not been exposed. Some equine venues request proof of vaccination within seven to 90 days of travel. The serial and lot number of the vaccine used for inoculation must also be recorded.





HORSE HEALTH EDUCATION: EHV



For the latest information on equine disease outbreaks across the US go to:

<http://www.equinediseasecc.org/>



HORSE HEALTH EDUCATION: EHV

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