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Equine Immunity, Vaccination Guidelines, and Recommendations

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Why are horses vaccinated?

The ability to mount a defense against disease comes from a healthy immune system. Immunologists recognize that there are two basic forms of immunity, innate and active. Innate or passive immunity involves defensive immune responses that are passively acquired to combat disease. Most animals are born with several innate immune mechanisms and require additional immunity from ingestion of immunoglobulins (antibodies) from their mother's colostrum (first milk). Innate immunity is not specific for disease agents and therefore not very efficient. Yet passive immunity provides a critical step between birth and the gearing up of the active immune system.

Active immunity is more specific and generated from the animal's own immune system as the animal is exposed to pathogens (antigens). Because active immunity is developed in response or exposure to disease, the immunity is more specific, but requires more time to develop.

Animals are constantly exposed to disease pathogens. Vaccines are used as a tool to minimize the effect infectious diseases have on the animals through selectively manipulating the immune system. Vaccines have the ability to stimulate a more specific active immune response.

How do repeated doses or "boosters" affect immunity?

Boosters are required for most types of vaccines during the initial time given to fully stimulate the active immune system. These repeated doses (boosters) create an immune response that is longer in duration with a quicker response. The ability for an immune system to remember foreign pathogens and respond accordingly is called the anamnestic response.

Foals require a series of boosters after the initial vaccine is given. As a foal's immune system matures, the first dose is often less effective when compared to subsequent boosters. It is critical to remember to administer the entire series of recommended shots in a given vaccine protocol.

Why do vaccinated horses have vaccine breakthroughs?

Vaccine breakthrough happens when animals get the disease even though they have been vaccinated. The primary culprit to this event is stress. Stress can affect the immune system in many different ways. In general, stress decreases the body's ability to mount or maintain an effective immunity. The biochemistry behind stress's negative effect on immunity is simply the over production of steroid (cortisol) in the body. This internal cortisol release may decrease the production and response of the immune system.

In the equine industry stress is most commonly found with weaning, training, traveling, and during gestation. Other times of stress can include the ambient temperature the horse is in. When seasons are drastic, and horses are exposed to hot and cold extremes, a horse's stress level may increase.

The vaccine recommendations vary from horse to horse depending on its stage of life and stress levels. For example, the recommendation for equine influenza may increase if the horse is competing, yet decrease as the same horse is being rested for a season.

Another issue that can affect vaccine effectiveness is exposure. A vaccinated horse may come in contact with another horse that is shedding the disease. This increased exposure to the organism may be at levels which overwhelm the protective immunity of the vaccinated horse causing clinical signs. This can be a common cause of vaccine breakthrough.

Is following the label instructions important?

Each vaccine is packaged with label instructions. When administering any biological agent to a horse, one must first read the label and be familiar with stated precautions. Some vaccines contain warnings or precautions that should be followed to minimize the risk to horse and/or human. Vaccines should always be used prior to the expiration date and stored at the correct temperature indicated on the label. Vaccines are most effective when administered according to the label. If the route of administration is intramuscular, giving the injection just under the skin (subcutaneously) may not produce an equivalent immune response than the route indicated on the label.

Which diseases should I vaccinate my horse against?

A number of diseases can be prevented or the affect lessened through the use of vaccinations. While the purpose of this paper is to discuss vaccinations; management and biosecurity also play a critical role in the prevention of disease. Any good vaccination protocol should include thought and planning in management and biosecurity. Consideration should be given to your horse's exposure to common diseases. Horses that travel or are around other horses will have an increased exposure risk. It is critical to consult a veterinarian when developing a vaccination program as they can provide critical insight into the similarities and differences that one farm may have versus another.

Not all equine diseases are found throughout the United States or even throughout Utah. Therefore it is critical to discuss the common diseases seen in your area with a veterinarian. This conversation is essentially a risk assessment for equine diseases in the area. Those diseases recognized as common should be considered first when designing a vaccine strategy.

Vaccine Recommendationsⁱ

The American Association of Equine Practitioners (AAEP), made up of equine veterinarians throughout the world, has developed vaccination recommendations for many classes and stages of a horse's life and lifestyle. These recommendations identify the minimal core vaccine... Core vaccines are defined as vaccinations

“that protect from diseases that are endemic to a region, those with potential public health significance, required by law, virulent/highly infectious, and/or those posing a risk of severe disease. Core vaccines have clearly demonstrated efficacy and safety, and thus exhibit a high enough level of patient benefit and low enough level of risk to justify their use in the majority of patients.”ⁱⁱ

The attached guidelines list the core vaccines along with a variety of other potential vaccines. Again, a vaccination program must be fitted to each individual stable's situation (training facility, competing, boarding facility, etc.) and potential exposure to disease. Furthermore, horses in various life stages may require different vaccine considerations. The table is broken down into different life stages. Your veterinarian can assist in this evaluation. (Click on title to go directly to table.)

Vaccinations for Foals

Vaccinations for Adult Horses

What are the core vaccines recommended for Utah?

Minimally, Utah horse owners should consider including tetanus, Eastern and Western equine encephalitis (EEE/WEE), and West Nile Virus (WNV) each year. The core vaccines could expand should the horse's travel expose it to other disease endemic areas, such as rabies. While Utah does not have reported cases of equine rabies, many neighboring states do (Colorado) and it is more common as you travel east.

Core vaccines for Utah:

- Tetanus
- Eastern and Western equine encephalitis (EEE/WEE)
- West Nile Virus (WNV)
- Rabies (for the public health aspect)

Which risk-based vaccines are commonly used in Utah?

Depending on stage of life, event activity and travel, the following risk-based vaccination regiment should be considered. Veterinarians also may recommend additional vaccines during gestation to help protect the fetus, along with increasing the quality of colostrum (mother's first milk).

Risk-based vaccines to consider are:

- Influenza
- Equine herpes virus (EHV)
- Strangles (if stable, show, or event requires; or if environmental risk is high)

Injection Sites

Vaccines have a specific route of administration indicated on their label. Common routes used are intramuscular (in the muscle), intranasal (in the nostril), and subcutaneous (SQ). The most common route is IM. There are several sites with quality muscle mass that are safe for vaccinations. Most vaccine type injections are given with a 20 gauge 1 to 1 ½ inch sterile needle and sterile syringe. Locations for injections (Figure 1)

include the neck, pectorals, shoulder, lower hip, and thigh regions.

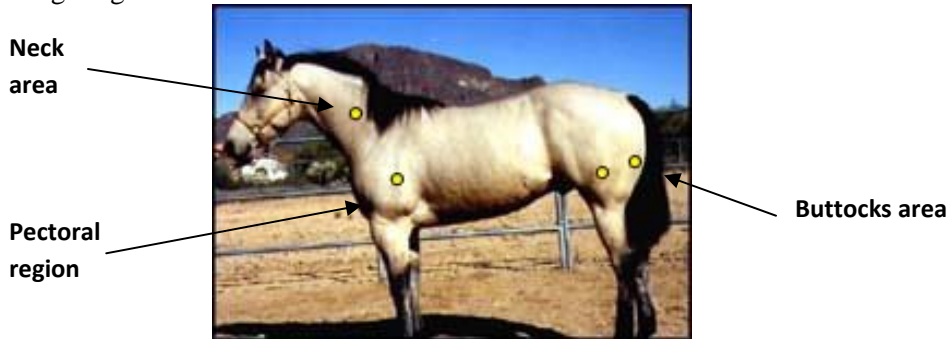


Figure 1. Areas of the horse used for IM injections.

Many people only give IM injections in the neck region but being aware of other sites is important. Some horses react to injections in the neck causing the neck to be sore. Some of these horses will not be able to put their heads down to eat or drink. Being able to give an injection in another site can make the horse more comfortable.

Many veterinarians will teach horse owners how to give injections. It is important to consult with your veterinarian before giving an injection.

Steps for giving an injection

1. Use sterile needles and syringes
2. Clean off site. This area does not need to be sterile but dirt should be brushed off.
3. Stand in a safe area so horse can't kick or bite you. Having a holder is important.
4. Remove the needle from the syringe. This helps the needle remain in the muscle if the horse moves away once the needle is inserted.
5. Bounce your hand or finger several times in the site.
6. Insert the needle perpendicular to the skin and full length of needle.
7. Attach the syringe and pull back on the plunger (aspirate). If blood is seen in the syringe upon aspirating, the needle should be redirected as IM substances are not meant to go into a blood vessel. To redirect, the needle can be backed out about one-half of its length and then directed back in on a different angle. Aspirate again.
8. Deposit the substance and remove the needle, dispose of the needle and syringe.

Summary

Vaccinations are an important part of horse management. Your horse can remain healthier when protected from diseases. Disease prevention is often less expensive than treatment or loss associated with disease.

The American Association of Equine Practitioners (AAEP) has specific core and risk-based vaccine recommendations for your horse. Using these recommendations along with consultation with your local veterinarian can form the basis for a preventative health program specific for your area, needs, and horse.

ⁱ Adapted From American Association of Equine Practitioners (AAEP)

ⁱⁱ AVMA Policy Statement: **Vaccination Principles** (Approved by the AVMA Executive Board April 2001; revised April 2007).

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VACCINATIONS FOR FOALS

****ALL VACCINATION PROGRAMS SHOULD BE DEVELOPED IN CONSULTATION WITH A LICENSED VETERINARIAN****

The two categories below reflect differences in the foal's susceptibility to disease and ability to mount an appropriate immune response to vaccination based on the presence (or absence) of maternal antibodies derived from colostrums. The phenomenon of maternal antibody interference is discussed in the text portion of these guidelines.

CORE VACCINATIONS protect against diseases that are endemic to a region, those with potential public health significance, required by law, virulent/highly infectious, and/or those posing a risk of severe disease. Core vaccines have clearly demonstrated efficacy and safety, and thus exhibit a high enough level of patient benefit and low enough level of risk to justify their use in all equids.

	Foals and Weanlings (<12 months of age)	Foals and Weanlings (<12 months of age)	
	<i>Of mares vaccinated in the prepartum period against the disease indicated</i>	<i>Of unvaccinated mare</i>	
DISEASE			COMMENTS
Tetanus	3-dose series: 1 st dose at 4-6 months of age 2 nd dose 4-6 weeks after the 1 st dose 3 rd dose at 10-12 months of age	3-dose series: 1 st dose at 1-4 months of age 2 nd dose at 4 weeks after the 1 st dose 3 rd dose 4 weeks after 2 nd dose	
Eastern/Western Equine Encephalomyelitis (EEE/WEE)	3-dose series: 1 st dose at 4-6 months of age* 2 nd dose at 4-6 weeks after 1 st dose 3 rd dose at 10-12 months of age, prior to the onset of the next vector season. *Foals in the Southeastern USA: The primary vaccination series should be initiated with an additional dose at 3 months of age due to early seasonal vector presence.	3-dose series: 1 st dose at 3-4 months of age* 2 nd dose 4 weeks after 1 st dose 3 rd dose at 10-12 months of age, prior to the onset of the next vector season. *Foals in the Southeastern USA: The primary vaccination series should be initiated at 3 months of age due to early seasonal vector presence.	<i>Note:</i> Primary vaccination series scheduling may be amended with vaccinations administered earlier to younger foals that are at increased disease risk due to the presence of vectors. A foal born during the vector season may warrant beginning vaccination at an earlier age than a foal born prior to the vector season.
Rabies	3-dose series: 1 st dose at 6 months of age 2 nd dose 4-6 weeks after 1 st dose 3 rd dose at 10-12 months of age	3-dose series: 1 st dose at 3-4 months of age 2 nd dose 4 weeks after 1 st dose 3 rd dose at 10-12 months of age	
West Nile Virus (WNV)	<u>Inactivated vaccine*</u> 3-dose series: 1 st dose at 4-6 months of age 2 nd dose 4-6 weeks after 1 st dose 3 rd dose at 10-12 months of age, prior to the onset of the next vector season. <u>Recombinant canary pox vaccine</u> 3-dose series: 1 st dose at 5-6 months of age 2 nd dose 4 weeks after 1 st dose 3 rd dose at 10-12 months of age, prior to the onset of the next vector season. <u>Flavivirus chimera vaccine</u> 2-dose series: 1 st dose at 5-6 months of age 2 nd dose at 10-12 months of age,	<u>Inactivated vaccine*</u> 3-dose series: 1 st dose at 3-4 months of age 2 nd dose at 4 weeks after 1 st dose 3 rd dose at 10-12 months of age, prior to the onset of the next vector season. <u>Recombinant canary pox vaccine</u> 3-dose series: 1 st dose at 5-6 months of age 2 nd dose at 4 weeks after 1 st dose 3 rd dose at 10-12 months of age, prior to the onset of the next vector season. <u>Flavivirus chimera vaccine</u> 2-dose series: 1 st dose at 5-6 months of age 2 nd dose at 10-12 months of age	<i>Note:</i> Primary vaccination series scheduling may be amended with vaccinations administered to younger foals that are at increased risk of exposure due to the presence of vectors. A foal born during the vector season may warrant initiation of the primary vaccination series at an earlier age than a foal born prior to the vector season There is no data for the use of the recombinant or chimera product in foals <5 months of age. If either product is administered to foals at

	<p>prior to the onset of the next vector season.</p> <p>*Foals in the Southeastern USA: Due to early seasonal vector presence, the primary vaccination series should be initiated earlier with the addition of a dose at 3 months of age.</p>	<p>prior to the onset of the next vector season.</p> <p>*Foals in the Southeastern USA: Due to early seasonal vector presence, the primary vaccination series should be initiated at 3 months of age.</p>	<p><5 months of age, the recommended primary schedule should still be completed.</p>
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RISK-BASED VACCINATIONS are those having applications which may vary between individuals, populations, and geographic regions. Risk assessment should be performed by, or in consultation with, a licensed veterinarian to identify which vaccines are appropriate for a given horse or population of horses. The listing of a vaccine here is not a recommendation for its inclusion into a vaccination program. Vaccine scheduling is provided for use after it has been determined which, if any, risk-based vaccines are indicated. Note: vaccines are listed in this table in alphabetical order not in order of priority for use.

DISEASE	Foals and Weanlings (<12 months of age) <i>Of mares vaccinated in the prepartum period against the disease indicated</i>	Foals and Weanlings (<12 months of age) <i>Of unvaccinated mares</i>	COMMENTS
Anthrax	Not applicable. As it is not recommended to vaccinate mares during pregnancy there will be no foals of mares vaccinated prepartum	No age specific guidelines are available for this vaccine. Manufacturer's recommendation is for primary series of 2 doses administered subcutaneously at a 2-3 week interval.	Antimicrobial drugs must not be given concurrently with this vaccine. Caution should be used during storage, handling and administration of this live bacterial product. Consult a physician immediately should accidental human exposure (via mucus membranes, conjunctiva or broken skin) occur.
Botulism	3-dose series: 1 st dose 2-3 months of age 2 nd dose 4 weeks after 1 st dose 3 rd dose 4 weeks after 2 nd dose	3-dose series: 1 st dose 1-3 months of age 2 nd dose 4 weeks after 1 st dose 3 rd dose 4 weeks after 2 nd dose	Maternal antibody does not interfere with vaccination; foals at high risk may be vaccinated as early as 2 weeks of age.
Equine Herpesvirus (EHV)	<u>Inactivated or modified live vaccine</u> 3-dose series: 1 st dose 4-6 months of age 2 nd dose 4-6 weeks after 1 st dose 3 rd dose at 10-12 months of age Revaccinate at 6-month intervals	<u>Inactivated or modified live vaccine</u> 3-dose series: 1 st dose of 4-6 months of age 2 nd dose 4-6 weeks after 1 st dose 3 rd dose at 10-12 months of age Revaccinate at 6-month intervals.	
Equine Viral Arteritis (EVA)	Colt (male) foals: Single dose at 6-12 months of age (see comments)	Colt (male) foals: Single dose at 6-12 months of age (see comments)	<u>Prior to initial vaccination, colt (male) foals should undergo serologic testing</u> and be confirmed negative for antibodies to EAV. Testing should be performed shortly prior to, or preferably at, the time of vaccination. As foals can carry colostral derived antibodies to EAV for up to 6 months, testing and vaccination should not be performed prior to 6 months of age.

<p>Equine Influenza</p>	<p><u>Inactivated vaccine</u> 3-dose series: 1st dose at 6 months of age 2nd dose 3-4 weeks after 1st dose 3rd dose at 10-12 months of age</p> <p><u>Modified live vaccine</u> 2-dose series administered intranasally: 1st dose at 6-7 months of age 2nd dose at 11-12 months of age</p> <p>Revaccinate at 6-month intervals</p>	<p><u>Inactivated vaccine</u> 3-dose series: 1st dose at 6 months of age 2nd dose at 3-4 weeks after 1st dose 3rd dose at 10-12 months of age</p> <p><u>Modified live vaccine</u> 2-dose series administered intranasally: 1st dose at 6-7 months of age 2nd dose at 11-12 months of age</p> <p>Revaccinate at 6-month intervals</p>	<p>An increased risk of disease may warrant vaccination of younger foals. Because some maternal, anti-influenza antibody is likely to be present, a complete series of primary vaccinations should be given after 6 months of age.</p>
<p>Potomac Horse Fever (PHF)</p>	<p>2-dose series: 1st dose at 5 months of age 2nd dose 3-4 weeks after 1st dose</p>	<p>2-dose series: 1st dose at 5 months of age 2nd dose 3-4 weeks after 1st dose</p>	<p>If risk warrants, vaccine may be administered to younger foals. Subsequent doses are to be administered at 4-week intervals until 6 months of age.</p>
<p>Rotavirus</p>	<p>Not recommended in foals</p>	<p>Not recommended in foals</p>	
<p>Strangles <i>Streptococcus equi</i></p>	<p><u>Killed vaccine</u> 3-dose series: 1st dose at 4-6 months of age 2nd dose 4-6 weeks after 1st dose 3rd dose 4-6 weeks after 2nd dose</p> <p><u>Modified live vaccine</u> 3-dose series administered intranasally: 1st dose at 6-9 months of age 2nd dose 3-4 weeks after 1st dose 3rd dose at 11-12 months of age</p>	<p><u>Killed vaccine</u> 3-dose series: 1st dose at 4-6 months of age 2nd dose 4-6 weeks after 1st dose 3rd dose 4-6 weeks after 2nd dose</p> <p><u>Modified live vaccine</u> 3-dose series administered intranasally: 1st dose at 6-9 months of age 2nd dose 3-4 weeks after 1st dose 3rd dose at 11-12 months of age</p>	<p>Vaccination is not recommended as a strategy in outbreak mitigation.</p> <p>If risk warrants, the modified live vaccine (MLV) may be safely administered to foals as young as 6 weeks of age. However, vaccine efficacy in this age group has not been adequately studied. If MLV is administered to younger foals, a 3rd dose of vaccine should then be administered 2-4 weeks prior to weaning.</p>

Vaccinations for Foals developed by the American Association of Equine Practitioners Infectious Disease Committee, 2008.

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VACCINATIONS FOR ADULT HORSES

**ALL VACCINATION PROGRAMS SHOULD BE DEVELOPED IN CONSULTATION
WITH A LICENSED VETERINARIAN**

CORE VACCINATIONS protect against diseases that are endemic to a region, are virulent/highly contagious, pose a risk of severe disease, those having potential public health significance, and/or are required by law. Core vaccines have clearly demonstrable efficacy and safety, with a high enough level of patient benefit and low enough level of risk to justify their use in all equids.

	Broodmares	Other Adult Horses (>1 year of age) <i>Previously vaccinated against the disease indicated</i>	Other Adult Horses (>1 year of age) <i>Unvaccinated or Lacking vaccination history</i>	
DISEASE				COMMENTS
Tetanus	<p><i>Previously vaccinated</i> Annual, 4-6 weeks pre-partum</p> <p><i>Previously unvaccinated or having unknown vaccination history:</i> 2-dose series 2nd dose 4-6 weeks after 1st dose Revaccinate 4-6 weeks pre- partum</p>	Annual	2-dose series 2 nd dose 4-6 weeks after 1 st dose. Annual revaccination	Booster at time of penetrating injury or prior to surgery if last dose was administered over 6 months previously.
Eastern/Western Equine Encephalomyelitis (EEE/WEE)	<p><i>Previously vaccinated:</i> Annual, 4-6 weeks pre-partum</p> <p><i>Previously unvaccinated or having unknown vaccination history:</i> 2-dose series 2nd dose 4 weeks after 1st dose Revaccinate 4-6 weeks pre- partum</p>	Annual – spring, prior to onset of vector season	2-dose series 2 nd dose 4-6 weeks after 1 st dose Revaccinate prior to the onset of the next vector season	Consider 6-month revaccination interval for: <ol style="list-style-type: none"> 1. Horses residing in endemic areas 2. Immunocompressed horses
West Nile Virus (WNV)	<p><i>Previously vaccinated:</i> Annual, 4-6 weeks pre-partum</p> <p><i>Unvaccinated or lacking vaccination history:</i> It is preferable to vaccinate naïve mares when open.</p> <p>In areas of high risk, initiate primary series as described for unvaccinated adult horses.</p>	Annual – spring, prior to onset of vector season	<p><u><i>Inactivated vaccine:</i></u> 2-dose series 2nd dose 4-6 weeks after 1st dose Revaccinate prior to the onset of the next vector season</p> <p><u><i>Recombinant canary pox vaccine:</i></u> 2-dose series 2nd dose 4-6 weeks after 1st dose Revaccinate prior to the onset of the next vector season</p> <p><u><i>Flavivirus chimera vaccine:</i></u> Single dose Revaccinate prior to onset of the next vector season</p>	When using the inactivated or the recombinant product, consider 6-month revaccination interval for: <ol style="list-style-type: none"> 1. Horses residing in endemic areas 2. Juvenile (<5 yrs of age) 3. Geriatric horses (>15 yrs of age) 4. Immunocompressed horses
Rabies	Annual, 4-6 weeks pre-partum OR Prior to breeding*	Annual	Single dose Annual revaccination	*Due to the relatively long duration of immunity, this vaccine may be given post-foaling but prior to breeding and thus reduce the number of vaccines given to a mare pre-partum

RISK-BASED VACCINES are selected for use based on risk assessment** performed by, or in consultation with, a licensed veterinarian. Use of these vaccines may vary between individuals, populations, and/or geographic regions.

Note: Vaccines are listed in this table in alphabetical order, not in order of priority for use.

**Refer to “Principles of Vaccination” in main document for criteria used in performing risk assessment.

	Broodmares	Other Adult Horses (>1 year of age) <i>Previously vaccinated against the disease indicated</i>	Other Adult Horses (>1 year of age) <i>Unvaccinated or Lacking vaccination history</i>	
DISEASE				COMMENTS
Anthrax	Not recommended during gestation	Annual	2-dose series 2 nd dose 3-4 weeks after 1 st dose Annual revaccination	Do not administer concurrently with antibiotics. Use caution during storage, handling and administration. Consult a physician immediately if human exposure to vaccine occurs by accidental injection, ingestion, or otherwise through the conjunctiva or broken skin.
Botulism	<i>Previously vaccinated:</i> Annual, 4-6 weeks pre-partum <i>Previously unvaccinated or having unknown vaccination history:</i> 3-dose series 1 st dose at 8 months gestation 2 nd dose 4 weeks after 1 st dose 3 rd dose 4 weeks after 2 nd dose	Annual	3-dose series 2 nd dose 4 weeks after 1 st dose 3 rd dose 4 weeks after 2 nd dose Annual revaccination	
Equine Herpesvirus (EHV)	3-dose series with product labeled for protection against EHV abortion. Give at 5, 7 and 9 months of gestation.	Annual (see comments)	3-dose series 2 nd dose 4-6 weeks after 1 st dose 3 rd dose at 4-6 weeks after 2 nd dose	Consider 6-month revaccination interval for: 1. Horses less than 5 years of age. 2. Horses on breeding farms or in contact with pregnant mares. 3. Performance or show horses at high risk.
Equine Viral Arteritis (EVA)	Not recommended unless high risk.	Annual <i>Stallions, teasers:</i> Vaccinate 2-4 weeks before breeding season. <i>Mares:</i> Vaccinate when open.	Single dose (see comments)	<u>Prior to initial vaccination, intact males and any horses potentially intended for export should undergo serologic testing</u> and be confirmed negative for antibodies to EAV. Testing should be performed shortly prior to, or preferably at, the time of vaccination.

<p>Influenza</p>	<p><i>Previously vaccinated:</i> <u>Inactivated vaccine:</u> Semi-annual with one dose administered 4-6 weeks pre-partum <u>Canary pox vector vaccine:</u> Semi-annual with one dose administered 4-6 weeks pre-partum</p> <p><i>Previously unvaccinated or having unknown vaccination history:</i> <u>Inactivated vaccine:</u> 3-dose series 2nd dose 4-6 weeks after 1st dose 3rd dose 4-6 weeks pre-partum <u>Canary pox vector vaccine:</u> 2-dose series 2nd dose 4-6 weeks after 1st dose but no later than 4 weeks pre-partum</p>	<p>Horses with ongoing risk of exposure: semi-annual</p> <p>Horses at low risk of exposure: Annual</p>	<p><u>Modified live vaccine:</u> Single dose administered intranasally. Revaccinate semi-annually to annually.</p> <p><u>Inactivated vaccine:</u> 3-dose series 2nd dose 4-6 weeks after 1st dose 3rd dose 3-6 months after 2nd dose Revaccinate semi-annual to annually.</p> <p><u>Canary pox vector vaccine:</u> 2-dose series 2nd dose 4-6 weeks after 1st dose Revaccinate semi-annually</p>	
<p>Potomac Horse Fever (PHF)</p>	<p><i>Previously vaccinated:</i> Semi-annual, with one dose given 4-6 weeks prepartum.</p> <p><i>Previously unvaccinated or having unknown vaccination history:</i> 2-dose series 1st dose 7-9 weeks prepartum 2nd dose 4-6 weeks prepartum</p>	<p>Semi-annual to annual</p>	<p>2-dose series 2nd dose 3-4 weeks after 1st dose Semi-annual or annual booster</p>	<p>A revaccination interval of 3-4 months may be considered in endemic areas when disease risk is high</p>
<p>Rotavirus</p>	<p>3-dose series 1st dose at 8 months gestation 2nd and 3rd dose at 4-week intervals thereafter</p>	<p>Not applicable</p>	<p>Not applicable</p>	
<p>Strangles <i>Streptococcus equi</i></p>	<p><i>Previously vaccinated:</i> <u>Killed vaccine containing M-protein:</u> Semi-annual with one dose given 4-6 weeks pre-partum</p> <p><i>Previously unvaccinated or having unknown vaccination history:</i> <u>Killed vaccine containing M-protein:</u> 3-dose series 2nd dose 2-4 weeks after 1st dose 3rd dose 4-6 weeks prepartum</p>	<p>Semi-annual to annual</p>	<p><u>Killed vaccine containing M-protein:</u> 2-3 dose series 2nd dose 2-4 weeks after 1st dose 3rd dose (where recommended by manufacturer) 2-4 weeks after 2nd dose Revaccinate semi-annually</p> <p><u>Modified live vaccine:</u> 2-dose series administered intranasally 2nd dose 3 weeks after 1st dose Revaccinate semi-annually to annually</p>	<p>Vaccination is not recommended as a strategy in outbreak mitigation</p>

Vaccinations for Adult Horses developed by the American Association of Equine Practitioners Infectious Disease Committee, 2008.

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