AAEP Vaccination Guidelines Executive Summary

As the name implies, this document constitutes "guidelines" for equine practitioners when making vaccination decisions for their patients. The recommendations for vaccine administration in this document may differ from the manufacturer's recommendations. It is incumbent on each individual practitioner to reach a decision on vaccine usage based on the circumstances of each unique situation and his or her professional experience. As such, a "standard" vaccination program for all horses does not exist. And depending upon these unique situations, the final vaccination recommendations may differ from those found here, as the attending veterinarian is the best authority for those decisions.

Principles of Vaccination

Vaccination decisions should be based upon: risk of disease, consequences of disease, effectiveness of selected products, potential for adverse events and the cost of immunization versus potential cost of disease. Veterinarians provide the foundation for realistic client expectations with respect to vaccination and should help their clients understand that 1) no vaccine is 100% effective in preventing disease; 2) vaccination without good management will not prevent infectious disease; 3) horses within a population vary in degree and duration of protective response after vaccination; and 4) protection is not immediate and requires the appropriate number of immunizations administered at appropriate intervals (prior to significant exposure).

Concepts in Vaccine Usage

A. Vaccine Technology

The vaccine technology utilized in equine products continues to evolve and improve. The two primary categories for vaccines are "live" (most commonly modified live) and "killed" or inactivated products with the latter being the most commonly used in equine practice. The killed products require an adjuvant system to effectively present antigen to the immune system for processing and to properly stimulate/amplify an immune response. New technologies have allowed for the development of recombinant vaccines that contain antigenic properties of the pathogen. The recombinant products are available in both inactivated and live vaccine formulations and these formulations may also require adjuvant systems.

B. Vaccine labeling

To use vaccines appropriately, veterinarians should be familiar with the respective product labels. The label claims granted by USDA will depend upon the level of protection demonstrated in well controlled studies by the product sponsors. Very briefly, in descending order of protection (from highest to lowest) these label claims read: "Prevention of infection," "Prevention of disease," "Aid in disease prevention," "Aid in disease control" and other claims such as "reduction of pathogen shedding" and "reduction in severity."

C. Vaccine Storage and Handling

Because proper vaccine storage and handling are critical to maintaining efficacy and safety, practitioners should read labels to ensure proper storage and handling conditions are achieved. Storage conditions should be monitored both within the clinic and the practice vehicle. Aseptic technique should always be utilized for injection and products administered via the intended route. 2

D. Vaccination and Passive Transfer

It is important to vaccinate broodmares 4 to 6 weeks before foaling for their own protection, as well as to maximize concentrations of immunoglobulins in their colostrum to be passively transferred to their foals. The majority of vaccines administered to broodmares during late gestation to maximize immunoglobulin transfer via the colostrum, do not carry a "safe for use in pregnant mare" claim. However, this is an accepted practice and clinical experience indicates these products are safe for this purpose. If the practitioner has specific safety questions or concerns, he or she is encouraged to contact the manufacturer for additional information.

Vaccination of a foal in the presence of colostral antibodies can potentially have a negative impact on vaccine efficacy because of maternal antibody interference. Foals with residual maternal antibodies generally produce a greater serologic response to killed vaccines when an initial series of three doses is administered, rather than the 2-dose series recommended by most manufacturers of vaccines for older horses without residual maternal antibodies.

E. Vaccination in an Infectious Disease Control Program
Infectious disease control measures are very important to maintain the health, productivity and performance of horses. The AAEP has excellent information on this topic which can be found at http://www.aaep.org/control_guidelines_intro.htm

Adverse Reactions
Because foreign material (including proteins and adjuvants) is being injected into a biological system, the risk of adverse reactions associated with vaccine use cannot be eliminated. These reactions can range from local soreness and swelling to life-threatening anaphylaxis. The potential for adverse reactions should be properly explained to the owner prior to vaccination. Whenever an adverse event occurs, the veterinarian should report it to the vaccine manufacturer and/or the USDA at (800) 752-6255 or online at http://www.aphis.usda.gov/animal_health/vet_biologics/vb_adverse_event.shtml. Veterinarians should always record the vaccine serial number in the medical record and provide this when reporting an adverse event.

Core Vaccination Guidelines:
Core vaccines are defined as those that: protect animals from diseases that are endemic to a region or have potential public health significance, are required by law, protect against virulent and highly infectious organisms, 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. The core equine vaccines include tetanus, eastern and western equine encephalomyelitis (EEE/WEE), West Nile virus and Rabies.

I. Tetanus
Adult horses: Tetanus toxoid is administered. Initial 2-dose series at a 3- to 4-week interval followed by a yearly booster. Horses that sustain a wound or undergo surgery 6 or more months after their previous tetanus booster should be revaccinated with tetanus toxoid immediately at the time of injury or surgery.
Foals of mares vaccinated against tetanus in prepartum period: Administer a 3-dose series beginning 4 to 6 months of age with a 4- to 6-week interval between the first and second doses and the third dose administered at 10 to 12 months of age.
Foals of unvaccinated mares or unknown vaccination history: Administer a 3-dose series beginning 1 to 4 months of age with a 4-week interval between doses.

II. EEE/WEE
Adult horses: An initial 2-dose series at a 4- to 6-week interval is followed by a yearly booster prior to the vector season. In high risk animals, and in areas with year-round vectors, more frequent vaccination is recommended during periods of likely exposure (twice yearly).
Foals of mares vaccinated against EEE/WEE in prepartum period: Administer a 3-dose series beginning at 4 to 6 months of age with a 4- to 6-week interval between the first and second dose. The third dose is administered at 10 to 12 months of age.
Foals of unvaccinated mares or having unknown vaccinal history: Administer a primary series of 3 doses beginning at 3 to 4 months of age, with a 30-day interval between the first and second doses and a 60-day interval between the second and third doses. If the primary series is initiated during the mosquito vector season, an interval of 3 to 4 weeks between the second and third doses is preferable to the above described interval of 8 weeks.

III. West Nile Virus
Adult horses: An initial 2-dose series at a 3- to 6-week interval is recommended with a yearly booster prior to the vector season. In high risk animals, and in areas with year-round vectors, more frequent vaccination (with any of the currently licensed products) may be recommended to meet the vaccination needs of these horses.
Foals of vaccinated mares: Administer a primary 3-dose series beginning at 4-6 months of age with a 4- to 6-week interval between the first and second dose. The third dose should be administered at 10 to 12 months of age prior to the onset of the next mosquito season.

Foals of unvaccinated mares or having unknown vaccinal history: Administer a primary series of 3 doses beginning at 3 to 4 months of age, with a 30-day interval between the first and second dose and a 60-day interval between the second and third dose. If the primary series is initiated during the mosquito vector season, an interval of 3 to 4 weeks between the second and third dose is preferable to the above described interval of 8 weeks.

IV. Rabies
Note: Rabies is an excellent immunogen and these vaccines induce a strong serologic response after a single dose.

Adult horses: Following an initial single-dose administration, rabies vaccines are administered as a yearly booster.

Foals of mares vaccinated against tetanus in prepartum period: Administer a 3-dose series beginning 4 to 6 months of age with a 4- to 6-week interval between the first and second doses and the third dose administered at 10 to 12 months of age.

Foals of unvaccinated mares or unknown vaccination history: Administer a 3-dose series beginning 1 to 4 months of age with a 4-week interval between doses.

Risk-Based Vaccination Guidelines
These are vaccine products which are used following a risk-benefit appraisal by the attending veterinarian. The use of risk-based vaccinations may vary regionally, from population to population within an area, or between individual horses within a given population. The diseases and associated vaccine products included in risk-based vaccination guidelines include: anthrax, botulism, equine herpesvirus type 1 and 4, equine viral arteritis, equine influenza, rotaviral diarrhea and strangles. The practitioner can find additional information on all risk-based guidelines within the complete guidelines on this website.

Strangles

Streptococcus equi subspecies equi (S. equi var. equi) is the bacterium which causes the highly contagious disease strangles (also known as “distemper”). Strangles commonly affects young horses (weanlings and yearlings), but horses of any age can be infected. Vaccination against S. equi is recommended on premises where strangles is a persistent endemic problem or for horses that are expected to be at high risk of exposure. Following natural infection, a carrier state of variable duration may develop and intermittent shedding may occur. The influence of vaccination on intermittent shedding of S. equi has not been adequately studied.

The organism is transmitted by direct contact with infected horses or sub-clinical shedders, or indirectly by contact with: water troughs, hoses, feed bunks, pastures, stalls, trailers, tack, grooming equipment, nose wipe cloths or sponges, attendants’ hands and clothing, or insects contaminated with nasal discharge or pus draining from lymph nodes of infected horses. Streptococcus equi has demonstrated environmental survivability particularly in water sources and when protected from exposure to direct sunlight and disinfectants, and can be a source of infection for new additions to the herd.

Infection by S. equi induces a profound inflammatory response. Clinical signs may include fever (102-106^{o} F); dysphagia or anorexia; stridor; lymphadenopathy (+/- abscessation); and copious

mucopurulent nasal discharge.

S. equi and S. zooepidemicus are antigenically similar organisms. However, exposure to, or vaccination against, one does not confer reliable immunity to the other.

Following natural or vaccinal exposure to streptococcal antigens, certain individuals may unpredictably develop purpura hemorrhagica, an acute, non-contagious syndrome caused by immune-mediated, generalized vasculitis. Clinical signs develop within 2 to 4 weeks following natural or vaccinal exposure to streptococcal antigens. Clinical signs may include urticaria with pitting edema of the limbs, ventral abdomen and head; subcutaneous and petechial hemorrhage; and sloughing of involved tissues. Severe edema of the head may compromise breathing. Immediate medical attention should be sought for individual horses suspected of having purpura hemorrhagica.

Vaccines:

Vaccination in the face of an outbreak should be carefully considered, as there is significantly increased risk of adverse reactions in exposed horses. Purpura hemmorrhagica can be associated with vaccine administration. In a recent retrospective study of 53 horses with purpura hemorrhagica, 5 cases were vaccinated with a S. equi M protein vaccine. Outbreak mitigation and the prevention of spread of S. equi infection are centered on management of horses, personnel, and facilities.

(View AAEP Infectious Disease Control Guidelines—S. equi.; view ACVIM Strep equi consensus statement)

Killed vaccines

Killed vaccines are an adjunct to the prevention of strangles. Vaccination with these products should not be expected to prevent disease. However, appropriate pre-exposure vaccination with these products appears to attenuate the severity of clinical signs in affected horses, should disease occur, and has been shown to reduce the incidence of disease by as much as 50% during outbreaks.

All injectable, inactivated S. equi. vaccines, can be associated with an increased rate of injection site reactions as compared to other equine vaccines. Due to the limited variability between commercially available vaccinal bacteria and field isolates, autogenous bacterins are not advocated.

Modified live vaccine

An intranasal product has been shown to stimulate a high level of immunity against experimental challenge. The inductive sites are the pharyngeal and lingual tonsils. Vaccinal organisms must reach these sites in sufficient numbers to trigger protective responses; therefore, accurate vaccine delivery is critical to vaccine efficacy. In a small percentage of cases, residual vaccinal organism virulence may result in formation of slowly developing mandibular or

retropharyngeal abscesses. The risk of vaccine-associated adverse events is increased when the product is administered to young foals.

Maternal antibody interference with respect to the development of mucosal immunity needs to be studied further.

In order to avoid inadvertent contamination of other vaccines, syringes and needles, it is advisable and considered a good practice to administer all parenteral vaccines or other injectables before the handling and administration of the intranasal vaccine against S. equi.

Vaccination Schedules:

Adult horses previously vaccinated: Vaccinate every 6 to 12 months based on risk assessment and manufacturers' recommendations.

Adult horses unvaccinated or having unknown vaccinal history

Killed vaccine:

Manufacturers' recommendations are for primary vaccination with a series of 2 or 3 doses administered at intervals of 2 to 4 weeks, depending on the product used, followed by annual revaccination. Revaccinate at 6- month intervals, regardless of the injectable product used.

Modified live vaccine:

Administer intranasally a 2-dose primary series with a 3 week interval between doses. Semiannual (6-month intervals) or annual revaccination is recommended.

Broodmares previously vaccinated

Killed vaccine:

Vaccinate 4 to 6 weeks pre-partum with approved products that contain inactivated M-protein. Maternal antibody interference is not known to occur when injectable, M-protein vaccines are administered.

Broodmares previously unvaccinated or having unknown vaccinal history

Administer primary series of killed vaccine containing M-protein (see above, Adult horses unvaccinated) with final dose to be administered 4 to 6 weeks pre-partum.

Foals

Killed vaccine:

For foals at high risk for exposure to strangles, administer a 3-dose primary series of an M-

protein product beginning at 4 to 6 months of age. An interval of 4 to 6 weeks between doses is recommended.

Modified live vaccine:

Administer intranasally at 6 to 9 months of age a 2-dose primary series with a 3-week interval between doses. This vaccine has been safely administered to foals as young as 6 weeks of age when there is a high risk of infection, such as occurs during an outbreak, but the efficacy of its use in very young foals has not been adequately studied. If administered to young foals in this manner, a third dose of the modified live vaccine should be administered 2 to 4 weeks before the foal is weaned to optimize protection during that time of high risk of infection. The risk of vaccine-associated adverse events is increased when the product is administered to young foals.

Horses having been naturally infected and recovered: Following recovery from strangles, most horses develop a durable immunity, persisting in over 75% of animals for 5 years or longer. This indicates that stimulation of a high level of immunity is biologically feasible given appropriate presentation of protective immunogens. Currently, a diagnostic test is available and may be used to assess the level of immunity conferred by natural exposure or vaccination. Since natural exposure or vaccination can provide variable levels of immunity, use of this test may provide a guideline in determining the need for current or future vaccination. Additional testing information is available from; ACVIM Strep equi consensus statement.

Snake Bite

Venomous snake bite of equids occurs in certain areas of North America. The risk of rattlesnake envenomation may justify the use of *Crotalus atrox* (Western Diamondback Rattlesnake) toxoid vaccine in equids. Pre-exposure vaccination may be recommended for those animals in geographic areas or for those traveling to areas where exposure to venomous snakes justifies vaccine usage.

Vaccine:
There is one conditionally licensed inactivated (Crotalus atrox Toxoid) vaccine for use in healthy horses 6 months of age or older as an aid in the reduction of morbidity and mortality due to intoxication with *Crotalus atrox* toxin.

The label claim for the vaccine is that it may also provide protection against the venoms of the Western Rattlesnake (including the Prairie, Great Basin, Northern and Southern Pacific varieties), Sidewinder, Timber Rattlesnake, Massasauga and the Copperhead. Partial protection may be obtained against Eastern Diamondback Rattlesnake venom. This vaccine does not provide protection against venom from the Water Moccasin (Cottonmouth), Mojave Rattlesnake or Coral Snake.

Vaccination Schedule:
Use in healthy horses 6 months of age or older.

Adult horses: Administer a primary series of three doses at one month intervals. Booster doses are recommended at 6 month intervals.

Pregnant mares: Manufacturer information claims the product is safe for use in pregnant mares, however this information does not appear on the product label. It is recommended veterinarians contact the manufacturer with questions regarding use in pregnant mares.

Foals: (6 months of age and older) Administer a primary series of three doses at one month intervals. Booster doses are recommended at 6 month intervals. There is no specific information available regarding the vaccination of foals

less than 6 months of age.

Potomac Horse Fever

Equine monocytic ehrlichiosis is caused by Neorickettsia risticii (formerly Ehrlichia risticii). Originally described in 1979 as a sporadic disease affecting horses residing in the eastern United States near the Potomac River, the disease has since been identified in various other geographic locations in the United States and Canada. The disease is seasonal, occurring between late spring and early fall in temperate areas, with most cases in July, August, and September at the onset of hot weather.

Clinical signs are variable but may include: fever, mild to severe diarrhea, laminitis, mild colic, and decreased abdominal sounds. Uncommonly, pregnant mares infected with N. risticii (usually in the middle trimester between 90 and 120 days) can abort due to fetal infection at 7 months of gestation.

If Potomac Horse Fever has been confirmed on a farm or in a particular geographic area, it is likely that additional cases will occur in future years. Foals appear to have a low risk of contracting the disease. Vaccination against this disease has been questioned because field evidence of benefit is lacking. Proposed explanations for this include lack of seroconversion and multiple field strains whereas only one strain is present in available vaccines.

Vaccine

The currently available commercial vaccines are killed, adjuvanted products. Two of these are also available combined with a rabies vaccine. None of the current vaccines carry a label claim for the prevention of abortion.

Vaccination Schedules

Due to the seasonal incidence of disease, vaccination should be timed to precede the anticipated peak challenge during the summer months or fall.

Adult horses, previously vaccinated: Manufacturers recommend revaccination at 6- to 12-month intervals. However, veterinarians may consider an interval of 3 to 4 months for horses in endemic areas because protection following vaccination can be incomplete and short-lived.

Adult horses, previously unvaccinated or with unknown vaccinal history: Administer a primary series of 2 doses, at a 3- to 4-week interval. Peak protection occurs 3 to 4 weeks after the second dose.

Pregnant mares previously vaccinated against PHF: Vaccinate semi-annually to annually. Schedule 1 dose to be administered 4 to 6 weeks before foaling. To date no studies have been published that examine the efficacy of PHF vaccines to prevent N. risticii induced abortion.

Pregnant mares unvaccinated or with unknown vaccinal history: Administer a primary series of

2 doses, at a 3- to 4-week interval. Schedule so that 2nd dose is administered 4 to 6 weeks before foaling.

Foals: Due to the low risk of clinical disease in young foals and the possible maternal antibody interference, primary immunization for most foals can begin after 5 months of age. The manufacturer's recommendation is for a 2-dose series administered at a 3- to 4-week interval. However, as with other killed products, a third dose at 12 months of age is recommended. If the primary series is initiated when foals are less than 5 months of age, additional doses should be administered at monthly intervals up to 6 months of age to ensure that an immunologic response is achieved.

Horses having been naturally infected and recovered: Administer a primary series (as described above) or booster vaccine (if previously vaccinated) 12 months following recovery from natural infection.

Equine Herpesvirus (Rhinopneumonitis)

Equine herpesvirus type 1 (EHV-1) and equine herpesvirus type 4 (EHV-4) can each infect the respiratory tract, causing disease that varies in severity from sub-clinical to severe and is characterized by fever, lethargy, anorexia, nasal discharge, and cough. Infection of the respiratory tract with EHV-1 and EHV-4 typically first occurs in foals in the first weeks or months of life, but recurrent or recrudescent clinically apparent infections are seen in weanlings, yearlings, and young horses entering training, especially when horses from different sources are commingled. Equine herpesvirus type 1 causes epidemic abortion in mares, the birth of weak nonviable foals, or a sporadic paralytic neurologic disease (equine herpesvirus myeloencephalopathy-EHM) secondary to vasculitis of the spinal cord and brain.

Both EHV-1 and EHV-4 spread via aerosolized secretions from infected coughing horses, by direct and indirect (fomite) contact with nasal secretions, and, in the case of EHV-1, contact with aborted fetuses, fetal fluids, and placentae associated with abortions. Like herpesviruses in other species, these viruses establish latent infection in the majority of horses, which do not show clinical signs but may experience reactivation of infection and shedding of the virus when stressed. Those epidemiologic factors seriously compromise efforts to control these diseases and explain why outbreaks of EHV-1 or EHV-4 can occur in closed populations of horses.

Because both viruses are endemic in most equine populations, most mature horses have developed some immunity through repeated natural exposure; thus, most mature horses do not develop serious respiratory disease when they become infected but may be a source of exposure for other susceptible horses. In contrast, horses are not protected against the abortigenic or neurologic forms of the disease, even after repeated exposure, and mature horses are in fact more commonly affected by the neurologic form of the disease than are juvenile animals.

Recently, a genetic variant of EHV-1 has been described (defined by a single point mutation in the DNA polymerase [DNApol] gene) that is more commonly associated with neurologic disease. This mutation results in the presence of either aspartic acid (D) or an asparagine (N) residue at position 752. Molecular diagnostic techniques can identify EHV-1 isolates carrying these genetic markers, although currently the implications of this finding for management of

EHV-1 outbreaks, or individual horses actively or latently infected with these isolates, are uncertain. It is important to understand that both isolates can and do cause neurological disease, it is just more common for the D_{752} isolates to do so (it is estimated that 80-90% of neurological disease is caused by D_{752} isolates, and 10-20% by N_{752} isolates). Experts do not currently advise any specific management procedures for horses based on which isolate they are latently infected with, and it is possible that 5-10% of all horses normally carry the D_{752} form (this estimate is based on limited studies at this time). In the face of an active outbreak of EHV-1 disease, identification of a D_{752} isolate may be grounds for some increased concern about the risk of development of neurological disease.

Primary indications for use of equine herpesvirus vaccines include prevention of EHV-1-induced abortion in pregnant mares, and reduction of signs and spread of respiratory tract disease (rhinopneumonitis) in foals, weanlings, yearlings, young performance and show horses that are at high risk for exposure. Many horses do produce post-vaccinal antibodies against EHV, but the presence of those antibodies does not ensure complete protection. Consistent vaccination appears to reduce the frequency and severity of disease and limit the occurrence of abortion storms but unambiguously compelling evidence is lacking. Management of pregnant mares is of primary importance for control of abortion caused by EHV-1.

Vaccines:

Inactivated vaccines

A variety of inactivated vaccines are available, including those licensed only for protection against respiratory disease, which currently all contain a low antigen load, and two that are licensed for protection against both respiratory disease and abortion which contain a high antigen load. Performance of the inactivated low antigen load respiratory vaccines is variable, with some vaccines outperforming others. Performance of the inactivated high antigen load respiratory/abortion vaccines is superior, resulting in higher antibody responses and some evidence of cellular responses to vaccination. This factor may provide good reason to choose the high antigen load respiratory/abortion vaccines when the slightly higher cost is not a decision factor.

Modified live vaccine

A single manufacturer provides a licensed modified live EHV-1 vaccine. It is indicated for the vaccination of healthy horses 3 months of age or older as an aid in preventing respiratory disease caused by equine herpesvirus type 1 (EHV-1).

EHM

All available vaccines make no label claim to prevent the myeloencephalitic form of EHV-1 (EHM) infection. Vaccines may assist in limiting the spread of outbreaks of EHM by limiting nasal shedding EHV-1 and dissemination of infection. For this reason some experts hold the opinion that there may be an advantage to vaccinating in the face of an outbreak, but in advance of EHV-1 infection occurring in the group of horses to be vaccinated. The vaccines with the

greatest ability to limit nasal shedding include the 2 high-antigen load, inactivated vaccines licensed for control of abortion (Pneumabort-K®: Pfizer; & Prodigy® Merck), a MLV vaccine (Rhinomune®, Boehringer Ingelheim Vetmedica) and an inactivated vaccine, (Calvenza®, Boehringer Ingelheim Vetmedica).

Vaccination against either EHV-1 or EHV-4 can provide partial protection against the heterologous strain; vaccines containing EHV-1 may be superior in this regard.

Vaccination schedules:

Adult, non-breeding, horses previously vaccinated against EHV : Frequent vaccination of non-pregnant mature horses with EHV vaccines is generally not indicated as clinical respiratory disease is infrequent in horses over 4 years of age. In younger/juvenile horses, immunity following vaccination appears to be short-lived. It is recommended that the following horses be revaccinated at 6-month intervals:

- Horses less than 5 years of age.
- Horses on breeding farms or in contact with pregnant mares.
- Horses housed at facilities with frequent equine movement on and off the premises, thus resulting in an increased risk of exposure.
- Performance or show horses in high-risk areas, such as racetracks. More frequent vaccination may be required as a criterion for entry to the facility.

Adult, non-breeding horses unvaccinated or having unknown vaccinal history: Administer a primary series of 3 doses of inactivated EHV-1/EHV-4 vaccine or modified-live EHV-1 vaccine. A 4 to 6 week interval between doses is recommended.

Pregnant mares: Vaccinate during the fifth, seventh, and ninth months of gestation using an inactivated EHV-1 vaccine licensed for prevention of abortion. Many veterinarians also recommend a dose during the third month of gestation and some recommend a dose at the time of breeding.

Vaccination of mares with an inactivated EHV-1/EHV-4 vaccine 4 to 6 weeks before foaling is commonly practiced to enhance concentrations of colostral immunoglobulins for transfer to the foal. Maternal antibody passively transferred to foals from vaccinated mares may decrease the incidence of respiratory disease in foals, but disease can still occur in those foals and infection is common.

Barren mares at breeding facilities: Vaccinate before the start of the breeding season and thereafter based on risk of exposure.

Stallions and teasers: Vaccinate before the start of the breeding season and thereafter based on risk of exposure.

Foals: Administer a primary series of 3 doses of inactivated EHV-1/EHV-4 vaccine or modified-live EHV-1 vaccine, beginning at 4 to 6 months of age and with a 4 to 6 week interval between

the first and second doses. Administer the third dose at 10 to 12 months of age.

Immunity following vaccination appears to be short-lived and it is recommended that foals and young horses be revaccinated at 6-month intervals.

The benefit of intensive vaccination programs directed against EHV-1 and EHV-4 in foals and young horses is not clearly defined because, despite frequent vaccination, infection and clinical disease continue to occur.

Outbreak mitigation: In the face of an outbreak, horses at high risk of exposure, and consequent transmission of infection, may be revaccinated. Administration of a booster vaccination is likely to be of some value if there is a history of vaccination. The simplest approach is to vaccinate all horses in the exposure area—independent of their vaccination history. If horses are known to be unvaccinated, the single dose may still produce some protection.

There remain concerns that heavily vaccinated horses may be more susceptible to developing neurological disease caused by EHV-1. This possibility is unsubstantiated and a subject of active investigation. To date, the use of a single vaccine immediately before exposure has not shown any association with an increased incidence of neurological disease.

Horses having been naturally infected and recovered: Horses with a history of EHV infection and disease, including neurological disease, are likely to have immunity consequent to the infection that can be expected to last for 3 to 6 months (longer in older horses). Booster vaccination can be resumed 6 months after the disease occurrence.

Equine Influenza

Equine influenza, caused by the orthomyxovirus equine influenza A type 2 (A/equine 2), is one of the most common infectious diseases of the respiratory tract of horses. It is endemic in the equine population of the United States and throughout much of the world, with the notable exceptions of New Zealand and Iceland. Equine influenza virus does not constantly circulate, even in large groups of horses, but is sporadically introduced by an infected horse. This epidemiologic finding and the rapid elimination of the virus by the equine immune response suggest that infection can be avoided by preventing entry of the virus into an equine population (i.e. by the quarantine of newly arriving horses for at least 14 days), and by appropriate vaccination before exposure. All horses should be vaccinated against equine influenza unless they live in a closed and isolated facility.

To date, the most important factors associated with increased risk of infection have been identified as:

1) Age: Horses 1 to 5 years old are more susceptible. Older horses are generally less susceptible to infection, but immunity can be overwhelmed in horses frequently exposed at shows or similar athletic events.

2) Serum concentrations of influenza virus-specific antibody: The importance of local mucosal

protection is difficult to quantitate by methods currently available.

3) Frequent contact with large numbers of horses.

Equine influenza is highly contagious and the virus spreads rapidly through groups of horses in aerosolized droplets dispersed by coughing. The severity of clinical signs depends on the degree of existing immunity, among other factors. Horses that are partially immune can become subclinically infected and shed virus. Immunity to the same (homologous) strain of virus following natural infection persists for approximately one year. Immunity following vaccination with inactivated influenza vaccines can be short-lived, allowing recently vaccinated horses to become infected and shed virus, thereby contributing to maintenance and spread of infection within the equine population. For these reasons, only vaccines of proven efficacy should be selected for use.

Although influenza is endemic in many countries and circulates continuously in the equine population, explosive outbreaks occur at intervals of several years when the immunity of the equine population wanes, and sufficient antigenic drift in the virus has occurred, allowing the virus to evade vaccinal immunity. Antigenic drift, by generating antigenically heterologous viruses, reduces the degree and duration of protection conferred by previous infection or vaccination. Although antigenic drift of equine influenza virus is slower than that of human influenza virus, it is still recommended that equine vaccines contain killed viral antigens from isolates obtained within the most recent 5 years The 2010 OIE Expert Surveillance Panel on equine influenza vaccine composition had a number of findings and recommendations:

- All equine influenza virus isolates in the previous two years (2008-09) were of the American lineage (Florida sublineage), and comprised two clades: Clade 1 was identified in North America, and parts of Europe; and Clade 2 was identified in Europe and parts of Asia. Global surveillance is likely insufficient to assure that these geographic restrictions are absolute but it seems likely that the equine influenza viruses circulating in North America are all from Clade 1: i.e. A/South Africa/2003-like or A/Ohio/2003-like.
- Because of the antigenic differences between Florida Clade 1 and Clade 2, it is possible that vaccination with only one of these antigens will not fully protect against disease caused by the other. However, at this time there is no evidence of a vaccine failure resulting from this phenomenon. This means that North American horses vaccinated with a Clade 1 virus, such as A/Ohio/2003-like, should be protected from current circulating North American influenza viruses, but may not be fully protected if they travel overseas, or in the event that Clade 2 viruses are introduced to North America, for example in a horse transported here for competition.
- The OIE panel recommended that vaccines contain examples of both Clade 1 (e.g. A/South Africa/2003-like or A/Ohio/2003-like) and Clade 2 (A/Richmond/1/2007) viruses particularly for horses traveling internationally.
- The absence of any isolation of Eurasian lineage influenza virus means these viruses no longer need to be included in vaccines.

Historically, equine influenza vaccines have been administered at intervals as short as every 3 months to horses considered at high risk of infection. All currently marketed equine influenza vaccines are likely to provide protection of at least six months duration. This is true for both of

the modified live vaccines on the market today, and for inactivated vaccines. This performance depends on the quality of currently marketed vaccines, and maintaining this performance will depend on the inclusion of any new antigenically distinct equine influenza viruses that may appear in the horse population in the future.

Vaccines:

There are three types of equine influenza virus vaccine currently marketed:

Inactivated vaccines

Each of these has been shown to be efficacious in providing protection against clinical disease and viral shedding when used appropriately. These vaccines frequently include multiple strains of equine influenza virus A2 representing the major circulating strains. Some of these vaccines also contain the A1 strain (now thought to be extinct), because this was part of their original formulation; this strain will likely be phased out of all equine vaccines in time. The majority of these vaccines require two-dose priming regimens, although a three-dose priming regimen is recommended here as described below; a 3-dose regimen is required for at least one of the most effective inactivated vaccines. These vaccines are well suited to pre-foaling boosters designed to increase colostral antibody levels against influenza virus.

Modified-live (MLV) cold-adapted equine influenza /A2 vaccine

This product is administered intranasally. The vaccine has proven to be very safe and a single administration to naïve horses is protective for 12 months, although only a 6-month claim is made on the product data sheet. Circulating antibody responses post-vaccination are minimal, suggesting that that other factors, such as local protection at the nasal mucosa may be enhanced by this vaccine. The product is licensed for vaccination of non-pregnant animals over 11 months of age using a single dose of vaccine, followed by boosters at 6-month intervals. Generally, horses shed vaccinal virus for less than 1 week after vaccination. However, the amount and duration of shed vaccinal virus is so minimal that other horses in contact with them will not be vaccinated. Incorporation of the MLV vaccine into a program which previously used inactivated vaccine can be easily accomplished by just substituting the MLV when routine boosters are scheduled.

Experience strongly supports the safety of the MLV intranasal vaccine when administered to foals less than 11 months of age. Similarly, the vaccine is protective when administered to foals six months of age or older. The onset of protection in previously unvaccinated naïve horses has been documented as early as seven days after vaccination. The vaccine is not recommended for vaccination of mares in late pregnancy to boost colostral antibodies, as data available to date suggest that circulating antibody responses to vaccination are low.

Canary pox vector vaccine

This product is to be administered by intra-muscular injection and has been shown to provide protection of at least six months duration. A two-dose priming regimen is recommended, with

boosters at a six-month interval. The vaccine is safe to use in foals as young as four months of age, and there is some evidence of efficacy in the face of maternal immunity. Because this vaccine generates high levels of antibody response, it is likely to be suitable for pre-foaling boosters.

Vaccination Schedules:

Adult horses, previously vaccinated: Mature performance, show, or pleasure horses constantly at risk of exposure should be revaccinated at 6-month intervals. Other adult horses could be vaccinated as infrequently as once a year.

Adult horses, unvaccinated or having an unknown vaccination history: Either one dose of the MLV intranasal vaccine or a 2-dose series of canary pox vector vaccine at a 4- to 6-week interval (revaccinate semi-annually) or a primary series of 3 doses of the inactivated-virus vaccines is recommended. The ideal intervals between these vaccinations are three to four weeks between the first and the second vaccination, followed by an interval ideally as long as three to six months before the third vaccination. This regimen generally induces higher and more persistent antibody titers than those induced by use of the previously recommended 2-dose initial series. Subsequent revaccination should be at intervals of 6 to 12 months, depending on the age of the horse as well as the degree and duration of risk of acquiring infection.

Pregnant broodmares, previously vaccinated: Vaccinate 4 to 6 weeks before foaling using an inactivated-virus vaccine or the canary pox vectored vaccine.

Pregnant broodmares, unvaccinated or having an unknown vaccination history: Use a 3-dose series of the inactivated-virus vaccines, with the second dose administered 4 to 6 weeks after the first dose and the third dose administered 4 to 6 weeks pre-partum. With a canary pox vector vaccine, a 2-dose series is recommended with the second dose administered 4 to 6 weeks after the first dose but no later than 4 weeks pre-partum.

Foals of vaccinated mares: Administer either a single dose of the MLV intranasal vaccine (2 doses are recommended if foal is less than 11 months of age, 1st dose at 6 to 7 months of age and second dose at 11 to 12 months of age) or a primary series of 2 doses of canary pox vector vaccine at a 5- week interval or 3 doses of inactivated-virus vaccine beginning at 6 months of age. The recommended intervals between these vaccinations with an inactivated-virus vaccine are 4 to 6 weeks between the first and the second vaccinations. The third dose should be administered between 10 and 12 months of age.

Foals of nonvaccinated mares: Administer either a single dose of the MLV intranasal vaccine (2 doses are recommended if foal is less than 11 months of age, 1st dose at 6 to 7 months of age and second dose at 11 to 12 months of age) or a primary series of 2 doses of canary pox vector vaccine at a 5-week interval or 3 doses of inactivated virus vaccine at 6 months of age (see above), unless there is an unusual threat that recommends earlier vaccination. Because some maternal anti-influenza antibody is still likely to be present, a complete series of primary vaccinations should still be given after 6 months of age.

Outbreak Mitigation:

Vaccination to boost immunity in the face of an outbreak may be a valuable strategy if the outbreak is detected early enough. In previously vaccinated horses, any vaccine can be used for this purpose. In unvaccinated horses, or horses with an unknown vaccination history, the early onset of immunity after administration of the intranasal product (protection within 7 days), may recommend it for use. The use of a canary pox vectored vaccine may also be considered for this purpose. (View AAEP Infectious Disease Control Guidelines—Influenza.)

Equine Viral Arteritis

Equine viral arteritis (EVA) is a contagious disease of equids caused by equine arteritis virus (EAV), an RNA virus that is found in horse populations in many countries. While typically not life-threatening to otherwise healthy adult horses, EAV can cause abortion in pregnant mares; uncommonly, death in young foals; and establish a long-term carrier state in breeding stallions. While various horse breeds appear equally susceptible to EAV, the prevalence of infection can vary widely, with higher seropositivity rates occurring in Standardbreds and Warmbloods.

Historically, outbreaks of EVA have been relatively infrequent. However, the number of confirmed occurrences appears to be increasing, likely attributable to increases in:

1) global movement of horses

2) accessability of carrier stallions

3) utilization of shipped cooled or frozen virus-infective semen

Transmission most frequently occurs through direct contact with virus-infective respiratory secretions leading to widespread dissemination of the virus among susceptible horses in close proximity. Venereal transmission by infected stallions has a significant role in virus spread on or between breeding farms. Equine arteritis virus can be very efficiently spread through artificial insemination and the use of fresh-cooled or frozen semen. There is limited evidence that virus can also be transmitted via embryo transfer where the donor mare is bred with infective semen from a carrier stallion. The virus has been shown to remain viable for considerable periods of time in raw, extended or frozen semen held at temperatures equal to or less than 4°C. Indirect transmission, though less significant, can occur through contact with virus-contaminated fomites.

The majority of primary EAV infections are subclinical or asymptomatic. EVA can vary in clinical severity both between and within outbreaks. EVA cannot be diagnosed based on clinical signs alone, as case presentation is similar to various other infectious and non-infectious equine diseases. Laboratory confirmation is required for diagnosis.

Clinical signs, if they occur, typically develop 3 to 7 days post-infection and are variable but

may include any combination or all of the following: fever; depression; anorexia; dependent edema (lower limbs, scrotum and prepuce or mammary glands); localized or generalized urticaria; supra or periorbital edema; conjunctivitis; lacrimal discharge and serous to mucoid nasal discharge. Abortion is a frequent sequel to infection in the unprotected, pregnant mare. When pregnant mares are exposed to the virus very close to term, they may not abort but give birth to a congenitally infected foal, affected with a rapidly progressive and fulminant interstitial pneumonia. Foals within a few months of age, if exposed to EAV can develop a life-threatening pneumonia or pneumoenteritis.

A carrier state can develop following EAV infection in the post-pubertal colt or stallion. The virus can persist in the reproductive tract of stallions for many years and may result in lifelong infection. The carrier stallion is widely accepted as the natural reservoir of EAV and the source of diversity among naturally occurring strains of the virus.

Vaccine:

The current licensed vaccine in N. America is a highly attenuated, modified live virus product. It has been shown to be safe and effective in stallions and non-pregnant mares. Mild post-vaccinal febrile reactions with transient lymphopenia have been observed in a small percentage of first-time vaccinated horses. Primary vaccination provides clinical protection against EVA but does not prevent re-infection and limited replication of challenge virus. However, in first-time vaccinates, the frequency, duration, and amount of vaccine virus that is shed via the respiratory tract is significantly less than that observed with natural infection.

Vaccination in the face of an EVA outbreak has been successful in controlling further spread of the virus within 7 to 10 days. Inmunization with the MLV vaccine stimulates a rapid protective response which in turn restricts development of the cell-associated viremia and viral shedding via the respiratory tract in horses naturally exposed to infection. As a consequence, the amount of EAV in circulation is greatly decreased, limiting further spread of the virus.

Vaccination Schedules:

In planning a vaccination program against EVA, it is important to consult with state and/or federal animal health officials to ensure that any such program is in compliance with the state's control program for EVA, if one exists.

The indications for vaccination against EVA have been:

1) To protect stallions against infection and subsequent development of the carrier state.

2) To immunize seronegative mares before being bred with EAV-infective semen.

3) To curtail outbreaks in non-breeding populations.

Note: It is not possible to differentiate vaccine-induced antibody response from that due to natural infection. It is strongly recommended that prior to vaccination, serum from all first-time

vaccinates be tested and confirmed negative for antibodies to EAV by a USDA-approved laboratory. Mares intended for export should be similarly tested.

Stallions

Breeding stallions, previously vaccinated: Should receive an annual booster vaccination against EVA every 12 months and no earlier than 4 weeks before the start of each breeding season.

Breeding stallions, first-time vaccinates: Prior to initial vaccination, all stallions shall undergo serologic testing and are confirmed to be negative for antibodies to EAV. Testing should be performed shortly prior to, or preferably at, the time of vaccination. Negative certification is of importance should a vaccinated stallion be considered for export at a later date. All first-time vaccinated stallions should be isolated for 3 weeks following vaccination before being used for breeding.

Teasers can play a role in the introduction and dissemination of EAV within a breeding population. Vaccination against EVA is recommended on an annual basis.

Mares to be bred to carrier stallions or to be bred with virus-infective semen should first be tested to determine their serological status for EAV antibodies.

Seronegative mares should be vaccinated against EVA and isolated from any other seronegative horses for 3 weeks. The purpose of the isolation period is twofold:

1) To enable the vaccinated mare adequate time to develop immunity against the disease before being exposed to EAV infection during breeding.

2) To afford ample opportunity for cessation of possible post-vaccinal viral shedding via the respiratory tract.

Following insemination, first-time vaccinated mares must be isolated for an additional 3-week period as they are likely to experience a limited re-infection cycle with the strain of EAV present in the semen. Should such mares fail to become pregnant, they can be bred back to a carrier stallion or with infective semen without the need for revaccination or an additional 3-week isolation period post-insemination.

In the case of embryo transfer, it is recommended that both donor and recipient mare, if seronegative, be vaccinated against EVA where the donor mare is to be bred with virus infective semen.

Seropositive mares, having tested serologically positive for antibodies to EAV, can be bred to a carrier stallion or with infective semen for the first time without the need for prior vaccination against EVA. After breeding, such mares should be physically separated from unvaccinated or unprotected horses for 24 hours to avoid possible risk of mechanical transmission of virus from voided semen.

Pregnant mares: The manufacturer does not recommend use of this vaccine in pregnant mares, especially in the last two months of pregnancy. Under circumstances of high risk of natural exposure to infection, the vaccine has been administered to pregnant mares in order to control outbreaks of the disease. Based on early experimental studies and field experiences using this vaccine, the last 1-2 months of pregnancy represent the time of greatest risk for a possible adverse effect on pregnancy. This was most recently illustrated in the aftermath of the 2006 multi-state occurrence of EVA when a very limited number of abortions associated with the vaccine virus were confirmed in mares vaccinated within the final 2 months of gestation.

Nurse mares can play a role in the introduction and spread of EAV among resident equine populations and should be vaccinated annually according to recommended protocols.

Foals The manufacturer does not recommend use of this vaccine in foals less than 6 weeks of age unless under circumstances of high risk of natural exposure to infection.

Colt (male) foals Especially in EAV endemic breeds, colt foals should be vaccinated between 6 and 12 months of age to protect against the risk of their becoming carriers later in life. Colts should be confirmed seronegative for antibodies to EAV prior to vaccination as described above and kept isolated for 3 weeks following vaccination. As foals of EAV-seropositive mares can carry colostral derived antibodies for up to 6 months, testing and vaccination should not be performed prior to 6 months of age.

Outbreak Mitigation

Non-breeding population: Vaccination is an effective strategy in containing outbreaks, particularly in congregated groups of horses where isolation may be problematic. Serologic testing, as described above, should be performed on intact males and females that may be intended for future breeding purposes and/or export.

Breeding population: Outbreaks of EVA can be complex and can have far reaching implications. Vaccination is a component of outbreak management but should be performed only under the direct supervision of a veterinarian. (Link to AAEP infectious disease guidelines)

Vaccination and Exporting of Horses

In instances where there is uncertainty or concern over whether vaccination against EVA could prevent the export of a horse to a particular country, it is advisable to consult the federal area veterinarian in charge in the state to determine the specific import requirements of that country. There are a number of countries which bar entry of any equid that is serologically positive for antibodies to EAV, regardless of vaccination history. Countries which do accept EVA vaccinated horses, regardless of gender, typically require stallions or colts to have a certified vaccination history and confirmation of pre-vaccination negative serological status.

Rotaviral Diarrhea

Rotavirus, a non-enveloped RNA virus, is a major infectious cause of foal diarrhea and has been

documented to cause 50% or more of foal diarrhea cases in some areas.

While rotavirus diarrhea morbidity can be high (50% of susceptible foals), mortality is low (<1%) with veterinary intervention.

Equine rotavirus is transmitted via the fecal-oral route and damages the small intestinal villi resulting in cellular destruction, maldigestion, malabsorption, and diarrhea.

As many as 70% of all foals in the United States will have at least one diarrheal episode prior to weaning. Mare owners need to be aware that strict biosecurity and disinfection during the foaling season also mitigates the morbidity associated with most types of infectious foal diarrheas and other contagious diseases.

Vaccination of mares results in a significant increase in foals' rotavirus antibody titers. Field trials of rotavirus vaccination in pregnant mares have shown a decrease in incidence and severity of foal diarrhea on farms that historically had annual rotaviral diarrhea cases. Other studies have shown increased rotavirus antibody in vaccinated mares' colostrum.

Vaccine:

The only available vaccine contains inactivated rotavirus Group A and is indicated for administration to pregnant mares to enhance concentrations of colostral immunoglobulins against equine rotavirus (Group A). The vaccine has been used in mares since 1996 in the USA and is considered to be safe.

Vaccination Schedules:

Pregnant mares (regardless of vaccination history): Should receive a 3-dose series of intramuscular vaccinations at 8, 9, and 10 months of gestation.

Concentrated horse breeding areas in the US routinely use rotavirus vaccine in pregnant mares. Pregnant mares that will be shipped to regions that have had a history of rotaviral diarrhea should also be considered candidates for vaccination.

**It is essential that the newborn foal receives an adequate amount of colostrum and absorbs sufficient anti-rotavirus antibodies from rotavirus-vaccinated mares.

Newborn foals: There are no data to suggest that vaccination of the newborn foal with inactivated rotavirus A vaccine has any benefit for preventing or reducing the severity of infection.

As colostral-derived antibody titers wane at approximately 60 days of age, foals may develop rotaviral diarrhea. However, the severity of diarrhea is generally milder and of shorter duration than foals that become ill within the first 30 days of life.

Other adult horses: Vaccination is unnecessary

Botulism

Botulism has been observed in horses as a result of the action of potent toxins produced by the soil-borne, spore-forming bacteria, Clostridium botulinum:

- Wound botulism results from vegetation of spores of Cl. botulinum and subsequent production of toxin in contaminated wounds.
- Shaker Foal Syndrome (toxicoinfectious) results from toxin produced by vegetation of ingested spores in the intestinal tract.
- Forage poisoning results from ingestion of preformed toxin produced by decaying plant material, including improperly preserved hay or haylage, or animal carcass remnants present in feed.
- Equine Grass Sickness (Equine Dysautonomia) is considered a form of botulism resulting from the overgrowth of Cl. botulinum type C in the intestinal tract, especially the ileum. There are reports of isolated cases of the disease occurring in the U.S.

Botulinum toxin is the most potent biological toxin known and acts by blocking transmission of impulses in nerves, resulting in weakness progressing to paralysis, inability to swallow, and frequently, death. Of the 8 distinct toxins produced by sub-types of Cl. botulinum, types B and C are associated with most outbreaks of botulism in horses.

Vaccine:

A killed vaccine (toxoid) directed against Cl. botulinum type B only is licensed for use in horses in the United States. Its primary indication is for prevention of the Shaker Foal Syndrome by colostral transfer of antibodies produced by vaccination of the pregnant mare. Almost all cases of Shaker Foal Syndrome, a significant problem in Kentucky and in the mid-Atlantic seaboard states in foals between 2 weeks and 8 months of age, are caused by Cl. botulinum type B. Limited information suggests that foals vaccinated with the toxoid at 2 weeks, 4 weeks and at 8 weeks of age developed adequate serologic response, even in the presence of passive maternal antibodies.

There are no licensed vaccines available for preventing botulism due to Cl. botulinum type C or other subtypes of toxins. Cross-protection between the B and C subtypes does not occur; thus routine vaccination against Cl. botulinum type C is not currently practiced.

Vaccination Schedule:

Previously vaccinated pregnant mares: Vaccinate annually with a single dose 4 to 6 weeks before foaling.

Previously unvaccinated pregnant mares: Vaccinate during gestation with a primary series of 3 doses administered at 4-week intervals and scheduled so that the last dose will be administered 4 to 6 weeks before foaling to enhance concentrations of immunoglobulin in colostrum (i.e. months 8, 9, 10 of gestation).

Foals of vaccinated mares (in endemic areas): Administer a primary series of 3 doses, at 4-week

intervals, starting at 2 to 3 months of age. As maternal antibody does not interfere with vaccine response, foals at high risk may have the vaccination series initiated as early as 2 weeks of age.

Foals of unvaccinated mares (born in, or moving to, endemic areas): Administer a primary series of 3 doses, at 4-week intervals, beginning at 1 to 3 months of age. Foals at high risk may have the vaccination series initiated as early as 2 weeks of age. Foals of unvaccinated mares may benefit from transfusion of plasma from a vaccinated horse or from administration of Cl. botulinum type B antitoxin. The efficacy of these practices needs further study.

All other horses (where indicated): Administer a primary series of 3 doses of vaccine given at 4-week intervals and followed by annual revaccination.

Horses having been naturally infected and recovered: Duration of immunity following natural infection is highly variable. As serum antibody does not interfere with response to vaccination, a recovered horse (foal or adult) may receive a primary 3-dose series (given at 4-week intervals between doses) after it is fully recovered from the disease.

Anthrax

Anthrax is a serious and rapidly fatal septicemic disease caused by proliferation and spread of the vegetative form of *Bacillus anthracis* in the body. Infection is acquired though ingestion, inhalation or contamination of wounds by soil-borne spores of the organism. Anthrax is encountered only in limited geographic areas where alkaline soil conditions favor survival of the organism. (View map of U.S. outbreaks.) Vaccination is indicated only for horses pastured in endemic areas.

Vaccine:

The only vaccine currently licensed for use in horses is a live Sterne strain, non-encapsulated spore-form. The vaccine has been shown to be effective; however, vaccination of pregnant mares is not recommended. Adverse reactions to the vaccine have been reported in young, and miniature, horses. Local swelling may occur at the injection site, most of which resolves within a few days.

Appropriate caution should be used during storage, handling and administration of this live bacterial product. Consult a physician immediately if human exposure to the vaccine occurs through accidental injection, ingestion, or otherwise through the conjunctiva or broken skin.

Antimicrobial drugs should not be given concurrently, as this may interfere with adequate response to the vaccine.

Vaccination Schedule:

Adult horses previously vaccinated against anthrax: Annual vaccination.

Adult horses previously unvaccinated or of unknown vaccinal history: Administer a primary series of 2 subcutaneous doses of vaccine with a 2- to 3-week interval between doses. Vaccinate annually thereafter.

Pregnant mares: Not recommended.

Foals: There is no specific information available regarding the vaccination of foals against anthrax

Lymes-??????????? It is hard to get a roomful of people to agree on anything, but just about every veterinarian attending the Lyme disease table topic session at the 2013 American Association of Equine Practitioners convention, held Dec. 7-11 in Nashville, Tenn., agreed that more research is needed on this disease in horses. We do know that Lyme disease is an increasingly recognized problem in people living in areas where the causative organism, *Borrelia burgdorferi*, is endemic. These areas include the northeast and north-central United States. We also know that *Borrelia* is capable of infecting horses. Despite only a handful of published case reports describing clinical signs in infected horses, many practitioners in endemic areas are convinced that they see cases of Lyme disease in horses. The most common signs in these cases are behavior changes, lethargy or poor attitude, and change in gait/lameness. Uveitis (inflammation within the eye) and neuroborreliosis (neurologic disease due to Lyme disease) are occasionally seen as well.

So if a horse is showing possible signs of Lyme disease, how can it be diagnosed? Several blood tests are available that will identify antibodies against *Borrelia*. The presence of antibodies (in an unvaccinated horse) indicates that the horse has been infected with *Borrelia* at some point in its life. The pattern of antibody production might help to ascertain whether infection is acute or chronic. However, more research is needed regarding patterns of antibody production in infected horses. Additionally, many horses infected with *Borrelia* never show signs of clinical disease, and these horses are what make diagnosing Lyme disease really challenging. Due to the number of infected but asymptomatic horses, veterinarians cannot make a diagnosis of Lyme disease in the horse using only a blood test. The diagnosis should be based on a combination of clinical signs of disease, evidence of exposure to the organism, and ruling out other potential problems.

Once a veterinarian diagnoses Lyme disease, how should he or she treat it? Most veterinarians recommend using a tetracycline-type drug, such as oxytetracycline, doxycycline, or minocycline. Some practitioners recommend intravenous treatment, often placing a long-term catheter, whereas other veterinarians prefer oral medications. It is unclear what the “best” treatment protocol is—again, more research is needed.

In areas where Lyme disease seems to be "everywhere," how should owners protect their horses? The veterinarians in attendance discussed preventive strategies at length, with most using vaccination as a primary control measure rather than applying topical tick-preventive medications. Although there are no Lyme vaccines labeled for use in horses at the current time, there are several vaccines for dogs that have been used in horses in an extra-label fashion. Most veterinarians did not report any adverse reactions to the canine vaccines, and many observed that the vaccinated horses responded appropriately to the vaccine by producing antibodies. Because different vaccines might induce different patterns of antibody production, it is important to record the name and manufacturer of the vaccine as well as the administration date. This information might help in the interpretation of future blood test results.

CPTB-?????????? Boehringer Ingelheim Vetmedica Inc.'s *Corynebacterium pseudotuberculosis* (Pigeon Fever) Vaccine[3]

Boehringer Ingelheim Vetmedica, Inc. has developed a *Corynebacterium pseudotuberculosis* (Pigeon Fever) Vaccine for horses. In the past ten years, Pigeon Fever has expanded in prevalence and geographic distribution. While treatment of external abscesses is usually considered straightforward, considerable time and expense may be incurred before the infection is resolved. It is not uncommon for horse owners to spend thousands of dollars and weeks to months treating a case of Pigeon Fever.[2]
Furthermore, internal abscessation associated with the disease has been reported to result in up to 40% mortality despite treatment.[2]
Until this vaccine, protocols used to combat Pigeon Fever were largely focused on treatment, versus immunization. Now you can immunize your horses before you need to treat.
To learn more, talk to your Boehringer Ingelheim Vetmedica, Inc. sales rep today or call 1-800-325-9167.

Vaccine Storage and Handling

Proper storage and handling of vaccines is critical to their efficacy and safety.

Per manufacturers' instructions, aseptic technique is to be followed when handling and

administering vaccines. Vaccine administration sites (skin / haircoat, mucosa) are to be clean. Each animal should be vaccinated with separate new needles for each vaccine product to avoid cross contamination of products and possible adverse reactions and to reduce the possibility of spreading blood-borne pathogens

Care must be taken to assure that vaccines are administered via the intended route, i.e. that intranasal vaccines should NEVER be given via the intramuscular route.

Storage and handling instructions may be product specific. It is important to read and follow the manufacturer's recommendations for each product regarding: storage temperature, exposure to light during storage, and shaking of the product to assure uniform vaccine suspension.

Maintaining vaccines at the appropriate temperature from transport from manufacturer/supplier to patient administration is a very important aspect of proper immunization delivery programs. Lack of adherence of proper temperature maintenance can result in lack of efficacy, undue vaccine failures, and an increased rate of adverse reactions post vaccination.

The following recommendations can help improve vaccine management practices:

- Have a designated individual responsible for handling and storage of vaccines.
- Maintain a vaccine inventory log, documenting: Vaccine name, manufacturer, lot number and expiration date, date and number of doses received; and arrival condition of vaccine.
- Store vaccines in a refrigerator with a separate freezer compartment.
- Keep a working thermometer in the refrigerator; monitor the temperature twice daily. Maintenance of a log is advisable, particularly if multiple people share responsibility for temperature monitoring.
- Store vaccines in the middle of the refrigerator, NOT in the door or against the back of the refrigerator.
- Organize vaccines according to expiration date, avoiding wastage by ensuring that products with earlier expiration dates are used before products with later dates.
- In the event of refrigerator failure, promptly remove vaccines to an adequately refrigerated container.
- In the event of a power failure, keep the refrigerator door closed until power is restored or a suitable location for the vaccine has been identified. Refrigeration can be maintained in a kitchen-sized refrigerator (20-24 ft^3) for 6-9 hours if the doors remain closed. Once power is restored, promptly check refrigerator temperature to determine if vaccines have been exposed to temperatures outside of the recommended range. If power outage is expected to be longer than 6 to 9 hours, remove vaccines to a container that is maintained with ice. Monitor temperature in this container.
- Ambulatory vehicles should have a thermometer in the refrigeration unit or portable cooler in which vaccines are carried. Temperature should be checked each time the container is opened. (Note: A freezer pack placed in a cooler is not sufficient to maintain vaccines in the proper temperature range throughout the course of a work day.)
- Consult the manufacturer if vaccine:
    - Is exposed to temperatures outside of the recommended range

- Undergoes color change during storage
- Is exposed to ultraviolet radiation

Vaccination and Passive Transfer

It is important to vaccinate broodmares 4 to 6 weeks before foaling for their own protection, as well as to maximize concentrations of immunoglobulins in their colostrum to be passively transferred to their foals. The significant majority of vaccines used in broodmares during late gestation to maximize immunoglobulin transfer via the colostrum do not carry a "safe for use in pregnant mare" claim. However, this is an accepted practice and clinical experience indicates these products are safe for this purpose, but if the practitioner has specific safety questions or concerns, he or she is encouraged to contact he manufacturer for additional information.

Recognize that simply vaccinating the mare is not sufficient for protection of the foal; successful passive transfer must also occur. The foal must receive adequate amounts of high quality colostrum and absorb adequate amounts of specific colostral immunoglobulins before absorption of macromolecules ceases (generally 24 to 48 hours). Specific colostral immunoglobulins provide protection against field infections for several months but also may interfere with vaccinal antigens and may interfere with foal responses to vaccines; a phenomenon termed "maternal antibody interference."

Although protective concentrations of maternal antibody decline with time, vaccination of a foal while these colostral antibodies are present - even at concentrations less than those considered to be protective - is often of minimal value because of maternal antibody interference. Consequently, a foal may be susceptible to infection before the primary vaccinal series is completed. Management directed at minimizing exposure to infectious agents is key during this interval.

Foals with residual maternal antibodies generally produce a greater serologic response to killed vaccines when an initial series of three doses is administered rather than the 2-dose series recommended by most manufacturers of vaccines for older horses without residual maternal antibodies.

Adverse Reactions

After receiving a vaccine(s) intramuscularly, some horses experience local muscular swelling and soreness or transient, self-limiting signs including fever, anorexia and lethargy. Severe reactions at sites of injection can be particularly troublesome, requiring prolonged treatment and convalescence. Systemic adverse reactions (such as urticaria, purpura hemorrhagica or anaphylaxis) can also occur. Other systemic adverse reactions have been anecdotally reported.

Veterinarians should report adverse reactions to the vaccine's manufacturer and/or the USDA Center for Veterinary Biologics at 1-800-752-6255 or through the agency's Web site.

Vaccine lot and serial numbers should be noted in horses' vaccination records. The ability to provide this information when reporting an adverse reaction will facilitate an investigation.

Adverse reactions are not always predictable and are inherent risks of vaccination. Therefore, it is recommended that horses not be vaccinated in the 2 weeks prior to shows, performance events, sales or domestic shipment. Some veterinarians may elect not to vaccinate horses within 3 weeks of international shipment.

Injection site selection should include consideration of potential adverse reactions. Injection in the gluteal muscles/hip region is not recommended, as gravitational drainage along fascial planes can be obscured. Should an abscess develop, considerable tissue damage can occur and result in eruptions in undesirable locations with lesions

that require prolonged time to heal.

The interval from vaccination to scheduled event or a predictable risk of exposure should be sufficient for:

- Generation of a protective immune response to vaccination.
- Recovery from unexpected adverse vaccination reactions that might otherwise interfere with the horse's performance or health prior to, or during shipment.

It should be recognized that:

- Administration of vaccines containing multiple antigens/adjuvants at the same time may increase the risk of adverse reactions.
- Safety and efficacy data are not available regarding the concurrent use of multiple vaccines.
- Administration of MLV and killed vaccines in the same location is discouraged as adjuvants may inactivate the MLV.

Therefore, veterinarians may elect to use a staggered schedule when multiple products are to be administered.

Vaccines should always be administered by, or under the direct supervision, of a veterinarian, as the possibility of adverse reactions (including anaphylaxis) exists with the administration of any vaccine.

Vaccine Technology

Live Vaccines contain agents capable of replicating within the horse yet have attenuated pathogenicity. Live vaccines stimulate a broad range of immune responses and generally long lasting duration of immunity with the administration of fewer doses. Live vaccines have the potential to induce cytotoxic T-lymphocytes (CTL) or mucosal immunity if administered at mucosal sites, both of which can be very advantageous.

There is potential risk in vaccinating animals whose immune status may be compromised due to disease (i.e. immunodeficiency, hyperadrenocorticism), physiologic states (pregnancy) or medications (i.e. corticosteroids).

Modified Live Vaccines (MLV) are typically derived from the naturally occurring pathogen, and are produced by: 1) attenuation in cell culture, 2) use of variants from other species, and 3) development of temperature-sensitive mutants.

Recombinant Vaccines:

- **Live Attenuated Vector Vaccines** are engineered by incorporation of a pathogen's antigenic peptides into a harmless carrier virus or bacteria.
- **Chimeric Vaccines** are produced by substituting genes from the target pathogen for similar genes in a safe, but closely related organism.
- **DNA Vaccines**consist of a DNA plasmid encoding a viral gene that can be expressed inside cells of the animal to be immunized.

Dead/Killed Vaccines lack pathogenicity and can neither replicate nor spread between hosts. These vaccines typically require multiple doses in the primary vaccinal series and regular boosters. Efficacy of inactivated/killed vaccines is often reliant on the use of potent adjuvants.

- **Inactivated/killed pathogen vaccines** contain whole pathogens that have been inactivated with agents

such as phenol (bacteria) and formalin or beta-proprionolcatone (viruses).

- **Protein vaccines** include naturally produced components of pathogens. These proteins are typically non-pathogenic and may promote fewer injection site reactions than products containing the entire pathogen.
- **Recombinant subunit vaccines** contain synthetically produced antigens that have been identified as important in developing immunity to a specific pathogen. Currently no such products are licensed for use in equids.
- **Adjuvants** function to modulate and amplify the host immune response to the accompanying antigen, and are critical to the success of inactivated vaccines.

Vaccine Labeling

Licensed vaccines can afford varying levels of protection. It is important to read and understand product labeling.

Label indications: Data must fully support label indications and accurately reflect the expected performance of the product.

The USDA can grant one of five possible levels-of-protection statements. (Veterinary Services Memorandum No. 800.202; June 14, 2002.) In declining order of level of protection, the label claims are:

Prevention of infection:
This claim may be made only for products able to prevent all colonization or replication of the challenge organism in vaccinated and challenged animals.

Prevention of disease*:*
This claim may be made only for products shown to be highly effective in preventing clinical disease in vaccinated and challenged animals. The entire 95% confidence interval estimate of efficacy must be at least 80%.

Aid in disease prevention:
This claim may be made for products shown to prevent disease in vaccinated and challenged animals by a clinically significant amount which may be less than that required to support a claim of disease prevention (see above).

Aid in disease control:
This claim may be made for products which have been shown to alleviate disease severity, reduce disease duration, or delay disease onset.

Other claims:
Products with beneficial effects other than direct disease control, such as the reduction of pathogen shedding, may make such claims if the size of the effect is clinically significant and well supported by the data.

Infectious Disease Control

Programs for the control of infectious diseases are important components of good managerial practices directed toward maximizing the health, productivity and performance of horses. Infectious disease in an individual horse, or outbreaks of infection within a group of horses, occurs when sufficient quantity of an infectious agent overcomes the resistance acquired through prior natural exposure to the disease agent or through vaccination. Click here to view the AAEP's Infectious Disease Control Guidelines.

Infectious disease control programs should be directed toward:

- Reducing the exposure to infectious agents in the horses' environment
- Minimizing factors that decrease resistance or increase susceptibility to disease
- Enhancing resistance to those diseases by vaccination

Consistent utilization of such management programs will, in time, lower the incidence and/or severity of infectious diseases.

Occurrence of infectious diseases in populations of horses tends to increase with:

- Increased population density of susceptible horses at a facility.

High population density situations as found on breeding farms, in sales or boarding facilities, in barns of performance and show horses, or at racetracks are often ideal for introduction and transmission of infectious diseases, particularly infections of the respiratory tract.

- Movement of horses on and off the facility.

The introduction of horses from various origins, commingling of horses of different ages, and the high proportion of susceptible horses pose special problems and demonstrate some important considerations in the practice of disease control.

- Environmental and managerial influences.

Examples of external factors that can contribute to increased risk of infectious disease include:

  - stress
  - over-crowding
  - parasitism
  - poor nutrition
  - inadequate sanitation
  - contaminated water source/supply
  - concurrent disease
  - inadequate rodent, bird and insect control
  - movement of people, vehicles, and/or equipment on and off facilities during infectious disease outbreaks

Copies of the vaccination and health maintenance records should accompany the movement of horses. Similarly, owners of equine facilities should establish health entry prerequisites, including, but not limited to, vaccinal history. Horses should be appropriately vaccinated no later than one month prior to entering or leaving such a facility in order to produce adequate antibodies before the anticipated exposure.

Strict attention should be afforded to the manufacturer's recommendations regarding storage, handling, and routes of administration of the vaccine to maximize efficacy and safety. However, results of research or clinical experience may support alternate protocols for vaccination that may improve the efficacy of a vaccine without increasing adverse effects.

Principles of Vaccination

A "standard" vaccination program for all horses does not exist. Each individual situation

requires evaluation based on the following criteria:

- Risk of disease (anticipated exposure, environmental factors, geographic factors, age, breed, use, and sex of the horse)
- Consequences of the disease (morbidity/mortality, zoonotic potential)
- Anticipated effectiveness of the selected product(s)
- Potential for adverse reactions to a vaccine(s)
- Cost of immunization (time, labor and vaccine costs) vs. potential cost of disease (time out of competition; impact of movement restrictions imposed in order to control an outbreak of contagious disease; labor and medication if, or when, horses develop clinical disease and require treatment, or loss of life.)

Note: The use of antibody titers or other immunological measurements to determine if booster vaccination is warranted is not currently practiced in the horse, as standardized tests and protective levels of immunity have not been defined in most cases. A correlation between antibody levels and protective immunity under field conditions has not yet been identified.

Clients should have realistic expectations and understand that:

- Vaccination alone, in the absence of good management practices directed at infection control, is not sufficient for the prevention of infectious disease.
- Vaccination serves to minimize the risks of infection but cannot prevent disease in all circumstances.
- The primary series of vaccines and booster doses should be appropriately administered prior to likely exposure.
- Each horse in a population is not protected to an equal degree nor for an equal duration following vaccination.
- Protection is not immediately afforded the patient after administration of a vaccine that is designed to induce active immunity. In most instances, a priming series of multiple doses of a vaccine must be administered initially for that vaccine to induce protective active immunity.
- All horses in a herd should be vaccinated at intervals based on the professional opinion of the attending veterinarian.
- A properly administered, licensed product should not be assumed to provide complete protection during any given field epidemic.
- Although rare, there is potential for adverse reactions despite appropriate handling and administration of vaccines.

(Ideally, the same schedule is followed for all horses in a population, thus simplifying record keeping, minimizing replication and transmission of infectious agents in a herd and indirectly protecting thoses horses in the herd that responded poorly to vaccination, thereby optimizing herd-immunity.)

Vaccinations Rethought

BY DR. JOYCE HARMAN, ON FEBRUARY 19TH, 2011

Article summary

The vaccine issue is a complex one. There is not one perfect answer as to whether

to vaccinate or not, or what to use. It is clear that annual vaccines can have negative effects on our animals, yet many people board their horses in barns where they are required to vaccinate. This lengthy article covers some of the latest thoughts about vaccinating, the use of titers and alternatives to regular vaccination.

Annual Vaccinations

Each spring we begin thinking about vaccinations. The vaccine issue is actually a complex one and needs the active participation of the owner to help make the best decisions for the horse. The days of just vaccinating all horses with the same protocol should be gone, but are part of the current reality of many boarding establishments and veterinary practices.

Definitions

Generically the process of protecting against an infectious disease by priming the immune system with material, the immunogen, designed to stimulate an immune response to the infectious agent is known as immunization (www.answers.com).

Vaccination is used when the immunogen is itself a living infectious agent, normally either a closely related bacterial species (as with smallpox and cowpox), or by using a strain weakened by some process. Technically immunization is different from vaccination in that vaccination uses a viable infecting agent (i.e., it can make the individual sick, ex: a live virus vaccine) while immunization does not use a viable agent (killed virus vaccine, or even just part of a virus-recombinant vaccine).

In everyday horse language, we use the words interchangeably. Either form of priming the immune system can produce a measurable antibody in the blood. A test for how much of this antibody is present is called a titer or serologic test. The measure of a titer response in the blood is one indication of how well a horse might be protected against a disease. Little research has been done to determine the exact amount of a titer needed. However, most vaccines are sold based on the fact that they produce a measurable titer in the blood, rather than that they are proven to protect a horse against an actual disease challenge.

Titers are a useful indicator, but not the perfect answer to determining the protection status of a horse. The reason they are not perfect is that the immune system is very complex and there are many more places inside the body where the vaccine can protect other than in the blood. Cells inside the body can also have immune responses, called cellular immunity. We cannot measure this from the outside easily. So, it is possible to have a horse with a low blood titer, that is actually well protected. Some university vaccine researchers feel that if any titer is present at all, there will be protection at the cellular level. Also they feel that even animals with no titer may be well protected. Titers are, however, the main way available to the horse owner and veterinarian to get an indication of how well your horse could be protected.

Many veterinarians refuse to check titers thinking they are invalid, and many more just do not know how to interpret the results or even to which laboratories to send the samples. The American Veterinary Medical Association (AVMA, www.avma.org , type in vaccine) does acknowledge that titers can be a measure to determine a need to for revaccination, but does caution that the data is unclear. The best way to approach titers is to use the results as a guide and take all the factors discussed below into account.

Annual vaccinations, official positions

For years we have been vaccinating our animals on a yearly or twice a year basis, however the actual need for doing this has not been documented. I am enclosing a paragraph from one of the major small animal veterinary textbooks that quotes research from several years ago:

A practice that was started many years ago and that lacks scientific validity or verification is annual revaccinations. Almost without exception there is no immunologic requirement for annual revaccination. Immunity to viruses persists for years or for the life of the animal. Successful vaccination to most bacterial pathogens produces an immunologic memory that remains for years, allowing an animal to develop a protective anamnestic (secondary) response when exposed to virulent organisms. Only the immune response to toxins requires boosters (e.g., tetanus toxin booster, in humans is recommended every 7 to 10 years), and no toxin vaccines are currently used for dogs and cats (they are used in horses-tetanus and botulism, ed comment). Furthermore, revaccination with most viral vaccines fails to stimulate an anamnestic (secondary) response as a result of interference by existing antibody (similar to maternal antibody interference). The practice of annual vaccination in our opinion should be considered of questionable efficacy unless it is used as a mechanism to provide an annual physical examination or is required by law (i.e., certain states require annual vaccination for rabies). Current Veterinary Therapy XI – Small Animals, p 205.

The AVMA web site contains several documents with current information about new thoughts on small animal vaccination. There is little research on horses, so the issue is ignored by the profession and no guidance is given for the equine practitioner. Here are some quotes from the AVMA web site that shows the lack of research about the topic and asks for individualization of vaccine protocols:

1. …When designing a vaccination program, veterinarians consider the pet's lifestyle, related disease risks, and the characteristics of available vaccines.

2. Q: How often should pets be revaccinated?
A: This is a subject of ongoing research and healthy debate. No one truly knows how long protection from various vaccines lasts (italics added by JCH). Veterinarians have traditionally vaccinated annually; however, they are now learning that some vaccines induce immunity that lasts less than one year, whereas others may induce immunity that lasts well beyond one year. The AVMA recommends that veterinarians customize vaccination programs to the needs of their patients. More than one vaccination program may be effective.

3. Q: How does my pet's lifestyle affect its vaccination program?
A: Some pets are homebodies and have minimal opportunity for exposure to infectious disease, whereas others have a great deal of exposure to other pets and/or wildlife by virtue of their activities. Still other pets live in geographic areas that place them at greater risk for contracting some infectious diseases. Differences in lifestyle illustrate the importance of customizing a vaccination program to individual patients.

4. Q: Are there risks?
A: Although most pets respond well to vaccines, like any medical procedure vaccination carries some risk. The most common adverse responses are mild and short-term, including fever, sluggishness, and reduced appetite. Pets may also experience temporary pain or subtle swelling at the site of vaccination. Although most adverse responses will resolve within a day or two, excessive pain, swelling, or listlessness should be discussed with your veterinarian.

Rarely, serious adverse responses occur. Contact your veterinarian immediately if your pet has repeated vomiting or diarrhea, whole body itching, difficulty breathing, collapse, or swelling of the face or legs. These signs may indicate an allergic reaction. In very rare instances death can occur. Visit with your

veterinarian about the latest information on vaccine safety, including rare adverse responses that may develop weeks or months after vaccination.

These next quotes are from a paper published on the AVMA website:

• Dr. Ford was on the American Animal Hospital Association Canine Vaccine Task Force, which released its vaccination guidelines in spring 2003. These guidelines recommended three-year booster intervals in adult dogs for distemper virus, parvovirus, adenovirus-2, and parainfluenza virus….

• Many veterinarians have responded to the three-year guidelines with resistance. It was truly a bitter pill, and we did not take this well, said Dr. Ford, who is also a Brigadier General in the U.S. Air Force Reserve. At issue here is that the bitterness of the pill prevails. Despite growing acceptance of the guidelines, there is still considerable resistance….

• Veterinarians are resistant because, when one examines the services that veterinarians provide in the United States, Europe, and the United Kingdom, vaccination is at the top of the list for both cats and dogs…

• COBTA (an AVMA vaccine advisory group) concluded that evidence shows that some vaccines provide immunity beyond one year. While annual vaccinations have been highly successful in curbing disease, the one-year revaccination frequency recommendation found on many vaccine labels is based on historical precedent, not scientific data. Even in cases where scientific data were submitted to qualify a label claim, the data generated generally represent a minimum duration of immunity and don't resolve the question about average or maximum duration of immunity. (italics added by JCH).

What do these quotes mean to you?

It is wise to give some thought to your vaccination schedule, and to not just vaccinate blindly for every possible disease. For some it may be time to make a change in your schedule. Vaccines are stressful to the immune system. Vaccines should not be given to animals that are in any way ill, whether the problem is a skin condition or a serious internal disease. The package insert in vaccines states that only healthy animals should be vaccinated. Remember that people used to be vaccinated only a few times as young children, then as adults only for flu or if the person is going to a foreign country. Now the current vaccine program for children has gotten as excessive as it has for the horses.

Vaccination must be done at the level of comfort of the animal's caretaker. If you feel uncomfortable changing the vaccination program, keep examining the issues. More evidence is surfacing that over-vaccination is a problem and should not be done, but until sound research tells us exactly what to do, the decisions are up to the individual.

Holistic veterinarians are trained to look for subtle signs of disease and have more tools in their medicine chest to treat these chronic problems. Many holistic vets, including myself, find a variety of illnesses related to over-vaccination. Some of these are serious and life-threatening, while others are annoying. Reactions can occur up to about two months after a vaccination. Horses often

become more susceptible to other diseases if their immune system is in poor shape after excessive vaccination. So, it is best to look at the vaccination issue with the information below and make decisions based on thinking rather than a rote program.

Annual vaccinations, practical applications

The key to a successful program is to examine each disease and vaccination based on the risk of the disease versus the risk and benefit of the vaccine.

For example, flu in the horse is not life-threatening, is easy to treat with alternative medicine and can be treated fairly well with conventional medicine (remember, it is a viral disease and antibiotics do not treat viruses). The injectable flu vaccine was proven to not work in a large study and, in my opinion, seems to be one of the most stressful vaccines for the horse. The intranasal vaccine does work, and should last for a long time, though there is no research to support its effects past 6 months to one year. Since the injectable vaccine is fairly ineffective, stressful to the horse (high risk) and disease is not serious (unless you just have to make that show!), the benefit of the vaccine is very low.

Rabies is the opposite in all ways. The disease is life-threatening and very serious and the vaccine is highly effective. However, since the vaccine is so effective, only one or a few shots in the lifetime of the horse will be protective for most horses. Extensive research in humans has shown that fairly low titers are very protective. Most horses in my practice have titers thousands of times higher than the protective level needed in humans. And, though no research indicates exactly what titer is needed by an equine, it is safe to say that the high titers seen in horses should be protective.

Potomac Horse Fever vaccines fall somewhere in the middle when analyzed. The vaccine has not been shown to have complete protection. If it were extremely effective, it would have eliminated the disease, since currently it is safe to say that most horses living along the Potomac River are vaccinated, yet the disease appears each year and horses still can die from it. However, if your barn is along a major river basin (high risk), and cases are seen each year in your immediate area, vaccination may be a wise thing to try, recognizing that it is not a perfect vaccine. However, if you are not along a river basin (low risk) and the veterinary practices in your immediate area do not see many cases, then it is a vaccine to skip. The vaccine does not appear to be as hard on the horses as some others. Titers are available and often are seen at a protective level without constant revaccination.

The Rhinopneumonitis vaccine is another vaccine where the disease is a low-risk upper respiratory infection. The vaccine is poorly effective; as such many vets recommend it every couple of months. It does seem to cause many side effects (high risk for the horse). The viral infection is easy to treat with alternative medicines such as homeopathy and Chinese herbs, but often is so mild it requires little treatment. The dangerous neurological form of the disease is not covered by any vaccine. Horses vaccinated against the respiratory form may actually be more susceptible to the neurological form if it passes through a barn. The abortion form of the disease does have a vaccine, but it needs to be given every few months, and is probably not needed in mares that foal at home rather than at a large facility with lots of chance for exposure. Titers can be taken, though they tend to be fairly low.

Tetanus is a high-risk disease with no titer test available. It also seems to be a very safe vaccine (low risk). In the early 1990s and again in the mid 2000's when a titer test was available, the vaccine appeared to be very effective with high titers for long periods of time without revaccination. This may be a vaccine to keep in the program, but it is also probably one that could be done every few years instead of yearly.

Strangles is a highly contagious disease, but actually is not usually life-threatening if the animal is cared for well, and is fairly easy to treat with both alternative and western medicine. The healthier the horse's immune system is, the less likely it is to get sick, and the easier it is to recover. Once the long-lived bacteria get onto a premise, it is a disease that can affect new horses coming onto the property. Most horses who have had the disease are immune for life. Since it is so contagious, barns with active cases are usually quarantined to prevent the spread of the disease. Strangles is an messy disease, the horse does feel sick and they do get abscesses that drain. However, it is a low risk disease as far as the long-term health of the horse goes. The vaccine seems to cause more problems that any other vaccine, so is high risk vaccine. Titers are available. An outbreak of this disease is one of the best places to use the homeopathic nosodes discussed later in this paper.

Western Encephalitis does not exist in the east, and Eastern Encephalitis not in the west. However, you cannot buy a vaccine for just one of these diseases. The disease is seen mostly in warm parts of the country with a large mosquito population. Occasionally it is seen in other parts of the country, but in general many areas of the country are at a low risk for the disease. In a high risk area, it may be advisable to vaccinate or at least check titers, since the disease can be life-threatening (high risk disease). The vaccine seems to be moderately safe, but can cause some reactions. Titers are available.

West Nile virus is the new disease on the block. It seems to be moving across the country leaving behind a low level of disease. However, we do not yet know what the disease patterns are or will be from year to year. It is a high risk disease (serious if your horse gets it), and possibly a problematic vaccine (there are quite a few reactions to some of the vaccines). So, vaccinating is not without some risk, and it is important to make the decision for each horse based on its health history. The young, strong animals are least susceptible. Titers are available and it appears that the vaccine and possibly some natural immunity are fairly effective as many titer levels are good.

Time of year for vaccinating

When making decisions about vaccination, study the disease. As an example, it is pointless to vaccinate for a mosquito-carried disease in October if you live in New England, or anywhere in the northern 2/3 of the country where there are no mosquitoes in the winter. The diseases that are carried by mosquitoes include Eastern and Western Encephalitis and West Nile Virus. All of these diseases occur primarily when the mosquito population builds up to high level in the late summer and fall. Cases are rare earlier in the year. Potomac Horse fever also occurs in July through October. So, for these late summer diseases it would be better to vaccinate in May for maximum protection rather than in February or March when it is convenient.

The best way to get maximum benefit from vaccination is to spread the shots out rather than overload the whole system with everything at once. If the immune system is at all weak, multiple vaccines given the same day may not be very

effective. Rabies and tetanus are year-around diseases, so these could be given at any time of the year. Save the late spring for diseases of the summer. Then the horse has maximum protection during the peak of the disease and there is no need to vaccinate twice a year for vaccines that may not be as effective. Twice a year vaccination adds more stress to the immune system.

Alternatives to vaccination

There are several alternatives to the conventional schedule. One is to check titers and just vaccinate for those diseases that have low levels of antibodies present. Another is to improve the health of the horse's immune system to help prevent susceptibility to disease, or to help the horse cope with the vaccine better.

When using with a regular vaccine, some of the side effects can be prevented by giving the homeopathic remedy Ledum Pal. 30X or 30C (6-8 tablets once a day for three days following a vaccination). This treatment can prevent reactions such as a stiff neck and lethargy, as well as some of the more severe reactions seen. Ledum can also help prevent some of the long-term negative effects of vaccines, though nothing can prevent all problems.

It is important to improve the overall heath of your horse's immune system with good nutrition and immune system support. The exact details of a program can be tailored to your horse's needs with a nutritionally-oriented veterinarian as well some good research on the part of the caretaker.

Another option for vaccines is to use homeopathic nosodes, which are like a homeopathic form of a vaccine. The nosode is made from the diseased part of the animal (such as mucous from the nose of a strangles horse), but is diluted so that it works like other homeopathic remedies. Nosodes often get used in place of vaccines. There is little research to support their use, and what has been done has not shown much promise. However, having said that, clinically there are many instances around the world where nosodes are used successfully in the prevention of disease.

It must be stated that no one can promise nosodes will prevent disease, and anyone that says that is giving false information. The correct answer is that they might work. The general conclusion in a recent discussion amongst holistic vets is that nosodes work best in the face of an out-break of a disease, but may not help much in the day-to-day long-term prevention. Regular vaccination is often not advised in the face of an outbreak, since it takes at least ten days for the vaccine to trigger the immune system. If the animal has already been exposed to the disease but does not yet have symptoms, sometimes a vaccination can make them sicker. Nosodes can be very helpful here.

The giving of any homeopathic remedy alters that body's chemical and energetic makeup. Most holistic vets are leaning way from using nosodes except in an outbreak situation. Nosodes are available for most of the common diseases, including West Nile, however they are only available through prescriptions with a holistic veterinarian. And it is best not to just give them to any horse without knowing something about the current state of health. In many cases it is better to improve health than to just throw nosodes into the horse and hope for the best.

When several generations of animals have been raised using no vaccines or only a few nosodes, the offspring become healthier and more resistant to diseases of all types.

Conclusion

There is not one perfect answer to the vaccination issue. Each and everyone must make the best, informed decision for each horse, each year. As new information comes available, read and learn everything you can. Your horse will thank you.