Stick to the Schedule

BY AMANDA DUCKWORTH

IN A ROUNDUP of key words from 2020, "vaccine" is likely to make almost any list. Thankfully, when it comes to horses, equine vaccination schedules are fairly standard and constantly monitored and updated.

The American Association of Equine Practitioners has guidelines surrounding the core vaccines—eastern/western equine encephalomyelitis (EEE/WEE), rabies, tetanus, and West Nile virus (WNV)—as well as risk-based vaccinations. Earlier this year its Infectious Disease Committee issued revised guidelines for the administration of selected vaccines.

The recommendations, which are based on the age of the horse and its previous vaccination history, are meant to serve as a reference for veterinarians. It is also helpful for owners to understand which vaccines are crucial for the well-being of their horses.

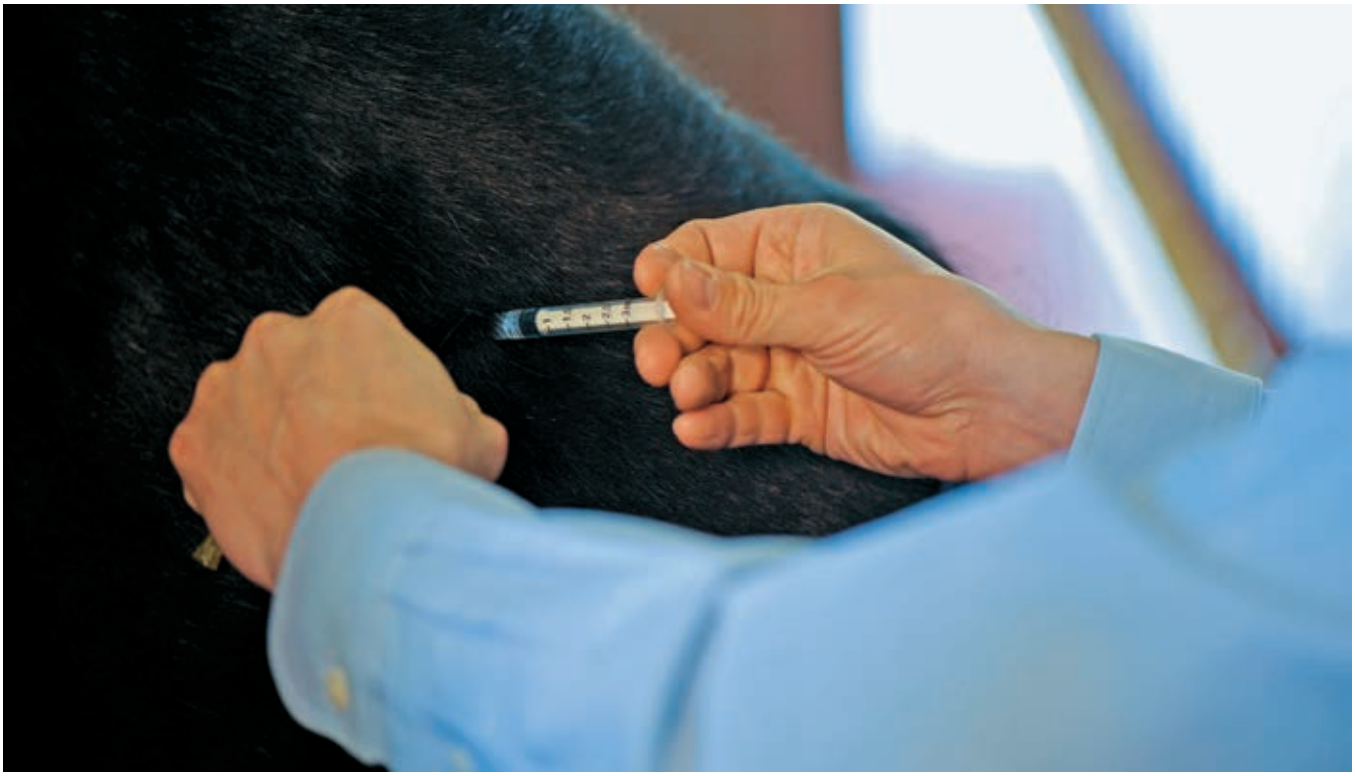
"The goal of the guidelines is to provide current information that will enable veterinarians and clients to make thoughtful and educated decisions on vaccinating horses in their care," said Infectious Disease Committee chair Dr. Katie Flynn. "The impact of infectious disease has been felt across the equine industry in recent years, and the committee hopes that these guidelines will be a useful tool in preventing or mitigating the effects of equine infectious disease."

> Equine vaccinations should remain standard, monitored, and updated

One of the risk-based vaccinations to get an update concerns equine influenza, which has seen a rise in outbreaks in recent years. With the exceptions of Australia, New Zealand, and Iceland, equine influenza is endemic in the equine population throughout much of the world, including the United States.

Although equine influenza is rarely fatal, it is highly contagious, spreads quickly, and can cause a horse to be away from competition for a significant amount of time, typically ranging from three weeks up to six months

"The most common form is airborne transmission," explained the AAEP. "Infected horses release infective droplets into the air by coughing or snorting, which are then inhaled by horses in close proximity. Horses can also be exposed to the virus by coming into contact with contaminated surfaces such as stalls, wash racks, stocks, water sources, feed,



ANNE M. EBERHARDT

It is helpful to understand which vaccines are crucial for the well-being of their horses

GlycoGuard.

RUNS WITH THE BEST OF THEM

DRUG-FREE
SHOW & RACE
SAFE

GlycoGuard is your solution for complete gut health.
An oral activated Microbial Gel that unlocks
key nutrients for maximum absorption.

A great life begins from within.

www.glycoguard.com

844-MY-GLYCO(694-5926)

MESSAGE FROM THE GRAYSON-JOCKEY CLUB RESEARCH FOUNDATION

CHALLENGES AND NEW PERSPECTIVES OF FOAL VACCINATION

BY DR. ANGELA I. BORDIN

Grayson-Jockey Club Research Foundation

Vaccination is one of the most effective ways to prevent infectious diseases, but there are many challenges to design efficacious vaccines to protect foals.

First, their immune cells are immature. Innate immune cells in adult horses, such as neutrophils and macrophages, rapidly respond to microbe invasion by engulfing and destroying them (or infected cells). Adaptive immune cells, such as B and T lymphocytes, produce antibodies and stimulate other cells to kill pathogens, respectively, but respond slower than the innate cells (approximately 10-14 days from the first encounter with a microbe). Studies from the Equine Infectious Disease Laboratory and others suggest that both innate and adaptive immune cells of newborn foals are immature, and function less effectively than adult horse cells.

The second challenge for designing foal vaccines is the presence of maternal antibodies. Foals ingest these when drinking enough of good-quality colostrum, and those antibodies can potentially neutralize the vaccine. The third challenge is that, even if the adaptive immune cells of foals were mature and functioning at birth, it would still take 10-14 days to generate protection from B and T lymphocytes, leaving them susceptible to diseases in this period.

For these reasons vaccination of pregnant mares is the best method to protect foals from infectious diseases; yet, many diseases for which maternal vaccines are not available are still a threat to the health of foals.

One example is pneumonia caused by *Rhodococcus equi*, an insidious disease that affects foals and immunodeficient adult horses. Because *R. equi* is ubiquitously present in the equine feces and soil of breeding farms, virtually all foals are exposed to it soon after birth. Some foals will later develop clinical pneumonia, others develop lesions in lungs without clinical signs (the so-called subclinical pneumonia), and some remain entirely healthy. This disease has an important economic impact to the equine industry, not only because many foals die due to clinical pneumonia but also because foals with subclinical disease are less likely to race. Despite decades of research trying to understand why some foals are susceptible and others resistant, this question still puzzles scientists.

Many different approaches were used in an attempt to develop an effective vaccine to protect foals against this tragic disease. All foal vaccines have universally failed for the reasons discussed above (immaturity of their immune cells and the need for protection soon after birth).

The EIDL has demonstrated that maternal vaccination with PNAG (a molecule in the surface of *R. equi* and many other pathogens) protected foals against pneumonia in an experimental setting. Optimization (dose and frequency of administration, different formulations, etc.) of products, however, usually takes years before a vaccine is commercially available. Additionally, maternal vaccination has other limitations, such as variable immune responses generated in the dam, need of production of good quality colostrum, and ingestion of sufficient quantity of colostrum, etc. Thus, even if a maternal vaccine is commercially available, there is still a need for strategies that can be used directly in the foal to help them fight diseases. Transfusion of hyperimmune plasma has been successfully used to prevent *R. equi* pneumonia, but there are some limitations, such as being expensive and labor-intensive, and carrying risks to the foal.

The EIDL has focused for many years in researching strategies to stimulate the innate immune responses of foals. We have demonstrated that parts of the genetic material of bacteria (called CpG-ODNs) can stimulate foals' cells to produce molecules (called cytokines) that facilitate communication between immune cells. One example of a cytokine important for the response to *R. equi* that can be stimulated by CpG-ODN is called interferon-gamma, which newborn foals are known to be deficient.

Additionally, with the support of a continuum grant awarded by the Grayson-Jockey Club Research Foundation, we have shown the nebulization of CpG-ODN and Pam2 (a synthetic product that mimics a molecule in the surface of pathogen) can boost foals' innate immune responses directly in the lungs. This strategy is called host-directed therapy, and we have shown that it could potentially shorten duration of clinical signs (such as fever and cough) and presence of lung lesions in pneumonic foals.

We have recently started studying trained immunity in horses, a relatively new concept in which innate immune cells are stimulated to provide long-term protection against microbes by generating "memory" (i.e., they "remember" the microbe after the first encounter and respond better and faster afterward). This happens by "turning on and off" genes (called epigenetic modifications) that are associated with eliminating invading pathogens. This is an exciting new area because, until recently,

it was believed that only T and B lymphocytes had immune memory. Training innate immune cells of foals would be extremely important for their health because it would help eliminate the susceptible period before their adaptive immune responses are mature.

With this strategy we hope to design new products that can improve vaccines against *R. equi* and other pathogens and save lives of foals. BH

Dr. Angela I. Bordin is an assistant professor, Department of Large Animal Clinical Sciences, and an associate director, Equine Infectious Disease Laboratory, at Texas A&M University.

tack, grooming equipment such as wipe rags, and transport vehicles. Humans can spread the virus from horse to horse by contaminated hands and clothing."

THE STRAIN GAME

Just like with influenza in humans, there are different strains of equine influenza. Currently circulating strains are reviewed by the Expert Influenza Surveillance panel of the World Organisation for Animal Health, which then makes recommendations for strain inclusion in vaccine products. It is important to understand the different strains of equine influenza, where they tend to be located, and how to vaccinate against them. In recent years there has been a shift globally concerning strains.

"With the exception of a clade 2 virus identified in China, all viruses isolated and characterized from the outbreaks in 2019 and early 2020 were from clade 1 of the Florida sublineage," announced the panel in April. "They were similar to those identified in the USA and South America in 2018. Clade 1 viruses are endemic in the USA, but these are the first major outbreaks associated with a clade 1 virus in Africa since 2003 and in Europe since 2009/10.

"Although the clade 1 viruses have gradually diverged genetically from the World Organisation for Animal Health recommended vaccine strains, the neutralization data with mono-specific horse sera indicated that they continue to remain antigenically similar to the viruses recommended for inclusion in the vaccines. Further virus characterization is ongoing, but at present the panel agreed that there is no evidence-based scientific justification for revising the recommendations on vaccine composition."

ERICA LARSON

While vaccines are the primary method of prevention, vaccinated horses can still be infected and shed the virus

There are two types of equine influenza vaccines currently on the market: inactivated (killed) vaccines for intramuscular administration and modified-live vaccine for intranasal administration. Horses need to be revaccinated annually, and those at increased risk of exposure should be revaccinated every six months.

Horses that are considered at-risk for equine influenza include those under the age of 5, those who haven't been vaccinated, and those who are stabled in areas with a high commingling of horses—such as racetracks, show grounds, and veterinary hospitals. Many facilities and competitions require vaccination within the previous six months to enter, and it is generally recommended that all horses should be vaccinated against equine influenza unless they live in a closed and isolated facility.

It is important to note, however, that while vaccines are the primary method of prevention, vaccinated horses can still be infected and shed the virus.

Additionally, due to variations in influenza strains, it is recommended horses with a history of equine influenza receive a booster vaccination six months after the disease is diagnosed, even though they are likely to have immunity to that specific strain for more than a year.

WELL-DOCUMENTED DISEASE

Equine influenza is one of the most common and oldest documented infectious diseases of the respiratory tract of horses. In September 2018, *Frontiers in Microbiology* published "A Comprehensive Review on Equine Influenza Virus: Etiology, Epidemiology, Pathobiology, Advances in Developing Diagnostics, Vaccines, and Control Strategies."

"Equine influenza (EI) is an extremely contagious disease of horses (including wild horses), which is caused by Influenza A viruses," explained the review. "These viruses are known for high rates of transmission in a wide variety of animal species. Equine influenza virus, the causative agent of EI, is considered to be one of the most important viral respiratory pathogens of equines. The disease is characterized by flu-like symptoms affecting predominantly the respiratory tract. The presence of influenza infections has been suggested in horses since the time of Hippocrates and Absyrtus, the latter a Greek veterinarian, who described a disease resembling influenza in 412 BC and 433 AD, respectively."

Clinical signs of a horse battling a contagious respiratory disease include fever, cough, lymphadenopathy, abnormal nasal discharge, abnormal respiratory sounds, urticaria, and limb edema. Until proven to be something else, a fever presenting by itself should be considered as a suspected contagious respiratory disease.

"To deal with emerging viral diseases of equines, including EI, it is mandatory to strengthen the medical/veterinary services with adopting appropriate preventive measures such as vaccines and adjuvants (substances that enhance the body's immune system)," the review states. "It has been seen that vaccination has been practiced since the 1960s; however, its efficacy is still a matter of debate due to the use of less potent vaccines, improper vaccination schedule, and also use of outdated virus strains, and due to continuous drift in the viral genome.

"There are many EIV subtypes circulating that provide no cross-protection to other strains. Recurrent epidemics lead to reduction in horse performance. The EI outbreaks have regularly been witnessed in non-vaccinated as well as vaccinated herds, and thus this disease has acquired a serious issue worldwide. Continuous emergence of newer strains due to mutations is yet another hindrance to the definite solution of this disease by means of vaccination."

RACEHORSES AT RISK

Due to its transient nature, horse racing contains a population of equines that are considered at-risk for equine influenza.

The study "Annual booster vaccination and the risk of equine influenza to Thoroughbred racehorses" was published in the July 2020 edition of *Equine Veterinary Journal*, and it examined an equine influenza outbreak that occurred among horses from four racing yards in Ireland within a four-week period.

The objective of the study was to carry out a detailed analysis of the racing yards affected in order to identify the source of infection and monitor virus spread among a vaccinated population. To do this, epidemiological and vaccination data along with repeat clinical samples were collected from 118 horses on the four properties. Of the studied yards

Boehringer Ingelheim

Don't settle for vaccines that may not be current with the latest influenza vaccine strains. Vetera® 2^{XP} and Vetera® Gold^{XP} are updated to align with current AAEP and OIE (World Organization for Animal Health) guidelines – arming your horse to withstand the constantly evolving equine influenza disease landscape. Updated protection you can count on. It's just what matters.

dealing with the outbreak, one was centered on flat racing, two on National Hunt racing, and one was both a National Hunt racing and a breeding yard.

"Failure to implement appropriate biosecurity measures following the introduction of new arrivals and the return of horses from equestrian events contributed to disease spread, as did the movement of horses within premises," the study found. "Mixing of racing and nonracing populations with inadequate vaccination histories also facilitated virus transmission.

"Traditionally, annual booster vaccination in many racing yards takes place just before Christmas. The synchronized scheduling of vaccination regimes across racing yards may contribute to the seasonal pattern of EI observed during this and previous outbreaks and trigger high-risk periods for EIV transmission."

According to the findings, vaccine breakdown was observed across all products in 27/80 horses (33.8%) with an up-to-date vaccination record. Eighteen of the 27 (66.7%) horses had not received a booster vaccination within the previous six months, and 10 (37%) horses were due annual booster vaccination at the time of developing clinical signs.

"Annual booster vaccination should not be relied on as the sole preventative measure against EI," the study concluded. "The findings of this study suggest that increasing the frequency of booster vaccinations may be beneficial particularly in young horses and that synchronized scheduling of vaccination regimes across racing yards may contribute to high-risk periods for EI virus transmission.

MARTIN KING / SPORTPIX

Equine influenza (EI) is an extremely contagious disease of horses, which is caused by Influenza A viruses

"Although vaccination plays a vital role, it should not be relied on as the sole preventive strategy. The degree to which vaccination can reduce transmission depends on several factors. This includes the antigenic relatedness of the vaccine strain and the field virus, an individual's immune response to vaccination, time since last vaccination, and the network and frequency of contacts."

In November 2015, the *Equine Veterinary Journal* published "The impact of different equine influenza vaccine products and other factors on equine influenza antibody levels in Thoroughbred racehorses." The study was conducted in order to ascertain the vaccination history of a population of Thoroughbred racehorses and identify factors that impacted their antibody titres against EI.

The observational field study was performed "because more knowledge of equine influenza vaccine usage in training yards and the factors that influence serological response to vaccination are required to determine evidence-based vaccination strategies."

The study population consisted of 102 vaccinated Thoroughbred horses in training on a single property. Analysis was done after their vaccination histories were studied and blood samples for serological testing were collected by the veterinary surgeon one month after being administered a booster vaccination.

According to the findings, more than 70% of horses received their first vaccine dose between ages 6 and 12 months. On average, horses had received six vaccine doses, and the mean interval between booster vaccinations was 7.7 months. The majority of horses (95%) had received more than one influenza vaccine product while 32% had received three vaccine products.

"There was a strong correlation between age and number of vaccine doses received," the study concluded. "Significantly higher antibody levels were observed in females than males, and there was a significant association between the number of vaccine products administered and antibody levels.

"In contrast, a negative association between number of vaccine doses and SRH antibody level was demonstrated. Important predictors of EI antibody titres in racehorses were sex, number of vaccine doses received, and number of different vaccine products administered."

Keeping up to date on the best vaccination strategy against equine influenza is a constantly evolving process but one that will serve individual horses as well as entire herds in the long run due to the virus' highly contagious and fast spreading nature. BH

Amanda Duckworth is a freelance writer based in Lexington.