



# Shot Clock

## RESEARCHERS EXAMINE TIMING OF EQUINE VACCINATIONS

By AMANDA DUCKWORTH

**FOR HUMANS, “VACCINES”** and “herd immunity” have become buzzwords over the past year, but for horse owners they are just a routine part of responsible equine care. While many operations have dedicated vaccine schedules in place, research continues into the best time to give various vaccines for maximum efficacy, especially when it comes to equine influenza.

As the American Association of Equine Practitioners explains in its “Principles of Vaccination,” there is no standard vaccination program for

all horses. As is typical when it comes to medical care, each individual horse and its situation are different. A veterinarian is required to determine the best course of action.

The core vaccines for horses that have demonstrated efficacy and exhibited a high level of patient benefit and low level of risk to justify their use in the majority of horses are for eastern and western equine encephalomyelitis, rabies, tetanus, and West Nile virus.

There are separate guidelines for risk-based vaccines, which might or

might not be required, based on region and horse population. It is important to work with a veterinarian to complete a horse’s individual vaccination program.

### THE RISK OF EQUINE INFLUENZA

Equine influenza, which falls in the risk-based vaccine category, is one of the most common respiratory infection diseases found in horses and, therefore, is routinely vaccinated against. It is endemic in most of the world’s equine population—including the United States—while some locations such as Iceland and New Zealand are exceptions.

“The Office International des Epizooties (World Organization for Animal Health) Expert Influenza Surveillance panel reviews currently circulating strains and makes recommendations for strain inclusion in the vaccine products,” explains the AAEP. “Equine influenza is highly contagious, and the virus spreads rapidly through groups of horses in aerosolized droplets dispersed by coughing or through fomite transmission (contact with an object contaminated with the virus). The majority of the clinical signs are respiratory and may also include fever, edema, and enlarged lymph nodes.”

In June 2019 the Centers for Disease Control and Prevention published the historical review “Equine Influenza Virus—A Neglected, Reemergent Disease Threat.” The publication provided a detailed look at equine influenza virus.

“Equine influenza virus is a common, highly contagious equid respiratory disease,” researchers explained. “Historically, EIV outbreaks have caused high levels of equine illness and economic damage. Outbreaks have occurred worldwide in the past decade. The risk for EIV infection is not limited to equids; dogs, cats, and humans are susceptible. In addition, equids are at risk from infection with avian influenza viruses, which can increase mortality rates.

“EIV is spread by direct and indirect contact, and recent epizootics also suggest wind-aided aerosol transmission. Increased international transport and commerce in horses, along with difficulties in controlling EIV with vaccination, could lead to emergent EIV strains and potential global spread.”

There are two equine influenza vaccines on the market: inactivated vaccines, in which the virus’ genetic material has been destroyed so it cannot replicate but can still trigger an immune response; and modified-live vaccine, which features a weakened version of the virus. Inactivated vaccines are administered intramuscularly and modified-live vaccines feature intranasal administration.

“A Brief Introduction to Equine Influenza and Equine Influenza Viruses”

was published in the *2020 Methods in Molecular Biology*, explaining: “EIV are Type A influenza viruses, and two subtypes are known: H3N8 and H7N7. Both are believed to have evolved from avian influenza virus ancestors. The H3N8 subtype circulates widely, but the H7N7 subtype is thought to be extinct. The clinical disease in horses, caused by either subtype, is an upper respiratory infection of varying severity, depending upon the immune status of the individual animal. It is not normally life-threatening in itself except in very young foals.

“However, it predisposes infected equids to secondary infections capable of producing life-threatening pneumonias. Vaccines are available and widely used in some horse populations, but their effectiveness is limited by antigenic drift and other factors, and vaccinated

animals with subclinical infections have been responsible for introduction of EIV into susceptible populations.”

#### CONTINUING EDUCATION

As Thoroughbreds often are around many others at breeding farms or at the track, they are at high risk for respiratory infections. The best methods for approaching vaccines and vaccination schedules are continually examined to help horse owners provide the best care possible for their horses.

“Programs for the control of infectious diseases are important components of good managerial practices directed toward maximizing the health, productivity, and performance of horses,” explains the AAEP. “Infectious disease in an individual horse or outbreaks of infection within a group of horses,



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In the racetrack environment, horses live in close proximity to many other horses

occurs when a sufficient quantity of an infectious agent overcomes the resistance acquired through prior natural exposure to the disease agent or through vaccination.

“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.”

In November 2020 the *Journal of Equine Veterinary Science* published the study “Antibody Responses Against Equine Influenza Virus Induced by Concurrent and by Consecutive Use of an Inactivated Equine Influenza Virus Vaccine and a Modified Live Equine Herpesvirus Type 1

Vaccine in Thoroughbred Racehorses.”

“An inactivated equine influenza virus (EIV) vaccine and a live equine herpesvirus type 1 (EHV-1) vaccine are usually administered concurrently to Thoroughbred racehorses in Japan,” explained researchers. “The objective of this study was to evaluate whether concurrent administration of an inactivated EIV vaccine and a live EHV-1 vaccine in Thoroughbred racehorses influences the antibody response against EIV.”

In the study, researchers compared antibody response against EIV between Group A, which comprised 27 horses administered both vaccines on the same day, and Group B, which comprised 20 horses administered an inactivated EIV vaccine first and then a live EHV-1 vaccine one to two weeks later.

According to the study, in both groups, geometric mean hemagglutination inhibition titers against A/equine/Ibaraki/1/2007 and A/equine/Yokohama/aq13/2010 increased significantly after EIV vaccination. However, the percentage of horses that showed a twofold increase or greater in HI titers against A/equine/Yokohama/aq13/2010 was significantly higher in the second group. In Group B, it occurred in 75% of the horses, as opposed to only 37% in Group A.

“These results suggest that the concurrent use of an inactivated EIV vaccine and a live EHV-1 vaccine reduced the immune response against EIV to some extent, and it would be better to use these vaccines consecutively, especially for naïve horses or horses whose vaccination history is incomplete,” researchers concluded.

Foals are commonly vaccinated against EIV as well. Researchers recently turned to examining the best intervals to administer the vaccines. In April 2021, the *Journal of Equine Veterinary Science* published “An Evaluation of Three Different Primary Equine Influenza Vaccination Intervals in Foals.”

For the study, researchers randomly divided 21 unvaccinated Thoroughbred foals into three groups of seven. Each group was vaccinated with three different intervals of primary immunization—either one, two, or three months between vaccine one and vaccine two. Then they measured antibody response by single radial hemolysis assay for up to a year after the third immunization, which was administered six months after the second immunization.

“All weanlings had seroconverted and exceeded the clinical protection threshold two weeks after V2 and one month after V3 until the end of the study,” researchers concluded. “Significant differences were measured at the peak of immunity after V2 and for the duration of the immunity gap between V2 and V3.

“The group with one-month primary vaccination interval had a lower



**“ALL HORSES IN A HERD SHOULD BE VACCINATED AT INTERVALS BASED ON THE PROFESSIONAL OPINION OF THE ATTENDING VETERINARIAN.”**

— AAEP

immunity peak after V2 and a wider immunity gap between V2 and V3 (18 weeks) when compared with other groups. The advantage observed in the group with one month primary vaccination interval, which induces an earlier protective immunity, is counterbalanced with a lower peak of immunity and a wider immunity gap after V2, when compared with foals vaccinated with 2- and 3-month intervals.”

Giving concurrent vaccinations is a typical management strategy. In September 2016 *Influenza and Other Respiratory Viruses* published the study “Concurrent vaccination against equine influenza and equine herpesvirus—a practical approach.”

“Epidemiological investigations of acute respiratory disease have con-



**Timing of vaccination administrations can be important**

firmed that equine influenza virus and equine herpesvirus 1 and 4 are important causes of both clinical and subclinical infection among young horses in racing yards and stud farms, and those returning from equestrian events,”

explained researchers. “Disease and suboptimal performance following infection with these viruses can result in significant financial loss. Equine viral diseases are primarily controlled by vaccination, and in the absence of multivalent vaccines, vaccines against different viruses may be given concurrently to simplify management and to minimize veterinary expense.”

The study was done to determine the impact of the concurrent use of EIV and EHV-1 or EHV-4 vaccines in Thoroughbred racehorses on their humoral immune response to EIV. It was carried out on a population of 30 horses, all of which were 2-year-olds in a racing yard in Ireland. They received inactivated whole-virus EIV vaccine and an inactivated EHV-1 and -4 vaccine.

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## Vaccines

The study's horses were randomly assigned to Group A, which was vaccinated against EIV and EHV-1 and -4 two weeks apart, and Group B, which was vaccinated against EIV and EHV-1 and -4 on the same day. Researchers then collected whole-blood samples on the day of vaccination as well as two weeks and six weeks later. Researchers found that the pattern of EIV antibody response post-vaccination was similar for both groups.

"The results of this study suggest that the two vaccines investigated are compatible and that concurrent vaccination against EIV and EHV-1 and -4 does not compromise the humoral immune response against either vaccine," researchers concluded. "In this study, there was no evidence of interference due to antigenic competition. In fact, it appears that a higher antibody response may be elicited against EIV when the influenza vaccine is administered at the same time as the EHV vaccine.

"The practice of concurrent vaccination against EIV and EHV-1 and -4 appears to be efficacious and may be advantageous to the owner/trainer in terms of affording greater protection against EIV and reducing the cost associated with vaccination. It also may be of benefit to the animal in improving health and minimizing veterinary intervention."

At the time, researchers noted that the study was restricted to a limited number of horses, all of the same age and breed, warranting further investigation. In February 2021, *Archives of Virology* looked at concurrent vaccinations in Warmblood foals in the study "Primary vaccination in foals: a comparison of the serological response to equine influenza and equine herpesvirus vaccines administered concurrently or 2 weeks apart."

"Infection with these respiratory pathogens is associated with loss of performance, interruption of training schedules, and, on occasion, cancellation of equestrian events," explained researchers. "Vaccination is highly recommended, and for some activities it



After a horse displayed neurological indications of EHV-1 in March at Laurel Park, four barns were quarantined

is a mandatory requirement of the relevant authority. As there is a dearth of information relating to the impact of concurrent vaccination on the antibody response to EHV and EIV vaccines, they are usually administered separately, often two weeks apart.

"In a previous study of booster vaccination in Thoroughbred racehorses, concurrent vaccination with whole-virus inactivated carbopol-adjuvanted EHV and EIV vaccines did not impact negatively on the antibody response. (An adjuvant is an ingredient added to the vaccine to help create a stronger immune response.) In this study, investigations were extended to concurrent versus separate primary vaccination of Warmblood foals."

Researchers performed a field study in order to compare the immune response to a carbopol-adjuvanted EHV vaccine and an immune-stimulating complex adjuvanted EI vaccine administered concurrently and two weeks apart, and they had similar findings to the Thoroughbred study.

"No adverse clinical reactions were observed, the pattern of EI and EHV antibody response was similar for both

groups, and there was no evidence that concurrent primary vaccination compromised the humoral response," researchers concluded. "The results are of relevance to horse owners who wish to decrease veterinary costs, limit handling of young animals, and simplify record keeping by vaccinating concurrently."

When designing a horse's vaccination protocol, the AAEP reminds owners it is important to have realistic expectations. Vaccinations without good management practices directed at infection control are not sufficient. While vaccines can greatly minimize the risk of infection, they are not capable of preventing diseases in all circumstances.

"All horses in a herd should be vaccinated at intervals based on the professional opinion of the attending veterinarian," explained the AAEP. "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 those horses in the herd that responded poorly to vaccination, thereby optimizing herd-immunity." **BH**

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