

A Novel DNA Vaccine Platform To Control EHV-1 and EHV-4

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The goal of this project is to develop an effective DNA vaccine for equine herpesvirus to protect horses against infection and disease and to prevent EHV outbreaks in the US.



Ongoing EHV-1 outbreaks, including cases of neurologic disease caused by EHV-1 and called 'equine herpesvirus myeloencephalopathy' (EHM), emphasize the fact that currently available EHV-1 vaccines are not fully protective. These disease outbreaks are occurring despite widely used vaccination and many available EHV vaccines on the market. The fact that currently available inactivated or attenuated vaccines have not been sufficient to completely protect from EHV-1 outbreaks has caused the demand for novel EHV vaccine formulations that can prevent horses from infection and severe disease, especially neurologic disease. Here, we propose to design and evaluate a novel DNA vaccine formulation against EHV-1/EHM for horses.

We are combining our expertise in equine immunology and EHV-1 research (Dr. Wagner) and virology and vaccine design (Dr. Diel) to first perform a comprehensive analysis of the best DNA vaccine candidate and then test the optimized vaccine candidate for its protective effects in horses. The DNA vaccine platform that we are testing in this project has already been used successfully for induction of immunity and protection from infectious disease in other species. The project will result in an established new EHV vaccine candidate and provide a new approach to effectively protect horses from EHV-1 infection and disease. Overall, the project is relevant to the prevention of disease induced by EHV-1 by increasing immunity and protection in the equine population and reducing severe neurological disease outbreaks in the US.

Importance to the Equine Industry: Equine herpesvirus type-1 (EHV-1) has a significant impact on animal health and the equine economy worldwide. Every year, several neurologic outbreaks are reported throughout the US (<http://www.equinediseasecc.org/alerts/outbreaks>).

In an outbreak scenario, EHM is first confirmed by an EHV-1 positive diagnostic test in the affected horse(s). The positive EHV-1 test result causes immediate regulatory actions with stringent quarantine and biosecurity of all horses at the facility where the EHM affected horse is kept to prevent further spread of the contagious disease. Quarantine is in place for 21-28 days after the last suspected infection. Currently, all potentially exposed horses at a quarantined location are kept there for the same time for general precaution and preventing the possible spread of EHV-1 to other horses. During this time all movements of horses to and from the quarantine facility stop. Depending on the location of the first affected horse, quarantine can apply to race, show and auction premises, or secondary locations if a potentially exposed horse already moved to another site, and can thus stop the movement of involved horses for weeks. Consequently, EHV-1 quarantine represents a high economic burden for the horse industry through loss of severely affected horses, medical treatment charges of diseased horses, quarantine management efforts, and lost training, racing and/or competition time for all horses involved in the quarantine scenario. EHV-1/EHM outbreaks and quarantine have not only a serious impact on equine health, they also restrict horse transport, racing and competitions, and economically affect horse owners, equine businesses, and the equine industry.

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