Comparison of Immune Responses in Healthy Foals When a Multivalent Vaccine Protocol Was Initiated at 90 or 180 Days of Age

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Foals are capable of immune activation after a three-dose immunization series with a multivalent vaccine started at 90 days of age, despite the presence of maternal antibodies. Authors’ addresses: Department of Clinical Sciences (Davis, Bryan) and Diagnostic Medicine Pathobiology (Wilkerson), College of Veterinary Medicine, Department of Statistics (Bello), Kansas State University, Manhattan, KS 66506; Pfizer (Zoetis) Animal Health, Global Headquarters, 100 Campus Drive, Florham Park, NJ 07932 (Hankins); e-mail: edavis@vet.k-state.edu. *Corresponding and presenting author. © 2013 AAEP.

1. Introduction

Induction of immunity to protect against infectious disease requires the implementation of an effective immunization program. In foals, most vaccine protocols are delayed until waning of maternal antibodies to avoid maternal antibody interference. It was the aim of this investigation to characterize immune activation among healthy foals in response to administration of a multivalent vaccine protocol and compare immune responses when foals were vaccinated at either 90 or 180 days of age.

2. Materials and Methods

Twelve healthy foals that received adequate colostrum were included in the investigation. Foals were blocked for age and randomly assigned to receive a three-dose vaccine protocol at 90 or 180 days of age. Immune activation was characterized by the measurement of CD4+ and CD8+ interferon-γ, interleukin-4, granzyme B, and major histocompatibility complex II expression after in vitro cellular stimulation with vaccine antigens that included Eastern equine encephalitis (EEE), Western equine encephalitis (WEE), West Nile virus (WNV), equine influenza virus (EIV), and equine herpesvirus (EHV)-1/4, and tetanus toxoid antigen. Total antigen-specific immunoglobulin G was assessed with the use of a flow cytometry–based microsphere bead assay. Time points of interest included 30 days after initial vaccination and at the end of the investigation, when vaccination was administered at approximately 11 months of age. Assessment of similarity was performed with bioequivalence testing; similarity was defined with a 95% level of significance.
3. Results
Comparable results were obtained for several measures of cellular immunity. In particular, antigen-specific CD4+ and CD8+ cellular expression of the cytokines interferon-γ and interleukin-4 were evident at specified time points for several vaccine antigens.

4. Discussion
The data presented in this report demonstrate that young foals are capable of immune activation after a three-dose immunization series with a multivalent vaccine, despite the presence of maternal antibodies. Although immune activation does not automatically translate into protection, several of the immune indicators measured showed comparable expression in foals vaccinated at 3 months of age, relative to those in the control group of foals initially vaccinated at 6 months of age. In a high-risk situation in which immune activation may be required earlier than at the completion of a conventional vaccine series, our data support that foals can respond to immunization that is initiated at 3 months of age in a manner comparable to that in foals initiated at an older age, provided that the immunization protocols include three doses followed by a booster at 11 months of age.