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Field Evaluation of Serum Antibody in Pigs Following Vaccination with End-FLUence® 2

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Introduction

A field study was conducted to evaluate the effect of End-FLUence® 2 vaccination on serum antibody titers in pigs. End-FLUence® 2 is an inactivated bivalent swine influenza (SIV) type A virus vaccine, containing subtypes H1N1 and H3N2 in a dual emulsion adjuvant.

The objective of this study was to evaluate serum antibody responses as determined by hemagglutination inhibition assay (HI) for both H1N1 and H3N2 SIV subtypes and by ELISA for the H1N1 subtype, as performed at a veterinary diagnostic lab service.

Methods

A Midwestern 1,200 sow farrow-to-finish operation characterized as high health, well managed and a good environment was selected for study. The farm had a history of a clinical SIV outbreak in 1998, approximately three years prior to this study. Swine influenza subtype H1N1 was diagnosed by virus isolation and serologic analysis of sows and pigs at that time. No further clinical signs have been observed since the initial outbreak. The herd remains negative for the Porcine Reproductive and Respiratory Syndrome Virus (PRRSV), also for the SIV H3N2 subtype and has used no SIV vaccinations prior to this study.

Forty-two nursery age pigs were randomly selected and divided into 2 groups of 30 vaccinates and 12 non-vaccinates. Vaccinates received two 2mL doses of End-FLUence®2 at 10 weeks and again at 13 weeks of age. Timing of the first vaccination was determined after serological monitoring to insure passive maternal antibodies had sufficiently declined as the sow herd still displayed moderate H1N1 serum titers.

Pigs were blood tested at 10, 16 and 22 weeks of age (prevaccination, 3 and 9 weeks after vaccination) for serological antibody profiling for both H1N1 and H3N2 subtypes. All serum samples were collected, stored and then submitted together at one time to a state veterinary diagnostic lab for assay in order to minimize variations over time. Hemmaglutination inhibition assay (HI) values <10 were coded as 1's for geometric mean titer (GMT) calculation. Values for ELISA for H1N1 represent an average of the reported individual S/P ratios.

Results

Geometric mean titers (GMT) by the HI assay for H1N1 and H3N2 in pigs vaccinated with End-FLUence® 2 are represented in *Figure 1*. Prevaccination titers were all negative. At 16 weeks of age, 3 weeks after the 2nd dose of vaccine, HI titers were 640 for the H1N1 and 584 for the H3N2 subtypes. The GMT for both subtypes may actually been much higher as titers were not end pointed and maximum reported titers were ≥640. One hundred percent (30/30) of the vaccinates were ≥640 for H1N1 and 87% (26/30) were ≥640 for H3N2. At 22 weeks of age, 9 weeks after their second vaccination, GMT for HI were still quite high, with 208 for H1N1 and 78 for H3N2. Even 34% (10/29) were still ≥640 for the H1N1 subtype. The frequency distributions of H1N1 and H3N2 titers in the 22 week-old vaccinated pigs are shown in *Figure 2*. The H1N1 IDEXX ELISA titers for non-vaccinated controls and vaccinates at 10, 16 and 22 weeks of age are shown in *Figure 3*. The controls as an average remained negative (<.40), though two individual pigs did go above .40, one at 16 weeks and one at 22 weeks. The vaccinates increased to a very high average value of 1.75 at 16 weeks of age which then decayed to a value of 1.38 another 6 weeks later.

Evaluation of SIV antibody passive decay was observed in an earlier group of non-vaccinated pigs. *Figure 4* depicts their H1N1 ELISA mean values at three-week intervals, from 3 – 15 weeks of age.

Discussion

This study evaluated the serologic response to End FLUence 2 in field pigs in a herd with some evidence of endemic SIV and potential levels of maternal interference by passive antibodies. Earlier controlled vaccination/challenge studies in pigs from SIV negative source herds have been reported for titer responses and disease protection [1,2]. A profile of H1N1 ELISA passive decay from 3 to 15 weeks of age is also depicted.

This herd appeared to be mildly endemic for the H1N1 subtype of SIV following a confirmed outbreak approximately three years prior to this study. The H1N1 ELISA profile of decaying passive antibody levels in non-vaccinated pigs from 3 to 15 weeks of age gives evidence of the endemic levels in the sow herd and potential interferences to SIV vaccination in the pigs.

Pigs vaccinated with End-FLUence 2 at 10 and 13 weeks of age showed a tremendous HI antibody response to both the H1N1 (100% ≥640) and the H3N2 (87% ≥640) subtypes of SIV as measured at three weeks following vaccinations. Their H1N1 IDEXX ELISA mean S/P ratio was also a tremendous 1.75 value. Another six weeks later, at 22 weeks of age, HI geomean titers were still 208 and 78 for H1N1 and H3N2 respectively, and H1N1 ELISA was 1.38. Non-vaccinated control animals' mean titers remained negative (HI <40, ELISA <.40) though one pig developed a positive H1N1 ELISA by 22 weeks and yet remained HI negative.

It has been reported that vaccination with a homologous strain of swine influenza generates better protection (lower virus titers within the lungs) than those vaccinated with a heterologous strain. However, pigs vaccinated with a heterologous strain having higher HI titers showed stronger protection (virus not recovered from lungs post-challenge) [3]. Be aware that major differences may exist among serological laboratories for normal time and personnel variations, minimum dilution thresholds (1:20 vs 1:10 for HI), denotation of "negative" thresholds regarding HI dilution titers and even simple individual sample reporting errors [4]. Prominent swine serological lab HI titer results following vaccination should be relevant as their common HI reference strains should be very similar to the commercial vaccine strains.

This study has shown that even with potential risk of passive interferences, unmeasurable by common assays, in an SIV endemic herd, all pigs demonstrated an excellent serum antibody response to End-FLUence 2 vaccinations after measurable passive titers had declined.

References

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2) Schlueter R. et.al. "Characterization and performance of a new bivalent, H1N1 & H3N2, swine influenza vaccine: End-FLUence2", An Proc, Amer Assoc Swine Practitioners 2001:p.213-214
3) Moreau, I.A. et.al. "Swine influenza virus serology and monitoring post-vaccination response", An Proc, Amer Assoc Swine Veterinarians 2002:p.79-80
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Figure 1.

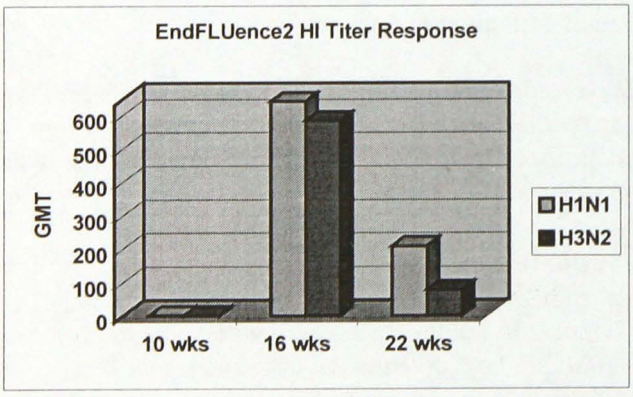

Figure 2.

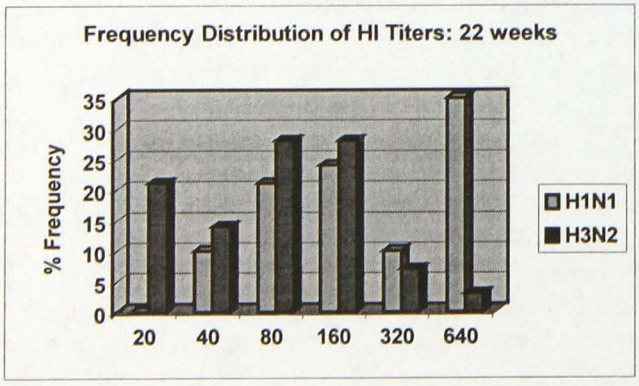

Figure 3.

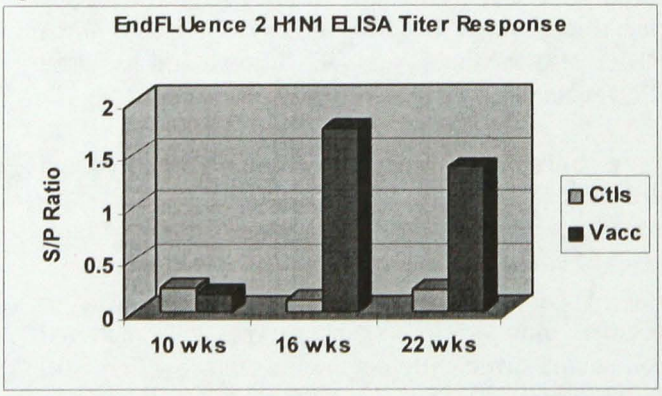

Figure 4.