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EFFICACY OF INTRADERMAL VACCINATION AGAINST CHALLENGE OF SWINE WITH A HETEROLOGOUS H3N2 SWINE INFLUENZA VIRUS

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Introduction

We have previously reported that intradermal (ID) vaccination with a needle-free injector results in hemagglutination inhibition (HI) antibody titers to H1N1 and H3N2 that are equivalent to those elicited by intramuscular (IM) vaccination (1). We have also demonstrated that SPAH's bivalent swine influenza (SI) vaccine, MaxiVac® Excell™, can protect against challenge with an H3N2 virus genetically distinct from the H3N2 virus contained in the vaccine (2). The purpose of this study is to evaluate whether ID vaccination will protect pigs from challenge with the heterologous H3N2 SI virus, and to evaluate the humoral and local antibody response following ID vaccination.

Materials and Methods

SI Virus Isolates: The H3N2 vaccine virus is from the TX/98 triple reassortant lineage that was established in the US swine population in 1998 (3). The challenge H3N2 virus (NC02a) was 1 of 3 isolates obtained in 2002 from G. Erickson, Rollins ADDL, Raleigh NC from a sow farm in a large production system in North Carolina. Sequencing of HA1 segment of the hemagglutinin gene demonstrated only 92% identity to the vaccine virus (2). These 2002 isolates belonged to a lineage of H3N2 swine viruses first identified in 2000 (4).

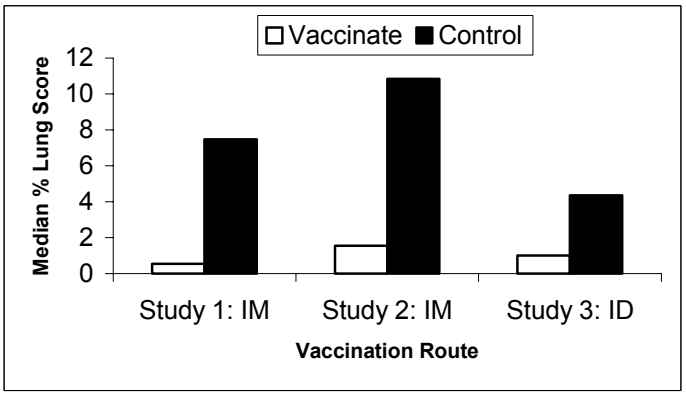
Serological and Genetic Characterization: Procedures for producing monospecific antisera in swine and HI testing were as reported previously (2*)*. Extraction of viral RNA, PCR, sequencing, and analysis were also performed as described previously (2,5).

Vaccination/Challenge: 5-7 week old pigs from a high-health status herd were vaccinated twice, with 2 mL IM of bivalent SI vaccine (Studies 1 and 2). In Study 3, pigs were vaccinated with 0.2 mL ID of a bivalent SI vaccine formulated to contain a typical field dose of SI antigen in Emunade® adjuvant. The treatment group sizes in each study was 7-10 vaccinates and controls. Three weeks after revaccination the pigs were challenged intranasally with H3N2 isolate NC02a. Post-challenge procedures, scoring of lung lesions, were as described previously (2). Bronchiolar alveolar lavage (BAL) fluids taken at necropsy were sent to P. Kitakoon, Iowa State University, for testing for isotype-specific local antibodies to the SI H3N2 vaccine strain (6). Statistical analysis was performed by Diane Sweeney, PhD, SPAH.

Results and Discussion

Challenge Studies: MaxiVac Excell protected against challenge with H3N2 isolate NC02a as evidenced by a significant reduction in lung consolidation (Figure 1). The % reduction in median scores was 92.7% (p=0.0001, Study 1) and 87.7% (p=0.0087, Study 2). In the 3rd study, ID vaccination produced a similar level of protection, with a % reduction in median score of 77.0% (p=0.0023).

Figure 1: Median % Lung Scores at Necropsy.



Consistent with previous results, ID vaccination produced HI titers equivalent to those seen after IM vaccination (data not shown). ID-vaccinated pigs had significantly higher IgG (p=0.0342) in BAL fluids at necropsy than control pigs (Table 1).

Table 1: SI H3N2 antibodies in BAL fluids at necropsy.

	ELISA OD (Mean ± SD)	
Group	IgG	IgA
Vaccinate	0.132 ± 0.063	0.304 ± 0.126
Control	0.034 ± 0.021	0.239 ± 0.144

Summary: In these controlled challenge studies, needle-free ID vaccination appeared as effective as the IM route for the prevention of lung lesions in swine challenged with a genetically distinct H3N2 SI strain.

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