Swine influenza (SI) is an acute, infectious and highly contagious febrile respiratory disease of swine caused by type A influenza viruses. The disease causes high morbidity and low mortality, and is characterized by a sudden onset of coughing, dyspnea, fever and prostration. Reproductive failures can occur in sows.

The hemagglutination inhibition (HI) test is a customary method for the detection of antibodies against H3N2 and H1N1 viruses. Variation in performance of HI tests has been shown by previous studies to be dependent upon technique, test virus strain and propagation methods, indicator cell type, specimen pretreatment method and other factors. Interpretation of titer outcomes varies between diagnostic laboratories. These factors predispose HI tests to inherent variability and compromise the use of test results over time or between laboratories in production-monitoring programs.

The enzyme-linked immunosorbent assay (ELISA) is a proven, versatile and less technique-dependent test than the HI test. Because the ELISA is a standardized test, its results are more easily reproduced, especially when comparing well-to-well and plate-to-plate results between ELISA tests and HI tests.

The IDEXX SIV H3N2 Ab Test and IDEXX SIV H1N1 Ab Test provide rapid screening for the presence of antibodies to swine influenza, indicating a herd’s vaccine-immune response or exposure to the H3N2 and H1N1 types of SI viruses.

Monitoring the immune status of a herd can help to establish baselines for vaccination programs. It is also useful for detecting the presence of field SI viruses that are infecting the vaccinated animals. These field SI viruses can cause mild respiratory signs. They can also indicate a clear SI outbreak due to new types of SI strains that are not present in the antigen formulation of the current vaccines, or indicate a lack of protection to resident SI viruses due to poor vaccine application, high maternal immune interference or immunosuppressive conditions currently occurring in the herd.

Monitoring the passive immunity from the sows to the piglets can help to determine the optimal time for vaccination in the face of maternal antibodies, and can play an important role in the control of swine influenza viruses.

**Interpretation**

<table>
<thead>
<tr>
<th>IDEXX SIV H3N2 Ab Test</th>
<th>IDEXX SIV H1N1 Ab Test</th>
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</thead>
<tbody>
<tr>
<td>S/P Ratio &lt;0.30</td>
<td>Negative</td>
</tr>
<tr>
<td>S/P Ratio 0.30–0.39</td>
<td>Suspect</td>
</tr>
<tr>
<td>S/P Ratio ≥0.40</td>
<td>Positive</td>
</tr>
<tr>
<td>S/P Ratio &lt;0.40</td>
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Sensitivity

**Study 1:** Forty, six-week-old pigs farrowed from influenza-negative sows were tested for H3N2 and H1N1 antibodies with the two IDEXX ELISA tests. All pigs were confirmed seronegative by all tests. Three treatment groups and one control group were identified (n=10 pigs/group) and maintained separately. Two doses of bivalent vaccine containing H3N2 and H1N1 antigens in its formulation were administered intramuscularly to treatment groups B, C and D at six weeks of age and at nine weeks of age. No vaccine was given to control group A.

Test bleedings were drawn on the first day of vaccination and again on days 7, 10, 14, 21, 27, 35, and 42 post-first-vaccination. Sera from all the animals were tested with IDEXX SIV H3N2 Ab and SIV H1N1 Ab Tests that detect SIV H3N2 and H1N1 antibodies respectively. Two additional bleedings were taken at the study site on days 56 and 66 after the first vaccine dose was administered. All study animals were moved to a finishing site after day 66.

**Results from Study 1:** All 40 pigs remained clinically normal through day 66. All test bleedings for the ten control pigs and all prevaccination bleedings for the 30 treatment group pigs yielded negative results on both ELISA tests; seroconversion in the treatment groups was apparent six days after administration of the second vaccine dose. Figures 1 and 2 show the vaccine-elicited responses to H3N2 and H1N1 immunogens that were detected by the IDEXX SIV H3N2 Ab and IDEXX SIV H1N1 Ab Tests in all treatment groups.

Approximately 120 days after the first vaccination, clinical signs of mild respiratory illness were observed in the study pigs and cohorts at the finishing site: barking cough and clear nasal discharge. Serology performed on sera drawn from a separate group of weaned nursery pigs transported to the finishing site indicated exposure to a field strain of the H3N2 virus. A final bleed was taken from the pigs in the treatment groups on study day 133. Figure 1 shows substantial anamnestic immune responses to the field-virus challenge observed for all study pigs 16 weeks after the second vaccine dose.

**Study 2:** Fourteen pigs were vaccinated with a bivalent H3N2/H1N1 inactivated product at five weeks of age and seven weeks of age, and monitored over a 140-day period after administration of the first vaccine dose. A live H3N2 virus challenge was administered 135 days after the first vaccination, and a final bleed was obtained five days after the challenge. Results were compared with the IDEXX SIV H3N2 Ab Test and with two different hemagglutination inhibition tests.

**Results from Study 2:** Figure 3 shows that the IDEXX SIV H3N2 Ab Test and the two HI tests detected a significant post-vaccination titer that peaked two weeks after the second vaccination with the bivalent product (mean S/P titer = 0.82). The slope of the antibody decay curve measured by the IDEXX SIV H3N2 Ab Test was flatter than the decay curve measured by the HI tests between 56 and 112 days post-vaccination. Figure 3 also shows that five days after the challenge, a significant anamnestic antibody response was detected by the IDEXX SIV H3N2 Ab Test, but not detected by either HI test.

**Study 3:** A correlation study between the IDEXX SIV H3N2 Ab and IDEXX SIV H1N1 Ab Tests and hemagglutination inhibition tests was performed at IDEXX Scandinavia, Sweden, and at Animal Health Services (AHS), Deventer, Holland, using swine sera collected by AHS from farms reporting respiratory illnesses. These samples were tested with the IDEXX SIV H3N2 Ab and IDEXX SIV H1N1 Ab Tests, and were compared to HI tests that utilized antigens from the following influenza viruses: A/swine/Netherlands/Best/96 (H1N1) and A/swine/Netherlands/S1-Oedenrode/96 (H3N2).

**Results from Study 3:** Figures 4 and 5 show that both ELISA tests correlate well to the HI tests results observed for low, moderate and high antibody titers. Sera from these cases and the negative results were in agreement between the test methods utilized.

**Maternal Antibody Decay**

Maternal antibodies play an important role in protecting offspring from clinical signs of SI infection, but they also interfere with early vaccination. Thirty-five piglets were tested from a sow herd vaccinated 60 days pre-farrowing H3N2 and H1N1. Serum samples were collected at 3, 7, 10, 13 and 18 weeks of age and were tested with the IDEXX SIV H1N1 Ab Test and a hemagglutination inhibition test.

**Results:** Figures 6 and 7 show the antibody decay curves for sera tested by ELISA and HI. A linear decay of the maternal antibody decay indicates that vaccination of the piglets may be optimal when pre-existing titers yield an S/P ratio of <0.40. The ELISA and HI tests correlate well (r=0.85), and the ELISA tests can be more sensitive for maternal antibody detection. Using the ELISA tests for determining an optimal time for a piglet’s early vaccination is much easier than using HI tests. The IDEXX SIV H1N1 Ab Test can detect low levels of residual maternal antibodies that HI tests cannot.
**Specificity**

Figure 8 shows a negative population of 714 serum samples. The IDEXX Swine Influenza H3N2 Ab Test exhibits 99.2% specificity (suspect zone not included) or 98.9% specificity (suspect zone included).

Figure 9 shows a negative population of 765 serum samples. The IDEXX SIV H1N1 Ab Test exhibits 99.7% specificity.

**Summary**

The IDEXX SIV H3N2 Ab and H1N1 Ab Tests can provide you with:

- A better guidance tool for monitoring maternal antibody decay, which can lead to improvements in the effectiveness of early influenza vaccinations
- A better guidance tool for monitoring vaccine application, profiling herd immunity and detecting exposure to incidental field-virus introductions. These are critical tasks for swine veterinarians because emerging strains of reassortant and variant swine influenza viruses pose continued challenges to respiratory and reproductive health problems.
- A proven versatile and less technique-dependent method than hemagglutination inhibition tests

**Figure 8:** IDEXX SIV H3N2 Ab Test tested on a presumptive-negative population (n=714)

**Figure 9:** IDEXX SIV H1N1 Ab Test Kit tested on a presumptive-negative population (n=765)

For more information about the IDEXX SIV H3N2 and H1N1 Ab Tests, please contact your IDEXX representative or visit idexx.com/siv.