Effective tool for monitoring avian pneumovirus in chicken and turkey flocks

The IDEXX APV Ab Test is an indirect ELISA for the detection of APV antibodies in chicken and turkey serum. This test has been developed as a flock-screening tool to aid in the diagnosis of APV.

- Detects A, B and C avian pneumovirus types
- Detects vaccine immune response 16 days after vaccination
- Chicken and turkey serum samples
- 98% specificity in SPF populations
- Indirect—quantitative ELISA

Avian pneumoviruses (APV) can cause damage to the upper respiratory tract (trachea), such as, lack of cilia movement and/or cilia loss—damage that may lead to respiratory clinical signs such as coughing, sneezing, swollen head and more complicated respiratory problems. This stress on the cilia and upper respiratory tract can facilitate the multiplication of *E. coli* and other bacterial infections such as *Mycoplasmas, Bordetella* sp, etc. that lead to a respiratory syndrome called swollen head syndrome (SHS). APV plays a role in the multiplication of infectious bronchitis virus (IBV) in the upper respiratory tract. APV can also affect the reproductive tract, impacting egg formation in turkey breeders, broiler breeders and egg-type chickens, resulting in an increase in the percentage of egg abnormalities and a drop in egg production.

The most prevalent types of APV are A and B, but type C is present in some poultry states in the United States. For this reason, it is important for monitoring purposes to have a diagnostic test that is able to detect any of the potential APV strains in the commercial chicken and turkey industries.

The IDEXX APV Ab Test is a quantitative test for the detection of A, B and/or C APV-specific types in specific pathogen-free (SPF), as well as commercial, chicken and turkey flocks that could be exposed to field or vaccine viruses. This test and xChek* software can help to screen SPF populations or monitor flocks that have been vaccinated with live or inactivated vaccine against A, B and/or C APV types. IDEXX recommends building a baseline for each company.

References:
### Specificity: German chicken population

The IDEXX APV Ab Test (graph 1) provided better than the gold-standard competitive, or blocking, ELISA (graph 2), with 98.4% specificity vs. 96.9%, respectively. The cutoff in graph 1 for the IDEXX APV Ab Test is 0.2, whereas, the arrows in graph 2 indicate the suspect zone for the blocking ELISA test.

### Specificity: U.S. turkey population

The IDEXX APV Ab Test (graph 3) displayed better specificity in a negative U.S. turkey population vs. another commercial indirect ELISA (graph 4). The IDEXX APV Ab Test has an excellent population distribution. The cutoff in graph 3 for the IDEXX APV Ab Test is 0.2, whereas, the arrows in graph 4 indicate the suspect zone for the other indirect ELISA test.

### Sensitivity: Chickens with type A and B vaccines

**Graph 5:** Percentage of positive samples with the IDEXX APV Ab Test—chickens vaccinated with inactivated product containing A or B antigens

<table>
<thead>
<tr>
<th>Age of sampling (vaccination)</th>
<th>Vaccine A</th>
<th>Vaccine B</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>3w (1x live)</td>
<td>60%</td>
<td>70%</td>
<td>40%</td>
</tr>
<tr>
<td>6w (2x live)</td>
<td>70%</td>
<td>80%</td>
<td>60%</td>
</tr>
<tr>
<td>12w (2x live)</td>
<td>80%</td>
<td>90%</td>
<td>70%</td>
</tr>
</tbody>
</table>

### Sensitivity: Turkeys with type A and B vaccines

**Graph 6:** Percentage of positive samples with the IDEXX APV Ab Test—turkeys vaccinated with live and inactivated avian pneumovirus vaccines against serotype A or B

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Percentage</th>
<th>Titers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccine A</td>
<td>90%</td>
<td>1,000 - 2,000</td>
</tr>
<tr>
<td>Vaccine B</td>
<td>95%</td>
<td>1,500 - 2,500</td>
</tr>
</tbody>
</table>

**Graph 7:** Percentage of positive samples with the IDEXX APV Ab Test—turkeys vaccinated with live and inactivated avian pneumovirus vaccines against serotype A or B

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Percentage</th>
<th>Titers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccine A</td>
<td>70%</td>
<td>1,000 - 2,000</td>
</tr>
<tr>
<td>Vaccine B</td>
<td>80%</td>
<td>1,500 - 2,500</td>
</tr>
</tbody>
</table>

Turkey flocks were vaccinated at one day of age with either type A or type B live vaccines. Serum samples (sample size = 23) were taken at three weeks of age, and the last serum sampling occurred after an inactivated vaccination at 33 weeks of age.

The IDEXX APV Ab Test detects antibodies in turkeys vaccinated with live and inactivated avian pneumovirus vaccines against serotype A or B.

**Vaccine A:** Graphs 7 and 8 show that there is low seroconversion at three weeks of age with vaccine A, most likely due to maternal antibodies interference. But after the booster with a live vaccine type A, the percentage of turkeys showing titers increases at six weeks of age, as well as at 12 weeks of age.

**Vaccine B:** Graphs 7 and 8 show a large percentage of positive serum samples from turkeys vaccinated at one-day old with the live vaccine type B. The percentage of seroconversion remains high at six weeks of age, and then starts to decline at 12 weeks of age.

Mean titers for both groups reached levels between 9,000 and 12,000 after the inactivated vaccine was applied.
Sensitivity: Chickens with type C vaccines

Seven birds were vaccinated intramuscularly/subcutaneously with a type C vaccine against avian pneumovirus. Serum samples were taken twice a week for four weeks post-vaccination.

The IDEXX APV Ab Test detects antibodies against type C avian pneumovirus 11 days post-vaccination. The rate of seroconversion and mean titers are shown in graph 9. At day 14, all birds had seroconverted with a mean titer of 1,400, which increased over time to 7,400 at day 28.

Conclusion

- The IDEXX APV Ab Test has better specificity than the blocking format or competitive ELISA, which is considered the gold-standard reference for negative populations. Now, poultry producers will have more confidence in monitoring SPF or naïve populations.
- The IDEXX APV Ab Test can detect the presence of A, B or C avian pneumovirus.
- The IDEXX APV Ab Test can detect immuno response to a commercially available live or inactivated vaccines against avian pneumovirus that contain A, B or C antigens.
- The IDEXX APV Ab Test has a good balance of sensitivity for the detection of A, B or C avian pneumovirus serotypes.
- The IDEXX APV Ab Test can be used with xChek* software to generate baselines and to monitor vaccination programs and field challenge interaction.
- The IDEXX APV Ab Test has the same sample diluent and same test protocol as the other IDEXX poultry ELISA test kits.