The publication of vaccination guidelines for dogs and cats—intended to provide useful insights on the selection and use of vaccines—also elicited some degree of controversy regarding implementation of these vaccination recommendations in practice.

**DURATION OF IMMUNITY CONCERNS**

In particular, the recommendation to administer core vaccines to adult dogs and cats at 3-year intervals (or longer) rather than annually resulted in differences of opinion among veterinarians. After all, veterinarians have been recommending annual boosters for years, doing so in accordance with manufacturer recommendations.

Therefore, the growing group of veterinarians who were skeptical of triennial vaccination recommendations began measuring antibody titers from individual patients to assess duration of immunity (DOI) and determine whether a patient required revaccination. As demand for vaccine titers increased, veterinary laboratories began offering antibody titer panels for dogs and cats while 2 companies developed in-clinic antibody tests.

With the increased focus on antibody titers, additional questions were raised:
- What are the indications for performing titers?
- When interpreting antibody titers, what test limitations apply?
- How should test results be interpreted when making vaccination decisions for individual patients?

**CORRELATION OF TITERS & IMMUNITY**

Antibody titers measured in laboratories and by in-clinic and antibody test kits typically record results as **positive** or **negative**, and include a brief description of the result’s significance. However, questions remain:
- How well does a **positive** antibody titer (or test kit result) correlate with protective immunity in a patient?
- How well does a **negative** titer (or test kit result) correlate with susceptibility in a patient?

When interpreting antibody titers, a few facts must be clear:

1. The only **true** test of protective immunity involves exposure (challenge) to a virulent pathogen in which nonvaccinates (controls) are infected and manifest clinical illness while vaccinated animals remain healthy. Animal vaccines are licensed based on this premise.
2. Interpreting antibody test results depends on understanding what results do and do not represent. In the clinical setting, antibody levels offer diverse and distinct clinical applications (see It’s All About PIE, page 36).
3. Different classes of antibody, also called immunoglobulin (Ig), have specialized functions (identified and categorized as IgA, IgG, IgE, or IgM). In veterinary medicine, the antibody titers used to assess protective immunity typically represent the IgG class.
4. When using an in-clinic test kit to measure (qualitative or semiquantitative) antibody levels, results are reported as either **positive** (indicates protection) or **negative** (indicates susceptibility) and must be correlated with gold standard laboratory tests, such as virus neutralization (VN) or hemagglutination inhibition (HI), in order...
to accurately represent a defined threshold of antibody. Both in-clinic tests have been correlated through VN, HI, or challenge testing results. While the correlation studies were conducted independently through universities, the data is available through the respective companies that manufacture the in-clinic test kits.

Today, in-clinic titer test kits for canine distemper (CDV), canine parvovirus (CPV), canine adenovirus (CAV), and feline parvovirus (panleukopenia, FPV) correlate well with appropriate gold standard tests. Therefore, when these in-clinic tests are performed properly:

- A positive test result indicates the patient does have protective levels of antibody against the virus.
- A negative test result indicates the patient does not have protective levels of circulating antibody. However, a negative test result does not necessarily define susceptibility.

**ANTIBODY DEVELOPMENT LIMITATIONS**

Seroconversion, the antibody response that follows vaccination, can be identified for most vaccines administered to dogs and cats. However, the development of antibody does not necessarily equate to protective immunity.

**Feline Calicivirus & Herpesvirus**

- Even if antibody test results are positive after feline herpesvirus (FHV) and feline calicivirus (FCV) vaccination, results do not correlate well with protective immunity; these results are not generally recommended for use when making vaccination decisions for an individual cat.
- The correlation between the gold stan-

**TABLE 1. Tests to Determine Immunologic Protection**

<table>
<thead>
<tr>
<th>VIRUS</th>
<th>APPROPRIATE TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabies</td>
<td>Rabies antibody titers are determined by FAVN. Test results cannot be used as an index of immunity in lieu of revaccination.</td>
</tr>
<tr>
<td><strong>CANINE</strong></td>
<td></td>
</tr>
<tr>
<td>Adenovirus</td>
<td>In-clinic titer test results correlate well with gold standard testing (VN).</td>
</tr>
<tr>
<td>Distemper virus</td>
<td>In-clinic titer test results correlate well with gold standard testing (VN).</td>
</tr>
<tr>
<td>Parvovirus</td>
<td>In-clinic titer test results correlate well with gold standard testing (HI).</td>
</tr>
<tr>
<td><strong>FELINE</strong></td>
<td></td>
</tr>
<tr>
<td>Calicivirus</td>
<td>The correlation between gold standard testing (VN) and protection is fair to good.</td>
</tr>
<tr>
<td>Herpesvirus</td>
<td>The correlation between gold standard testing (VN) and protection is only fair; cell-mediated immunity is a better correlate of protection.</td>
</tr>
<tr>
<td>Parvovirus</td>
<td>In-clinic titer test results correlate well with gold standard testing (HI).</td>
</tr>
</tbody>
</table>

**INDICATIONS FOR ANTIBODY TESTING**

The following indications apply to antibody tests for CAV-1, CDV, CPV, and FPV because these results correlate well with gold standard testing:

1. Evaluation of Immune Response Following Initial Administration of Core Vaccines

If a client would like to determine whether a young dog/cat responded to the initial vaccination series (usually 3 doses), in-clinic test kits provide an excellent means of identifying those that did respond versus those that did not and, therefore, remain susceptible.

2. Management of Infection Among Vaccinates

For veterinarians faced with treating confirmed parvovirus infection in a well vaccinated dog or cat, antibody testing can be used to rapidly determine whether the affected
animal developed a protective immune response following the initial vaccination series.

- A *positive antibody test* suggests the vaccinated patient was infected during a period of susceptibility (eg, in the presence of MDA).
- Patients with a *negative test result* are likely to be susceptible (genetic) non-responders (or low-responders).
- The antibody test *does not* distinguish vaccine-induced seroconversion from that caused by infection.

### 3. Determination of Antibody Level in Lieu of Revaccination

For patients with a history of a known, or suspected, serious vaccine adverse event (reaction), evaluating the level of antibody will determine whether the patient has previously developed a protective immune response to vaccination. Patients with a *positive test result* can avoid revaccination and potential risk for an adverse event.

If, on the other hand, a patient with a history of a serious vaccine adverse event is tested for antibody and has a *negative test result*, the decision whether or not to administer vaccine is more complicated because:

- Among previously vaccinated animals, immune memory (B-lymphocytes) can be sustained for many years despite declining antibody levels; exposure to a pathogenic virus (eg, distemper or parvovirus) can result in a rapid and protective anamnestic response.
- Prior history of a vaccine adverse reaction is not predictive of future risk.
- Immunization may not be optional, regardless of the antibody status of the individual (eg, rabies).

### 4. Assessment of Adult Dogs & Cats with an Unknown Vaccination History

Clientele who have adopted an adult dog/cat that has no known vaccine history may elect to avoid vaccination if a protective level of immunity can be determined serologically.

### 5. Antibody Testing in Lieu of Annual Revaccination

International guidelines for administration of core vaccines to adult dogs and cats consistently recommend revaccination schedules of no more *often* than every 3 years for core antigens (CAV-1*/CDV/CPV and FCV/FHV/FPV). However, with regard to rabies vaccination, veterinarians must follow state or local laws.

### 6. Management of Infection Risk Among Animals Entering a Shelter

Immunization status of young animals presented to animal shelters is often unknown. Because the infection risk among shelter-housed dogs and cats is high, determining antibody status of an animal at time of entry allows vaccination and separation (foster) of animals deemed susceptible until a *positive* test result is obtained.

### 7. Management of Outbreaks Within an Animal Shelter

Antibody test kits offer shelters a management advantage when faced with an infectious disease outbreak involving CDV, CPV, or FPV. Identifying and separating animals with *positive* (protected) test results from those with *negative* (susceptible) results may help avoid unnecessary euthanasia.

When feasible, susceptible animals should be isolated from the general population, which limits propagation of the outbreak. Isolated, seronegative survivors can be placed or adopted once the incubation period for the infectious agent has passed (2 weeks for CPV and FPV; 6 weeks for CDV).

### TABLE 2. In-Clinic Antibody Titer Test Kits

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>TiterCHEK</th>
<th>VacciCheck Antibody Test Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canine Antibody</strong></td>
<td>Synbiotics Corporation (synbiotics.com)</td>
<td>Biogal Galed Laboratories (biogal.co.il)</td>
</tr>
<tr>
<td><strong>Feline Antibody</strong></td>
<td>None</td>
<td>Biogal Galed Laboratories (biogal.co.il)</td>
</tr>
<tr>
<td><strong>Sample</strong></td>
<td>Serum or plasma (can use hemolyzed sample)</td>
<td>Serum, plasma, or whole blood (can use hemolyzed sample)</td>
</tr>
<tr>
<td><strong>Test Time</strong></td>
<td>15–20 min (minimum)</td>
<td>21 min (minimum)</td>
</tr>
<tr>
<td><strong>Results</strong></td>
<td>Qualitative: Positive or negative</td>
<td>Semiquantitative (based on color): Negative, low positive, significant positive, or high positive</td>
</tr>
</tbody>
</table>

*All antibody tests detect antibodies against CAV-1; however, the vaccine antigen protects against CAV-2 (a respiratory pathogen), which also cross protects against the more serious, systemic CAV-1 (canine hepatitis virus).
INTERPRETATION OF ANTIBODY TEST RESULTS

The following interpretations apply to antibody test results for CAV-1*, CDV, CPV, and FPV, reported by a reputable diagnostic laboratory or obtained from an in-clinic test kit:

1. A positive antibody test result in an unvaccinated, but healthy dog or cat suggests prior exposure to and recovery from infection; the patient has protective immunity.

2. A positive antibody test result in a previously vaccinated dog or cat correlates well with protective immunity.

3. A negative antibody test result in a previously vaccinated dog or cat must be interpreted on the basis of age and prior vaccination history.
   - Negative test result in protected patient: Over time, antibody levels in a previously vaccinated adult dog or cat that is not revaccinated (or naturally exposed) may fall to negative levels. Memory cells (B-lymphocytes), however, can persist longer than antibody. Exposure to virulent virus is expected to rapidly boost the patient’s antibody response and protect.
   - Negative test result in susceptible patient: A puppy or kitten that is antibody negative following administration of initial core vaccine series is considered susceptible to infection if exposed. These patients may be (genetic) non-responders (or low-responders) or received the vaccine during a period when interfering levels of MDA were present.

CAV = canine adenovirus; CDV = canine distemper; CPV = canine parvovirus; DOI = duration of immunity; FCV = feline calicivirus; FHV = feline herpesvirus; FAVN = fluorescent antibody virus neutralization; FPV = feline parvovirus (panleukopenia); HI = hemagglutination inhibition; Ig = immunoglobulin; MDA = maternally-derived antibody; VN = virus neutralization

Suggested Reading

LINKS TO VACCINATION GUIDELINES

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