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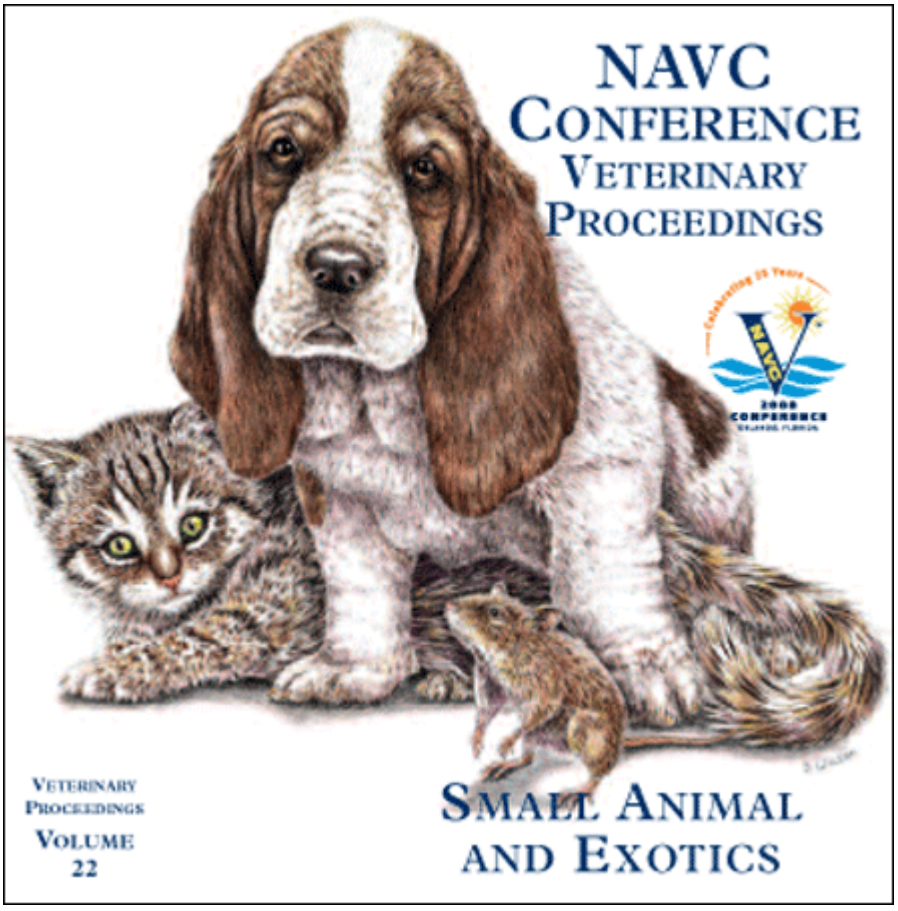

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VACCINATION 2008 – BUILDING THE PROTOCOL…IMPLEMENTING THE GUIDELINES

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Vaccination *Guidelines* for the cat were first published in 1998; canine *Guidelines* followed in 2003. By the end of 2006, both sets of *Guidelines* had been reviewed extensively, updated, and published. Today, the complete text of both the AAHA Canine Vaccine Guidelines (www.aahanet.org) and the AAFP Feline Vaccine Guidelines (www.aafponline.org) is available to the entire profession. Let there be no question…veterinarians continue to pay close attention to the numerous, sometimes controversial, presentations and publications that address how we should select and use vaccines in companion animal practice. Yet, whether or not you intend to implement any of the recommendations outlined, every clinician should at least read the *GUIDELINES*. These two publications serve as a critical resource for any veterinary practice engaged in administering vaccines to dogs and cats. The pace of change regarding vaccine technology along with new product introductions virtually mandates that veterinarians carefully assess the manner in which vaccines are selected and used.

Today there's simply no room for complacency with respect to developing a *rational vaccination protocol.* It's a fact—there are too many issues and too many new facts to ignore the changes impacting the selection and use of vaccine.

Perhaps the single most significant challenge regarding implementation of a vaccine protocol in practice today is the number of vaccines available today. At this writing, there are approximately 26 vaccine antigen types for the dog and 18 types for the cat; combined, there are over 150 proprietary (trade name) vaccines in the US! Just months after publication of the 2006 Feline Vaccination Guidelines, two new vaccines were licensed (VS Feline Calicivirus and Canine Malignant Melanoma-therapeutic vaccine); throughout 2008 it is reasonable to expect additional canine and feline vaccines will be licensed.

But it's not just the number of new vaccines that impact vaccination protocols used in practice, it's the frequency of vaccination, it's the duration of immunity of the various vaccines we use, it's the dramatic change occurring in vaccine technology and development, it's vaccine safety, it includes medical, legal, and ethical responsibilities and more.

The objective of this article is not to attempt defining standards for vaccinating dogs and cats, nor is it to recommend a universal vaccination protocol. Instead, the goal is to facilitate the efforts of individual clinicians in implementing a ***rational*** vaccination program, consistent with current body of knowledge.

BUILDING THE PROTOCOL

The concept of CORE and NON-CORE vaccines is valid and has direct application in veterinary medicine today. Simply stated, this means separating the vaccines currently in your refrigerator into two separate groups: those that every dog and every cat will receive (CORE) and those that the attending clinician decides are necessary (or NOT necessary) based on health risk assessment of the individual patient (NON-CORE). While this may not sound especially important, there is value in assuring that every person in the hospital, technicians as well as veterinarians, is aware of the CORE vaccines and can consistently communicate the same vaccine message to clientele. The series of four tables that follow represent a list the CORE vaccines for the dog and cat *and* current recommendations for incorporating these vaccines into a rational vaccination protocol.

Antibody Titers vs. Annual Vaccination

Current vaccination guidelines for the dog and cat recommend triennial administration of core vaccines rather than the conventional annual booster recommendation found on the package inserts of most products. Veterinarians seeking serologic evidence of sustained immunity to prior vaccination, along with client concerns over excessive vaccination practices, prompted an increase in requests from practices for antibody titers against selected canine and feline antigens. The widespread availability of "vaccine titers" has culminated in questions concerning indications for testing, interpretation of test results (POSITIVE vs. NEGATIVE), and the significance of using these tests as part of a patient's routine health care assessment. A recent issue of *Immunology Bulletin* addresses these key points.

WHAT DOES A TITER SIGNIFY?

When submitting serum from an individual patient to assess serologic response to vaccination, the Ab titer reported only indicates prior exposure to a particular antigen. It does not distinguish between natural exposure, vaccination, or (in puppies/kittens) maternally derived Ab, *nor does it represent confirmation of infection.*

It must not be assumed that a vaccine titer reported as POSITIVE is confirmation that the patient is resistant to infection. There is considerable variation in the significance of a POSITIVE titer result. For example, leptospirosis Ab titers are used diagnostically to assess prior and current exposure, but antibody titers do not correlate well with immunity or susceptibility. Cats having a POSITIVE titer to feline herpesvirus-1 or calicivirus are likely to experience minimal clinical disease following exposure, but are not resistant to infection and subsequent viral shedding.

On the other hand, a POSITIVE Ab titer to canine distemper or parvovirus and feline parvovirus (panleukopenia) generally correlates with protection against challenge. However, a POSITIVE Ab titer in an

individual patient only reflects past immunity. The patient that is POSITIVE today may not be POSITIVE tomorrow.

Interpretation of a NEGATIVE titer is somewhat more complex. Antibody is subject to catabolism over time. The absence of a measurable Ab titer does not necessarily correlate with susceptibility. Immunologic "memory," in the form of B-lymphocytes and plasma cells can be called on for a rapid immunologic 'boost' in the event of subsequent exposure. This is particularly true for canine distemper and canine/feline parvovirus.

INDICATIONS FOR TESTING

Routine testing of dogs and cats for Ab titers to core vaccines is not generally recommended. While a POSITIVE titer likely correlates with protective immunity (canine distemper and canine/feline parvovirus), a NEGATIVE titer, a rare finding in previously vaccinated animals, does not necessarily define susceptibility.

Indications for testing are generally limited to the assessment of individual puppies and kittens for evidence of a response to the initial series of core vaccines. Serum can be submitted as early as 2 weeks following the last of vaccines in the series. Testing of puppies and kittens is reasonably limited to high risk groups (group housing environments, use of dog 'day-care' facilities, and frequenting dog parks). Today, there is no known breed-predisposed susceptibility to infection (eg, Rottweillers and parvovirus) that justifies routine Ab testing.

Antibody testing, in lieu of vaccination, is also indicated in patients with a prior history of having experienced a known or suspected adverse vaccine reaction. Likewise, patients having recovered from an immune-mediated disorder, eg, immune-mediated hemolytic anemia or thrombocytopenia, are reasonably subjected to antibody titers rather than booster vaccination. In the unlikely event a patient has a negative Ab titer, the decision to vaccinate or not is left to the discretion of the individual clinician. Rabies vaccination may not be an option in those States that do not recognize rabies vaccination waiver authority to veterinarians.

Routine use of serologic testing to assess immunity in the individual dog or cat carries significant limitations. Variation of test results reported by individual laboratories, the lack of uniform laboratory standards for performing titers, and the inability of these tests to reliably distinguish protected from susceptible patients requires the clinician to have a clear understanding of the meaning of an antibody titer in the individual patient.

VACCINE-ASSOCIATED SARCOMA (VAS) vs. ADJUVANT

The association between feline rabies and feline leukemia (FeLV) vaccination and tumorigenesis was established in 1993. Ironically, in 2001, the AVMA's Vaccine-Associated Feline Sarcoma Task Force published vaccination-cite recommendations for both FeLV and rabies vaccines: rabies RIGHT (rear leg); leukemia LEFT (rear leg) "as distally as feasible." The reason (not specifically stated in the guidance) was to facilitate tumor management through amputation of the affected leg in order to save the patient. This hardly seems a rational solution to the problem.

MITIGATING RISK

First…it's a Cat Thing!

VAS has been reported in humans and in dogs, but documented cases are exceptionally rare compared with the VAS prevalence recognized in cats. Yet it's not just vaccine. There are published reports documenting fibrosarcoma formation in cats subsequent to ocular trauma, repository drug administration, and nylon suture left in skin for an extended time. In addition, all cats do not have equal risk. Yet undefined genetic determinants are likely to play a role.

Second…it was 1985!

In 1985, the first feline leukemia vaccine (aluminum adjuvanted) was licensed in the US. Being the first FeLV vaccine to reach the market, widespread use followed. Also in 1985, sale of modified-live rabies vaccine in the US was withdrawn and replaced with killed, adjuvanted rabies vaccine. Then, in 1987, the State of Pennsylvania issued legislation that required, for the first time, all cats receive a rabies vaccine. It was in 1991 that the Pathology Laboratory at the University of Pennsylvania, School of Veterinary Medicine reported a significant increase in the number of fibrosarcomas in cats. They went on to note that these tumors were particularly aggressive, were occurring in younger, versus older, cats, and that the tumors occurred in a location where veterinarians commonly administer vaccine.

Third…the Science is Compelling

Several scientific studies published in the last 10 years support a link between adjuvant-induced inflammation and sarcoma formation in some cats. While it may never be possible to actually proved cause-and-effect, the evidence is compelling. For this reason, the AAFP Feline Vaccine Advisory Panel has recommended that veterinarians avoid the use, whenever feasible, of vaccines that are associated with inflammation. In effect, the Advisory Panel is recommending that veterinarians avoid the use of adjuvanted vaccine, when feasible.

Note: The presence or absence of adjuvant is NOT required on the product label. The only way to know if a feline vaccine is adjuvanted is to know whether or not the product contains a killed virus or bacterial antigen. All killed vaccines are adjuvanted. Modified live and recombinant feline vaccines are not adjuvanted.

"3-YEAR" VACCINES vs. TRIENNIAL VACCINATION RECOMMENDATIONS

Recommendations of the AAHA Canine Vaccine Task Force and the AAFP Feline Vaccine Advisory Panel include administration of core vaccines to adult dogs (distemper, parvovirus, adenovirus-2) and cats (panleukopenia, herpesvirus-1, calicivirus) triennially (every 3 years). These recommendations were based on data derived from recent challenge and serological studies involving vaccines that have been on the market

for the past 6 years. While most vaccines have a minimum duration of immunity (the *maximum* is not known) of 5 to 7 years, the 3-year recommendation is regarded as a standard of care that does provide protection to dogs and cats in the face of natural challenge.

Subsequent to the publication of the AAHA and AAFP triennial vaccine guidelines, most vaccine manufacturers provided data on individual products that supported these recommendations. Vaccines labeled for 3-year administration were also released. It should be noted, however, that:

1. veterinarians are NOT required to vaccinate adult dogs and cats every 3 years; administration of *annual* boosters still represents a standard of care in veterinary medicine today…and,
2. furthermore, there is no legal or ethical mandate for veterinarians to use a vaccine licensed for administration every 3 years in order to comply with current published vaccine guidelines. All core vaccines (modified live and recombinant) are regarded as 3-year vaccines, regardless of the manufacturer.

Any implication that a "3-year vaccine" *must* be used when adhering to current vaccination recommendations is wrong…and misrepresents the intent of the 2006 AAHA Canine Vaccine Guidelines.

ADDITIONAL READING

1. 2006 Canine Vaccine Guidelines and Recommendations. American Animal Hospital Association (AAHA) Canine Vaccine Task Force: (the complete Report, including Supporting Literature, is available at www.aahanet.org).
2. 2006 Report of the American Association of Feline Practitioners (AAFP) Feline Vaccine Advisory Panel. *J Am Vet Med Assoc* 2006; 229(9):1405-1441. The entire report and references are available at: www.aafponline.net
3. Greene CE, Schultz RD: Immunoprophylaxis. In: Greene CE (ed.): Infectious Diseases of the Dog and Cat, 3rd ed. St. Louis, MO: Saunders-Elsevier, 2006, pp 1068-1119.
4. Böhm M, Thompson H, Weir A, et al. Serum antibody titres to canine parvovirus, adenovirus, and distemper. Vet Rec. 2004;154:457-462.
5. Kass PH, Barnes WG, Spangler WL, Chomel BB, et al. Epidemiologic evidence for a causal relation between vaccination and fibrosarcoma tumorigenesis in cats. J Am Vet Med Assoc. 203:396-405, 1993.

Table 1. CORE Canine Vaccines and Recommendations for Administration (based on the 2006 Report of the AAHA Canine Vaccine Task Force)

CORE Vaccines	Primary Puppy Series (≤ 16 weeks)	Primary Adult Series (> 16 weeks)	Booster Interval
Distemper Recombinant, or Modified-Live **Parvovirus** Modified-Live **Adenovirus**-2 Modified-Live (SQ injection)	Administer 1 dose at 6–8 weeks of age, then, Every 3 to 4 weeks until 15–16 weeks of age. (Initial series includes 3 to 4 doses depending on age at the time of first vaccine)	Administer 2 doses 3 to 4 weeks apart.	Administer 1 dose one year following completion of the initial series; then Every 3 years thereafter.
Rabies Killed, 1–Year Killed, 3–Year (SQ injection)	Administer 1 dose at 12 to 16 weeks of age.	Administer 1 dose	Administer 1 dose one year following administration of the first dose, then Every 3 years thereafter.

NOTE: Requirements for canine rabies vaccination are established by State and/or local statutes and may differ from the recommendations listed above.

Recombinant Canine Distemper Virus Vaccine: An independent study (U of Wisconsin,2006) has shown that the recombinant Canine Distemper Virus (rCDV) vaccine was able to protect puppies against the consequences of infection using only 1 dose administered at 8 weeks of age. This heightened immunity results from the inability of maternal antibody to recognize and interfere with the recombinant CDV vaccine. Today, the AAHA Canine Vaccine Task Force recommends administration of this vaccine to puppies as young as 3 weeks old in the face of CDV outbreak (see Shelter Guidelines)

An additional vaccine challenge study (2007) designed to assess the duration of immunity of the recombinant CDV vaccine demonstrated a minimum duration of immunity that exceeds 3 years. Hence veterinarians electing to implement triennial vaccination of core canine vaccines can use either recombinant or Modified Live Virus vaccine for canine distemper. Current AAHA Guidelines have been amended to reflect these data.

Table 2. NON-CORE Canine Vaccines and Recommendations for Administration
(Based on the Report of the 2006 AAHA Canine Vaccine Task Force)

NON-CORE (optional) Vaccines	Primary Puppy Series (≤ 16 weeks)	Primary Adult Series (> 16 weeks)	Booster Interval
***Bordetella bronchiseptica* + Parainfluenza** Avirulent-Live (intranasal administration ONLY)	A single dose is recommended by the manufacturers and may be given as early as 3–4 weeks of age. 2 doses, 2–4 weeks apart are recommended. May be given as early as 3–4 weeks of age.	A single dose.	Annually; animals in a high risk/exposure environment may benefit from a booster if longer than 6 months since the previous dose.
Bordetella bronchiseptica Killed, or Antigen Extract (SQ administration)	Administer 2 doses, 2 to 4 weeks apart beginning as early as 8 weeks of age.	Administer 2 doses, 2–4 weeks apart.	Annually; animals in a high risk/exposure environment may benefit from a booster if longer than 6 months since the previous dose.
Leptospirosis (serovars: canicola, icterohemmorhagiae, pomona, grippotyphosa) Various 2-way and 4-way combinations are available. Killed bacterin (SQ administration)	Administer 2 doses, 2 to 4 weeks apart beginning as early as 12 weeks of age. (Vaccination of dogs less than 12 weeks of age is generally not recommended)	Administer 2 doses, 2–4 weeks apart.	Annual booster is recommended for dogs with a defined risk of exposure. Vaccination is *not* recommended for all dogs. Exposure risk should be considered prior to recommending.
Lyme borreliosis Recombinant, or Killed bacterin (SQ administration)	Administer 2 doses, 2–4 weeks apart beginning as early as 12 weeks of age.	Administer 2 doses, 2–4 weeks apart.	Annual booster is recommended for dogs with a defined risk of exposure. Vaccination is not recommended for all dogs.
Crotalus atrox (Western Diamondback Rattlesnake vaccine) Toxoid (SQ administration)	Recommendations vary depending on size of the dog and risk of exposure. See Manufacturer's Recommendations.	Recommendations vary depending on size of the dog and risk of exposure. See Manufacturer's Recommendations.	Not Stipulated. Duration of immunity studies have not been conducted.
***Porpyhromonas* spp**. Killed bacterin (SQ administration)	Administer 2 doses, 3 weeks apart beginning as early as 7 weeks of age (manufacturer recommendation)	Administer 2 doses, 3 weeks apart.	Not Stipulated. Duration of immunity studies have not been conducted.

NOTE: Although vaccines licensed by the USDA are currently available in the United States, routine vaccination of dogs against coronavirus and *Giardia lamblia* is NOT recommended.

Table 3. CORE Feline Vaccines and Recommendations for Administration
(Based on the 2006 Report of the AAFP Feline Vaccine Advisory Group)

CORE Vaccines	Primary Kitten Series (≤ 16 weeks)	Primary Adult Series (> 16 weeks)	Booster Interval
Parvovirus (Panleukopenia) **Herpesvirus-1 and Calicivirus** Modified-Live (non-adjuvanted) or… Killed (adjuvanted) (SQ or intranasal administration)	Administer 1 dose as early as 6 weeks of age, then Every 3–4 weeks until 16 weeks of age	Administer 2 doses, 3–4 weeks apart	Administer 1 dose one year following completion of the initial series; then every 3 years thereafter. Note: Annual booster of cats against FHV-1 and FCV may be recommended in cats housed in high risk environments.
Rabies Recombinant (non-adjuvanted) (SQ injection)	Administer 1 dose at 12–16 weeks of age.	Administer 1 dose	Annually
Rabies Killed, 1–Year Killed, 3–Year (adjuvanted) (SQ injection)	Administer 1 dose at 12–16 weeks of age.	Administer 1 dose	Administer 1 dose one year following administration of the first dose, then every 3 years thereafter.

NOTE: Requirements for feline rabies vaccination are established by State and/or local statutes and may differ from the recommendations listed above.

Table 4. NON-CORE Feline Vaccines and Recommendations for Administration
(based on the 2006 Report of the AAFP Feline Vaccine Advisory Group)

NON-CORE (optional) Vaccines	Primary Kitten Series (≤ 16 weeks)	Primary Adult Series (> 16 weeks)	Booster Interval
Feline Leukemia Recombinant (non-adjuvanted) (Transdermal administration ONLY)	Administer 2 doses, 3 to 4 weeks apart beginning as early as 12 weeks of age.	Administer 2 doses, 3 to 4 weeks apart.	Annual booster; booster vaccination is *not* recommended for all cats. Exposure risk should be considered prior to recommending.
Feline Leukemia Killed (adjuvanted) (SQ administration)	Administer 2 doses, 3 to 4 weeks apart beginning as early as 12 weeks of age.	Administer 2 doses, 3 to 4 weeks apart.	Annual booster; booster vaccination is *not* recommended for all cats. Exposure risk should be considered prior to recommending.
Chlamydophila felis Avirulent Live (non-adjuvanted) (SQ administration)	Administer 2 doses, 3 to 4 weeks apart beginning as early as 12 weeks of age.	Administer 2 doses, 3 to 4 weeks apart.	Annual booster; booster vaccination is *not* recommended for all cats. Exposure risk should be considered prior to recommending.
Chlamydophila felis Killed (adjuvanted) (SQ administration)	Administer 2 doses, 3 to 4 weeks apart beginning as early as 12 weeks of age.	Administer 2 doses, 3 to 4 weeks apart.	Annual booster; booster vaccination is *not* recommended for all cats. Exposure risk should be considered prior to recommending.
Feline Immunodeficiency Virus Killed (adjuvanted) (SQ administration)	Administration of 3 initial doses is required. Beginning as early as 8 weeks of age, administer 2 additional doses 2 to 3 weeks apart.	Administration of 3 initial doses is required. Each dose should be administered 2 to 3 weeks apart.	Annual booster; vaccination is *not* recommended for all cats. Exposure risk should be considered. NOTE: A single dose of FIV vaccine will cause a false-positive test result on all commercial FIV tests.
Bordetella bronchiseptica Avirulent Live (non-adjuvanted) (Intranasal ONLY)	Administer a single dose as early as 8 weeks of age.	Administer a single dose	Annually, but only in cats with established risk of exposure
Virulent Systemic Calicivirus Killed (adjuvanted) (SQ administration)	Administer 2 doses, 3 to 4 weeks apart beginning as early as 12 weeks of age	Administer 2 doses, 3 to 4 weeks apart.	Duration of immunity is not known. Annual booster is recommended by the manufacturer.

NOTE: Although vaccines licensed by the USDA are currently available in the United States, vaccination of cats against feline coronavirus (FIP) and *Giardia lamblia* is NOT recommended.