



# 2017 AAHA Canine Vaccination Guidelines\*

Richard B. Ford, DVM, MS, DACVIM, DACVPM (Hon)<sup>†</sup>,  
Laurie J. Larson, DVM, Kent D. McClure, DVM, JD,  
Ronald D. Schultz, PhD, DACVM (Hon),  
Link V. Welborn, DVM, DABVP<sup>‡</sup>

## AFFILIATIONS

North Carolina State University, College of Veterinary Medicine, Raleigh, North Carolina (R.B.F.); Department of Pathobiological Sciences, University of Wisconsin-Madison School of Veterinary Medicine, Madison, Wisconsin (L.J.L.); General Counsel, Animal Health Institute, Washington, DC (K.D.M.); Department of Pathobiological Sciences, University of Wisconsin-Madison School of Veterinary Medicine, Madison, Wisconsin (R.D.S.); Tampa Bay Animal Hospitals, Tampa, Florida (L.V.W.).

## CONTRIBUTING REVIEWERS

Catherine M. Brown, DVM, MSc, MPH (Massachusetts Department of Public Health); Anthony E. Cascino, Jr. Attorney at Law (Cascino & Assoc, P.C.; Chicago, Illinois); Leah A. Cohn, DVM, PhD, DACVIM (University of Missouri); Cynda Crawford, DVM, PhD (Maddie's Shelter Program, University of Florida); Michael J. Day, BSc, BVMS (Hons), PhD, DECVP (University of Bristol, United Kingdom); Cynthia Delany, DVM (University of California, Davis); Brian DiGangi, DVM, DABVP (University of Florida); Kelli Ferris, DVM (North Carolina State University); Laurel Gershwin, DVM, PhD, DACVM (University of California, Davis); Douglas C. Jack, Solicitor (Borden Ladner Gervais LLP, Toronto, Canada); Linda Janowitz, DVM (Peninsula Humane Society); Lila Miller, DVM (American Society for the Prevention of Cruelty to Animals, New York City); Susan Moore, MS, PhD, director of KSVDL Rabies Laboratory (Kansas State University); Kris Otteman, DVM (Oregon Humane Society); Apryl Steele, DVM (Chief Operating Officer, Dumb Friends League); Brenda Stevens, DVM (North Carolina State University); Amy Stone, DVM, PhD (University of Florida); Jane Sykes, BVSc, PhD, DACVIM (University of California, Davis).



## Executive Summary

THE AMERICAN ANIMAL HOSPITAL ASSOCIATION (AAHA) is pleased to introduce this revision of the Canine Vaccination Guidelines published, for the first time, as an online educational resource for the veterinary medical profession. This format will allow for frequent online updates as necessary. The revised AAHA Canine Vaccination Guidelines offer important updates to the 2011 Guidelines. The content of the Guidelines has been significantly expanded to facilitate efforts by practicing veterinarians to meet patient and client needs in a complex infectious disease environment. The Guidelines are an authoritative source of evidence-based recommendations and expert opinion provided by the AAHA Canine Vaccination Guidelines Task Force. The Task Force includes individuals with extensive experience in primary care practice, academia, shelter medicine, public health, and veterinary law related to clinical practice.

\* These guidelines were prepared by a task force of experts convened by the American Animal Hospital Association. This document is intended as a guideline only, not an AAHA standard of care. These guidelines and recommendations should not be construed as dictating an exclusive protocol, course of treatment, or procedure. Variations in practice may be warranted based on the needs of the individual patient, resources, and limitations unique to each individual practice setting. Evidence-based support for specific recommendations has been cited whenever possible and appropriate. Other recommendations are based on practical clinical experience and a consensus of expert opinion. Further research is needed to document some of these recommendations. Because each case is different, veterinarians must base their decisions on the best available scientific evidence in conjunction with their own knowledge and experience.

These guidelines were sponsored by a generous educational grant from Boehringer Ingelheim, Merial, Merck Animal Health, and Zoetis. They were subjected to a formal peer-review process. The AAHA Canine Vaccination Guidelines Task Force gratefully acknowledges the contribution of Mark Dana of Scientific Communications Services, LLC, in the preparation of the Executive Summary.

† R.B. Ford was the lead editor of the AAHA Canine Vaccination Guidelines Task Force.

‡ L.V. Welborn was the chair of the AAHA Canine Vaccination Guidelines Task Force.

While there is often consensus on which canine vaccines fall into core and noncore categories and when they should be administered, in practice, the vaccination protocol should always be individualized based on the patient's risk factors, life stage, and lifestyle. For this reason, these Guidelines are not intended to represent a universal vaccination protocol applicable to all dogs. Instead, the Guidelines offer a range of recommendations that will aid practitioners in making rational decisions on vaccine selection for their individual patients.

The AAHA Canine Vaccination Guidelines offer important updates to previously published guidelines as well as new, relevant information that directly impacts the practicing veterinarian:

- Updated, quick-reference tables summarizing vaccination recommendations for client-owned and shelter-housed dogs.
- Internet links that provide ready access to regularly updated online sources of information that will supplement the Guidelines themselves, for example, state-by-state information on rabies vaccination law and regulations, and comprehensive information on vaccine storage and handling.
- Algorithms outlining indications for antibody testing (serology) as well as recommended actions for patients with a “positive” or “negative” test result.
- Product information on the emerging class of immunotherapeutics approved for use in veterinary medicine.

As one of the safest and most cost-effective means of infectious disease prevention, vaccination has long been a focal point of canine practice. This revision of the entire AAHA Canine Vaccination Guidelines is presented in an online format at [aaha.org/CanineVaccinationGuidelines](http://aaha.org/CanineVaccinationGuidelines). Termed an “Online Educational Resource,” this iteration of the AAHA Canine Vaccination Guidelines offers readers immediate accessibility to current, “must-know” information that directly impacts clinical practice on a daily basis.

The table on vaccination recommendations in practice is an up-to-date, master reference that functions as a stand-alone resource covering all commercially available canine vaccines licensed in the United States and Canada. Core and noncore vaccines are listed along



with recommendations for revaccination intervals and various precautions. The table contains links to sections in the Guidelines that provide additional, relevant detail. This is the only section available in print in *JAAHA*. The remainder of the sections listed below can be found at [aaha.org/CanineVaccinationGuidelines](http://aaha.org/CanineVaccinationGuidelines).

## The Guidelines include a new section entitled therapeutic biologics specifically directed at informing veterinarians about the availability and intended use of these novel adjunctive immune-based therapies.

---

Rabies vaccines are the only vaccines administered by veterinarians that are required by law. Because rabies laws may vary from state to state (or jurisdictions within states), a new section on rabies vaccination provides access to current state-by-state information on rabies and rabies vaccination law, and regulations that directly impact decisions veterinarians make in practice.

Another new section offers recommendations for dogs that are overdue for vaccination. Vaccine-specific guidance is provided for what is often an ambiguous aspect of veterinary practice, i.e., the canine patient that presents with an unknown or out-of-date vaccination history. Recommendations for core and noncore vaccines are presented.

Shelter-housed dogs represent a sizeable population of animals at increased risk of exposure to vaccine-preventable infectious diseases. The Guidelines include an updated table on recommendations for vaccination of shelter-housed dogs, including those in long-term housing facilities.

Another novel component of the Guidelines is a section on antibody testing (serology) as an adjunct to vaccination. Information is included that addresses not only the indications for testing, but also provides recommended actions based on whether the test results are “positive” or “negative.” Antibody testing represents

a selective approach to assessing an individual dog’s response to vaccination. Determination of antibody status is especially relevant for the assessment of patients that have an unknown vaccination history, are overdue for vaccination, those undergoing chemotherapy, those receiving immunosuppressive drugs, as well as patients with a history of vaccine adverse reactions.

As noted in the section on legal considerations, veterinarians can exercise some professional discretion in deviating from vaccine label recommendations, such as determining appropriate revaccination intervals based on the patient’s risk. On the other hand, the protocol for administering rabies vaccinations is not discretionary. Decisions surrounding the administration of rabies vaccines require strict adherence to statutory requirements.

The section on vaccine storage and handling summarizes “must know” information related to the storage and use of vaccines within the practice. Included are tips for avoiding misidentification of vaccines, monitoring storage conditions, and the consequences of subjecting vaccines to out-of-range temperatures. A link to comprehensive Center for Disease Control (CDC) guidelines for proper vaccine storage and handling of vaccines is provided.

Immunotherapeutic products represent a rapidly emerging class of biologics licensed for use in veterinary medicine. The Guidelines include a new section entitled therapeutic biologics specifically directed at informing veterinarians about the availability and intended use of these novel adjunctive immune-based therapies.

In the section on frequently asked questions, readers will find informative recommendations for dealing with an assortment of commonly encountered, vaccine-related situations seen in clinical practice.

The AAHA Canine Vaccination Guidelines support the implementation of effective, individualized pathways for the prevention of infectious diseases of dogs. Implicit in the Guidelines is the integral role vaccination plays in the veterinary profession’s emphasis on preventive healthcare and regular exams as the foundation of a long, active, and rewarding relationship between pets and their human companions. To read these guidelines in their entirety, visit [aaha.org/CanineVaccinationGuidelines](http://aaha.org/CanineVaccinationGuidelines).

NOTE: Vaccines designated as CORE should be administered to all dogs. However, because exposure risk to vaccine-preventable disease varies, selected NONCORE vaccines may be recommended as CORE in individual practices depending on geographic region, patient lifestyle, age, etc.

TABLE

Vaccination Recommendations—Practice

CORE Vaccinations	Initial Vaccination (Dogs ≤16 Wk of Age)	Initial Vaccination (Dogs >16 Wk of Age)	Revaccination (Booster)	REMARKS
<p>Combination vaccine administered as:</p> <p><b>MLV or Recombinant Canine Distemper Virus + MLV Parvovirus + MLV Adenovirus-2 ± MLV Parainfluenza Virus</b></p> <p>The recommendations listed apply whether or not CPiV vaccine is included.</p> <p>Administer by the subcutaneous (SQ) route</p>	<p>Beginning as early as 6 wk of age, administer sequential doses of a combination vaccine at an interval of 2 to 4 wk until at least 16 wk of age.</p> <p>Dogs that are w16 wk of age when presented for initial vaccination should receive a second dose 2 to 4 wk later.</p> <p><b>NOTE:</b> Dogs residing in a HIGH-RISK environment may benefit from receiving a final dose at 18 to 20 wk of age.</p> <p>HIGH RISK is a subjective assessment applicable to dogs residing at locations in which the incidence of CDV and/or CPV is considered to be high; it may also include puppies known to have significant exposure to other dogs or contaminated environments.</p>	<p>Administer 1 or 2 doses of a combination vaccine (see below):</p> <p><b>NOTE:</b> Dogs residing in a HIGH-RISK environment and between 16 and 20 wk (4–5 mo) of age when presented for initial vaccination may benefit from administration of 2 doses of a combination vaccine 2 to 4 wk apart.</p> <p><b>NOTE:</b> Dogs residing in a HIGH RISK environment and over 20 wk (5 mo) of age when presented for initial vaccination are expected to derive protective immunity from a single dose of a combination vaccine.</p> <p>HIGH RISK is a subjective assessment applicable to dogs residing at locations in which the incidence of CDV and/or CPV is considered to be high; it may also include puppies known to have significant exposure to other dogs or contaminated environments.</p>	<p>Administer a single dose of a combination vaccine within 1 yr following the last dose in the Initial Vaccination series.</p> <p>Administer subsequent boosters at intervals of 3 yr or longer.</p> <p>Measuring antibody levels (quantitative or qualitative) provides a reasonable assessment of protective immunity against CDV, CPV, and CAV2.</p> <p>Visit <a href="http://aaha.org/CanineVaccineTiters">aaha.org/CanineVaccineTiters</a> for more information on antibody testing.</p>	<p>Following completion of the Initial Vaccination series and the initial booster dose, MLV and Recombinant Core vaccines will provide a sustained protective response lasting beyond 3 yr.</p> <p>The rCDV and MLV-CDV vaccines perform similarly with regard to onset of immunity following vaccination (in the absence of MDA) and duration of immunity.</p> <p><b>Parvovirus (CPV):</b> All MLV-CPV vaccines available as of 2017 are expected to provide immunity from disease caused by any field variant currently recognized (including CPV-2b and -2c<sup>†</sup>).</p> <p><b>Canine Adenovirus-2 (CAV2):</b> Primarily intended to protect against canine infectious hepatitis virus caused by CAV-1 (infectious canine hepatitis virus) but also offers protection against the respiratory CAV-2 (one of the pathogens associated with canine infectious respiratory disease syndrome).</p> <p><b>Canine Parainfluenza Virus (CPiV):</b> CPiV vaccine administered by the intranasal route may provide superior protection compared to vaccine administered by a parenteral route.</p> <p>Following reconstitution, vaccine loss of potency may occur within hours. CORE vaccines should be administered within 1 hr following reconstitution; it is recommended that reconstituted vaccines held longer than 1 hr should be properly discarded. (Visit <a href="http://aaha.org/CanineVaccineResources">aaha.org/CanineVaccineResources</a> for more information on Vaccine Handling &amp; Storage.)</p> <p>For recommendations on managing dogs who are overdue for these vaccines, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>

(Table continues)

**TABLE (CONTINUED)**

<b>CORE Vaccinations</b>	<b>Initial Vaccination (Dogs ≤16 Wk of Age)</b>	<b>Initial Vaccination (Dogs &gt;16 Wk of Age)</b>	<b>Revaccination (Booster)</b>	<b>REMARKS</b>
<p><b>Rabies virus (killed*)</b></p> <p>1-yr &amp; 3-yr labeled vaccines are available.</p> <p>Administer by the SQ or intramuscular (IM) route (see Manufacturer’s Package Insert for the vaccine selected)</p> <p>For state-specific information on rabies immunization and law, visit <a href="http://aaha.org/CanineVaccineResources">aaha.org/CanineVaccineResources</a></p>	<p>Administer a single dose not earlier than 12 wk of age.</p> <p>A second dose is required within 1 yr following the initial dose.</p> <p>Most, but not all, states and provinces allow discretion in the use of a 1-yr or a 3-yr labeled rabies vaccine when administering the initial dose. (Local requirements may vary.)</p> <p>A majority of states and jurisdictions require the owner of a young dog to have the initial rabies vaccine administered between 12 and 16 wk of age. (Local requirements may vary.)</p> <p>State/local/provincial law applies.</p>	<p>Administer a single dose of vaccine.</p> <p>Regardless of the age of the dog at the time the initial rabies vaccine is administered, a second dose is required within 1 yr following the initial dose of rabies vaccine.</p> <p>In most states and provinces, veterinarians are allowed discretion in administering either a 1-yr or a 3-yr labeled rabies vaccine.</p> <p>Vaccination requirements may vary for dogs imported from other countries/states.</p> <p>State/local/provincial law applies.</p>	<p>Administer a single dose of vaccine.</p> <p>In most states and provinces, veterinarians are allowed discretion in administering either a 1-yr or a 3-yr labeled rabies vaccine.</p> <p>The interval between subsequent doses is determined by the product label of the last vaccine dose administered (i.e., either 1 yr or 3 yr).</p> <p><b>NOTE:</b> Some states and some jurisdictions within states do NOT recognize a 1-yr labeled rabies vaccine, in which case a 3-yr labeled vaccine must be administered.</p> <p>State/local/provincial law applies.</p>	<p>Although some states and most provinces do not have a rabies vaccination requirement/law for dogs (or cats), rabies vaccination is recommended as a CORE vaccine in all states and provinces.</p> <p>Most states (and jurisdictions within states) do NOT permit veterinarians to exempt the requirement for rabies vaccination even in dogs having medical contraindications to vaccination. For state-specific information on rabies immunization, vaccine exemption, and law, visit <a href="http://aaha.org/CanineVaccineResources">aaha.org/CanineVaccineResources</a></p> <p>For recommendations on managing dogs who are overdue for this vaccine, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>
<b>NONCORE Vaccinations</b>	<b>Initial Vaccination (Dogs ≤16 Wk of Age)</b>	<b>Initial Vaccination (Dogs &gt;16 Wk of Age)</b>	<b>Revaccination (Booster)</b>	<b>REMARKS</b>
<p><b>Bordetella bronchiseptica + canine parainfluenza virus</b></p> <p>Administer by the intranasal (IN) route.</p> <p>OPTION: some IN products may also contain CAV2 vaccine.</p>	<p>A single IN dose is indicated for dogs at risk of exposure and is generally administered between 8 and 16 wk of age.</p> <p>The IN vaccine may be administered as early as 3 to 4 wk of age in puppies at risk of exposure to infected dogs (maternally derived antibody does not interfere with the immune response following mucosal vaccination).</p>	<p>A single IN dose of vaccine is indicated for dogs at risk of exposure.</p>	<p>Where risk of exposure is sustained, administer a single dose 1 yr following the last dose administered, then annually thereafter.</p> <p>There is no known value in administering the IN vaccine bi-annually (every 6 mo).</p>	<p>Onset of protective immunity has been shown to be as early as 48 to 72 hr following a single inoculation.</p> <p>The duration of immunity, based on challenge studies (B.bronchiseptica), is 12 to 14 mo following a single dose of IN vaccine.</p> <p>Canine Parainfluenza Virus (CPiV): Parenterally administered CPiV vaccine may not provide a level of protection that is comparable to CPiV vaccine administered by the IN route.</p> <p>The duration of immunity for the IN CPiV vaccine component is expected to exceed 1 yr.</p> <p>The IN CAV2 vaccine is not intended for use in the prevention of canine infectious hepatitis.</p> <p><b>DO NOT ADMINISTER IN VACCINE PARENTERALLY or ORALLY.</b></p> <p>For recommendations on managing dogs who are overdue for this vaccine, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>

*(Table continues)*

**TABLE (CONTINUED)**

<b>NONCORE Vaccinations</b>	<b>Initial Vaccination (Dogs ≤16 Wk of Age)</b>	<b>Initial Vaccination (Dogs &gt;16 Wk of Age)</b>	<b>Revaccination (Booster)</b>	<b>REMARKS</b>
<p><b><i>Bordetella bronchiseptica</i> only</b> (monovalent)</p> <p>Three options are available:</p> <p><b>Parenteral (CAe)</b> Administer by the SQ route.</p> <p>-or-</p> <p><b>Intranasal</b> (avirulent live) Administer by the intranasal (IN) route.</p> <p>-or-</p> <p><b>Intraoral</b> (avirulent live) Administer orally (buccal pouch).</p>	<p><b>Parenteral</b> (SQ): Two initial doses are required, 2 to 4 wk apart beginning as early as 8 wk of age.</p> <p><b>IN:</b> Administer a single dose intranasally. The IN vaccine may be administered as early as 3 to 4 wk of age.</p> <p><b>Oral:</b> Administer a single dose into the buccal pouch as early as 8 wk of age.</p>	<p><b>Parenteral</b> (SQ): Two initial doses are required, 2 to 4 wk apart, regardless of the patient's age.</p> <p><b>IN:</b> Administer a single dose intranasally.</p> <p><b>Oral:</b> Administer a single dose into the buccal pouch.</p>	<p>Where risk of exposure is sustained, administer a single dose 1 yr following the last dose administered, then annually thereafter.</p>	<p>The duration of immunity following a single dose of <i>B bronchiseptica</i> vaccine administered by the IN route is 12 to 14 mo.</p> <p>Maternally derived antibody does not interfere with the immune response following mucosal vaccination. - Although the IN vaccine may be administered as early as 3 to 4 wk of age, it is conventional in practice to administer a single dose between 8 and 16 wk of age.</p> <p>Duration of immunity studies, based on challenge, have not been published for the parenteral (SQ) or the oral <i>B. bronchiseptica</i> vaccines.</p> <p>For recommendations on managing dogs who are overdue for this vaccine, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>
<p><b><i>Leptospira</i></b> (killed) 4-serovar</p> <p>serovar <i>canicola</i>; serovar <i>icterohaemorrhagiae</i>; serovar <i>grippityphosa</i>; serovar <i>pomona</i></p> <p>Administer by the SQ route.</p>	<p>Two initial doses, 2 to 4 wk apart., are required; the initial dose may be administered as early as 8 to 9 wk of age.</p>	<p>Two initial doses, 2 to 4 wk apart, are required regardless of the dog's age.</p>	<p>Where risk of exposure is sustained, administer a single dose 1 yr following completion of the initial 2-dose series, then annually thereafter.</p>	<p>Because there is limited cross-protection among serovars in the vaccine, administration of a 4-serovar leptospirosis vaccine is recommended over a 2-serovar vaccine.</p> <p>4-serovar leptospirosis vaccines are available in combination with CORE vaccines and as a 4-serovar (only) product that is not combined with other vaccines.</p> <p>For recommendations on managing dogs who are overdue for this vaccine, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>
<p><b><i>Borrelia burgdorferi</i></b> (canine Lyme disease)</p> <p>Four vaccine types are currently available:</p> <ul style="list-style-type: none"> <li>• killed whole cell bacterin (OspA),</li> <li>• killed whole cell bacterin (OspA1C),</li> <li>• recombinant OspA, himeric-recombinant OspA1OspC</li> </ul> <p>Administer by the SQ route.</p>	<p>Two initial doses, 2 to 4 wk apart, may be administered as early as 8 or 9 wk of age (as labeled); (see REMARKS).</p>	<p>Two initial doses, 2 to 4 wk apart, are required regardless of the dog's age (see REMARKS).</p>	<p>Where risk of exposure is sustained, administer a single dose 1 yr following completion of the initial 2-dose series, then annually thereafter.</p>	<p>Dogs traveling into Lyme-disease-endemic areas from nonendemic areas may be at increased risk for exposure and infection. Vaccination may be indicated: administer 2 doses of vaccine, 2 to 4 wk apart, such that the last dose is administered approximately 2 to 4 wk prior to travel.</p> <p>For recommendations on managing dogs who are overdue for this vaccine, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>

(Table continues)

**TABLE (CONTINUED)**

<b>NONCORE Vaccinations</b>	<b>Initial Vaccination (Dogs ≤16 Wk of Age)</b>	<b>Initial Vaccination (Dogs &gt;16 Wk of Age)</b>	<b>Revaccination (Booster)</b>	<b>REMARKS</b>
<p><b>Canine Influenza Virus-H3N8</b> (killed)</p> <p>Administer by the SQ route.</p>	<p>Two initial doses, 2 to 4 wk apart, are required. The first dose may be administered to dogs 6 to 8 wk of age or older (see package insert for specific information).</p>	<p>Two initial doses, 2 to 4 wk apart.</p>	<p>Where risk of exposure is sustained, administer a single dose within 1 yr following completion of the initial 2-dose series, then every year thereafter.</p>	<p>When vaccination is recommended, dogs intended to be housed in boarding kennels or day-care facilities should BEGIN the initial vaccination series 4 wk prior to entry (2 wk between the initial vaccines plus 2 wk to allow time for a humoral immune response to develop).</p> <p>Any dog deemed at risk for exposure to influenza virus should be vaccinated against both H3N2 and H3N8 strains.</p> <p>Vaccinated dogs may still become infected following exposure, develop mild clinical signs, and transiently shed virulent virus.</p> <p>For recommendations on managing dogs who are overdue for this vaccine, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>
<p><b>Canine Influenza Virus-H3N2</b> (killed)</p> <p>Administer by the SQ route.</p>	<p>Two initial doses, 2 to 4 wk apart, are required. The first dose may be administered to dogs 6 to 8 wk of age or older (see package insert for specific information).</p>	<p>Two initial doses, 2 to 4 wk apart.</p>	<p>Where risk of exposure is sustained, administer a single dose within 1 yr following completion of the initial 2-dose series, then every year thereafter.</p>	<p>When vaccination is recommended, dogs intended to be housed in boarding kennels or day-care facilities should BEGIN the initial vaccination series 4 wk prior to entry (2 wk between the initial vaccines plus 2 wk to allow time for a humoral immune response to develop).</p> <p>Any dog deemed at risk for exposure to influenza virus should be vaccinated against both H3N2 and H3N8 strains.</p> <p>Vaccinated dogs may still become infected following exposure, develop mild clinical signs, and transiently shed virulent virus.</p> <p>For recommendations on managing dogs who are overdue for this vaccine, visit <a href="http://aaha.org/CanineVaccinesOverdue">aaha.org/CanineVaccinesOverdue</a></p>
<p><b>Crotalus atrox</b> (Western Diamondback Rattlesnake)</p> <p>Administer by the SQ route.</p>	<p>Dosing requirements and frequency of administration vary among dogs depending on body weight and exposure risk. Follow the manufacturer’s label recommendations for dosing and administration.</p>			<p>The vaccine should only be administered to dogs with a defined risk for exposure.</p>

\*Killed, inactivated.

<sup>1</sup>CPV-2b and CPV-2c, field variants of canine parvovirus recognized in the United States today.

+ “combined with” the vaccine that follows. ± “with or without” the vaccine(s) that follow.

CAe, cellular antigen extract (*Bordetella bronchiseptica*); CAV2, canine adenovirus-2; CCV, canine coronavirus; CDV, canine distemper virus; CPIV, canine parainfluenza virus; CPV, canine parvovirus; CPV-2b and CPV-2c, field variants of canine parvovirus recognized in North America today; IM, intramuscular; IN, intranasal; MDA, maternally derived antibody; MLV, modified-live virus or attenuated; oral, specifically administered into the buccal pouch (*Bordetella bronchiseptica*); OspA, outer surface protein A (*Borrelia burgdorferi*); OspC, outer surface protein C (*Borrelia burgdorferi*); rCDV ¼ recombinant canine distemper virus; SQ, subcutaneous

**MEASLES VACCINATION:** Attenuated Measles Vaccination is a heterologous, single-dose (do not booster) vaccine for administration to young dogs (not less than 6 wk of age and not older than 12 wk of age) as a means of protecting young dogs (only) against canine distemper virus. The measles vaccine must be administered by the intramuscular (IM) route.

**NOTE:** Canine coronavirus (CCV) vaccination is not recommended on the grounds that infection: (1) causes mild or subclinical disease, (2) generally occurs in dogs 6 wk of age and younger, and (3) is typically self-limiting.

**NOTE:** Administration of multiple doses of parenteral vaccine at the same appointment, particularly among small breed dogs (≤10 kg), may increase the risk of an acute-onset adverse reaction. Alternative vaccination schedules may be indicated, e.g., delaying administration of a noncore vaccine by 2 wk following administration of core vaccines.

## References

The following citations apply to the “Vaccination Recommendations—Practice” table.

### General Principles of Immunization

1. Abdelmagid OY, Larson L, Payne L, et al. Evaluation of the efficacy and duration of immunity of a canine combination vaccine against virulent parvovirus, infectious canine hepatitis virus, and distemper virus experimental challenges. *Vet Ther* 2004;5(3):173–86.
2. Chastant-Maillard S, Freyburger L, Marcheteau E, et al. Timing of the intestinal barrier closure in puppies. *Reprod Domest Anim* 2012; 47 (suppl 6):190–193.
3. Davis-Wurzler GM. 2013 Update on current vaccination strategies in puppies and kittens. *Vet Clin N Am Small Anim Pract* 2014;44(2):235–63.
4. Day MJ, Schultz RD. Vaccination. In: *Veterinary Immunology: Principles and Practice*. Boca Raton (FL): Taylor and Francis; 2014:224.
5. Day MJ, Horzinek MC, Schultz RD, et al. Guidelines for the Vaccination of Dogs and Cats. World Small Animal Veterinary Association, Vaccine Guidelines Group. *J Sm Anim Pract* 2016;57:E1–E45.
6. Ford RB. Companion animal vaccines. In: Ettinger SJ, Feldman EC, eds. *Textbook of Veterinary Internal Medicine*. Vol 1. 7th ed. St Louis: Elsevier Saunders; 2010:853.
7. Ford RB. Canine vaccination guidelines: Key points for veterinary practice. *Today's Vet Pract* 2012;2:20–6.
8. Gill M, Srinivas J, Morozov I, et al. Three-year duration of immunity for canine distemper, adenovirus, and parvovirus after vaccination with a multivalent canine vaccine. *J Appl Res Vet Med* 2004;2(4):227–34.
9. Greene CE, Schultz RD. Immunoprophylaxis and immunotherapy. In: Greene CE, ed. *Infectious Diseases of the Dog and Cat*. 3rd ed. Philadelphia: WB Saunders; 2006:1069–119.
10. Larson LJ, Schultz RD. Three-year serologic immunity against canine parvovirus type 2 and canine adenovirus type 2 in dogs vaccinated with a canine combination vaccine. *Vet Ther* 2007;8(4):305–10.
11. Larson LJ, Newbury S, Schultz RD. Canine and feline vaccinations and immunology. In: Miller L, Hurley KF, eds. *Infectious Disease Management in Animal Shelters*. Ames (IA): Wiley-Blackwell; 2009:61–82.
12. Mouzin DE, LorenzenMJ, Haworth JD, et al. Duration of serologic response to five viral antigens in dogs. *J Am Vet Med Assoc* 2004;224(1):55–60.
13. Renshaw RW, Zylich NC, Laverack MA, et al. Pneumovirus in dogs with acute respiratory disease. *Emerg Infect Dis* 2010;16(6):993–995.
14. Roth JA. Mechanistic bases for adverse vaccine reactions and vaccine failures. In: Schultz RD, ed. *Advances in Veterinary Medicine 41: Veterinary Vaccines and Diagnostics*. San Diego (CA): Academic Press; 1999: 681–700.
15. Ruch-Gallie R, Moroff S, Lappin MR. Adenovirus 2, *Bordetella bronchiseptica*, and Parainfluenza Molecular Diagnostic Assay Results in Puppies After vaccination with Modified Live Vaccines. *J Vet Intern Med* 2016;30:164–6.
16. Schultz RD. Duration of immunity for canine and feline vaccines: a review. *Vet Microbiol* 2006;117(1):75–9.
17. Schultz RD, Thiel B, Mukhtar E, et al. Age and long-term protective immunity in dogs and cats. *J Comp Pathol* 2010;142(suppl 1):S102–8.
18. Spickler AR, Roth JA. Adjuvants in veterinary vaccines: Modes of action and adverse effects. *J Vet Intern Med* 2003;17(3):273–81.
19. Tizard I. Vaccines and their production. In: *Veterinary immunology*. 9th ed. St Louis: Elsevier-Saunders; 2013:258–70.

20. Tizard I. The use of vaccines. In: *Veterinary immunology*. 9th ed. St Louis: Elsevier-Saunders; 2013:272–82.

### Pathogens

#### Canine Distemper Virus

21. Jensen WA, Totten JS, Lappin MR, et al. Use of serologic tests to predict resistance to Canine distemper virus-induced disease in vaccinated dogs. *J Vet Diag Invest* 2015;27(5):576–80.
22. Larson L, Schultz RD. Effect of vaccination with rCDV vaccine immediately before exposure under shelter-like conditions. *Vet Ther* 2006;7(2):113–8.
23. Larson LJ, Schultz RD. Three-year duration of immunity in dogs vaccinated with a canarypox-vectored recombinant canine distemper virus vaccine. *Vet Ther* 2007;8(2):101–6.
24. Pardo MC, Bauman JE, Mackowiak M. Protection of dogs against canine distemper by vaccination with a canarypox virus recombinant expressing canine distemper virus fusion and hemagglutinin glycoproteins. *Am J Vet Res* 1997;58(8):833–6.
25. Pardo MC, Tanner P, Bauman J, et al. Immunization of puppies in the presence of maternally derived antibodies against canine distemper virus. *J Comp Pathol* 2007;137(suppl 1):S72–5.
26. Perrone D, Bender S, Niewiesk S. A comparison of the immune responses of dogs exposed to canine distemper virus (CDV) - Differences between vaccinated and wild-type virus exposed dogs. *Can J Vet Res* 2010;74(3):214–7.

#### Canine Parvovirus

27. Decaro N, Crescenzo G, Desario C, et al. Long-term viremia and fecal shedding in pups after modified-live canine parvovirus vaccination. *Vaccine* 2014;32:3850–3.
28. Hernández-Blanco B, Catala-López F. Are licensed canine parvovirus (CPV2 and CPV2b) vaccines able to elicit protection against CPV2c subtype in puppies?: A systematic review of controlled clinical trials. *Vet Microbiol* 2015;180(1–2):1–9.
29. Larson LJ, Schultz RD. Do two current canine parvovirus type 2 and 2b vaccines provide protection against the new type 2c variant? *Vet Ther* 2008;9(2):94–101.
30. Miranda C, Thompson G. Canine parvovirus in vaccinated dogs: a field study. *Vet Rec* 2016;178(16):397.
31. Pratelli A, Cavalli A, Martella V, et al. Canine parvovirus (CPV) vaccination: comparison of neutralizing antibody responses in pups after inoculation with CPV2 or CPV2b modified live virus vaccine. *Clin Diagn Lab Immunol* 2001;8(3):612–5.
32. Ridel M, Truyen U, Reese S, et al. Prevalence of antibodies to canine parvovirus and reaction to vaccination in client-owned, healthy dogs. *Vet Rec* 2015;177:597.
33. Spibey N, Greenwood NM, Sutton D, et al. Canine parvovirus type 2 vaccine protects against virulent challenge with type 2c virus. *Vet Microbiol* 2008;128(1–2):48–55.
34. Wilson S, Illambas J, Siedek E, et al. Vaccination of dogs with canine parvovirus type 2b (CPV-2b) induces neutralizing antibody responses to CPV-2a and CPV-2c. *Vaccine* 2014;32(42):5420–4.

#### Canine Adenovirus (Canine Infectious Hepatitis)

35. Greene CE. Infectious canine hepatitis and canine acidophil cell hepatitis. In: Greene CE, ed. *Infectious Diseases of the Dog and Cat*. 4th ed. St. Louis: Elsevier-Saunders; 2012:42–8.



## Rabies

36. Brown CM, Slavinski S, Ettestad P, et al. Compendium of Animal Rabies Prevention and Control, 2016. *J Am Vet Med Assoc* 2016;248(5):505–17.
37. Frana TS, Clough NE, Gatewood DM, et al. Postmarketing surveillance of rabies vaccines for dogs to evaluate safety and efficacy. *J Am Vet Med Assoc* 2008;232(7):1000–2.
38. Monroe BP, Yager P, Blanton J, et al. Rabies surveillance in the United States during 2014. *J Am Vet Med Assoc* 2016;248(7):777–88.
39. Moore MC, Davis RD, Kang Q, et al. Comparison of anamnestic responses to rabies vaccination in dogs and cats with current and out-of-date vaccination status. *J Am Vet Med Assoc* 2015;246(2):205–11.
40. Murray KO, Holmes KC, Hanlon CA. Rabies in vaccinated dogs and cats in the United States, 1997–2001. *J Am Vet Med Assoc* 2009;235(6):691–5.

## Leptospirosis

41. Andre-Fontaine G. Diagnosis algorithm for leptospirosis in dogs: disease and vaccination effects on the serological results. *Vet Rec* 2013;172(19):502.
42. Gautam R, Wu CC, Guptill LF, et al. Detection of antibodies against *Leptospira* serovars via microscopic agglutination tests in dogs in the United States 2000–2007. *J Am Vet Med Assoc* 2010;237(3):293–8.
43. Goldstein R. Canine leptospirosis. *Vet Clin N Am Small Anim Pract* 2010;40(6):1091–101.
44. Ghneim GS, Viers JH, Chomel BB, et al. Use of a case-control study and geographic information systems to determine environmental and demographic risk factors for canine leptospirosis. *Vet Res* 2007;38(1):37–50.
45. Klaasen HL, van der Veen M, Sutton D, et al. A new tetravalent canine leptospirosis vaccine provides at least 12 months immunity against infection. *Vet Immunol Immunopathol* 2014;158(1–2):26–9.
46. Langston CE, Heuter KJ. Leptospirosis. A re-emerging zoonotic disease. *Vet Clin North Am Small Anim Pract* 2003;33(4):791–807.
47. Lee HS, Levine M, Guptill-Yoran C, et al. Regional and temporal variations of *Leptospira* seropositivity in dogs in the United States, 2000–2010. *J Vet Intern Med* 2014;28(3):779–88.
48. Midence JN, Leutenegger CM, Chandler AM, et al. Effects of recent *Leptospira* vaccination on whole blood real-time PCR testing in healthy client-owned dogs. *J Vet Intern Med* 2012;26(1):149–52.
49. Moore GE. Leptospirosis: preventing a complex and elusive disease. *Vet Rec* 2013;172(7):179–80.
50. Raghavan RK, Brenner KM, Higgins JJ, et al. Neighborhood-level socioeconomic and urban land use risk factors of canine leptospirosis: 94 cases (2002–2009). *Prev Vet Med* 2012;106(3–4):324–31.
51. Raghavan RK, Brenner KM, Higgins JJ, et al. Evaluations of hydrologic risk factors for canine leptospirosis: 94 cases (2002–2009). *Prev Vet Med* 2012;107(1–2):105–9.
52. Sykes JE, Hartman K, Lunn KF, et al. 2010 ACVIM Small Animal Consensus Statement on Leptospirosis: Diagnosis, Epidemiology, Treatment, and Prevention. *J Vet Intern Med* 2011;25(1):1–13.
53. Wilson S, Stirling C, Thomas A. A new multivalent (DHPPI/L4R) canine combination vaccine prevents infection, shedding and clinical signs following experimental challenge with four *Leptospira* serovars. *Vaccine* 2013;31(31):3131–4.

## Borreliosis (Canine Lyme Disease)

54. Conlon JA, Mather TN, Tanner P, et al. Efficacy of a nonadjuvanted, outer surface protein A, recombinant vaccine in dogs after challenge by ticks naturally infected with *Borrelia burgdorferi*. *Vet Ther* 2000;1(2):96–107.
55. Ford RB, Eschner A. Canine Lyme disease: how real the threat? *Today's Veterinary Practice* 2014;4(2):70–4.
56. Goldstein RE. Lyme disease. In: Ettinger SJ, Feldman EC, eds. *Textbook of Veterinary Internal Medicine*. Vol. 1. 7th ed. St Louis: Elsevier Saunders; 2010:868.
57. Leschnik MW1, Kirtz G, Khanakah G, et al. Humoral immune response in dogs naturally infected with *Borrelia burgdorferi* sensu lato and in dogs after immunization with a *Borrelia* vaccine. *Clin Vaccine Immunol* 2010;17(5):828–35.
58. Littman MP, Goldstein RE, Labato MA. ACVIM consensus statement on Lyme disease in dogs: diagnosis, treatment, and prevention. *J Vet Intern Med* 2006;20(2):422–34.
59. O'Connor TP, Esty KJ, Hanscom JL, et al. Dogs vaccinated with common Lyme disease vaccines do not respond to IR6, the conserved immunodominant region of the VlsE surface protein of *Borrelia burgdorferi*. *Clin Diagn Lab Immunol*. 2004;11(3):458–62.
60. Rhodes DV, Earnhardt CG, Mather TN, et al. Identification of *Borrelia burgdorferi* ospC genotypes in canine tissue following tick infestation; implications for Lyme disease vaccine and diagnostic assay design. *Vet J* 2013;198(2):412–8.
61. Töpfer KH, Straubinger RK. Characterization of the humoral immune response in dogs after vaccination against the Lyme borreliosis agent: A study with five commercial vaccines using two different vaccination schedules. *Vaccine* 2007;25(2):314–26.

## Agents Associated with Canine Infectious Respiratory Disease (CIRD)

62. Anderson TC, Crawford PC, Dubovi EJ, et al. Prevalence of and exposure factors for seropositivity to H3N8 canine influenza virus in dogs with influenza-like illness in the United States. *J Am Vet Med Assoc* 2013;242(2):209–16.
63. Castleman WL, Powe JR, Crawford PC, et al. Canine H3N8 influenza virus infection in dogs and mice. *Vet Path* 2010;47(3):507–17.
64. Davis R, Jayappa H, Abdelmagid OY, et al. Comparison of the mucosal immune response in dogs vaccinated with either an intranasal avirulent live culture or a subcutaneous antigen extract vaccine of *Bordetella bronchiseptica*. *Vet Ther* 2007;8(1):32–40.
65. Deshpande MS, Jirjis FF, Tubbs AL, et al. Evaluation of the efficacy of a canine influenza virus (H3N8) vaccine in dogs following experimental challenge. *Vet Ther* 2009;10(3):103–12.
66. Edinboro CH, Ward MP, Glickman LT. A placebo-controlled trial of two intranasal vaccines to prevent tracheobronchitis (kennel cough) in dogs entering a humane shelter. *Prev Vet Med* 2004;62(2):89–99.
67. Ellis JA, Krakowka GS. A review of canine parainfluenza virus infection in dogs. *J Am Vet Med Assoc* 2012;240:273–84.
68. Ellis J, Rhodes C, Lacoste S, et al. Antibody responses to *Bordetella bronchiseptica* in vaccinated and infected dogs. *Can Vet J* 2014;55(9):857–64.
69. Ellis JA. How well do vaccines for *Bordetella bronchiseptica* work in dogs? A critical review of the literature 1977–2014. *Vet J* 2015;204(1):5–16.
70. Ellis JA, Gow SP, Waldner CL, et al. Comparative efficacy of intranasal and oral vaccines against *Bordetella bronchiseptica* in dogs. *Vet J* 2016;212: 71–7.

71. Erles K, Brownlie J. Canine respiratory coronavirus: an emerging pathogen in the canine infectious respiratory disease complex. *Vet Clin North Am Small Anim Pract* 2008;38(4):815–25.
72. Ford RB. *Bordetella bronchiseptica*: beyond “kennel cough.” In: Bonagura J, Twedt DC, eds. *Kirk’s Current Veterinary Therapy XIV*. St. Louis: Saunders-Elsevier; 2009:647–50.
73. Gore T, Headley M, Laris R, et al. Intranasal kennel cough vaccine protecting dogs from experimental *Bordetella bronchiseptica* challenge within 72 hours. *Vet Rec* 2005;156(15):482–3.
74. Hess T, Parker D, Hassal, et al. Evaluation of efficacy of oral administration of *Bordetella bronchiseptica* intranasal vaccine when used to protect puppies from tracheobronchitis due to *Bordetella bronchiseptica* infection. *Intern J Appl Res Vet Med* 2011;9(3):300–5.
75. acobs AA, Theelen RP, Jaspers R, et al. Protection of dogs for 13 months against *Bordetella bronchiseptica* and canine parainfluenza virus with a modified live vaccine. *Vet Rec* 2005;157(1):19–23.
76. Jacobs AA, Bergman JG, Theelen RP, et al. Compatibility of a bivalent modified-live vaccine against *Bordetella bronchiseptica* and CPiV, and a trivalent modified-live vaccine against CPV, CDV and CAV-2. *Vet Rec* 2007;160(2):41–5.
77. Larson LJ, Henningson J, Sharp P, et al. Efficacy of the canine influenza virus H3N8 vaccine to decrease severity of clinical disease after cochallenge with canine influenza virus and *Streptococcus equi* subsp. *zooepidemicus*. *Clin Vaccine Immunol* 2011;18(4):559–64.
78. Larson L, Thiel BE, Sharp P, et al. A comparative study of protective immunity provided by oral, intranasal and parenteral canine *Bordetella bronchiseptica* vaccines. *Intern J Appl Res Vet Med* 2013;11(3): 153–60.
79. Lehar C, Jayappa H, Erskine J, et al. Demonstration of 1-year duration of immunity for attenuated *Bordetella bronchiseptica* vaccines in dogs. *Vet Ther* 2008;9(4):257–62.
80. Newbury S, Godhardt-Cooper J, Poulsen KP. Prolonged intermittent virus shedding during an outbreak of canine influenza A H3N2 virus infection in dogs in three Chicago area shelters: 16 cases (March to May 2015). *J Am Vet Med Assoc* 2016;248(9):1022–6.
81. Payungporn S, Crawford PC, Kouo TS, et al. Influenza A virus (H3N8) in dogs with respiratory disease, Florida. *Emerg Inf Dis* 2008;14(6):902–8.
82. Squires RA. How well do vaccines against *Bordetella bronchiseptica* work in dogs? *Vet J* 2015;204(3):237–8.

#### ***Crotalus Atrox (Western Diamondback Rattlesnake Vaccine)***

83. Wallis DM, Wallis JL. Rattlesnake vaccine to prevent envenomation toxicity in dogs. Presented at the Dr Ross O. Mosier 77th Annual Western Veterinary Conference. Las Vegas (NV), February 20–24, 2005.
84. Cates CC, Valore EV, Couto MA, et al. Comparison of the protective effect of a commercially available western diamondback rattlesnake toxoid vaccine for dogs against envenomation of mice with western diamondback rattlesnake (*Crotalus atrox*), northern Pacific rattlesnake (*Crotalus oreganus oreganus*), and southern Pacific rattlesnake (*Crotalus oreganus helleri*) venom. *Am J Vet Res* 2015;76(3):272–9.

#### ***Canine Enteric Coronavirus***

85. Greene CE, Decaro N. Canine viral enteritis. In: Greene CR, ed. *Infectious Diseases of the Dog and Cat*. 4th ed. St. Louis: Elsevier-Saunders; 2012:67–80.

## Maximize Compliance: AAHA’s Tools to Help You Implement the Guidelines

Visit the online educational resource for the 2017 AAHA Canine Vaccination Guidelines ([aaha.org/CanineVaccinationGuidelines](http://aaha.org/CanineVaccinationGuidelines)), where you’ll find the following tools, calculators, and tables:

- Vaccination Recommendations for General Practice
- Rabies Vaccination
- Lifestyle-Based Vaccine Calculator
- Overdue for Vaccination
- Vaccination Recommendations for Shelter-Housed Dogs
- Antibody Testing Versus Vaccination
- Legal Considerations
- Vaccine Adverse Reactions
- Vaccine Types
- Vaccine Storage and Handling
- Therapeutic Biologics
- Vaccine Licensure in the United States
- The Vaccine Label
- Frequently Asked Questions

Show clients why their pets need vaccinations with our new “Vaccinating Your Pet” Pet Health Brochure, which has been fully updated according to the 2017 guidelines.

