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VACCINE ANTIBODY TITERS

The following update discusses use of serologic viral antibody titers for determining the need for revaccination of healthy pets (see Antech News, April, 1998 for background). The information summarizes Antech's recently published article from the October 1, 2000 issue of the *Journal of the American Veterinary Medical Association*.

Current debate in veterinary medicine concerning issues related to vaccine efficacy and safety, as well as the duration of immunity induced by the currently available vaccines, underscores a compelling need for more objective and scientific data. Determination of serum antibody titers is one method commonly used to assess host humoral immune responses to a number of disease-causing organisms. In dogs, **serum canine parvovirus (CPV)** and **canine distemper virus (CDV)** antibody titers have been measured in the past to help assess duration of immunity induced by vaccines against these two viruses. The rationale for selecting CPV and CDV for serum antibody testing is based on the clinically important diseases they cause, combined with the usefulness of the host's humoral immune response to these viruses for determining the need for revaccination.

Although measuring serum titers in cats was not a goal of the study summarized here, a similar approach to feline diseases applies. One study found adequate serum antibody titers to last for at least 6 years for **feline panleukopenia virus**, 4 years for feline calicivirus, and 3 years for feline herpesvirus in cats vaccinated at 8 and 12 weeks of age with polyvalent killed vaccine. Results of subsequent challenge studies with these cats supported the earlier predictions of protection made on the basis of antibody titers.

METHODS

Serum samples were obtained from dogs during routine healthcare visits from various

veterinary clinics across the United States and Canada. Most of the dogs (1,169; 81.1%) were purebreds and represented 114 different breeds, with breed frequencies generally representative of their respective popularity as companion animals. Two hundred fifty-two dogs were of mixed breeding; breed was not reported for 20 (1.4%) dogs. Dogs ranged from 6 weeks to 17 years old. Only 3 (0.2%) dogs were < 4 months old. There were 400 sexually intact males, 222 neutered males, 451 sexually intact females, 351 spayed females, and 17 dogs for which sex was not reported. Vaccine histories for 468 of 1,441 (32.5%) dogs were reported by the submitting veterinarians; all but 4 of these dogs had been vaccinated previously. For 75 dogs, serum antibody titers had been measured annually for the previous 2 (n = 59), 3 (13), 4 (2), and 5 (1) years, and all titers remained adequate. Thirty-three serum samples for which CPV and CDV titers were > 1:5 were randomly selected and serially diluted to determine the titer endpoints.

Antibody titers were determined by use of the immunofluorescent antibody method. 1,441 canine parvovirus (CPV) and 1,379 canine distemper virus (CDV) antibody titers were evaluated. An adequate antibody response was determined to be $\geq 1:5$ as determined by the IFA method.

RESULTS

Age, breed, and sex were not significantly associated with adequate serum CPV- or CDV-specific antibody responses. One thousand three hundred and seventy of 1,441 (95.1%) dogs had adequate and 71 (4.9%) had inadequate antibody responses to CPV, whereas 1,346 of 1,379 (97.6%) dogs had adequate and 33 (2.4%) had inadequate responses to CDV. Vaccination histories were available for 468 dogs (468 for CPV and 457 for CDV). The interval between last vaccination and antibody measurement was between 1 and 2

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years for the majority of dogs (281/468; 60.0%) and between 2 and 7 years for 142 of 468 (30.3%) dogs. The interval was < 1 year in only 45 of 468 (9.6%) dogs.

Of the 33 serum samples that were serially diluted to determine endpoint titers, endpoint titers for CPV ranged from 1:10 to 1:320; the median endpoint was 1:128. For CDV, endpoint titers ranged from 1:10 to 1:1,280, with a median endpoint of 1:256. Therefore, the endpoint titers for CPV and CDV in dogs for which IFA titers were > 1:5 are likely to be higher.

Of the 468 dogs with available vaccine histories, 401 of 423 (94.8%) had an adequate response to CPV for more than 1 year after vaccination, and 390 of 412 (94.7%) had an adequate response to CDV for more than 1 year after vaccination. Moreover, 133 of 142 (93.7%) dogs and 127 of 136 (93.4%) dogs had adequate responses to CPV and CDV, respectively, more than 2 years after vaccination.

DISCUSSION

The goal of measuring serum antibody titers in companion animals is to provide a rational way of establishing whether an individual animal has an adequate antibody response to a given disease agent, and of using this information as a practical indicator of the need for revaccination. Antibody titers in this study population of dogs were likely a result of prior immunization combined with any natural exposure, and suggest that these dogs had adequate immunologic memory, the mechanism that provides animals with protection from clinical disease upon natural viral challenge.

Results of the present study indicate that adequate antibody titers to CPV were found slightly less consistently than to CDV. The number of dogs with an inadequate CPV titer but an adequate CDV titer (53 of 71; 75%) was significantly higher than the number of dogs with an inadequate CDV titer but an adequate CPV titer (15 of 33; 45%). Several factors may explain these findings. Some of

the dogs with inadequate CPV titers may have been inadequately immunized as puppies. This occurs when maternally derived antibodies are at a high enough concentration to interfere with vaccination, but not high enough to provide protection. This could explain their poor immunologic response to revaccination as adults. In addition, certain breeds of dogs (e.g., Rottweiler, Doberman pinscher, Labrador retriever, Alaskan sled dog, pomeranian, and American Staffordshire terrier) have difficulty mounting an appropriate immune response to CPV. Serology could be performed after puppies in these susceptible breeds are vaccinated to determine whether an adequate immune response has been established.

Some dogs never appear to mount an adequate antibody response to vaccination, but remain healthy, presumably because of persistence of immune memory cells and development of cell-mediated and mucosal immune responses, or alternatively, lack of exposure to infectious virus. It may be appropriate to stop vaccinating these dogs, especially if they had experienced adverse reactions to vaccination in the past.

CONCLUSION

By measuring serum antibody titers annually, one can assess the level of a given dog's humoral immune response to CPV and CDV. Results of the present study indicate that a large percentage of healthy dogs have serum antibody titers to CPV and CDV, regardless of duration of time since last vaccination. Moreover, of the dogs with a known CPV and CDV vaccination history, 133 of 142 (93.7%) and 127 of 136 (93.4%) dogs, respectively, had serum antibody responses even though they had last received a vaccine more than 2 years ago. These results support the contention that annual vaccination for these viral diseases is unnecessary in most cases.

References: Tizard, I and Ni, Y, *JAVMA* 213: 54-60, 1998; Shultz, RD, *Vet Med* 93: 233-254, 1998; Scott, FW and Geissinger, CM, *Am JVet Res* 60: 652-658, 1999; Dodds, WJ, *Adv Vet Med* 41: 715-732, 1999; Twark, L and Dodds, WJ, *JAVMA* 217: 1021-1024, 2000.

LAB TIPS

Fructosamine

How should I use this test?

Sequential evaluation of fructosamine levels may be very helpful in confirming changes in glycemic control. Therefore, *it is recommended to obtain a baseline fructosamine level before beginning treatment with insulin in order to follow trends in the future.* After initially using blood glucose curves to determine the correct type and dosing schedule of insulin, fructosamine levels can be used together with clinical signs and an occasional blood glucose curve for further monitoring. If clinical signs, physical examination findings, fasting morning blood glucose levels, and fructosamine levels all indicate good glycemic control, then a serial blood glucose curve may not be necessary. If clinical

signs or physical examination findings suggest poor glycemic control, then a blood glucose curve is recommended regardless of the fructosamine level.

In very fractious patients or patients that are too stressed to accurately assess their glycemic control with a blood glucose curve, fructosamine levels can be used together with clinical indicators of glycemic control (changes in body weight, polyuria/polydipsia, client perception of glycemic control) to estimate response to treatment. In addition, fructosamine levels can be very helpful in differentiating stress hyperglycemia from true diabetes mellitus, especially in cats.