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Vaccines for Dogs

Recent advances in veterinary medical science have resulted in an increase in vaccines available for dogs. Improvements are continuously being made in vaccine safety and effectiveness. Veterinarians routinely recommend certain vaccines for all dogs (called core vaccines), while others (called non-core vaccines) are used more selectively according to the dog's environment and lifestyle.

In all cases, decisions regarding the vaccine types and vaccine schedules that are best for each dog require professional advice.

What is a vaccine?

A vaccine is a preparation of either killed or altered microorganisms that is administered into the body. The vaccine stimulates the immune system to learn how to fight the microorganism so that if the microorganism is encountered in the future, the dog will either not get sick or will have a less severe illness.

How do vaccines work?

Vaccines work by stimulating the body's immune system to recognize and fight a particular microorganism such as a virus, bacteria, or other infectious organisms. Once vaccinated, the animal's immune system is then primed or prepared to react to future infection with that microorganism. In other words, the vaccine mimics a true infection so that the immune system can better protect the body in the future. Depending on the disease, the vaccine will help the body prevent infection or lessen the severity of the infection and promote rapid recovery.

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While a vaccine can prevent illness, it cannot block microorganisms from getting into the body. This means that sometimes a dog may not look sick thanks to the vaccine, but the dog can still spread the invading microorganisms to other dogs.

What is the difference between a modified live vaccine and a killed vaccine?

In a modified live or live attenuated vaccine, the causative organism (virus, bacterium, etc.) has been weakened or altered so that it is no longer harmful or virulent but is still capable of stimulating protective immunity when injected or otherwise administered. With a killed vaccine, the causative organism has been killed or inactivated to render it harmless.

Killed vaccines often need a helper or adjuvant (added ingredient) included in the vaccine to stimulate a longer-lasting immune response. Both have advantages and disadvantages.

The choice of which vaccine is better for your dog will depend on its individual circumstances. Your veterinarian will consider these circumstances when choosing the appropriate vaccine for your pet.

How are vaccines administered to dogs?

Some vaccines are given locally, for example into the nose, but most require injection so that the maximum stimulation of the immune system is achieved. Some vaccines are injected subcutaneously (just under the skin) and others are injected into intramuscularly (into the muscle).

Which vaccines are recommended for dogs?

Depending on where you live, some infections may be more or less likely. The range of vaccines available includes rabies, distemper, adenovirus (infectious canine hepatitis), parvovirus, leptospirosis, parainfluenza, coronavirus, *Bordetella bronchiseptica*, Lyme disease, and canine influenza (for details on these diseases, see individual handouts “Rabies in Dogs”, “Distemper in Dogs”, “Infectious Hepatitis (Adenovirus) in Dogs”, “Parvovirus in Dogs”, “Leptospirosis in Dogs”, “Kennel Cough or Tracheobronchitis in Dogs”, “Lyme Disease in Dogs”, and “Canine Influenza – The Dog Flu”).

These vaccines are often available in combinations that can be given in one dose. Combination vaccines are convenient and avoid extra injections for your dog. Your veterinarian will advise you on the appropriate vaccines for your dog based on his relative risks and lifestyle.

The following core vaccines are recommended for all puppies and dogs by the American Animal Hospital Association (AAHA) Canine Vaccine Task Force:

- canine distemper virus
- canine parvovirus
- canine adenovirus-2 (hepatitis)
- rabies virus

The following non-core vaccines are recommended for puppies and dogs in special circumstances, dependent on the exposure risk of an individual dog, by the AAHA Canine Vaccine Task Force:

- *Leptospira* species
- *Borrelia burgdorferi* (Lyme disease)
- canine parainfluenza virus
- *Bordetella bronchiseptica* (kennel cough)
- canine influenza

What is maternal immunity?

Newborn animals have not yet had a chance to make their own immunity so they need protection against infections present in their environment. They receive this immunity from their mother, as maternal antibodies. Part of this passive immunity is transferred across the placenta while the pup is still in the uterus, but most of it is transferred in the first milk or colostrum. This maternal immunity is only temporary and declines steadily over the first few weeks of life, largely gone by twelve weeks. The rate of decline is variable, depending on many factors.

Why do puppies need more than one dose of some vaccines?

First, without complicated testing, it is impossible to know when a puppy has lost the passive protection it gets from its mother. An early decline in a puppy's maternal antibody can leave it susceptible to infection at a very young age. A strong maternal immunity can actually interfere with early vaccination (see handout “Vaccination Failure in Dogs”). Second, particularly with killed vaccines, the first dose is a priming dose, and the second dose boosts the response to a higher, longer-lasting level of immunity.

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Why does my dog need to be revaccinated?

In most properly vaccinated dogs, the immunity should last more than one year, and often several years. However, immunity does decline with time and this decline rate varies between individuals. To maintain the best protection against infectious diseases, revaccinations have proven very successful. As vaccines are improved over time, some do not need to be given as often, depending on individual circumstances. Most dogs with low-risk lifestyles can be vaccinated every three years with the core vaccines and as needed for any non-core vaccines (most non-core vaccines require annual boosters). Your veterinarian will discuss the need and frequency of booster vaccinations for your dog based on your dog’s needs and lifestyle.

How long does it take a vaccine to produce immunity?

Within a few hours of vaccination, the earliest phases of the immune response are being stimulated. It usually requires 10 to 14 days before a reasonable level of protection is established. Killed vaccines may not provide adequate protection until after the second dose. In young puppies, maternal antibodies may hinder protection until later in the vaccine series. Therefore, it is advisable to keep even a vaccinated puppy away from dogs or puppies of unknown vaccination history until it has finished its vaccination course.

Why is the same amount of vaccine given to a small dog and a large dog?

Vaccination doses are the same for all dogs, regardless of size. When these vaccines are tested, all dogs in the test group receive the same dose of vaccine and have been proven safe for dogs of all sizes at the recommended dosage. Smaller doses of vaccine may not adequately protect small pets. In addition, there is no evidence that smaller doses of vaccinations are associated with a decreased likelihood of vaccine reactions.

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What happens if my dog is sick when vaccinated?

The veterinary check-up prior to vaccination and sometimes pre-vaccination blood tests help prevent this situation. In most cases, minor illnesses would not have disastrous consequences, but it is important that an animal is healthy when vaccinated to ensure the proper development of immunity.

Can vaccination make my dog sick?

Some dogs develop mild lethargy or soreness one to two days after vaccination. In the case of killed vaccines containing an adjuvant, lump formation may occur at the vaccination site. If this is painful or persists for more than a few weeks with no decrease in size, consult your veterinarian. A few dogs will develop more severe reactions that are forms of hypersensitivity (allergy). The effects will usually occur within minutes but may be delayed by a few hours. Your dog may salivate, vomit, develop diarrhea, hives, or have difficulty breathing. Should this occur, consult your veterinarian immediately.

Do vaccines provide 100% protection?

Vaccines have been highly successful in protecting the majority of dogs against disease. As a direct result of vaccination, previously common diseases such as distemper are now rare. However, there are situations in which the dog's immunity may be overcome and a vaccinated dog may still develop disease. In such cases, the disease is generally milder than it would have been had the dog not been vaccinated.

Some causes for apparent vaccine failure include:

Maternally derived antibodies. As mentioned above, when a puppy is born and after it suckles its mother, it acquires a proportion of antibodies from the mother. A well-vaccinated female will transfer antibodies to her puppies for the diseases she has been vaccinated against, as well as any others she has acquired naturally. Such antibodies protect the pup against those diseases for the first two to three months of its life, the most critical time. However, during this same period, the maternally derived antibodies can block the pup's ability to respond to vaccination.

This blocking effect decreases as the maternal antibodies gradually disappear over those two to three months. A point in time is reached when vaccination can be successfully given. Unfortunately, this point varies between pups, mainly because the amount of maternal antibodies that each pup receives is variable. This is a factor as to why most 'puppy programs' involve a series of vaccinations, given two to four weeks apart. Maternal antibody interference has been a particular problem with canine parvovirus vaccination.

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Incomplete immune response. There is variation between dogs' immune systems. Some respond less well to vaccination, so immunity may be incomplete or shorter-lived than normal. Certain breeds and genetic lines have a tendency for such problems.

Declining immunity. Without booster vaccinations or the natural boosting of immunity by sporadic exposure to the infectious agent in nature, immunity to the specific organism declines over time. This is particularly true in older dogs, and eventually, the immunity will be too low to prevent disease.

Immune suppression. Certain infections and some drugs, such as anti-cancer drugs, may cause a suppression of the immune system so that an otherwise well-vaccinated dog becomes susceptible to infection and disease if exposed.

New strains of an organism. Some infectious agents exist in different strains or evolve into new strains that are not directly covered by the vaccines given. In these cases, the vaccine may give some 'cross-protection' or partial protection, but protection may not be complete.

The above are not the only reasons for vaccination failure, but they are the most common. It is important to keep in mind that not all vaccines are able to completely prevent illness; some vaccines are designed to decrease the severity of disease but the disease is still possible. If you feel your dog has contracted an infection for which it has been vaccinated, let your veterinarian know. Tests can be done to establish why vaccination has failed to be protective.