

AN UPDATE ON WHAT EVERYONE NEEDS TO KNOW ABOUT CANINE AND FELINE VACCINATION PROGRAMS

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For many veterinary practitioners canine and feline vaccination programs have been “practice management tools” rather than medical procedures. Thus, it is not surprising that attempts to change the vaccines and vaccination programs based on scientific information have created great controversy and unique methods of resistance to the proposed changes have been developed. For some practitioners the issues are not duration of immunity for the vaccines, or which vaccines are needed for the pet, instead it is felt that all licensed vaccines should be given to every dog and cat on an annual or more often basis. Ironically this practice is often fostered by the fact that multivalent products with 7 or more vaccines can be purchased for the same price or less than a product with one or two vaccine components. A “more is better” philosophy prevails with regard to vaccines. It is often believed that at least some of the vaccines administered in the combination product probably aren’t needed but it is assumed that it won’t hurt to give them. It is also believed the animal may need all of them some time during its life because of unknown risk. Although it is well known that the duration of immunity for certain vaccines, like distemper (CDV), parvoviruses of the canine (CPV-2) and feline (FPV), and hepatitis (CAV-1), is many years to a lifetime. Until another equally effective method way is found to get the client into the office on a regular basis, some veterinarians will continue to recommend even these core vaccines annually. Annual revaccination has been and remains the single most important reason why many pet owners bring their animals for an annual or more often “wellness visit.” The importance of these visits for the health of the pet is exceptional, and every effort must be made to separate the need for vaccines from the need for the physical examinations as well as other important procedures. Therefore, dog and cat owners must be told by practitioners that vaccines are not the only reason their dog or cat needs an annual wellness visit, and at some visits vaccines will not be given. Furthermore, certain vaccines (optional/noncore) when given to a dog or cat at risk must be given annually or more often. Thus for those pets receiving the noncore vaccines, the core vaccines should not be given. It is the core vaccines CDV, CPV-2, CAV-2 for the dog and FPV, FCV, and FHV-1 for the cat and rabies for both species that don’t need to be given more often than once every three years. Another reason for the reluctance to change current vaccination programs is many practitioners really don’t always understand the principles of vaccinal immunity and/or they are not aware of the current vaccine guidelines for the dog and cat. A significant number of practitioners believe:

- 1) *the annual revaccination recommendation on the vaccine label is evidence the product provides immunity for (only) one year.* Not true. Some vaccines provide a life-time or many years of immunity, whereas others probably provide less than a year of immunity if at all.
- 2) *that they are legally required to vaccinate annually and if they don’t they will not be covered by AVMA liability insurance if the animal develops a vaccine preventable disease -* Not true. The only vaccine required at all by law is rabies and even that vaccine is not required in some states, especially for cats. There is also a concern that certain companies will not provide assistance if practitioners don’t vaccinate annually with core vaccines. Not true. In fact, all of the major companies have now demonstrated their core products provide at least 3 years of immunity and endorse the not more often than 3 year vaccination recommendation made in the AAEP Feline Guidelines and the AAHA Canine Guidelines.
- 3) *that not revaccinating will cause the animal to become susceptible soon (days or a few weeks) after the one year.* – Not true for the core vaccines. They provide up to a lifetime of immunity or at the very least many years of immunity
- 4) *if the animal is not revaccinated at or before one year the “whole vaccination program needs to be started again”.* – Not true. If the immune response had been stimulated previously, memory cells will persist well beyond a year for the core vaccines. Even with the non-core vaccines, if the animals was previously vaccinated properly (eg one dose of MLV at an age when maternal antibodies did not block

the vaccine or two doses of a killed vaccine that were given 3 to 4 weeks apart, it is not necessary to do anything other than give another dose of vaccine!

- 5) *if they don't continue to revaccinate annually, diseases like canine distemper, canine parvovirus, feline panleukopenia, and infectious canine hepatitis (CAV-1) will "reappear and cause widespread disease similar to what was seen prior to the development of vaccines for these diseases."* – Not true with the core vaccines, it is not how often you revaccinate; it is dependent on how many animals in the population (herd immunity) receive at least one dose of the core vaccines at an age when MDA cannot block active immunity (eg >16 weeks of age).
- 6) *that if the revaccination "doesn't help, it won't hurt."* – Not true. Vaccines can and do cause adverse reactions, thus don't administer vaccines if and when they are not needed. Vaccines can cause severe adverse reactions, including death!
- 7) *that giving a vaccine annually that has a duration of immunity of 3 or more years provides much better immunity than if the product is given only once during the three or more years.* – Not true.
- 8) *there are regional/state rabies programs that suggest annual rabies vaccination programs provide better protection than revaccination once every three years regardless of whether a 1 year or 3 year rabies product is used.* – Not true The 3 year rabies vaccine provides equal to or better immunity than the 1 year vaccine and reduces the potential for adverse reactions from overvaccination. There is no sound immunologic reason to revaccinate for rabies more often than every 3 years and that may be less in the future (eg there is already a 4 year rabies vaccine licensed for the cat).
- 9) *that parvovirus vaccines only provide six months of immunity, thus they must give them semi-annually and the CPV-2 vaccines need to be given with coronavirus vaccine (CCV) to prevent enteritis.* Not true. Parvovirus vaccines are excellent and they provide protection against all the CPV-2 variants (2, 2a, 2b, 2c) for many years after vaccination. Furthermore, no benefit can be shown for a CCV vaccine either in reducing the severity of parvovirus enteritis or preventing enteritis.
- 10) *"It's much cheaper to revaccinate the pet annually than it is to treat the disease the animal will develop because it didn't get revaccinated annually."* The "better safe than sorry" philosophy - It is less expensive to prevent disease. That is why it is necessary to use the core vaccines. However, if the core vaccines are given as a puppy and again at 6 months to a year of age, then annual revaccination is not needed. Furthermore, if a vaccine is given that is not needed and it causes an adverse reaction that is unacceptable and very expensive.
- 11) *they need to revaccinate all new dogs/cats coming to their clinic irrespective of vaccination history even when vaccination records are available from another clinic. Presumably the "other clinic" used the wrong vaccine or didn't know how to vaccinate.* – Not true
- 12) *"Dogs and cats need to be revaccinated annually up to 5 to 7 years of age, then and only then would vaccination every three years be okay."* – Not true. Dogs and cats should be vaccinated as puppies and kittens with the core vaccines making sure the last dose of vaccine is at 14 to 16 weeks of age. They should be revaccinated again at 6 months to 1 year of age, unless titers were performed; then they need not be revaccinated more often than every 3 years. Also, they do not need to have antibody titers performed more often than every 3 years and only then if you decide not to revaccinate. Rabies vaccines by law must be given every 3 years after the initial 2 doses are given. Rabies laws requiring revaccination more often than every 3 years after the initial 2 doses should be changed!
- 13) *"Surgical procedures, including anesthesia, are immunosuppressive thus dogs should be vaccinated prior to or shortly after surgery."* – Not true. Vaccines should not be given during anesthesia and animals already vaccinated prior to surgery need not be vaccinated again. If they have never been vaccinated prior to surgery, wait until the animal has recovered from anesthesia to vaccinate.
- 14) *"Because boarding kennels require annual or more often (kennel cough every 3 to 6 months) vaccination, practitioners must continue vaccinating annually with all vaccines."* – Not true – help change the kennel rules through education and just use the vaccines that need to be given (eg Kennel Cough.) The kennels need to understand that dogs and cats are up-to-date on their core vaccines when they have been vaccinated within the past 5 to 7 years and no kennel should require core vaccines more often than every 3 years. It is reasonable for the kennels to require the "kennel cough" products annually.

Note: There are kennels that require every licensed vaccine and the vaccines must have been given within 1 year

or less prior to admission – help change these rules! Those kennels that are members of the American Kennel Association follow the AAHA Guidelines, but many kennels do not belong to this association. It will be necessary to correct many of these and additional misunderstandings by providing education on vaccines to some veterinary practitioners, kennel owners and pet owners before significant changes in vaccination programs can or will occur to reduce the over-vaccination of both cats and dogs.

However it is **equally important** that we don't, in our efforts to prevent over-vaccination:

- 1) fail to vaccinate all or as many pups and kittens as possible with the core vaccines – in the US, where we probably vaccinate as many or more dogs and cats, we currently vaccinate about 50% of all puppies and 25% of all kittens
- 2) fail to vaccinate often enough with the vaccines that provide one year or less of immunity (eg most non-core vaccines)
- 3) fail to use products that are necessary such as the core vaccines
- 4) use products (eg nosodes, vaccines that are not from major vaccine manufacturers, or mishandled products) that don't provide protective immunity for our pets.

Canine Vaccines and Vaccination Programs

I believe every practitioner, kennel owner and dog owner should know the following general information about canine vaccines and vaccination programs. What vaccines are needed for all puppies? I do mean all pups; as mentioned above, we only vaccinate 50% of all dogs. If we could increase this percentage to 75%, we would be able to eliminate many of the diseases prevented by core vaccines. The “core vaccines,” those that every pup should receive and identified as core by most canine vaccine experts in the United States, include: 1) Canine Parvovirus type 2 (CPV-2), 2) Canine Distemper virus (CDV), 3) Canine Adenovirus type 2 (CAV-2), 4) Rabies Virus (RV). When do the core vaccines need to be given? As a minimum, puppies should be given at least one dose at 16 weeks of age or older. Preferably, they should be given three or more times starting at 6 to 9 weeks then at an interval of 2 to 4 weeks, revaccinate at 9 to 12 weeks, then again at 14 to 16 weeks. For those not wanting to vaccinate 3 times, start the vaccination program at 10 to 12 weeks and revaccinate at 14 to 16 weeks, or start at 16 weeks and revaccinate at 18 to 19 weeks, making sure the puppies remain in an environment where they will not be exposed to CDV or CPV-2 prior to vaccination. It is also possible to vaccinate once or twice prior to 12 to 14 weeks, then perform a CDV and CPV-2 antibody test to be sure the animal has responded. If it has not, then revaccinate. It is critical that the last dose of vaccine be given at 14 to 16 or more weeks of age when an antibody test for CDV/CPV-2 is not performed. A significant percentage of pups (eg up to 8%) receiving the last dose of vaccine prior to 14 to 16 weeks will not develop immunity. It is important not to give MLV core vaccines earlier than 6 weeks unless there is a significant risk of a specific disease (eg shelter), then give only the vaccine for the disease you want to prevent (e.g. CPV-2). Never vaccinate a pup or kitten at less than 4 weeks of age with MLV vaccines because the vaccine may cause an adverse reaction in an animal without MDA. The most effective canine core products currently available include modified live and recombinant vaccines alone or in combination with other viral products from the major biological companies (eg Ft. Dodge, Intervet, Merial, Pfizer, Schering Plough.) The combination products with CPV-2, CDV and CAV-2 currently often include canine parainfluenza (CPI) virus. New “core only” products have been and are being developed that don't have CPI, however, the CPI will not cause a problem if and when used as a parenteral 5 way combination product. However, the CPI will not provide effective immunity when given parenterally and it should be given intranasally to provide local mucosal, humoral (antibody), and cellular immunity. I recommend giving the 3 core viral vaccines in combination rather than separately. I also do not recommend mixing the 3 core viral vaccines with bacterial vaccines (eg Leptospira, Lyme, Chlamydia) for the primary puppy or kitten vaccination series. Instead, first complete the puppy or kitten core viral vaccination series at 14 to 16 weeks before giving any non-core bacterial vaccines. One exception to this recommendation would be the intranasal kennel cough vaccine, which can be administered at the same time as the core viral products are given, because the intranasal vaccine will not interfere with the parenteral core viral products since they are given at different sites of the body.

After the initial series of vaccines, and at a time when the viral and bacterial vaccines should not be given together, later or at the time of revaccination (eg at or after 6 months of age), a combination viral, bacterial product can be given. After the puppy or kitten core series is completed, revaccination is recommended between 6 months to one year of age, unless titers for CDV and CPV-2 show the animal is immune. Rabies vaccine by law (in many states) should be given first at 12 to 16 weeks, again at 1 year, then every 3 years, whereas the other

core vaccines need not be given more often than 3 years. There is no benefit from annual rabies vaccination and most one year rabies products are similar or identical to the 3-year products with regard to duration of immunity and effectiveness. However, the rabies vaccines labeled by the USDA as 1 year rabies vaccines must, by law, be given annually! Rabies vaccine is the one canine vaccine requiring a minimum duration of immunity study and duration of immunity labeling by the USDA. Currently, there are rabies vaccines labeled as 1 year, 3 year, and 4 year (cat only.) Revaccination annually with rabies does not improve immunity; however, annual revaccination with rabies vaccine does significantly increase the risk for an adverse reaction. Thus, a 3 year vaccine is recommended for the dog. In the case of the cat, the rabies vaccine I recommend is a 1 year vaccine. It is the PureVax® canarypox vectored recombinant rabies vaccine that does not contain an adjuvant. I believe this vaccine given annually is less likely to cause an “injection site sarcoma” when compared to the adjuvanted rabies vaccines given every 3 years. I would recommend to ensure the puppy vaccination program was successful, that a CDV and CPV-2 antibody titer be performed 2 or more weeks after the last dose of core vaccines. Laboratory tests as well as “in-office test” for CDV and CPV-2 antibody are available. If there is no or very low antibody two weeks or more after the last puppy vaccination at 14 to 16 weeks, revaccinate and perform a test two or more weeks after revaccination. If you still don’t have antibody, change the product and revaccinate. If the animal remains antibody negative for CDV or CPV-2, it is very likely a genetic non-responder. This is important information for you and the owner since the non-responder, if infected, will die, because it cannot mount an immune response. I estimate 1 per 1,000 dogs to be non-responders to CPV-2 and 1 per 5,000 to be non-responders to CDV. Since genetics are responsible, it is likely that certain breeds and certain families of dogs will have a much higher percentage than the general population. Therefore, you may have several pups in a litter that are non-responders. Antibody tests (titers) are very useful after the puppy vaccination series to ensure the animal is immunized. The problem with antibody tests is they are very expensive, thus in general, these tests are often not used routinely. Revaccination at 6 months of age to ensure that all animals have responded to the core vaccines, rather than waiting until 1 year of age, may provide an advantage, as those few dogs not responding when last vaccinated at 14 to 16 weeks of age would remain unvaccinated for a shorter period of time if revaccinated at 6 months rather than a year. Revaccination would not be required more often than every 3 years, since the minimum duration of immunity for the core vaccines except rabies is at least 7 years and up to a lifetime based on challenge and/or antibody data (Table 1). Thus revaccinating annually will not improve protection. Ironically “the better safe than sorry philosophy” can be equally applied to less vaccination, since the animal that develops an adverse reaction (e.g. hives, facial edema, anaphylaxis, autoimmune disease, death) from a vaccine that wasn’t needed is an example of “being sorry, not safe!”

What about All the Other Vaccines Currently Available for the Dog?

They are non-core or optional vaccines that should only be given to animals that need them and only as often as needed. There are also some vaccines that are **not recommended** for any dogs (eg CCV and Giardia). The duration of immunity is not known for certain non-core products, the efficacy is limited or not known and the risk vs. benefit factors are not always well established nor understood. The minimum duration of immunity for *Leptospira* vaccines is probably less than one year, especially in certain dogs, thus when required for a high risk dog, leptospira products may need to be given as often as semi-annually and not less often than annually. Considering the low vaccine efficacy, the adverse event rate and the minimal risk for leptospirosis in many regions of the US, certain practitioners do not use the current products. However, if an animal is in a high-risk environment for leptospirosis, the product to use should contain the 4 serovars because there is no or limited significant cross protection among the serovars. I recommend starting vaccination not earlier than 12 weeks of age, preferably later and after the viral vaccines have ended at 14 to 16 weeks. Revaccinate in 2 to 4 weeks with the *Leptospira* bacterin. It is critically important with all killed vaccines (eg lepto, Lyme, injectable Bordetella) to give two doses, 2 to 4 weeks apart, during the primary series of vaccinations. If there is more than 6 weeks between the initial dose and the second dose, I recommend starting the series again, making sure the next 2 doses are given with a 2 to 4 week interval between the doses. I would revaccinate with leptospira 3 months after the second dose, then revaccinate again at a year of age and then you may have to revaccinate as often as every 6 to 9 months, but not less often than annually for optimal protection. Starting the vaccination program for leptospirosis later (after puppy viral core vaccines) will reduce the interference the bacterial vaccines can create for the viral vaccine immunity, reduce the development of hypersensitivity reactions, and increase the likelihood that a protective immune response will develop to bacterial vaccines because the immune system should be more

mature in the older puppy. Using this vaccination program for *Leptospira* bacterins, the animal should not develop clinical disease but it may get infected and could shed organisms in its urine. Bordetella immunity may also be less than one year and the efficacy for the various products is not well established. Many animals receive “kennel cough” vaccines that include Bordetella and CPI with or without CAV-2 every 6 to 9 months without evidence that this frequency of vaccination is necessary or beneficial. In contrast, other dogs are never vaccinated for kennel cough and disease is not seen. CPI immunity lasts at least 3 years when given intranasally, and CAV-2 immunity lasts a minimum of 7 years when given parenterally for CAV-1, but duration of immunity is probably less for CAV-2 (eg 3 years). In most pet dogs, immunity to CAV-2 is adequate with a parenteral vaccine, but in animals at high risk (such as those in shelters or high risk kennels), an intranasal CAV-2 vaccine may provide improved immunity. However, kennel cough is not preventable with vaccines. These two viruses (CPI and CAV-2), in combination with *Bordetella bronchiseptica* are only a few of the agents associated with kennel cough, however, many other factors play an important role in disease (e.g. stress, dust, humidity, molds, CDV, CIV, *Streptococcal* spp., *Pasteurella multocida*, mycoplasma, etc.), thus kennel cough is not vaccine preventable because of the complex factors associated with this disease. Furthermore, kennel cough is often a mild to moderate self limiting disease, which I refer to as the “Canine Cold.” My preference when a kennel cough vaccine is used is the intranasal vaccine rather than the parenteral, but some dogs will not allow an intranasal vaccine to be administered. On rare occasions, the intranasal vaccines will cause kennel cough in certain dogs!

There is a new respiratory disease of dogs, caused by canine influenza virus (CIV). In 2004, CIV infected and caused severe disease of greyhounds in Florida. Since that first outbreak, other outbreaks have occurred in greyhounds at racing tracks in a number of states and in shelters, as well as in a few commercial kennels. When there was an outbreak at a race track or shelter, the virus did not cause large disease outbreaks in the community as would have been expected, since the majority of dogs nationwide are susceptible to CIV. The virus does not seem to be highly transmissible even in the susceptible dog population when dogs are not in intimate contact. It is still not known if canine influenza virus will become a significant cause of canine respiratory disease, nor if it will be an important emerging disease of dogs worldwide as it is currently found primarily in the US. Cases of CIV continue to be reported in shelters and kennels in various states, suggesting the virus is surviving and spreading. Because influenza viruses often mutate, this virus may become more virulent and cause widespread disease in our susceptible dog population. At the present time, there are no vaccines licensed to prevent CIV, but vaccines could become available quickly if and when they are needed. Questions about the role of influenza virus and, for that matter, all viruses other than CPI and CAV-2 and bacteria other than *Bordetella bronchiseptica*, various mycoplasmas and additional factors causing kennel cough exist and must be answered if we expect to be more successful in reducing Canine Respiratory Disease Complex.

The geographic distribution of Lyme disease would suggest vaccination would only be of benefit in certain regions of the US, thus widespread use of this product is neither necessary nor desired. Lyme disease is very localized and often one part of a state has a high level of infection and other parts very low levels. For example, Wisconsin is an endemic area for Lyme disease. However, we have used very few doses of Lyme vaccines in our VMTH UW-Madison and we have not seen significant numbers of clinical cases of Lyme disease. However in certain areas of western and northwestern Wisconsin and eastern Minnesota, many cases of confirmed Lyme disease are seen in unvaccinated dogs and even in some vaccinated dogs. Tick control for prevention and antibiotics for treatment must be used in high risk areas, even in vaccinated dogs that develop signs of disease (eg arthritis). Immunity from Lyme vaccines have been shown experimentally to last up to one year. Lyme vaccines are either whole cell or recombinant products. I prefer the recombinant product when a Lyme vaccine is used, because I believe it is more likely to kill the *Borrelia burgdorferi* in the tick or, if the spirochete enters the dog, the OSPA antibody should kill it before it replicates and infects the dog. This would be considered “sterile immunity.” In contrast, I don’t think the whole cell bacterin will provide that same level of immunity. Unfortunately, Lyme disease is highly complex and none of the vaccines in my opinion provide more than 70% protection. Even with the most effective vaccines, there are some dogs that fail to develop immunity or the immunity is short-lived and the vaccinated dogs are susceptible to infection. There are also, in my opinion, a small percentage of dogs when vaccinated that will develop a vaccine induced “Lyme-like arthritis” similar to what has been seen in small percentage of vaccinated people. This is an immune mediated disease that is not responsive to antibiotic treatment.

To date no one has demonstrated a benefit for coronavirus (CCV) vaccine, therefore it is not recommended. Giardia vaccine may be of value in a few animals (eg dog remains infected after multiple drug treatments.)

However, in my opinion and the opinion of others, there is no need nor benefit from routine use of Giardia vaccine in dogs. Giardia and CCV are in the not generally recommended vaccine group in the vaccination guidelines from the American Animal Hospital Association. There are therapeutic vaccines for snakebites (Western and Eastern rattlesnakes), for periodontal disease and for treatment of canine oral melanomas. New vaccines will continue to be produced and licensed, but they are likely to be optional vaccines. Thus, their use will be determined from a risk/benefit analysis and they should only be given on an as needed basis.

Table 1: Minimum Duration of Immunity for Canine Core Vaccines

Vaccine	Minimum Duration of Immunity	Methods Used to Determine Immunity
Canine Distemper Virus (CDV)		
Rockborn Strain	7 yrs/15 yrs	challenge/serology
Onderstepoort Strain	5 yrs/9 yrs	challenge/serology
Canarypox Vectored rCDV	4 yrs/5 yrs	challenge/serology
Canine Adenovirus-2 (CAV-2)	7 yrs/9 yrs	challenge-CAV-1/serology
Canine Parvovirus-2 (CPV-2)	7 yrs/10 yrs	challenge/serology
Canine Rabies	3 yrs/5 yrs	challenge/serology

Feline Vaccines and Vaccination Programs

I believe every practitioner and cat owner should know the following general information about feline vaccines and vaccination programs: The core vaccines or those every cat should receive are feline parvovirus (panleukopenia), feline calicivirus and feline herpes virus (viral rhinotracheitis) and rabies virus. If one wants to take a purely “minimalistic approach” every cat should, at the very least, be vaccinated with feline parvovirus and rabies, because most cats are at risk of getting infected with FPV and the outcome of the infection with FPV cannot be predicted. Cats do pose a public health risk for rabies and vaccination should reduce that risk. In general, young susceptible kittens are more likely to develop FPV disease than older susceptible cats, but I have recently seen unvaccinated cats of all ages in a closed colony develop panleukopenia and die regardless of their health status or age. The age when core vaccination is recommended for the kitten is similar to the puppy with the last dose given at 14 to 16 weeks of age. In kittens, it is more common to give only 2 doses of vaccines rather than the 3 or 4 doses given to pups. There are many feline products to choose among such as parenterally vs locally administered and live vs killed vaccines. Just as with dogs, there is no one vaccination program that meets the needs of all cats. Sometimes a killed product is preferable to an MLV and sometimes a local (intranasal) is better than a parenteral and vice versa. In cats at high risk for infection with FPV, FCV, and/or FHV-1, the MLV vaccines are preferred because they provide more rapid protection. For example, immunity after vaccination with a MLV-FPV vaccine would be as early as 3 days post vaccination, whereas immunity after vaccination with a killed FPV vaccine would take about 3 weeks if MDA does not block the vaccine. We have found that with the intranasal product containing FPV that some cats, especially kittens with MDA, do not get enough vaccine virus for infection to occur, which is an absolute requirement for an MLV to provide immunity. In high risk environments like shelters, I always recommend a parenteral MLV-FPV vaccine, not a killed or an intranasal FPV vaccine. In the average household cat, which is generally at low risk for FPV, FCV, and FHV-1 infection, the MLV, parenteral or intranasal, or Killed vaccines can all be used and the protection they provide should be for a minimum of 3 years to a lifetime for FPV. Protection from FCV and FHV-1 is never complete, thus these vaccines are not as effective as the excellent FPV protection, which is likely to reach 99% effectiveness and provide immunity for up to the life of the cat. FCV and FHV-1 MLV parenteral and intranasal vaccines generally provide excellent protection for the pet cat because their risk of disease is low. However, they are not very effective in high stress and under highly infectious conditions like a shelter.

The non-core products for the cat include some that I recommend and others that I don't recommend. If a cat is at risk for FeLV, vaccinate it with 2 doses as early as possible (e.g. 8 to 9 and 11 to 12 weeks) with an effective product. Our research and the research of others show the killed adjuvanted FeLV products from Ft. Dodge Animal Health and Schering Plough Animal Health are highly effective. We have also shown the new canarypox vectored recombinant rFeLV vaccine from Merial is highly effective and does not have an adjuvant. The canarypox recombinant FeLV vaccine must be administered with the VetJet™, a bioinjector, and it should not be

given via needle and syringe.

If the cat is still at risk, revaccinate it at one year of age. Then I would never revaccinate with FeLV, since I believe the kitten vaccinations and again at 1 year of age together with the natural age related resistance to FeLV would provide all the protection that is required to prevent persistent viremia (PV), the purpose of giving the FeLV vaccines. Furthermore, the risk of an injection site sarcoma, especially with annual or once every 3 year administration of the adjuvanted leukemia products, may increase significantly, especially in genetically predisposed cats. Unfortunately the cats at greatest risk to persistent viremia and disease caused by FeLV are cats infected at less than 3 months of age. Those cats don't benefit from vaccination since the product given at 8 to 9 and again at 11 to 12 weeks doesn't provide protection until after 12 to 16 weeks (4 months) of age. However, at present, vaccination at an earlier age has not been shown to be effective. We and others have demonstrated the excellent naturally occurring age related resistance to development of persistent viremia in cats 1 year of age or older. Thus, the most susceptible period for development of PV is birth to 1 year.

With regard to the other non-core/optional vaccines for cats, I don't recommend any of them for the pet cat, whereas for cats at high risk, such as those in shelters, other vaccines, when demonstrated to be effective should be given. However, even in shelters where feline respiratory disease complex (FRDC) is common and often severe, adding *Chlamydomphila felis* and Bordetella to the core vaccines have not, in general, been shown to reduce clinical disease. However, changes in management, like reducing stress and minimizing fomite transmission have reduced severity and/or prevalence of FRDC, but have not eliminated this disease complex. The question of whether it is better to give a parenteral vs. intranasal FCV/FHV-1 vaccine in shelters seems to depend on the conditions that exist in the specific shelter. In one shelter, where both the MLV parenteral and intranasal were being used, discontinuing the intranasal had no effect on prevalence nor severity of FRDC. In some shelters, we have found the killed parenteral FCV and FHV-1 vaccines were more effective in reducing disease than the MLV parenteral and/or intranasal FCV/FHV-1. I don't recommend FIV vaccine because it is in general not needed, it interferes with the current diagnostic tests, and it doesn't protect against certain strains (clades) of FIV. I don't recommend the killed virulent systemic calicivirus vaccine, the feline infectious peritonitis (FIP) vaccine, nor the Giardia vaccine.

Summary

At present, most canine and feline core vaccines are given more often than needed, but a few non-core vaccines probably not often enough to be of benefit. Also, many vaccines/vaccinations are given that are not needed or that cannot be shown to provide a benefit for the specific animal. Vaccines are medical products that should only be given if needed and only as often as is necessary to provide protection from diseases that cause risk to the health of the animal. If a vaccine that is not necessary causes an adverse reaction that would be considered an unacceptable medical procedure.

Vaccination programs are changing and they will continue to change. The vaccination program must be tailored to the individual animal. Vaccines are medical products that should not and need not be used as practice management tools. My general philosophy is to vaccinate more animals in the population, but vaccinate with only those vaccines that the animal needs and only as often as required to maintain protective immunity. With some products, vaccination may only need to occur once or twice in a life time, whereas with other products vaccination may need to be every 6 to 9 months, or at the very least annually.

Be Wise and Immunize, but Immunize Wisely!

Frequently Asked Questions (FAQ)

From the Vaccination Guidelines Group (VGG) of the World Small Animal Veterinary Association (WSAVA), published in the Journal of Small Animal Practice 48 (9) , 528-541, 2007.

1. Is there a risk of over-vaccinating a pet (e.g. injecting it too often, or using vaccines that are not required for the specific pet)?

Yes - Vaccines should not be given needlessly, as they may cause adverse reactions. Vaccines are medical products that should be tailored to the needs of the individual animal.

2. May I mix different types of vaccines in the syringe?

No - One should never mix different vaccine preparations in the syringe unless specified by the data sheet.

3. May I co-inject different vaccines (not part of a single commercial product) into the same animal?

Yes - but different vaccines should be injected into separate sites that are drained by different lymph nodes.

4. May I use smaller vaccine doses in small breeds to reduce the risk of adverse reactions?

No - The volume (e.g. 1.0 ml) as recommended by the manufacturer generally represents the minimum immunizing dose, therefore the total amount must be given.

5. Should the large dog (Great Dane) be injected with the same volume of vaccine as the small dog (Chihuahua)?

Yes - Unlike pharmaceuticals that are dose-dependent, vaccines are not based on volume per body mass (size), but rather on the minimum immunizing dose.

6. May I vaccinate the anaesthetized patient?

It is best not to do this if possible - the patient may develop a hypersensitivity reaction and vomit, leading to an increased risk of aspiration. Also, anaesthetic agents may be immunomodulatory .

7. May I vaccinate pregnant pets?

No - Vaccination with ML V and killed products during pregnancy should be avoided, if at all possible.

8. May I vaccinate pets that are on immunosuppressive or cytotoxic therapy (e.g. for cancer or immune-mediated diseases, such as those with an autoimmune or hypersensitivity pathogenesis)?

No - Vaccination especially with ML V products should be avoided as they may cause disease; vaccination with killed products may not be effective or may aggravate the immune-mediated disease.

9. How long after stopping immunosuppressive therapy do I wait before vaccinating a pet?

A minimum of 2 weeks.

10. May I vaccinate every week if an animal is at high risk of disease?

No - Vaccines should not be given more often than every other week, even when different vaccines are being given.

11. When should the last vaccine dose be given in the puppy and kitten vaccine series?

The last dose of vaccine should be given at around 16 weeks of age.

12. May I inject a killed vaccine, followed at a later time with a ML V for the same disease?

No - The killed vaccine may induce an effective antibody response that will neutralize the ML V in the vaccine, thereby preventing immunization. It would be preferable to give the ML V vaccine first and if/when needed, revaccinate with the killed vaccine preparation.

13. May I inject a modified live intranasal *Bordetella* vaccine?

No - The vaccine can cause a severe local reaction and may even kill the pet.

14. May I give a killed *Bordetella* vaccine destined for parenteral use intranasally?

No - This will not stimulate a specific response to the *Bordetella*; you should give a live vaccine via the intranasal route, as specified by the data sheet.

15. Are precautions necessary when using MLV FHV-I/FCV parenteral vaccines in cats?

Yes - Mucosal (e.g. conjunctival and nasal) contact with the preparation must be avoided, because the vaccine virus can cause disease.

16. Can nosodes (holistic preparations) be used to immunize pets?

No - Nosodes cannot be used for the prevention of any disease. They do not immunize because they do not

contain antigen.

17. Should dogs and cats with a history of adverse reaction or immune-mediated diseases (hives, facial oedema, anaphylaxis, injection site sarcoma, autoimmune disease, etc.) be vaccinated?

If the vaccine suggested to cause the adverse reaction is a core vaccine, a serological test can be performed, and if the animal is found seropositive (antibody to CDV, CPV-2, FPV) revaccination is not necessary. If the vaccine is an optional non-core vaccine (e.g. *Leptospira* bacterin) revaccination is discouraged. For rabies, the local authorities must be consulted to determine whether the rabies vaccine is to be administered by law or whether antibody titre may be determined as an alternative.

18. May I use different vaccine brands (manufacturers) during the vaccination program?

Yes - It may even be desirable to use vaccines from different manufacturers during the life of an animal, because different products may contain different serotypes (e.g. of feline calicivirus).

19. Should I use a disinfectant (e.g. alcohol) on the injection site?

No - The disinfectant might inactivate an MLV product, and it is not known to provide a benefit.

20. Can vaccines cause autoimmune diseases?

Vaccines themselves do not cause autoimmune disease, but in genetically predisposed animals they may trigger autoimmune responses followed by disease - as can any infection, drug, or a variety of other factors.

21. May I split vaccines in combination products?

Yes - For example, *Leptospira* bacterins are often the diluent for the viral antigen combination. The "viral cake" may be resuspended in sterile water, and the *Leptospira* bacterin be given separately at another site or time, or discarded.

22. Will a single vaccine dose provide any benefit to the dog or cat? Will it benefit the canine and feline populations?

Yes - One dose of a MLV canine core vaccine (CDV, CPV-2, CAV-2) or a feline core vaccine (FPV, FCV, FHV-1) should provide long term immunity when given to animals at or after 16 weeks of age. Every puppy and kitten 16 weeks of age or older must receive at least one dose of the MLV core vaccines.

If that were done, herd (population) immunity would be significantly improved. Even in the USA with its good vaccination record, probably <50% of all puppies and <25% of all kittens ever receive a vaccine. We must vaccinate more animals in the population with core vaccines to achieve herd immunity (e.g. 75% or higher) and prevent epidemic outbreaks.

23. When an animal first receives a vaccine that requires two doses to immunize (e.g. killed vaccines like *Leptospira* bacterins or feline leukemia virus), and it does not return for the second dose within ~6 weeks, is there any immunity?

No - A single dose of a two-dose vaccine does not provide immunity. The first dose is for priming the immune system, the second for boosting. If a second dose is not given within 6 weeks of the first, the regime must start again, making sure the two doses are given within 2 to 6 weeks. After those two doses, revaccination with a single dose can be done at any time.

24. May I give a MLV product to a wild, exotic species or to a domestic species other than to the ones which the vaccine was licensed to protect?

No - Never. Many MLV vaccines have caused disease in animal species other than those for which they had been licensed. Even worse: the vaccine could be shed from those animals, regain virulence through multiple passages and cause disease even in the target species for which it had been developed. The consequences could be catastrophic!

A highly effective and very safe vaccine for species that are susceptible to CDV is a canary poxvirus-vectored

recombinant CDV vaccine that is available as a monovalent product for ferrets or a combination product for dogs. The monovalent vaccine is being used in many wild and exotic species susceptible to CDV.

25. May I vaccinate a puppy that is at high risk of getting CDV with a human measles vaccine?

No - Due to an insufficient amount of virus, the human MV vaccine is not immunogenic in the puppy. Measles virus vaccines made specifically for the dog (sometimes combined with CDV) will give temporary protection at an earlier age than a CDV vaccine. At 16 weeks or older, the puppy must be vaccinated with a CDV vaccine, to achieve permanent immunity.

26. I know that maternally derived antibodies (MDA) can prevent active immunization with MLV vaccines - but can they also block immunity to killed vaccines?

Yes - MDA can indeed block certain killed vaccines. If the killed product requires two doses, as is often the case, and the first dose is blocked by MDA, then the second dose will not immunize. In this circumstance, the second dose will prime (if not blocked), and a third dose is required to boost and immunize.

This is not true *for* MLV, where - in the absence of MDA - it only takes a single dose to prime, immunize, and boost. Nevertheless two doses are often recommended, particularly in young animals, to be sure one is given when MDA cannot block. That is why in the puppy *or* kitten series, the last dose should be given at around 16 weeks of age *or* later.

27. I have been told that certain canine MLV combination core products need only be given twice, with the last dose at an age as young as 10 weeks. Is that accurate?

No - it is not. No combination core product currently available will immunize an acceptable percentage of puppies when the last dose is given at 10 weeks of age. The last dose should be given at around 16 weeks of age, regardless of the number of doses given earlier.

In the presence of MDA, MLV vaccines either immunize or they don't, and the animal will be either immune or not immune - there is nothing in between. MLV vaccines do not give a little immunity with any dose when blocked by MDA.

28. For how long can a reconstituted MLV vaccine sit at room temperature without losing activity?

At room temperature, some of the more sensitive vaccines (e.g. CDV, FHV-1) will lose their ability to immunize in 2 to 3 hours, whereas other components will remain immunogenic for several days (e.g. CPV, FPV).

29. May I give the same type of vaccine parenterally and intranasally, for example the canine and feline vaccines used to prevent respiratory diseases ('kennel cough' and feline upper respiratory disease)?

Yes - But be sure to give the product approved for that route. If you use the parenteral MLV vaccines containing FCV and FHV-1 locally, you could cause disease in the cat. If you use the killed FCV and FHV-1 vaccines locally, you would not get any immunity and might cause significant adverse reactions. If you gave the intranasal live 'kennel cough' vaccine parenterally, you could cause a severe necrotizing local reaction and even kill the dog, whereas giving the parenteral killed *Bordetella* vaccine intranasally will not immunize and may cause a hypersensitivity reaction.

However, both types of products can be given at the same time or at various times in the life of the animal. Vaccinating both parenterally and intranasally may actually provide better immunity than vaccinating at only one site. Thus parenteral vaccination provides protection in the lung but little or no immunity in the upper respiratory tract (especially local secretory IgA and CMI), whereas intranasal vaccination will engender good secretory IgA and local CMI and non-specific immunity (e.g. type I interferons), but will not always provide immunity in the lung.

30. Are there dogs and cats that cannot develop an immune response to vaccines?

Yes - This is a genetic characteristic seen particularly in some breeds, and these animals are called 'non-responders'. Genetically related (same family or same breed) animals will often share this non-responsiveness. If the animal is a non-responder to a highly pathogenic agent, like canine parvovirus or feline panleukopenia

virus, the infected animal will die if infected. If it is a non-responder to a pathogen that rarely causes death, it may become very sick but will survive (e.g. after a *Bordetella bronchiseptica* infection).

31. Are there mutants (biotypes or genotypes) of CDV or CPV-2 in the field that the current vaccines cannot provide protective immunity against?

No. - All the current CDV and CPV-2 vaccines provide protection from all the known isolates of CDV or CPV-2, respectively, when tested experimentally as well as in the field.

32. How long after vaccination does it take for the dog to develop immunity that will prevent severe disease when the core vaccines are used?

This is dependent on the animal, the vaccine, and the disease.

- The fastest immunity is provided by CDV vaccines - MLV and recombinant canarypox virus vectored. The immune response starts within minutes to hours and provides protection within a day to animals without interfering levels of MDA and dogs that are not severely immunosuppressed.
- Immunity to CPV-2 and FPV develops after as few as 3 days and is usually present by 5 days when an effective MLV vaccine is used. In contrast, the killed CPV-2 and FPV-2 vaccines often take 2 to 3 weeks or longer to provide protective immunity.
- CAV-2 MLV given parenterally would provide immunity against CAV-1 in 5 to 7 days; when given intranasally, however, the same level of immunity to CAV-1 is not present until after 2 or more weeks.
- Time from vaccination to immunity is difficult to determine for FCV and FHV-1 because some animals will not develop any immunity.

33. Will the current 'kennel cough' vaccines provide any protection from disease caused by the new canine influenza virus?

No - The racing greyhounds that have been found infected and that developed disease had been routinely vaccinated 3 or more times a year with commercial 'kennel cough' vaccines. Canine influenza virus is antigenically unrelated to any other virus of dogs, but related to Equine Influenza Virus.

34. If an animal has gone beyond the time that is generally considered to be the maximum DOI for the vaccine (7 to 9 years for CDV, CPV-2, CAV-2; >1 year for *Leptospira*, *Bordetella bronchiseptica*; >3 years for rabies), do I have to start the series of vaccinations again (multiple doses 2 to 4 weeks apart)?

No - For MLV vaccines, multiple doses are only required at the puppy or kitten age, when an animal has MDA.

35. What can I expect from the core vaccines in terms of efficacy in the properly vaccinated puppy/dog and kitten/cat?

- Dogs properly vaccinated with MLV or recombinant CDV, CPV-2 and CAV-2 would have $\geq 98\%$ protection from disease. Similarly we would expect a very high protection from infection.
- For the properly vaccinated cat that had received MLV vaccines, we would estimate that $\geq 98\%$ would be protected from disease and infection with FPV.
- In contrast, we can expect FCV and FHV-1 vaccines, at best, to protect from disease, especially in a highly contaminated environment (e.g. shelter) and protection would be seen in 60 to 70% in a high risk environment and higher in the household pet cat.

36. Are serum antibody titres useful in determining vaccine immunity?

Yes - Especially for CDV, CPV-2 and CAV-1 in the dog, FPV in the cat and rabies virus in the cat and dog. Serum antibody titres are of limited or no value for the other vaccines. Assays for CMI are of little or no value for any of the vaccines for various technical and biological reasons. Such factors are less of an issue for serological tests where it is much easier to control many of the variables. However, discrepant results are still obtained, depending on the quality assurance program of the given laboratory.

37. Do puppies develop immunosuppression after the initial series of core vaccines?

Yes - If a combination product containing MLV-CDV and MLV-CAV-2 with other components is used, a period of immunosuppression lasting approximately 1 week develops, beginning 3 days after vaccination. If the combination vaccine does not contain either MLV-CDV or MLV-CAV-2, then such suppression does not occur.

Suggested Reading:

AAHA Canine Vaccination Guidelines – 2006 www.aaahanet.org/PublicDocuments/VaccineGuidelines06Revised.pdf

AAFP Feline Vaccination Guidelines – 2006

http://www.aafponline.org/resources/guidelines/2006_Vaccination_Guidelines_JAVMA_%20PDF_Plus.pdf

WSAVA Vaccination Guidelines – 2007

<http://www.blackwell-synergy.com/doi/abs/10.1111/j.1748-5827.2007.00462.x>

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