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# FELINE VACCINATION FROM KITTENS TO SENIOR CATS TRICKS AND HOAXES

**Dr. Paola Dall'Ara**
Prof. DVM, PhD

## Q&A

1. **Is it really necessary to repeat all three main vaccines every year? How can we tell whether antibody levels are low? Should antibody levels be tested prior to administrating the vaccinations?**

**2. What are your recommendations for effective annual immunization and how many boosters should be given?**

For the previous questions, the answer is the same. Annual repetition of the core vaccines (panleukopenia [FPV], herpesvirus [FHV-1], and calicivirus [FCV]) is not necessary: all vaccines work very well and you can decide on a 3-year booster for all core diseases if the cat is a zero-low risk cat (indoor, solitary, no contact with unknown cats). You may opt to give a booster every 1-2 years if the cat is a medium-high-risk cat, but only for FHV-1 and FCV infections because FPV gives long-lasting protection. There is the possibility to check protection with VacciCheck (in its complete name: Immuno-Comb VacciCheck Feline), a very useful in-clinic test based on the dot-ELISA technique, both before and after vaccination in order to check whether a booster is needed (before) or if vaccination has worked (after).

**3. The latest US vaccination protocol says you need to vaccinate every three years for core vaccines, rather than every year. Yet, some veterinarians push for yearly vaccines (of all core vaccines). Could you please comment on this?**

Annual core vaccine boosters are not necessary if live vaccines (MLV) or killed vaccines that state this opportunity in their leaflet are used. Vets should always control and consider each individual cat's risks of respiratory pathogens (FHV-1 and FCV, core) and FeLV (circumstantial or non-core).

## 4. Can you use the intranasal rhino/calici vaccine as a treatment for an upper respiratory infection?

In Italy, there are no respiratory vaccines registered for IN use in cats, but some vets can use this administration route with SC vaccines. However, I believe it is used more for preventive rather than for therapeutic purposes.

## 5. Are the queen variability factors that affect the transfer of passive immunity known? For example health status, previous exposure to natural immunity, or vaccination?

Yes, all these factors affect the transfer of passive immunity both in queen and in bitch are known. There is tremendous individual variability between queens and also between mammary glands of the same queen. It is very important to consider how many antibodies the mother has (which can differ according to her age, health status, stress, nutrition, immunity, the strength of the immune response, etc.). Furthermore, consider how many antibodies it transfers into the colostrum, how much colostrum is taken in by the kitten (which can also differ according to her maternal predisposition), and how many colostral antibodies are absorbed into the gut… so yes, the variability among queens is huge!

## 6. Herpes is transferred from many queens to their kittens through their milk. Does that mean that FHV-1 vaccinations should be given earlier than other kitten vaccinations?

No, you can't vaccinate kittens as early as the virus is transmitted. Feline vaccines are generally registered for 6-8 weeks-old kittens (in Italy and in some other countries only at 8-9 weeks of age). Only in case of emergency can you precede vaccination as early as 4 weeks of age, but never before 4 weeks, in order not to risk vaccine adverse effects.

## 7. When should the queen be vaccinated after giving birth?

Only if needed, you can vaccinate after weaning. In many cases protection lasts very long, and you don't need to vaccinate too often.

## 8. Is it recommended to vaccinate a FIP-positive cat?

What do you mean by a FIP-positive cat? As far as I know, there are no reliable tests available for this, and a PCR positivity for Coronavirus doesn't allow confirmation of FIP. If you mean a Coronavirus-positive cat, like other cats with some infections (eg. FIV and FeLV) you can consider vaccination if the cat is well and is only positive for that pathogen, but if the cat is not well your priorities are different.

## 9. What would the vaccine protocol be for a 5-year-old cat with epilepsy?

In this case, you must consider the infectious risk for the cat: if it has an indoor life (as I can imagine) risks are very low; if it lives with other cats consider their lifestyle (are they indoor or outdoor cats), and consider the possibility to vaccinate the other cats. In any case, this cat should be tested with VacciCheck for core diseases, while for FeLV you must consider the risk factors as well. The "2020 AAFP Feline Retrovirus Testing and Management Guidelines" are a perfect read I'd highly recommend you check out: https://journals.sagepub.com/doi/pdf/10.1177/1098612X19895940

## 10. Which vaccines are country-specific (primarily recommended in certain regions because of the higher prevalence of certain illnesses in certain regions)?

For cats, this distinction is not as easy as for dogs, partly because the number of feline vaccines is fewer. Apart from the core vaccines (highly recommended for all cats worldwide starting from when they are kittens), FeLV vaccines (recommended for all kittens since you don't know the life they're going to live when they grow up, with a booster after 1 year), and rabies vaccines (mandatory in some countries and for international movements), the few others (Chlamydophila felis, FIV, FIP, dermatomycosis) are non-core and in each country and vets should evaluate every single cat and decide if this kind of vaccination is useful or useless.

## 11. Why are FIP vaccines not recommended, even though it's such a deadly disease?

For this question, I always look to the "WSAVA Guidelines for the Vaccination of Dogs and Cats" guidelines and other research studies. I suggest you read this very interesting and recent work (2020) by Dr. Diane D. Addie "Feline coronavirus and Feline Infectious Peritonitis diagnosis and prevention": https://www.biogal.com/wp-content/uploads/2020/06/Addie-FCoV-FIP-diagnosis-prevention-2020.pdf

In this paper, Dr. Addie explains that the only FIP vaccine available is an intranasal temperature-sensitive vaccine which must be used in seronegative cats at least at 16 weeks of age (with the second dose given 3 weeks later) in order to be effective. Unfortunately, however, by 16 weeks of age, most purebred kittens are already infected, which means that the vaccine is of limited use in the largest demographic of FIP victims: young pedigree cats. Also the "2020 AAHA/AAFP Feline Vaccination Guidelines" don't recommend giving the FIP vaccine:

**Not Generally Recommended Vaccines for Pet Cats**

| FIP | Administration Instructions | Clinically Relevant Comments for Administration |
|---|---|---|
| Intranasal<br>Attenuated live | For frequency and interval, follow label instructions | • **Not generally recommended** at this time because its uncertain ability to uniformly prevent disease in North American cat populations does not justify its routine use<br>• Only coronavirus seronegative cats have the potential to be protected, and most cats are seropositive before the age of recommended vaccination<br>• Vaccine virus (serotype II) differs from the serotype (I) that predominantly causes clinical disease<br>• The benefits and risks of vaccination remain unclear (see comments in text) |

[https://www.aaha.org/aaha-guidelines/2020-aahaaafp-feline-vaccination-guidelines/feline-vaccination-home/]

## 12. Which rabies vaccine is the safest?

Today's rabies vaccines for companion animals are all safe because in most of the world they are non-infectious (killed) or vectored, while live vaccines (MLV) are no longer often used. In fact, although MLV rabies vaccines are safe and potentially potent in dogs, the WHO stopped recommending them for parenteral inoculation in animals in 2004. In any case, when permitted (not in Europe) MLV rabies vaccines are safe. MLV is instead still present in baits for oral immunization of wild animals, since in this case the stimulation of local immunity is needed and only MLV vaccines are suitable for this purpose.

## 13. You talk about using live vaccines for kittens. However, in the US, primarily killed vaccines are used. Could you please comment on this?

Inactivated (killed) vaccines are generally more difficult to manage in stimulating good protection. Firstly, differently from MLV, killed vaccines require two doses 3-4 weeks apart, and immunity is present only after the second dose and is not complete. Secondly, the duration of immunity (DOI) after vaccination with killed vaccines is likely to be shorter than for MLV. Thirdly, killed vaccines generally (but not always) contain adjuvants that help stimulate the immune system, but in cats, these molecules are suspected to stimulate an inflammatory process and then to be responsible, among others, of the development of the so-called Feline-Injection Site Sarcoma (FISS). Considering all these aspects, vets must then correctly use killed vaccines and possibly check protection after vaccination (VacciCheck is perfect for this purpose).

## 14. Is it handy to vaccine every 6 months if the cat has chronic sneeze disease?

I wouldn't recommend it. The duration of immunity (DOI) reported in the leaflet of all vaccines represents a minimum value: this means that a vaccine protects for at least 1 year (some for 3 years). Using them every 6 months, above all in ill cats, is useless. Cats recovered from FHV-1 disease are usually not protected for life against further disease episodes: in these cases, vaccination is recommended, but not in chronically infected cats.

## 15. What would be the most appropriate vaccination protocol for a kitten shelter?

It depends on the shelter situation and there is no one-size-fits-all strategy for vaccinating shelter animals. Underlined in the WSAVA guidelines (see below), animal shelters are characterized by a random source population with a mostly unknown vaccination history, high population turnover, and a high infectious disease risk. Due to this high risk of diseases, kittens entering a shelter core vaccination may be started as early as 4-6 weeks of age (never before), foreseeing revaccination every 2 weeks until kittens reach 20 weeks of age if they are still in the shelter (see WSAVA table 4 below). For adult cats, literature also demonstrates that cats entering shelters may be seropositive for vaccine-preventable infectious disease agents and at least partially protected.

**Table 4. WSAVA Guidelines on Feline Vaccination for the Shelter Environment**

| Vaccine | Kittens | Adult | Comments |
|---|---|---|---|
| FPV<br>FHV-1<br>FCV | Administer a single dose prior to or at the time of admission as early as 4–6 weeks of age; then, every 2 weeks until 20 weeks of age if still in the facility. | Administer a single dose at the time of admission; repeat in 2 weeks if the animal remains in the shelter. | MLV preparations are preferable.<br>Use of intranasal FPV vaccines is not recommended in the shelter environment (Schultz 2009). Use of intranasal FCV/FHV-1 MLV vaccines may be preferable when rapid onset (48 hrs) of immunity is important. Post-vaccinal sneezing, more commonly seen following administration of intranasal FCV/FHV-1 vaccine is impossible to distinguish from active infection. |
| Rabies | A single dose should be administered at the time of discharge from the facility. | A single dose should be administered at the time of discharge from the facility. | The administration of rabies vaccine will be determined by whether the shelter is in a country in which the disease is endemic and vaccination is required by law. |

The VGG does not recommend the use of other feline vaccines in the shelter situation.

[https://wsava.org/wp-content/uploads/2020/01/WSAVA-Vaccination-Guidelines-2015.pdf]

## 16. Besides FISS are there any other adverse events, specific to cats (and especially correlated to life stages)?

## 17. For the first time in 30 years, I had two lethal adverse reactions in two kittens, about 3 months old, a Blue Russian, and an adopted European stray. Both were in good clinical condition and checked for parasites, etc. including panleukopenia, herpes, and calicivirus. Both had pneumonia, and there was no post-mortem examination. I used the same vaccine box. The manufacturer, after the pharmacovigilance alert, claims there is no connection. What is your opinion?

In cats, like dogs, vaccine side effects are also possible, but the risk is very small. Only 1-10 cats out of every 10,000 vaccinated will experience serious vaccine side effects (a rate of 0.52% of vaccinated cats). I suggest you read the AAHA webpage dedicated to the post-vaccine adverse reactions in cats ("Adverse Postvaccination Reaction", see below), where this problem is well explained.
explained.

AAHA > AAHA Guidelines > Adverse Postvaccination Reactions

# Adverse Postvaccination Reactions

[https://www.aaha.org/aaha-guidelines/2020-aahaaafp-feline-vaccination-guidelines/adverse-postvaccination-reactions/]

On this page, AAHA explains that postvaccination adverse events in cats are considered rare: most of the side effects are short in duration and generally mild, far less dangerous than the illnesses the vaccinations protect from. Examples are lethargy, anorexia, slight and transient fever, localized swelling, sneezing, and cold-like symptoms. Only in a few rare cases, more severe reactions requiring immediate medical attention can occur. This is the case of anaphylaxis, the most severe highly rare allergic reaction that pets can get from vaccinations (1-5 reactions per 10,000 vaccinations). It may manifest in vomiting, diarrhea, respiratory distress, facial or generalized pruritus, facial swelling, and collapse. It typically occurs very soon (a 20-30 minute range) after vaccination, but delayed reactions can appear up to 48 hours after the vaccine administration. For these reasons, it is very important to carefully monitor cats in the veterinary practice 20-30 minutes after vaccination (since it is during this time that these problems are most likely to occur) and then ask owners to continue to monitor cats over the next 24 hours.

Relative to the two kittens who died after core vaccination, unfortunately without a post-mortem examination it is really difficult to establish the real role of vaccines in this sad situation. It would also be important to know when the reaction occurred (whether after the first vaccination or after subsequent vaccinations and how long after).

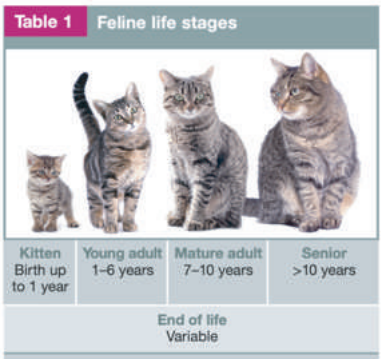
## 18. Important needle gauge in FISS?

No, it is not important. Please refer to the ISFM- the International Society of Feline Medicine's Facebook page dedicated to FISS "How much do you know about FISS?" [https://www.facebook.com/ISFMcats/-photos/how-much-do-you-know-about-fiss-one-article-published-in-our-recent-feline-focus/2976849239051267/]. Variables such as needle gauge and types of syringes do not alter the risk for tumor development.

## 19. Hi Dr., is it necessary to vaccinate geriatric cats annually? If not, at what age do we stop the annual vaccine (if the risk is low)?

## 20. Is it true that senior cats over 10 years don't require vaccination anymore?

For the previous questions, the answer is the same. Based on the "2021 AAHA/AAFP Feline Life Stage Guidelines", a cat that is more than 10 years old is considered a senior cat.




[https://catvets.com/guidelines/practice-guidelines/life-stage-guidelines]

Senior cats don't need annual vaccination nor do they need to stop receiving vaccines. The elderly immune system doesn't work very well: the component most affected by the aging process is the cell-mediated one. An older subject may have difficulty fighting a new antigen (never encountered before) while remembering a known antigen (because immune memory still works well) and successfully fighting it.

Therefore, the trick is to not let the immune memory forget. As the "2020 AAHA/AAFP Feline Vaccination Guidelines" [https://www.aaha.org/aaha-guidelines/2020-aahaaafp-feline-vaccination-guidelines/feline-vaccination-home/] I explain, most adult cats should be revaccinated every 1-3 years based on their lifestyle and risk levels, and an older cat should be treated as an adult one. A decision not to vaccinate might involve a senior or geriatric cat residing in a single-cat household with no outdoor access, or when the risk is a pathogen with low virulence or limited local prevalence. To avoid unnecessary core vaccination (above all FPV) you can control if antibody levels are adequate (and once again VacciCheck is perfect for this purpose).

## 21. So, if you see a cat that has no known prior vaccination history, say at 7 months of age, do you need to give an FVRCP booster 3 to 4 weeks later?

## 22. Would you recommend giving a single dose of MLV vaccine to a cat/dog that is over 16 weeks of age?

For the previous questions, the answer is the same. The WSAVA guidelines state that an adult cat (even a kitten over 16 weeks of age is considered an adult) with an unknown vaccination history requires only a single dose of MLV panleukopenia (FPV) core vaccine and two doses of MLV FHV-1/FCV vaccine (3-4 weeks apart) to stimulate a protective immune response.
Using two vaccinations for a very good immunogen like FPV in an adult cat (or in kittens less than 16 weeks old) is considered unjustified and contrary to fundamental immunological principles that state that multiple vaccinations are needed in kittens to overcome MDA interference. Nevertheless, in my opinion, giving two MLV vaccinations to cats less than one-year-old would not be a mistake, as their immune system is not yet fully mature. This has to do with the fact that FHV-1/FCV, serological and challenge studies show that postvaccination protection lasts up to 3 years or longer in the majority of animals; nevertheless, protection is not always complete and may decline slightly as the vaccination interval increases. Once again, VacciCheck can help clarify the situation.

## 23. Should a calici vaccine be administered to an older cat with calicivirus?

Having read specific literature dedicated to the FCV infection, I never found a suggestion to use this vaccination for therapeutic purposes.

## 24. If the kitten did not suckle from its mom within 24 hours, should the kitten be vaccinated earlier than 8-9 weeks?

Yes, this possibility is suggested because this could be considered an emergency, but you can't anticipate vaccination before 4 weeks of age so as not to risk vaccine adverse effects (VAEs). As I have already mentioned (see question n. 6), feline vaccines are generally registered for 6-8 weeks old kittens, but in Italy and in some other countries they are registered only for 8-9 week old kittens, so if you have to use them first begin with an off-label use.

## 25. What is the recommended vaccination protocol for both low- and high-risk older cats (>1 y.o.) vaccinated for the first time?

## 26. What is the vaccination protocol for pets older than one year old?

For the previous questions, the answer is the same. If you must vaccinate an adult cat of unknown vaccination history, see question n. 21 & 22. If this cat has been properly vaccinated as a kitten, the suggested protocols could be as follows based on the risk:

| AGE | VACCINATION |
|---|---|
| ZERO risk cats | |
| 1 year* | panleukopenia, herpesvirus and calicivirus infection + FeLV |
| 2 years | === |
| 3 years | === |
| 4 years | panleukopenia, herpesvirus and calicivirus infection |
| 5 years | === |
| 6 years | === |
| 7 years | panleukopenia, herpesvirus and calicivirus infection |
| ... AND SO ON | |

| AGE | VACCINATION |
|---|---|
| LOW-risk cats | |
| 1 year* | panleukopenia, herpesvirus and calicivirus infection + FeLV |
| 2 years | === |
| 3 years | herpesvirus and calicivirus infection + FeLV |
| 4 years | === |
| 5 years | panleukopenia, herpesvirus and calicivirus infection + FeLV |
| 6 years | === |
| 7 years | herpesvirus and calicivirus infection + FeLV |
| ... AND SO ON | |

| AGE | VACCINATION |
|---|---|
| HIGH-risk cats | |
| 1 year* | panleukopenia, herpesvirus and calicivirus infection + FeLV |
| 2 years | herpesvirus and calicivirus infection + FeLV |
| 3 years | herpesvirus and calicivirus infection + FeLV |
| 4 years | panleukopenia, herpesvirus and calicivirus infection + FeLV |
| 5 years | herpesvirus and calicivirus infection + FeLV |
| 6 years | herpesvirus and calicivirus infection + FeLV |
| 7 years | panleukopenia, herpesvirus and calicivirus infection + FeLV |
| ... AND SO ON | |

## 27. What are the factors that influence the formation of a sarcoma?

As you can read in the already mentioned (see question n. 18) Facebook page of the International Society of Feline Medicine (ISFM) dedicated to FISS "How much do you know about FISS?" [https://www.-facebook.com/ISFMcats/photos/how-much-do-you-know-about-fiss-one-article-published-in-our-recent-feline-focus/2976849239051267/], several studies have shown that specific risk factors may increase the probability of developing a FISS. For example, getting two or more separate injections into the interscapular region has proven to increase risk; on the contrary, when vaccines are warmed to room temperature prior to administration, FISS development risk decreases. In my experience, the risk is higher in young cats, with cold vaccines, as the number of doses at the same point increases, using adjuvanted vaccines (without adjuvants the local inflammation is significantly lower and with a faster resolution), and using any substance/material causing inflammation. Recommendations are to administer only SC and never IM vaccines and to abandon the interscapular area permanently, preferring inoculations in many more distal areas, which are more easily surgically removed in case of FISS. With that being said, always remember that the FISS risk is still lower than that of developing the disease if unvaccinated, and the risk/benefit ratio is always in favor of vaccination.

## 28. What is the recommendation for a cat that is recovering from a viral disease? When should we restart vaccination?

## 29. If a cat overcomes a viral infection, how long after should it be vaccinated?

## 30. When can we give a FPV vaccination to a cat that has recovered from the parvovirus?

## 31. If a cat just went through a viral infection what are your recommendations for starting vaccination?

For the previous questions, the answer is the same. In cats recovering from FPV infection, the duration of immunity (DOI) is lifelong, while respiratory natural infections/diseases should not be expected to provide the same robust degree and duration of protection: immunity is far from solid and of variable duration. Consequently, in my opinion, it is possible to restart the FHV-1 and FCV vaccination after 1 year following recovery.

## 32. What would be your protocol for the revaccination of older cats diagnosed with chronic kidney disease?

## 33. In an elderly cat with a chronic disease such as cancer or chronic renal disease that only lives indoors, should core vaccines be continued?

## 34. Are any of the vaccines contraindicated for cats with heart disease (valvular disease as well as sick sinus disease)?

## 35. How often do you recommend revaccination in adult feline cancer patients?

For the previous questions, the answer is the same. Cats with well-controlled CKD, cancer or heart disease can be vaccinated. Before vaccinating, however, it is always advisable to perform an antibody titration for core vaccines to assess the actual need for such vaccinations (and VacciCheck is perfect for this purpose), primarily because some authors suspect that vaccination is a potential risk factor for CKD in cats. Similarly, the need to administer one or more non-core vaccines should always be very carefully evaluated by the vet together with the owner, based on the subject's lifestyle and risk/benefit ratio. If the disease is not well controlled, vaccination should be avoided: in fact, in these cases, there are other priorities over-vaccination (eg, stabilization of the patient and treatment of the ongoing chronic disease).

## 36. What can you say about internal and external parasite vaccines? Can you give your suggestions in terms of zoonotic? (only for indoor cats).

As far as I know, there are no vaccines either for external parasites (eg, fleas, ticks, lice) or for vector-borne diseases for cats (for dogs there are 3 vaccines against vector-borne diseases:

leishmaniasis, Lyme disease, and piroplasmosis). Nor are there vaccines for internal parasites. A commercial vaccine for giardiasis was previously developed for pets and farm animals, but its efficacy was controversial. Unfortunately, at the present time, efficient vaccines against Giardia are not still available, above all because this parasite, undergoing antigenic variation, is able to escape the host's immune defenses causing chronic infections and/or re-infections. To the best of my knowledge, there is currently only one promising but experimental vaccine (being studied in Argentina since 2016, see below) that appears highly efficient in preventing new infections and reducing chronic giardiasis in dogs and cats both in experimental and natural infections.

Vaccination of domestic animals with a novel oral vaccine prevents *Giardia* infections, alleviates signs of giardiasis and reduces transmission to humans

Marianela C Serradell[1], Alicia Saura[1,2], Lucía L Rupil[1,2], Pablo R Gargantini[1,2], Marcela I Faya[3], Paulina J Furlan[3] and Hugo D Lujan[1,2]

*Npj Vaccines* (2016) **1**, 16018; doi:10.1038/npjvaccines.2016.18; published online 15 September 2016

[https://www.nature.com/articles/npjvaccines201618]

## 37. Do you recommend vaccination against feline leukemia in patients who are at high risk of contracting the disease, but in cases where it is not possible to perform an antigen or PCR test?

## 38. It is necessary to perform a negative test for FeLV before vaccinating?

## 39. As a former student of yours I would first like to say thank you for your great lectures! II wanted to ask about the feline leukemia vaccine and whether it is necessary to carry out the test before vaccinating?

Thanks for the compliment! For the previous questions, the answer is the same. As the "2020 AAFP Feline Retrovirus Testing and Management Guidelines" [https://journals.sagepub.com/doi/pdf/10.1177/1098612X19895940] state, cats should be tested for FeLV before initial vaccination. Administering FeLV vaccines to infected cats is of no therapeutic value (there is no benefit, as vaccine will not offer any protection against the virus) and every unnecessary vaccination carries the risk of potential adverse reactions (see question n. 16 & 17). One of the reasons is that if a vaccinated cat's status is unknown and the cat is later determined to have a progressive FeLV infection, vaccine efficacy would be questioned, and vaccine failure suspected. On the other hand, FeLV vaccination does not affect the test results and does not give false positives.

## 40. Let's say a cat received all of the core vaccinations (FPV, FCV, FHV, FeLV, and Rabies) during its first year but when it was time for its annual vaccinations the cat wasn't brought in on time to receive them. In this case, does the cat need only one dose or do we need to give more than one dose in the course of the next 3-4 weeks?next 3-4 weeks?

It depends on the type of vaccine used and the duration of the delay. If MLV vaccines are used, you don't have to worry about any delay because these vaccines "recall themselves" and only one dose is sufficient to recall immune memory (see question n. 21 & 22). If non-infectious (killed) vaccines are used and the delay is long (5-6 months), I think it could be better to administer two doses 3-4 weeks apart. Rabies vaccination (generally with killed or vectored vaccines, see question n. 12) depends on the current rules of each country, and it is therefore advised that you go according to the guidelines in your country.

## 41. Is there a link between specific feline breeds and adverse events?

No. While some adverse vaccinal effects are more commonly seen in certain breeds of dogs (Dachshunds, Pugs, Boston terriers, Miniature pinschers, Chihuahuas, Boxers, etc.) suggesting a genetic predisposition, no similar predisposition seems to affect cats.

## 42. If a 7-year-old adult cat never received any vaccines, should I vaccinate now?

In my opinion yes, at least with core vaccines. WSAVA guidelines suggest that all cats (regardless of circumstances or geographical location, no matter where or how they live) should receive core vaccines (including rabies in endemic areas) at least once in their lives, in order to provide lifelong protection against infectious diseases of global significance. In fact, core vaccines protect animals from severe and life-threatening diseases that have widespread distribution. For FeLV, considered a circumstantial vaccine, it is advisable to well assess the risk taken by the cat (indoor/outdoor, solitary/multicat household, etc.) and decide accordingly. For this purpose, the "2020 AAFP Feline Retrovirus Testing and Management Guidelines" are a perfect read: [https://journals.sagepub.com/doi/pdf/10.1177/1098612X19895940].

## 43. Is the vaccine applied in general according to each region/country?

Yes, it is possible that some regions/countries ask for particular vaccinations. This is for example the case of the rabies vaccination, which is mandatory in some countries and in others is not and is administered with one shot in some countries and in others with two shots, repeated annually in some countries and in others depending on the vaccine used.

## 44. How effective are the FIV and FeLV tests? What are your recommendations?

The FIV and FeLV tests are a very useful tool to manage any type of cat. There are many different tests on the market based on the ELISA or lateral flow technique, and they must be used to check the status of each individual cat. Generally, FeLV tests look for antigen while FIV tests look for antibodies (as far as I know there is only one other test for FeLV that also looks for antibodies). Once again, the "2020 AAFP Feline Retrovirus Testing and Management Guidelines" [https://journals.sagepub.com/doi/pdf/10.1177/1098612X19895940] are a perfect read to help use them correctly.

One hoax regarding FIV and FeLV tests is that they cannot be used in cats less than 6 months old. Obviously, the interpretation of the results depends on various factors, but if, for example, an 8-week-old kitten must be tested for a general screening and the result is negative for both diseases this can be considered as valid as well as if the result is positive for FeLV (apart from some exceptions). In case of a FIV-positive result in a kitten less than 6 months old, however, the detected positivity could be related to the presence of the maternally derived antibodies (MDA) since the queen (and not the kitten) was infected, and thus represent a false positive result. FIV antibody-positive kittens can be retested immediately with a reliable PCR assay to clarify their status since PCR looks for a virus and not for antibodies.

## 45. When should I apply a rabies vaccine?

As already explained, the rabies vaccination depends on the current rules of each country. For example, in Europe the 576/2013 EU regulation on formalities for pet animals travelling between EU countries applies to non-commercial movement of pet animals. In accordance with this European regulation, dogs, cats, and ferrets must be identified by a transponder, have the Pet Passport and be vaccinated against rabies by an authorized veterinarian before leaving their own country. Animals must be at least 12 weeks old at the time of the first vaccination (there are some exceptions). The period of validity of the vaccination starts no less than 21 days from the completion of the vaccination protocol for the primary vaccination (often only one shot), and any subsequent vaccination should be carried out within the period of validity of the vaccination according to the manufacturer's instructions reported in the leaflet of the chosen vaccine (1, 2 or 3 years).
To enter some non-EU countries, rabies vaccination alone is not sufficient and an antibody titration by an authorized lab must be performed, and a positive result must be reported on the passport. When an owner tells you he wants to go abroad with his pet, always move early and carefully consult official and reliable sources (the best are the government sites but also PetTravel [https://www.-pettravel.com/], a really useful independent website designed for pet owners traveling with their pets). In countries where rabies is endemic, vaccination is mandatory and generally free of charge and may require one or two administrations in the primary vaccination.

## 46. Should the application be subcutaneous or intramuscular?

Parenterally vaccines are generally registered for a subcutaneous (SC) administration, and only few are also registered for intramuscular (IM) administration. One of the recommendations for avoiding the development of FISS in cats is to only use the SC route ad never the IM one.

## 47. Would you recommend that different type of vaccines (FPV FCV FHV) (FeLV) be administered as a single dose at intervals of two weeks?

## 48. Is it dangerous to administer multiple vaccines at the same time?

Generally, FPV, FCV and FHV-1 are contained in a single vaccine and represent the so-called "trivalent" vaccine, sometimes with the addition of FeLV as well.

The commercial production of polyvalent (multivalent) vaccines has made vaccine protocols less expensive and more convenient for both veterinarians, owners, and breeders, increasing the likelihood that animals are properly vaccinated. Manufacturers produce polyvalent vaccines with an appropriate balance between different valences: consequently, polyvalent vaccines and separately administered monovalent vaccines stimulate the same immunity vs the contained pathogens. For this reason, only licensed polyvalent products (tested for their compatibility) should be administered. Different products should never be mixed to create a "do-it-yourself" polyvalent vaccine:. This is the case of vaccines from different brands or even vaccines of the same brand when the possibility is not clearly specified in the leaflets.

Polyvalent vaccines must be administered according to the vaccine types (MLV or killed): if killed, they generally require two shot 3-4 weeks apart (2 weeks should be used only in emergencies and not as a routine protocol). Veterinarians and owners are often concerned about the number of components included in some polyvalent vaccines thinking that they are too many to well stimulate the immune system or even that they are dangerous, but this is an unfounded fear. The immune system is perfectly capable of responding to multiple antigens simultaneously, and multicomponent vaccines would not be licensed if all components were not proven to be effective. Furthermore, there is no evidence of any kind of danger or increased risk of adverse reactions by using such vaccines.

## 49. Would you always suggest administering the FeLV Elisa test before every FeLV vaccination?

It depends on the risks of each cat: repeat testing over time might be needed to clarify the status of some cats. Since not all vaccinated cats will be protected by the FeLV vaccination (because it is not 100% protective), preventing exposure remains important even for vaccinated cats and checking that the situation has remained unchanged can be very important.

## 50. How do I vaccinate a previously unvaccinated young adult cat with moderately compromised immunity?

In this case, like in the others, the evaluation of risks is highly important. If the cat lives solitary and is an indoor cat, one core vaccination could be sufficient, but it would be ideal to test the protection after vaccination (VacciCheck would be perfect for this purpose). Also in case of a FIV- or FeLV-positive but healthy cat (I don't know what you mean with "cat with moderately compromised immunity"), vaccine selection and protocol should be based on individual risk assessments (and the "2020 AAHA/AAFP Feline Vaccination Guidelines" qualify for this purpose [https://www.aaha.org/aaha-guidelines/2020-aahaaafp-feline-vaccination-guidelines/feline-vaccination-home/]).

## 51. What do you think about vaccinating cats undergoing FIP treatment as well as those who have been cured of FIP?

For these patients, a careful evaluation of the real risk of infection (eg, indoor/outdoor, solitary or living with other cats, no contact with unknown cats) and their health status is needed. Since vaccination is a stressful practice, it may be possible to avoid the stress of a booster vaccine by testing for specific antibodies against core vaccines (above all FPV). If a booster shot is essential use as few components as possible, meaning only core vaccines and eventually FeLV in cats at risk.

## 52. What are your recommendation when vaccinating FIV and FeLV positive cats?

In the case of a FIV- or FeLV-positive but healthy cat, vaccine selection and protocol should be based on individual risk assessments (and the "2020 AAHA/AAFP Feline Vaccination Guidelines" [https://www.aaha.org/aaha-guidelines/2020-aahaaafp-feline-vaccination-guidelines/feline-vaccination-home/])
As I wrote in my book "Vaccines and Vaccinations of Pets" (EDRA, 2020, in Italian), patients with potentially reduced immune response, such as FIV- or FeLV-infected cats, are exposed to an increased risk of infection. Consequently, vaccinations are not necessarily to be avoided, but there are definite rules to follow:
-Clinically healthy cats must be vaccinated with core vaccines.
-Cats with overt clinical symptoms should not be vaccinated (either with cores or other vaccines).
-In immunocompromised patients inactivated vaccines should be used.
-In asymptomatic patients MLV vaccines can also be used.
-FIV-positive cats should be vaccinated for FeLV but only if there is a real risk of infection (eg, living with an indoor/outdoor cat).
-FeLV-positive cats must not be vaccinated for FeLV.

## 53. What age do you stop vaccinating older cats?

For a complete answer to this question, please read questions n. 19 and 20. Briefly, in an older cat vaccinations should not be discontinued. This cat must be considered and treated as an adult one and revaccinated every 1-3 years based on the cat's lifestyle. Only in the case of a low-risk senior/-geriatric cat (eg, living in a single-cat household with no outdoor access), vaccination can be stopped. To avoid unnecessary core vaccination (above all FPV) protection can also be controlled by using in-clinic tests (VacciCheck is perfect for this purpose). For more details, please read the "2020 AAHA/AAFP Feline Vaccination Guidelines" [https://www.aaha.org/aaha-guidelines/2020-aahaaafp-feline-vaccination-guidelines/feline-vaccination-home/].

## 54. I help out with sterilising cats from poor areas. I would like to ask the vet to vaccinate them for the usual rabies and 3-in-1. This would be the only time that these cats would get vaccinated. But I have been told by several people that I am wasting my money because vaccinating only once does not accomplish anything.

Whoever said this to you could not be more wrong. WSAVA guidelines themselves state that all cats should be vaccinated at least once in their life to assure a long-lasting protection. This is a correct practice first of all because most core vaccines are live (MLV), and the few who are not are acting as such. That means they boost themselves without the need for further administrations (unlike the circumstantial and non-core vaccines, many of which require two doses both in kittens and in adults for the first immunization). Unfortunately, many core vaccine datasheets advise that adult cats require two vaccinations (as do kittens), but this practice is considered by WSAVA guidelines (and by me) as unjustified and contrary to fundamental immunological principles. The protocol involving multiple vaccinations in kittens is motivated by the well-known interference of Maternally Derived Antibodies (MDA), a problem absent in adult cats.

For rabies, on the other hand, classical protocols in nonendemic areas always involve a single inoculation also for the first immunization, even though all vaccines for dogs, cats, and ferrets are noninfectious (killed). So once again you are right.