

## Miscellaneous questions frequently arising during antiviral drug treatment for FIP and aftercare

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Several questions frequently arise during FIP treatment. Before discussing these questions, it is important to review the status of FIP treatment. Only antiviral drugs that target specific viral proteins and inhibit replication of FIP virus have been shown to be curative. At present, these include the nucleoside analogs and RNA replication inhibitors GS-441524 (and related prodrug Remdesivir) and Molnupiravir (EIDD-2801), and the viral protease inhibitor GC376. The proper application of these drugs has resulted in a cure rate for all forms of FIP of over 90% with minimal side-effects. Most treatments are completed without complications. However, certain questions frequently come up, which is the purpose of this handout.

The problems associated with adverse sexual behavior in intact females and males on specific antiviral drug treatment have come to my attention. The questions often come from countries where neutering is either delayed to later in life or not a routine practice. The concerns are that stresses of spay/neuter surgeries and vaccines may affect antiviral drug treatment outcome. I believe that such fears are overblown. If a cat is on treatment and in remission, or has been deemed cured, it is ok to spay or castrate it, but preferably in the least stressful manner. Cats can be spayed and castrated quickly and efficiently and returned to their homes the same day (castrations) or within a day (spays) with a minimum of pre-surgical, surgical, and post-surgical drug treatments and restraints (e.g., caging, E-collars). Such surgeries will be less stressful to the cats (and owners, which then reflect on their cats) than the sexual behaviors.

I am also not a fan of hormonal treatment to prevent adverse male or female sexual behavior and feel that efficient spaying and castration will be less stressful in the long run than such preventions. Therefore, if a need to permanently alter this behavior is required, surgical neutering is preferable to chemical neutering.

It appears that some owners want to keep treated cats intact for later use as breeding stock or to allow them to experience procreation. We know that there are genetic as well as environmental components to FIP, which has led to the recommendation that purebred cats producing FIP kittens should not be used for breeding. This would be even more true for cats that have been cured of FIP.

As for vaccines, many already know that I am not a big fan of vaccines for cats after kittenhood and the first yearly boosters as I feel that immunity is long lasting. I also feel that rabies vaccines cannot be justified for routine use in cats, either for the health of the public or the cats. Regardless, I accept that these beliefs are not widely accepted and that laws in a few states require rabies vaccination for cats, a few no vaccination, and others recommended but

not required. I have seen no consequences by routine vaccinations in any of our cured cats. However, they are not something I would recommend for cats undergoing treatment. The immune systems of these cats have other things to do than respond to vaccines.

What are the indications for medications other than specific antiviral drugs for FIP treatment? Supportive (symptomatic) treatment may be needed during the initial illness to keep cats alive long enough for antivirals to have their effect. The drugs often used at this initial stage usually include an antibiotic (doxycycline/clindamycin), analgesics (opioids, gabapentin), anti-inflammatories (corticosteroids, NSAIDs), immunostimulants (interferons, non-specific immunostimulants), anti-seizure medications, and fluids. I have tried to avoid overuse of these drugs except on a temporary basis and only if there is strong justification for them, especially in severely ill cats for the first few days. The most important goal for treating FIP is to stop virus replication in macrophages, which will immediately halt the production of the numerous inflammatory and immunosuppressive cytokines that cause FIP signs. While some drugs such as corticosteroids (prednisolone) or NSAIDs (meloxicam) may inhibit inflammatory cytokines and cause clinical improvement, they are not curative. They may also mask beneficial effects to GS treatment, which are often monitored to gauge treatment effect and progress. A response to antiviral drug treatment also being used for diagnostic purposes. The only drugs that will completely inhibit these harmful cytokines and cure FIP are antiviral drugs such as GS-441524, Monupiravir, or GC376 and related compounds. These antiviral drugs will cause dramatic improvements in fever, activity, appetite, etc. within 24-48h. This improvement will be far greater than any achieved by other medications. Therefore, unless there is justification to use other drugs, they should be stopped as soon as a steady improvement in FIP signs occurs.

I am also not a believer in many of the supplements claiming to treat or prevent liver, kidney, immune system, or other organ problems. These supplements are expensive and not proven to be effective in doing what they claim. B12 injections only treats B12 deficiency, which is rare, and not the anemia of FIP. The same is true for other vitamins. This also applies to a wide range of dietary supplements and specialty cat diet of many types. There is no essential ingredient in any of these supplements that cannot be provided in a well tested commercial brands of cat food. There is also a possibility of some supplements interfering with the absorption of oral antiviral drugs.

How should cats be monitored after they have completed their treatment and post-treatment observation periods? Technically, further blood testing is not necessary, especially if routine health assessments such as weight, appetite, and temperature are continued over this period. Blood testing during this period will not change the outcome and may only add to the cost of treatment and increased stress on the owner. However, it is common for successfully treated cats to be routinely blood tested during the 12-week post-treatment observation, usually every 4 weeks but sometimes more frequently. In some cases, the routine blood testing is continued beyond the 12-week post-treatment observation, also out of fear of possible relapse or

recurrences. Relapses or new infections after the 12-week observation period are rare and will be preceded by outward disease signs such as weight loss, lethargy, inappetence, poor coat, and fever, which would be the best indicators for blood testing. Blood test panels also contain many values, and it is not unusual for one or more value to be abnormal even in healthy cats. Care must be taken that such abnormalities are not over interpreted and lead to excessive worry or additional testing trying to determine their significance. For instance, a mild to moderate increase in one of three liver enzymes, in a healthy cat, has much less importance than in another cat with signs of illness.