

Black-market production and sale of GS-441524 and GC376

*Niels C. Pedersen, DVM PhD
Distinguished Professor Emeritus
School of Veterinary Medicine
University of California, Davis*

April 26, 2019

A number of entities, largely in China, are manufacturing GS-441524 (GS) and GC374 (GC) for sale mainly to desperate owners of cats with FIP. Although the first effort was centered around GC, the emphasis of this black-market has rapidly shifted to GS. Although this sort of marketing and use of GS and GC is technically illegal and it could be considered unethical for veterinarians to assist in treating cats with such drugs, the companies holding patents on GC and GS have no effective means to halt this black-market use. The individuals and companies that are offering GS and GC are usually including a disclaimer to customers limiting the use of their compounds to what they call "for research use only - not to be used for human or veterinary use." This will effectively shield them from any "improper or illegal use." Owners purchasing such black-market products are under no legal obligation to abide by such limited use disclaimers. However, veterinarians that choose to assist owners with treating cats with such drugs may have no such protection against adverse situations that might arise from such unauthorized use. Therefore, some veterinarians are also requiring signed waivers from owners freeing them of any legal or ethical obligations for such treatment.

I have been opposed to the black-market use of GC or GS mainly because I have seen the "wild-west-like" situations that it creates. Although chemists producing these drugs indicate that they are highly pure, there is no testing for biological activity (i.e., antiviral effect). We already know that GC and GS are being made by an increasing number of individuals and that the quality on a mg/kg or molar dosage can greatly vary. We also know that the price of GC and GS can also vary greatly and that owners may pay many thousands of dollars for enough drug to complete a treatment. Purchasing sufficient drug, and soon enough to be of help, is only the first step. The drug may be purchased in a powder form, which requires more than average knowledge to successfully convert to a stable and injectable form. In response to this problem, some suppliers are offering GC or GS that has already been made into an injectable form. There is often no information on how this was done, what diluent was used, local and systemic toxicity, and its stability once in injectable. If owners or veterinarians insist on purchasing GS or GC on the black-market, usually at a very high price, they should expect some sort of information from the supplier as to biological (antiviral) activity on a molar basis, diluent used, and information on storage conditions and shelf-life.

The second problem with black market GS and GC involves how it is used, even if it should be equivalent in purity and biological activity to GS and GC described in peer-reviewed scientific publications. If the purity and anti-viral activity is the same as the drugs described in research publications, the published information can be directly applied. If they are not, then published information will not apply. It is also critical that the diagnosis of FIP be as strong as possible, as the disease is still frequently mis-diagnosed. Therefore, it is hoped that owners have access to a level of veterinary expertise that will assure that only cats needing such treatment will be subjected to a regimen of this emotional involvement, duration, cost, and need for proper monitoring. There is still a lack of knowledge of how to properly treat cats with the neurological and ocular/neurological forms of FIP. GC and GS penetrate into the brain with some difficulty. The only way to increase drug levels in the brain is to increase the blood level by using higher and higher

dosage regimens. It does appear that higher dosages, especially with GS, can lead to complete or near complete remission of clinical signs, but relapses are common, and it is still uncertain whether every cat with neurological FIP can be cured. Because of these facts, cats with FIP and neurological involvement should be approached with far more caution than other forms of FIP. Cats treated for other forms of FIP, and later developing neurological signs, should be considered the same as cats with primary neurological FIP. The expense of retreating after relapses and using higher dosage of drug, with unknown expectation of cure, should be reason to carefully evaluate the pros, cons and unknowns of treating such cats.

I will continue to provide as much advice as possible for owners and veterinarians contemplating the use of black-market GS and GC to treat cats with FIP. However, I must make it clear that I would have preferred these drugs to be approved and commercialized in the normal manner. I am certain that this will happen within the next few years, and as it does, the black-market demand for drugs like GS and GC will disappear. In the meantime, UC Davis will continue to research new antiviral drugs for diseases like FIP and to share our findings in the conventional manner of peer-reviewed research publications. Our obligations are only to assure owners and veterinarians that our findings are accurate, reproducible, and applicable. We have no direct control of how our findings are ultimately applied.