

Rethinking feline coronavirus infection outcomes

Feline coronavirus (FCoV) is a common pathogen of domestic and nondomestic felids. Although most cats infected with FCoV have only mild to inapparent gastrointestinal disease, a small subset develops the lethal disease feline infectious peritonitis (FIP).¹ Feline infectious peritonitis was first described by Holzworth² as chronic fibrinous peritonitis before it gained its current name,³ and since then, the disease has often been further subdivided into effusive (so-called wet) and noneffusive (so-called dry) forms, with a mixed form sometimes included.¹

In parallel, the related coronavirus, SARS-CoV-2, is the etiologic agent of COVID-19 in people, and similar to the case of cats infected with FCoV, a large portion of people infected with SARS-CoV-2 are asymptomatic or only mildly symptomatic. However, cough, fever, shortness of breath, malaise, headaches, and anosmia have been reported for those who do develop disease. More severe presentations of COVID-19 include acute respiratory distress syndrome and multisystem inflammatory syndrome in children.⁴ Additionally, numerous other organ systems may be involved, manifesting as acute kidney injury, high liver enzyme activities, gastrointestinal abnormalities, deep vein thromboses, cardiomyopathies, hyperglycemia, and cutaneous lesions.⁵ Despite the range of clinical outcomes, each of these clinical scenarios has been considered a part of the COVID-19 spectrum. In addition, because the initial cases of SARS-CoV-2 infection were reported less than a year ago, its long-term effects have not yet been fully described. However, concerns for the development of diabetes mellitus, heart disease, and even Alzheimer's disease in COVID-19 patients have been raised.

Endotheliitis and vasculitis underly disease development with both SARS-CoV-2 and FCoV infection.^{1,5} From a one-health perspective, it is possible that cats with subclinical FCoV infections may provide clues to the future impacts of SARS-CoV-2 infection. Investigating previous FCoV exposure in cats with various diseases may help provide insight into the diseases that we might expect to result from SARS-CoV-2.

By the same token, however, information regarding SARS-CoV-2 infection in people may provide insights

into FCoV infection in cats. In particular, the variety of long-term disease outcomes in people with COVID-19 raises the question of whether we should rethink the dichotomous outcome of FCoV infection in cats (ie, lethal FIP versus mild disease with no long-term consequences). Feline infectious peritonitis may not be the only consequential disease outcome resulting from FCoV infection, and FCoV infection may, in fact, be represented by a spectrum of outcomes.

Veterinarians, physicians, and basic researchers addressing coronavirus disease may benefit from thinking more broadly about the impacts of FCoV infection in cats. We believe that the clinical signs of FCoV infection exceed those of classic FIP and that understanding the long-term implications of FCoV infection in cats may inform our understanding of SARS-CoV-2 infection in people. This prompts a careful consideration of diseases caused by coronavirus infections from a one-health perspective.

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