

Risk factors in cats with FCoV infection (A review)

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Abstract

Feline coronavirus (FCoV) is an important viral pathogen of domestic cats. Risk factors of FCoV infection are important for the control and prevention of this disease in cats living in multi-cat environments. This present review deals with epidemiological factors such as housing conditions (whether the cat lives in a single or multi-cat household), lifestyle (whether the cat lives exclusively indoors, or whether it goes outside), behavioral characteristics such as sharing food and water dishes, and the use of common litter trays in multi-cat environments, as well as breed, age, gender, and health status. According to the literature data presented in this review paper, multi-cat households, lifestyle, certain breeds, health status, and age are risk factors for the occurrence, development, and spread of FCoV infection among cats.

Key Word: Review; Risk factors; Feline coronavirus; Cat.

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I. Introduction

Feline coronavirus (FCoV) is an important viral pathogen of domestic cats (Baneth *et al.*, 1999). 5-10% of FCoV seropositivity cats develop fatal feline infectious peritonitis (FIP) (Baneth *et al.*, 1999; Benetka *et al.*, 2004; Klein-Richers *et al.*, 2020). The FCoV infection occurs in crowded living conditions such as multi-cat households, catteries, animal shelters, and pet stores (Holst *et al.*, 2006; Sharif *et al.*, 2009; Almeida *et al.*, 2019; Klein-Richers *et al.*, 2020). Epidemiological factors are important for control and prevention of FCoV infection among cats (Holst *et al.*, 2006; Oğuzoğlu *et al.*, 2013; Almeida *et al.*, 2019). FCoV infection rates are affected by epidemiological factors such as housing conditions (whether the cat lives in single or multi-cat household) (Baneth *et al.*, 1999; Bell *et al.*, 2006b; Holst *et al.*, 2006), lifestyle (whether the cat lives exclusively indoors or goes outside) (Bell *et al.*, 2006b; Almeida *et al.*, 2019), behavior characteristics such as sharing food and water dishes, and the use of common litter trays in multi-cat environment (Baneth *et al.*, 1999; Bell *et al.*, 2006b), breed (Bell *et al.*, 2006a; Bell *et al.*, 2006b; Holst *et al.*, 2006), age (Almeida *et al.*, 2019; Klein-Richers *et al.*, 2020), gender (Baneth *et al.*, 1999; Moestl *et al.*, 2002) and health status (Kummrow *et al.*, 2005; Bell *et al.*, 2006b).

II. A Literature Review

FCoV is transmitted through the fecal-oral route (Sharif *et al.*, 2009; Almeida *et al.*, 2019) among cats in multi-cat environments where many cats share the same litter trays where the FCoV infection is spread among cats by infected feces (Baneth *et al.*, 1999; Klein-Richers *et al.*, 2020). Bell *et al.* (2006b) and Holst *et al.* (2006) observed that the number of cats in the household had a significant influence on the seropositivity to FCoV infection. Bell *et al.* (2006b) reported that the seroprevalence of FCoV was significantly higher in multi-cat households than in single-cat households. Holst *et al.* (2006) found that seroprevalence was significantly higher if the cats lived in groups of at least five than if they lived in groups of less than five. Kummrow *et al.* (2005) and Raukar (2022) reported that FCoV seroprevalence was more frequently registered in cats from multi-cat than in single-cat households, but the difference was not significant. Klein-Richers *et al.* (2020) reported that FCoV seroprevalence was more frequently registered if the cats lived in groups of more than 10 cats than if they lived in groups of 5 to 10 cats, but the difference was not significant.

Almeida *et al.* (2019) reported that the seroprevalence of FCoV infection in indoor cats was significantly higher than the seroprevalence in outdoor cats. On the other hand, Raukar (2022) observed that FCoV infection was significantly more frequently registered in cats with access to the outdoors than in exclusively indoor cats. Oğuzoğlu *et al.* (2013) reported that FCoV infection was more frequently registered in outdoor cats than in indoor cats, but the difference was not significant. Bell *et al.* (2006b) observed that FCoV seroprevalence was more frequently registered in exclusively indoor cats than in outdoor cats, but the difference was not significant. Bell *et al.* (2006b) suggest that outdoor access reduces the risk of FCoV infection because cats with outdoor access bury their feces outside and so minimize fecal-oral contact and FCoV transmission. Based on the above literature data, it can be concluded that no strong agreement or conclusion has been reached

among the researchers as to whether cats that go outside or cats that live exclusively indoors in multi-cat environments are more susceptible to FCoV infection. The authors agree that the main risk factor for transmission of FCoV infection is sharing the same litter tray, where the FCoV infection is spread among cats living in the same household by infected feces.

Holst *et al.* (2006) reported that the seroprevalence of FCoV infection was significantly higher among pure-bred cats than among non-pedigree cats. Sharif *et al.* (2009) observed that FCoV infection was significantly more frequently registered in purebred Persian cats than in cross-bred cats. Bell *et al.* (2006a) and Bell *et al.* (2006b) observed that there were significant differences in median Coronase antibody titres between breeds of cats. Researchers (Bell *et al.*, 2006a; Bell *et al.*, 2006b) reported that breed-related differences exist in the immunological responses to FCoV infection. Breed-associated variation in the immune response to FCoV could be an important factor determining the susceptibility or resistance of certain breeds to FIP (Bell *et al.*, 2006a). The median Coronase antibody titres of Siamese, Persians, Domestic Shorthairs, and Bengal cats were significantly lower than those of British Shorthairs, Cornish Rex, and Burmese cats (Bell *et al.*, 2006a). On the other hand, Bell *et al.* (2006b) observed that the median Coronase antibody titres of Persians, Siamese, and Devon Rex were significantly lower than those of Burmese, British Shorthair cats, Ragdoll, Russian Blue, Birman, and Abyssinian cats. Moestl *et al.*, (2002) and Rypulaet *et al.*, (2014) observed that FCoV infection was more frequently registered in purebred cats than in non-pedigree cats, but the difference was not significant. Based on literature data, it can be concluded that purebred cats are more susceptible to FCoV infection than domestic cats and cross-bred cats.

Most studies (Rodgers and Baldwin, 1990; Baneth *et al.*, 1999; Moestl *et al.*, 2002; Bell *et al.*, 2006a; Bell *et al.*, 2006b; Holst *et al.*, 2006; Sharif *et al.*, 2009; Oğuzoğlu *et al.*, 2010; Taharaguchi *et al.*, 2012; Oğuzoğlu *et al.*, 2013; Rypulaet *et al.*, 2014; Tekelioglu *et al.*, 2015; Almeida *et al.*, 2019; Raukar, 2022) found no significant link between gender and FCoV seropositivity. Authors (Baneth *et al.*, 1999; Moestl *et al.*, 2002; Sharif *et al.*, 2009; Raukar 2022) reported that FCoV infection was more frequently registered in female cats than in male cats, but the difference was not significant. On the other hand, authors (Rodgers and Baldwin, 1990; Bell *et al.*, 2006b; Taharaguchi *et al.*, 2012; Oğuzoğlu *et al.*, 2010; Oğuzoğlu *et al.*, 2013; Tekelioglu *et al.*, 2015; Almeida *et al.*, 2019) registered FCoV infection more frequently in male cats than in female cats, but the difference was not significant. According to the presented literature data, it can be concluded that no strong agreement or conclusion has been reached among researchers as to which gender is more susceptible to FCoV infection.

Oğuzoğlu *et al.*, (2013), Almeida *et al.*, (2019) and Klein-Richers *et al.*, (2020) observed a significant association between age and seropositivity to FCoV infection. Klein-Richers *et al.* (2020) reported that FCoV infection was registered significantly more frequently in cats under one year of age than in older cats. However, Almeida *et al.* (2019) observed that the seroprevalence of FCoV infection in adult and elderly cats was significantly higher than in cats less than 3 years of age. On the other hand, Oğuzoğlu *et al.* (2013) found that the seropositivity of FCoV was significantly higher in cats older than four years compared to younger cats. Studies (Baneth *et al.*, 1999; Rodgers and Baldwin, 1990; Moestl *et al.*, 2002; Bell *et al.*, 2006a; Bell *et al.*, 2006b; Holst *et al.*, 2006; Sharif *et al.*, 2009; Oğuzoğlu *et al.*, 2010; Rypulaet *et al.*, 2014) did not find a significant association between age and FCoV seropositive status. According to the presented literature data, it can be concluded that no strong agreement or conclusion has been reached among researchers at which age the cat is more susceptible to FCoV infection, although all authors agree that the age of the cat is an important risk factor for FCoV infection.

Kummrow *et al.*, (2005), Bell *et al.*, (2006b), and Oğuzoğlu *et al.*, (2013) observed significant association between health status and seropositivity to FCoV infection. Kummrow *et al.*, (2005) and Oğuzoğlu *et al.*, (2013) reported that FCoV infection was significantly more frequent in sick cats than in healthy cats. On the other hand, Bell *et al.* (2006b) found that the seroprevalence of FCoV infection was significantly higher in healthy cats than in sick cats. Studies (Sharif *et al.*, 2009; Oğuzoğlu *et al.*, 2010; Raukar, 2021) reported that anti-FCoV antibodies were confirmed in healthy cats. Moestl *et al.* (2002) found that FCoV infection was more frequent in healthy cats than in sick ones, but the difference was not significant. However, An *et al.* (2011) found that FCoV infection was more frequent in sick cats than in healthy ones, but the difference was not significant.

III. Conclusion

According to the literature data presented in this review paper, multi-cat households, lifestyle, certain breeds, health status, and age are risk factors for the occurrence, development, and spread of FCoV infection among cats.

References

- [1]. Almeida, A., Galdino, M. V. and Araújo Jr, J. P. Seroepidemiological study of feline coronavirus (FCoV) infection in domiciled cats from Botucatu, São Paulo, Brazil. *Pesquisa Veterinária Brasileira*, vol. 39, pp. 129-133, 2019.
- [2]. An, D. J., Jeoung, H. Y., Jeong, W., Park, J. Y., Lee, M. H. and Park, B. K. Prevalence of Korean cats with natural feline coronavirus infections. *Virology*, vol. 28, pp. 455, 2011.
- [3]. Baneth, G., Kass, P. H., Steinfeld, D. and Besser, M. A. Seroepidemiological study of feline coronavirus, feline immunodeficiency virus and feline leukemia virus among cats in Israel, *Israel Journal of Veterinary Medicine*, vol. 54, pp. 39-43, 1999.
- [4]. Bell, E. T., Malik, R. and Norris, J. M. The relationship between the Feline Coronavirus antibody titre and the age, breed, gender and health status of Australian cats, *Australian veterinary journal*, vol. 84, pp. 1-7, 2006a.
- [5]. Bell, E. T., Toribio, J. A. L. M. L., White, J. D., Malik, R. and Norris, J. M. Seroprevalence study of feline coronavirus in owned and feral cats in Sydney, Australia, *Australian veterinary journal*, vol. 84, pp. 74-81, 2006b.
- [6]. Benetka, V., Kübber-Heiss, A., Kolodziejek, J., Nowotny, N., Hofmann-Parisot, M. and Möstl, K. Prevalence of feline coronavirus types I and II in cats with histopathologically verified feline infectious peritonitis, *Vet Microbiol*, vol. 26, pp. 31-42, 2004.
- [7]. Holst, B. S., Englund, L., Palacios, S., Renström, L. and Berndtsson, L. T. Prevalence of antibodies against feline coronavirus and *Chlamydia felis* in Swedish cats, *Journal of Feline Medicine and Surgery*, vol. 8, pp. 207-211, 2006.
- [8]. Klein-Richers, U., Hartmann, K., Hofmann-Lehmann, R., Unterer, S., Bergmann, M., Rieger, A., Leutenegger, C., Pantchev, N., Balzer, J. and Felten, S. Prevalence of Feline Coronavirus Shedding in German Catteries and Associated Risk Factors, *Viruses*, vol. 12, pp. 1-13, 2020.
- [9]. Kummrow, M., Meli, M. L., Haessig, M., Goenczi, E., Poland, A., Pedersen, N. C., Hofmann-Lehmann, R. and Lutz, H. Feline coronavirus serotypes 1 and 2: seroprevalence and association with disease in Switzerland, *Clinic Diagn Lab Immunol*, pp. 1209-1215, 2005.
- [10]. Moestl, K., Knotek, Z., Toman, M. and Faldyna, M. Seroprevalence of feline coronaviruses in two central European countries: Czech Republic and Austria, 2nd International Feline Coronavirus/Feline Infectious Peritonitis Symposium, Glasgow, Scotland, August, 2002.
- [11]. Oğuzoğlu, T. Ç., Sahna, K. C., Ataseven, V. S. and Dilek, M. U. Z. Prevalence of feline coronavirus (FCoV) and feline leukemia virus (FeLV) in Turkish cats, *Ankara Üniversitesi Veteriner Fakültesi Dergisi*, vol. 57, pp. 271-274, 2010.
- [12]. Oğuzoğlu, T. Ç., Muz, D. İ. L. E. K., Timurkan, M. Ö., Maral, N. and Gurcan, I. S. Prevalences of feline coronavirus (FCoV), feline leukaemia virus (FeLV), feline immunodeficiency virus (FIV) and feline parvovirus (FPV) among domestic cats in Ankara, Turkey, *Revue Méd Vét*, vol. 164, pp. 511-516, 2013.
- [13]. Raukar, J. Prevalence of feline coronavirus, feline leukemia virus, and feline immunodeficiency virus in client-owned cats in Croatia, *Journal of Advances In Natural Sciences*, vol. 8, pp. 24-38, 2021.
- [14]. Raukar, J. Risk factors for FCoV infection in client-owned cats in Zagreb and Varaždin, Croatia, *American Journal of Applied Sciences*, vol.13, 2022. Accepted
- [15]. Rodgers S. J. and Baldwin C. A. A serologic survey of Oklahoma cats for antibodies to feline immunodeficiency virus, coronavirus, and *Toxoplasma gondii* and for antigen to feline leukemia virus, *J Vet Diagn Invest*, vol. 2, pp. 180-183, 1990.
- [16]. Rypuła, K., Płoneczka-Janeczko, K., Bierowiec, K., Kumala, A. and Sapikowski, G. Prevalence of viral infections in cats in southwestern Poland in the years 2006 to 2010, *Berliner und Münchener Tierärztliche Wochenschrift*, vol. 127, pp. 163-165, 2014.
- [17]. Sharif, S., Arshad, S. S., Hair-Bejo, M., Omar, A. R., Zeenathul, N. A. and Hafidz, M. A. Prevalence of feline coronavirus in two cat populations in Malaysia, *Journal of Feline Medicine and Surgery*, vol. 11, pp. 1031-1034, 2009.
- [18]. Taharaguchi, S., Soma, T. and Hara, M. Prevalence of feline coronavirus antibodies in Japanese domestic cats during the past decade, *J Vet Med Sci.*, vol. 74, pp. 1355-1358, 2012.
- [19]. Tekelioglu, B. K., Berriatua, E., Turan, N., Helps, C. R., Kocak, M. and Yilmaz, H. A retrospective clinical and epidemiological study on feline coronavirus (FCoV) in cats in Istanbul, Turkey, *Preventive Veterinary Medicine*, vol. 119, pp. 41-47, 2015.

List of abbreviations

FCoV: feline coronavirus

FIP: feline infectious peritonitis

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