

Pelargonium graveolens: Can it be effective in the treatment of Feline Infectious Peritonitis?

Feline coronavirus (FECOV) is a large, enveloped RNA virus that can cause different infections in domestic and feral cats of all ages worldwide (Tekes et al., 2016). After entering the body following fecal-oral transmission, FECOV settles in enterocytes and begins to replicate there. When replication exceeds a certain limit, the virus mutates into Feline Infectious Peritonitis Virus (FIPV) (Gunn-Moore et al., 1998). In cats with Feline Infectious Peritonitis (FIP), clinical signs and severity of clinical signs may vary depending on the organs affected by the virus. In infected cats, many organs such as the liver, kidney, pancreas, eye and central nervous system can be affected. Organ damage in FIP is seen as a result of vasculitis in blood vessels and associated organ failure (Hartmann, 2005; Dobbie, 2023). In addition, it has been reported that degenerations associated with oxidative stress may be a factor in the occurrence of various organ pathologies, since a decrease in antioxidant parameters and an increase in oxidant substances were found in cats infected with FIP (Teclles et al., 2015). Clinical findings of FIP can be categorised under two headings as effusive and non-effusive form. The effusive form is characterized by peritonitis, pleuritis and ascites, while the non-effusive form is characterized by the formation of granulomatous lesions in lymph nodes, kidneys, eyes and organs associated with the central nervous system (Tekes et al., 2016). Various combinations of clinical signs, hematologic, biochemical, serologic and molecular tests are used to diagnose FIP in cats (Diaz et al., 2009). In the treatment of FIP disease, many antiviral, antiparasitic, antibiotic, antimycotic, immunosuppressant and immunomodulatory drugs such as remdesivir metabolite, molnupiravir, ivermectin, amphotericin B, ribavirin, favipiravir, tylosin, feline interferon- ω , prednisolone, dexamethasone, cyclosporine, nystatin, human interferon-alpha, itraconazole, etc. have been tried from past to present (Kameshima, 2020; Krentz, 2020; Kameshima, 2020; Krentz, 2020). However, since there is not yet a fully effective, licensed and approved drug for the treatment of FIP, current alternative treatment research continues (Papies, 2021).

Pelargonium graveolens is a herbal extract from Geranium, native to South Africa. The root, leaves and flowers of the plant are used for medicinal purposes (Androutopoulou et al., 2021). *Pelargonium* is one of the traditional medicinal plants used very effectively in the treatment of upper respiratory tract infections, strengthening the immune system, eliminating inflammation caused by viral, bacterial and fungal agents, eliminating bacteria, viruses and fungi (Ben Hsouna et al., 2012). As a matter of fact, *Pelargonium graveolens*, which has been evaluated for its antifungal, antibacterial and antioxidant properties in different studies, has been found to prevent tissue degeneration by minimizing pathogen and host cell interaction on the respiratory tract (Kolodziej, 2011). It is also reported to be effective in regulating blood circulation, stimulating the adrenal glands and lymphatic system and providing diuresis. In addition, *Pelargonium spp.* can be used in the hygiene of the oral cavity and in the treatment of various dermal diseases with its antiseptic effects (Dzamic et al., 2014). In a previous study, the inhibitory effect of *P. graveolens* on *Mycobacteria spp.* strains and replication stages of respiratory viruses was also observed (Mativandla, 2007). In addition, positive effects on the movement of cilia in the respiratory tract and increasing surfactant fluid have also been reported (Tekes, 2016). In humans with acute rhinosinusitis, *P. sidoides* was found to show selective immunomodulatory activity by reducing the levels of some inflammatory chemokines in nasal secretion (Peric et al., 2021). Again, in an in vitro study in human lung cell culture infected with SARS CoV-2, it was found that *P. sidoides* inhibited the entry stage of SARS CoV-2 into the cell and had antiviral and immunomodulatory activity by reducing the levels of some cytokines (IL8, IL13, TNF α) in many patients (Papies et al., 2021).

In the light of this information, it is thought that *Pelargonium graveolens*, with its antiviral, immunomodulatory and antioxidant effects in suppressing viral replication, especially in viral infections, is promising in the treatment of FIP disease in cats, in which many organ systems are affected (Teclles et al., 2015; Papies et al., 2021). As a matter of fact, in our clinical study, which was conducted as a preliminary evaluation in cats infected with FIP, it was observed that clinical findings and laboratory parameters improved in cats treated with *P. graveolens*, and no negative effects on kidney and liver parameters were observed in any cat treated with the drug. In conclusion, *Pelargonium graveolens* extract should be used in more cats diagnosed with FIP and its efficacy on the disease should be demonstrated by clinical, biochemical and viral gene expression level tests.

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Assistant Professor
Yigit KAÇAR


Dr. Yigit KAÇAR
Dip no: 2015-2742