



THE WINN FELINE FOUNDATION

For the Health and Well-Being of All Cats

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Update on Feline Coronavirus and FIP Testing

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Feline Infectious Peritonitis (FIP) is an enigmatic disease that strikes down cats and strikes fear into the people who love the cats. On Thursday, June 24, 2004, Dr. Melissa Kennedy, DVM, PhD, DACVIM presented an Update on Feline Coronavirus and FIP Testing at the Winn Feline Foundation's 26th Annual Feline Symposium. This report shares the information provided at the Symposium.

FIP is a multi-factorial disease resulting from tissue damage caused by an ineffective immune response to the FIP biotype of feline coronavirus. Unlike classic viral damage that results in destruction of cellular tissue from intracellular viral replication and subsequent explosion of host cells, the response to the FIP virus causes cells involved with the immune system to malfunction causing the cat's system to attack itself. Simply put, FIP hijack's the immune system and the body self-destructs.

To understand the immunologic response, one needs a basic understanding of the structure of the feline immune system. The immune system has two major components: humoral immunity and cell-mediated immunity. Humoral immunity is the immunity that is provided primarily by the production and action of antibodies. Cell-mediated immunity is provided by the action of specific defense cells including lymphocytes, macrophages, neutrophils, eosinophils, and others.

In FIP, the antibodies produced against the coronavirus are not effective. A cell-mediated immune response (CMI) is mounted but is ineffective. A small CMI response will result in effusive FIP (wet form) and a partial CMI response results in the dry form. Lymphocyte apoptosis (lymphocyte self-destruction) occurs, there is a rise in vascular permeability, increase in tumor necrosis factor, decrease in interferon, production of inflammatory infiltrates, and tissue destruction.

Symptoms of the wet form of FIP include effusion, antibiotic non-responsive fever, anorexia, depression, lethargy, and weight loss. Symptoms of the dry form

of FIP are vague, have an insidious onset, and reflect the organs that have become involved. Pyogranulomas (small abscesses) form on the organs. Non-septic fluid may accumulate in the abdomen.

No treatments have proven to be effective and the disease is ultimately fatal once a cat shows clinical signs.

Factors involved in susceptibility to FIP include stressors such as concurrent infections, trauma, change in environment, change in dominance hierarchy, high population density, and familial history of susceptibility. The challenge will be in finding genetic components that lead to the ineffective immune response. Factors in cell-mediated immunity are believed to be critical to understanding the disease.

Because symptoms can be vague, a current challenge is to make an accurate diagnosis. Cats most prone to FIP are those that are less than 2 years of age, elderly cats, and/or cats with a familial history of susceptibility to FIP. Two areas are important for diagnosis: the patient's history and clinical tests. Patient history should include origin, history of FIP in close relatives, and concurrent stressors.. On physical examination, classical signs of fluid accumulation in the chest or abdominal cavity may be found. Laboratory evaluation should include a complete blood count and blood chemistries. Typically, laboratory results will show anemia, decreased lymphocytes, leukocytosis, elevated total protein, decreased albumin, and increased globulins. Difficulties in diagnosis may occur because the lab results do not always fit those described above.

Feline coronavirus includes two biotypes. Feline enteric coronavirus (FECV) is a fairly benign biotype. FIP virus is the virulent biotype. Unfortunately, current virus assays (IFA, VI, RT/PCR, and Elisa) cannot distinguish between the benign type and the virulent form. Therefore, these serologic tests are not diagnostic for FIP, regardless of how commercial laboratories may market such tests.

A large part of the diagnosis involves ruling out other possible disease. The definitive diagnostic tool remains histopathology and the detection of pyogranulomatous lesions.

Current investigations haven't found candidate genes that increase the virulence of FIP virus. FIP is an RNA virus and the serotypes are based on the antigenicity of spike proteins responsible for attachment to cell receptors.

Three factors have been studied: 7a7b genes, 3c gene and alterations of spike protein. The 7a7b genes are responsible for the production of nonstructural proteins whose function is unknown. Deletions in the 7b gene seem to be associated with a decrease in virulence, while deletions in the 3c gene seem to be associated with an increase in virulence and may be a factor in regulating the disease. Deletions in the 7a gene may contribute to virulence. **Screening for 7b antibodies may be helpful, but is not diagnostic for FIP.** This conclusion was reached through research conducted by Dr. Kennedy in a project entitled "Screening for antibodies to the 7b protein of feline coronavirus in cats for

diagnosis of feline infectious peritonitis” funded by the Winn Feline Foundation in 2002.

The presenter, Dr. Kennedy, doubts that there will ever be a single diagnostic test for FIP. Diagnosis may be reached with a combination of tests and careful evaluation of the patient.

She also presented results from a study of FIP in the cheetah population. Cheetahs are interesting to researchers because they are closely related genetically. An increased population density among cheetahs resulted in an increase in the occurrence of infection. Interestingly, some cheetahs were seropositive for coronavirus but PCR negative.

Dr. Kennedy concluded her presentation with results of a study into a newly recognized strain of hemorrhagic calicivirus. This new strain has a high mortality rate and is highly virulent. No major genetic changes were found to help differentiate this viral strain from other known strains of calicivirus. She believes that there may be a genetic predisposition to susceptibility to the new strain in affected cats. The Winn Feline Foundation awarded funds to Dr. Kennedy for a research project entitled “Genetic characterization of feline calicivirus associated with fatal hemorrhagic disease” in 2003.