

Winn Feline Foundation
25th Annual Feline Symposium
June 19, 2003
St. Louis, MO

Update on Two Feline Parasites: Ehrlichia and Hemobartonella

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Part One: *Hemobartonella*

Hemobartonella felis is a bacterial parasite of the red blood cells of cats found worldwide. Since its discovery in 1942, it has become known as the cause of infectious anemia in cats. Recent advances in our knowledge of this parasite have been due to the advent of polymerase chain reaction (PCR) and genetic sequencing technology. Analysis of the 16S rRNA DNA sequences of *H. felis* has led to the conclusion that the organism is closely related to *Mycoplasma*. In addition, PCR has revealed the presence of variant strains of *H. felis*. Therefore, it has been proposed that the organism be reclassified and renamed as two new species:

- 1) *Mycoplasma haemofelis*: also known as *H. felis* – Ohio, or the large form of the organism. It is the most pathogenic form.
- 2) *Candidatus Mycoplasma haemominutum*: also known as *H. felis* – California, or the small form of the organism. It is thought to be less pathogenic.

Cats that become acutely ill with hemobartonellosis may have typical clinical signs of illness:

- Pale mucous membranes
- Fever
- Lethargy and depression
- Enlarged spleen and lymph nodes
- Icterus (jaundice)

Cats that are chronically ill with hemobartonellosis may show weight loss, depression, intermittent fevers, and recurrence of acute signs of illness at times of stress.

Diagnosis of hemobartonellosis is based on:

- Finding typical signs of illness
- Results of routine blood examination
- Cytological examination of a blood smear for the presence of the organism
- PCR testing of blood samples

Affected cats typically have a regenerative hemolytic anemia. The organism attaches itself to the surface of red blood cells, and may be seen under the microscope. This is the

most common method of diagnosis. However, in many cases, examination of blood smears yields a negative result. This is for two main reasons:

- 1) The organism may be present in very low levels, especially in chronically affected cats and even in acutely infected cats;
- 2) The organism may literally fall off the surface of the red blood cells when the blood sample is collected in blood tubes containing EDTA anti-coagulant.

Further complicating diagnosis, false positive results can also occur when particles of the stain used to examine the blood smears are mistaken for the organism. PCR is a powerful molecular technique that detects minute quantities of DNA. PCR testing is able to provide a more reliable diagnosis of hemobartonellosis. It is a more sensitive and specific test than examination of blood smears, and it can differentiate between *M. haemofelis* and *M. haemominutum* infections. It is important to note that 10% or more of apparently healthy cats test positive, demonstrating that a positive PCR result is not always associated with clinical disease.

It has long been suspected that transmission of these organisms has been via the bite of infected fleas. Dr. Lappin's lab devised a simple plan to test this theory. They used a previously developed small flea cage that could be humanely applied to a cat for a period of a few days. Two groups of cats were experimentally infected with *Mycoplasma haemofelis* or *M. haemominutum*. On varying days after the primary infection, flea cages were attached to the cats for 5 days, allowing the fleas to feed on the infected cats and to see if the fleas became infected themselves. Then the cages with the infected fleas were put on a second group of cats that were known to be uninfected with either *Mycoplasma* spp. for a period of 5 days. The study confirmed that the fleas successfully became infected with *M. haemofelis* and were able to infect the second group of cats. However, when the experiment was performed using *M. haemominutum*, the fleas became infected, but transmission via the fleas to other cats was unsuccessful.

A variety of drugs can be used to treat hemobartonellosis. Commonly used drugs include enrofloxacin (Baytril[®], Bayer) at 5 mg/kg once daily for up to 28 days and doxycycline at 10 mg/kg once daily for up to 28 days. Enrofloxacin has been associated with very rare cases of blindness in cats, [especially when doses exceeding 5 mg/kg are used](#).

Doxycycline in the tablet form has been associated with cases of severe esophageal damage. This problem is not seen with the capsule or liquid form of the drug. In addition, neither medication may be able to clear the organism totally from the cat, making recurrent infections possible. In one study, azithromycin (Zithromax[®], Pfizer) was not an effective treatment. Some patients also benefit from short-term administration of prednisone since the anemia caused by this parasite is partly immune-mediated.

Dr. Lappin has investigated the use of a drug called imidocarb (Imizol[®], Schering-Plough) for treatment of hemobartonellosis in cats. A dose of 5 mg/kg given intramuscularly every 14 days, for a total of 2 to 4 doses, was successful in treating cats that were resistant to traditional therapy for hemobartonellosis. Imidocarb is currently not approved for this use in cats.

Finally, prevention of hemobartonellosis in cats can be achieved by keeping cats indoors and by ensuring good flea-control measures are in place. All cats maintained as blood donors should be screened by PCR for hemobartonellosis.

The Winn Feline Foundation has supported Dr. Lappin's work since 1998.

For further reading:

Jensen, W.A., Lappin, M.R., Kamkar, S., Ragan, W., Use of a polymerase chain reaction assay to detect and differentiate two strains of *Haemobartonella felis* in naturally infected cats. *AM J Vet Res* 2001;62:604-608.

Lappin, M.R., Foster, A., Geitner, K., et al. Imidocarb dipropionate for the treatment of recurrent haemobartonellosis in cats. *J Vet Int Med* 2002;16:364.