



American Ferret Association, Inc.
Committee On Health Affairs

SPECIAL MEDICAL ALERT

DISSEMINATED IDIOPATHIC MYOSITIS (DIM) IN FERRETS (aka "POLYMYOSITIS")

Disseminated Idiopathic Myositis (DIM) (aka "Polymyositis") is a "new" disease in pet ferrets. It is a disease that results in a severe inflammatory condition that primarily affects muscles (myositis). Ferret owners and veterinarians are frustrated with DIM. Although research on the disease has been ongoing since it was first described in 2003, the cause of DIM is still unknown and the disease process is poorly understood. DIM is suspected when a ferret exhibits certain clinical signs and has abnormal blood values that are consistent with the disease. There have been over 85 suspected cases with approximately half having been confirmed with histopathology.

Signalment: DIM affects young ferrets, usually less than 18 months of age; however, there have been a few ferrets over 2 years of age confirmed to have DIM. Both male and female ferrets are susceptible to DIM, and there is no apparent correlation with coat color. Ferrets diagnosed with DIM have been from a variety of breeders, and almost all of the DIM ferrets were spayed or neutered and descended at the breeding facility.

Morbidity: The disease does not appear to be contagious. Most of the ferrets suspected or confirmed to have DIM lived in multi-ferret households; the other ferrets still do not appear to be affected, even several months to years after being exposed to a ferret with DIM.

Physical Signs of DIM: The onset of DIM is usually fairly fast. Owners often report that their ferret was normal one day and then had signs of DIM the next. Initial signs of DIM are variable but commonly include: a severe, persistent, fluctuating fever (usually over 104° F), severe lethargy and weakness, masses under the skin (commonly in an armpit, but can be anywhere); abnormal stools, and a decreased appetite. Other signs that are often observed (especially as the disease progresses) include: elevated respiratory and heart rates, dehydration, clear discharge from the nose (and sometimes the eyes), depression, nausea, and skin or coat changes, such as orange dots or abrasions. Ferrets with DIM often seem to be in pain when they are touched on the back or hind end. A veterinarian may detect a heart murmur in a ferret with DIM. Although signs of DIM usually come on relatively quickly, the duration of the illness can be days to weeks, or even months. So far, all confirmed DIM cases have died or been euthanized.

Diagnostic Results: Although the white blood cell count may initially be normal, it often rises dramatically within 7-10 days of onset of the symptoms of DIM. Mature neutrophils can rise to 12,000-100,000 cells per micro liter of blood (normal is under 8,500), and they may have abnormal (toxic) changes. Ferrets with DIM are usually mildly to moderately anemic. Glucose levels are frequently elevated, and albumin is usually decreased. Alanine aminotransferase (ALT) (a liver-specific enzyme) is elevated in some ferrets. Interestingly, creatine kinase (CK), a value that is usually elevated when there is damage to muscle tissue or severe inflammation, is NOT elevated in ferrets with DIM.

Ferrets suspected to have DIM that have been tested for distemper, Aleutian disease virus, feline infectious peritonitis, sarcocystis, and bartonella have been negative for these diseases. Bacterial cultures and sensitivities have been done and have not revealed any bacterial cause for DIM. Electron microscopy and virus isolation results have also been negative. Except for an occasional enlarged spleen or abdominal lymph node, x-ray and ultrasound results are usually normal. Exploratory surgeries usually do not reveal any significant abnormalities. Special stains for protozoa and fungi have been negative. The urine of some ferrets with DIM has had a high pH (7-8). Crystals, blood and protein have been present in several cases, and a few ferrets with DIM have had urinary tract infections. The relevance and significance of these urinary findings is unknown.

Pathologic findings: Biopsies of enlarged lymph nodes and muscle tissue reveal severe, widespread inflammation, often with suppurative (pus) changes. The inflammation appears to have a multi-focal distribution; therefore, ferrets with DIM *occasionally* will have a negative muscle biopsy.

Postmortem findings: Severe inflammation of muscle tissue (skeletal, cardiac, and smooth muscle), with the esophagus being particularly affected. Non-muscular organs such as fat, brain, liver, lung, spleen and bone marrow have also been affected (e.g. bronchopneumonia in the lungs and extramedullary hematopoiesis in the spleen). Testing has been negative for infectious organisms (cultures, special stains, electron microscopy, and virus isolation), including rabies.

Etiology: DIM may be an immune-mediated disease. Vaccines (or vaccine adjuvants), genetic predisposition, and infectious organisms are currently being investigated as potential causes or triggers to this condition. As several cases have had only some of the desired clinical or diagnostic information available, common denominators have been identified to try to characterize the disease in terms of history (e.g. vaccines, diets), clinical signs, diagnostic results, and histologic findings. Ferrets diagnosed with DIM had been on various diets, including several different ferret and cat or kitten foods.

Vaccine histories were obtained for most of the ferrets diagnosed with DIM. Some had received a rabies vaccination and the recommended series of distemper vaccinations. Several ferrets had received only the distemper vaccination that was initially given to them when they were between 4 and 7 weeks of age at the breeding facility. Imrab-3 (Merial, Athens, GA) is the only approved rabies vaccine for use in ferrets, and it should be given once a ferret turns 12 weeks old. Three distemper vaccines used in ferrets diagnosed with DIM were Fervac-D (United Vaccines, Inc., Madison, WI), Purevax (Merial, Athens, GA), and Galaxy-D (Schering-Plough Animal Health Co., Omaha, NE). Although all confirmed DIM ferrets received at least one distemper vaccination, there is currently no direct evidence indicating that there is an association between vaccines and DIM. All pet ferrets should continue to be vaccinated for distemper and rabies as recommended.

Diagnosis: A presumptive diagnosis is based on physical signs and laboratory results (see above). A definitive diagnosis in a living ferret will most likely be obtained with a *biopsy of external skeletal muscle*; samples most indicative of DIM from a deceased ferret are esophagus, heart, and skeletal muscle.

Treatment: There is currently no known definitive treatment for DIM. One characteristic of ferrets with DIM is a general lack of response to treatments. Some ferrets have temporarily improved with certain medications, but it is unknown whether it was a true response to a drug or a temporary spontaneous remission. *Supportive care is currently recommended* (e.g. supplemental feedings and fluids) and antibiotics may help prevent secondary bacterial infections.

Prognosis: Although all of the ferrets confirmed to have DIM have ultimately died, there are a handful of potential survivors. Unfortunately, although several suspected cases appear to have responded to medical therapy, *prior biopsies were never done to confirm that these ferrets ever had DIM*. These cases are being thoroughly investigated. Although there is no known definitive treatment for DIM, there are experimental treatment options available.

RECOMMENDATIONS: *This Alert is for informational purposes only and should NOT be construed as veterinary advice. This alert is intended to assist practitioners and pathologists in recognizing the condition. In order to develop a better understanding of this condition, your assistance is needed in collecting information about each new case.*

FERRET OWNERS: If you suspect your ferret has DIM, contact your veterinarian as soon as possible. You may also write to DIMFerrets@yahoo.com if you have a suspected case. For up to date information, please visit the AFA website: <http://www.ferret.org>.

VETERINARIANS:

1. **Accurate Diagnosis:** A complete physical exam should be performed; lethargy, pyrexia, tachycardia, tachypnea, and hyperesthesia of the caudal dorsum/rear legs are of particular interest. Conduct appropriate diagnostic evaluations - a complete blood panel and urinalysis usually provide more evidence indicative of DIM than fecal exams, radiographs, or ultrasounds. When signalment and clinical/physical signs (especially persistent, fluctuating fever) are consistent with those of DIM and a significant leukocytosis is present, surgical biopsies are recommended. Surgical biopsies of muscle tissue +/- subcutaneous masses are most indicative of DIM. It should be noted that DIM appears to have a multifocal distribution, so two muscle biopsies are recommended. Animals presenting for necropsy (regardless of prior treatments) should have a wide range of tissues collected, including esophagus, skeletal muscle, heart, bone marrow, viscera, and brain. Equal tissue samples should be formalin-fixed and frozen. Screening of formalin-fixed tissues will be performed to determine whether further investigation (bacteriology, virology, etc.) is warranted.

* **Biopsy and necropsy samples should be submitted for histologic examination for diagnostic purposes and to facilitate DIM research.** Please contact Dr. Ramsell for information regarding sample submission for histopathology (see below).

2. **Supportive Treatment is warranted** – supplemental feedings, fluids, and broad-spectrum antibiotics should be given as needed. Please contact Dr. Ramsell to discuss potential treatment options.

3. For each presumptive case, PLEASE complete the AFA DIM Case Report Form (see attachment or the AFA website: www.ferret.org) and contact Dr. Ramsell.

4. **VETERINARIANS ONLY:** To report a case or for questions regarding the above, contact Dr. Ramsell at exoticpetvet@hotmail.com or Southwest Animal Hospital (Ph: 503-643-2137). Clients should work through their veterinarians and not call directly.