There are two distinct forms of diabetes mellitus in humans:

- Non-Insulin Dependent (NIDDM)
- Insulin Dependent (IDDM)

Non-insulin dependent diabetes mellitus, or Type II diabetes, is characterized by hyperglycemia despite the ability to secrete insulin. Thus, a relative deficiency of insulin exists.

Insulin dependent diabetes mellitus, or Type I diabetes, is characterized as an absolute deficiency of insulin secretion by the pancreas.

Though differentiation of IDDM and NIDDM in dogs and cats is sometimes difficult, the majority of cases of diabetes in these animals is IDDM. NIDDM has been known to occur in cats with transient diabetes. However, this typically occurs in obese animals due to peripheral insulin antagonism brought about by decreasing insulin receptor sites, decreasing binding of insulin to receptor sites, and decreasing activity of plasma membrane glucose transport carriers (similar to late-onset, or adult, diabetes in humans).

In cats, both NIDDM and IDDM appear to be on a continuum of disease in which insulin resistance can eventually lead to a loss of pancreatic beta cell function. It is thought that NIDDM could exist undetected for long periods of time in cats living in unstressed home environments (Nelson, 1989). However, if insulin resistance is increased due to concurrent illness or severe stress, blood glucose can increase above the renal threshold resulting in the clinical signs of diabetes.

Factors that promote insulin resistance include obesity, infections, and endocrinopathies. Often the most severely diabetic animals have concurrent disease(s) such as pancreatitis, urinary tract infection, pyometra, pneumonia, renal failure, hyperadrenocorticism, or heart failure. Upper respiratory infection in cats is a common concurrent illness that can initiate more severe NIDDM.

Fortunately, many cats will recover from their insulin dependent state with resolution of the insulin antagonism and return to the milder form of NIDDM that no longer requires insulin therapy.

**Case Study**

**DJ**: 10-year-old, neutered, male domestic longhair cat

DJ first presented in my practice on 11/7/98 for a recurrent bilateral, serous nasal discharge and superficial keratitis. Important historical findings include the occurrence of the initial respiratory infection in March 1998, following surgery for a urethral obstruction and cystotomy for removal of a urolith that was
performed at another veterinary facility. DJ returned home following the surgery with a severe upper respiratory infection; it spread rapidly among the other cats in the home. One cat became extremely ill, anorexic, and died despite therapy.

Based on clinical signs, history, and a characteristic corneal ulceration, herpetic keratitis was diagnosed. Due to the chronic nature of recurrent herpes virus infection, nutritional supplementation to augment and stimulate the immune response was attempted along with conventional therapy consisting of oral prednisone and topical antibiotics. The oral prednisone was administered at an anti-inflammatory dose as opposed to an immune-suppressive dose, in order to reduce inflammation in the ocular tissues and minimize swelling and discharge in the nasal passages to ease breathing.

Unfortunately, DJ was unwilling to take pill-form supplements, but was willing to eat Wysong Biotic (Wysong Corporation, Midland, MI) on his Hills c/d food (Hill’s Pet Nutrition Inc., Kansas City, MO), which is formulated to reduce the risk of developing magnesium ammonium phosphate crystals in the urine and subsequent uroliths. Wysong Biotic is a powdered nutritional supplement containing a variety of whole foods such as ground sesame seeds, barley grass powder, wheat grass powder, carrot powder, dried kelp, Aspergillus derived digestive enzymes, spray-dried digest of liver, poultry meal, and several synthetic vitamins. DJ improved.

Ocular pain and inflammation decreased, with resolution of corneal ulceration within two weeks. Mild epiphora and intermittent sneezing and runny nose continued on a waxing and waning course for the following six months, without significant ocular signs, until the corneal ulceration recurred in May 1999. It was treated similarly with a good response.

DJ was examined in December 1999, one week after being shaved and bathed at PetSmart, a national pet store franchise. He presented for evaluation of nasal congestion, wheezing, sneezing, runny nose, and drinking more water than usual. At that time, Immuplex® (Standard Process Inc., Palmyra, WI), one capsule SID, was initiated with a recommendation to continue it for 6-12 months. Immuplex® is an immune support product containing vitamin complexes A, C, and E along with zinc, copper, chromium, iron, and selenium. It also contains Protomorphogen™ extracts of liver, bone, spleen, and thymus. The owner also began adding Missing Link (Designing Health, Valencia, CA) to DJ’s food.

Because of a mild heart murmur, Cardio-Plus® (Standard Process), one tablet SID, was also started. Cardio-Plus® contains heart Protomorphogen™ extract, Coenzyme Q10, and other whole foods combined to supply essential nutrition for the cardiovascular system.

DJ returned for examination one month later, at the end of January 2000, acting lethargic and ill, and with a poor appetite. He was 5-7% dehydrated with mild dyspnea and nasal discharge. CBC revealed an HCT of 33.4% (normal range=24-45%), a total protein of 8.5 gm/dL (5.4-7.8 gm/dL), and a mild leukocytosis (21,000; normal range=5,000-15,000). The serum chemistry profile was unremarkable except for elevated blood glucose (658 mg/dL; normal range=70-150 mg/dL). Urinalysis was normal except for blood >250 ery/microliter, leukocytes (++), and glucose of 1000 mg/dL. Ketones were negative on urinalysis but there was evidence of cystitis.

Chest radiographs revealed diffuse increased interstitial and alveolar density in ventral lung fields—changes compatible with a diagnosis of pneumonia. Intravenous fluids and insulin were initiated. Antibiotics (cefazolin and enrofloxacin) were administered for the pneumonia and cystitis.

DJ was discharged two days later. Insulin and antibiotics were continued. Respiratory function steadily improved and antibiotics were discontinued after three weeks. Cataplex® GTF and Pancreatrophin PMG® (Standard Process Inc.) were initiated at one tablet of each SID. DJ accepted these when they were crushed and mixed with food. Cataplex® GTF contains a biologically active form of chromium called glucose tolerance factor (GTF), which supports the action of insulin. Pancreatrophin PMG® contains the Protomorphogen™ extract of pancreas along with several whole food concentrates—all designed to provide nutritional support for healthy pancreatic function.

The insulin dose was gradually increased over two months until, at 14 Units ultralente (a long-acting form of insulin) SID, DJ had a hypoglycemic episode and was treated at the local emergency clinic. The increasing insulin dose was needed to adequately control blood glucose elevation. After obtaining a glucose response curve, individual blood samples were drawn on a regular basis at the approximate time of maximum insulin activity, and therefore the presumed nadir of
blood glucose. Adjustments were made in the insulin dose according to these results. On 3/23/00, DJ’s glucose was 364 mg/dL. Insulin was increased to 14 Units from 12 Units. On 4/6/00, his blood glucose was 85.4 mg/dL. DJ was active and eating well without polyuria/polydipsia. The hypoglycemic episode occurred on 4/20/00.

After that incident, his insulin dose was reduced to approximately half the previous dose and was gradually increased over the following twelve months to a high of 10 Units SID.

Over the span of several months in 2000, DJ was gradually switched from Hill’s c/d food to Wysong Vitality. He discontinued Wysong Biotic and continued supplementation with Missing Link daily on the food. He continued the Cataplex® GTF and Pancreatrophin PMG®.

DJ’s owner demonstrated an amazing ability to observe and monitor the cat’s blood sugar and insulin dose at home. Such compliance is uncharacteristic of many pet owners. Once she established and understood the correlation between DJ’s behavior and his blood glucose, she was flawless in her determination of his need for more or less insulin on any given day. With this ability and blood glucose measurements taken every two to four weeks, DJ’s insulin dosages began decreasing in July 2000. By September 2000 insulin was being administered only once every two or three days and injections were discontinued altogether by October 2000.

There were no further signs of respiratory infection or herpetic keratitis after the spring of 2000.

DJ continued on Immuplex®, Cataplex® GTF; Pancreatrophin PMG®, and Cardio-Plus®, SID for the next year. He was eating Wysong Vitality with added Missing Link.

In August 2001, in preparation for a dental prophylaxis and grooming, a routine pre-anesthetic CBC indicated leukocytosis (26,000; normal range=5,000-15,000) with neutrophilia (16,900; normal range=2,500-11,300), band neutrophils at 1,300 (normal=rare), and lymphocytes at 3,640 (normal range=1,400-6,100). Eosinophils were 3,380 (normal range=0-1,500). The serum chemistry profile revealed an elevated BUN (41.7 mg/dL; normal range=0.8-1.8 mg/dL). Because of prior vaccination, feline leukemia virus was not suspected at this time so testing was not performed.

Follow-up results two weeks later showed only slight changes: WBC at 19,800; BUN at 47.8 mg/dL; and creatinine at 2.5 mg/dL. Dental prophylaxis and whole body clip was performed on 9/11/01 using IV fluids and general anesthesia.

Two weeks later, DJ’s owner applied an over-the-counter topical flea control product and DJ soon developed a large area of erythema and moist dermatitis in the dorsal cervicothoracic area where the product had been applied. Within two days, the owner noticed dyspnea developing. Radiographs were compatible with pneumonia again, with an increase in interstitial density visible throughout the lungs. DJ’s clinical signs improved with antibiotic therapy but the leukocytosis and immature neutrophilia did not improve.

DJ developed a progressive azotemia during the month of October 2001 and had poor appetite, weight loss, and a generally deteriorating condition. Subsequently, ascites developed and DJ became completely anorexic. A peritoneal fluid sample was obtained and examined cytologically. A diagnosis of lymphoma was made based on the large number and typical appearance of lymphocytes in the fluid.

DJ was euthanized on 11/01/01 without necropsy.

Final Thoughts

Although DJ succumbed to complications of his disease state, I believe his quality and quantity of life was greatly improved by the dietary changes undertaken by his owner and the use of supportive whole food supplements. DJ had received the usual annual feline vaccinations, including feline leukemia virus, for several years. Feline herpes virus/calici virus/panleukopenia virus combination and feline leukemia virus vaccines were discontinued after coming under my care in 1998. DJ and the other cats in the home were strictly indoor pets and did not require these. It is unknown if DJ had previously been tested for feline leukemia virus (FelV) antigen or feline immune deficiency virus antibodies. It is unclear if either may have been a contributing agent or predisposing factor in the eventual development of lymphoma or the chronic herpes virus infection. DJ was strictly an indoor cat and the assumption was made that he had been tested prior to initiating FelV vaccinations.
I did not suspect FeLV as a contributing factor until after the diagnosis of lymphoma, and testing at that time would have been pointless.

Infectious disease and the resultant inflammation are known to contribute to the development of diabetes in a number of ways including the induction of inflammatory cytokines resulting in glucose transport protein dysfunction and insulin resistance. Ironically, alterations in carbohydrate tolerance can lead to increased inflammatory reactions further impacting on insulin sensitivity.

I believe the herpes infection likely contributed to the development of the initial episode of pneumonia. The resolution of signs of chronic upper respiratory infection preceding the decline in exogenous insulin administration suggests that the underlying viral infection was a major contributor to the onset of clinical diabetes. Thus, the enhanced immune response to the virus and the ability to induce an inactive latent state appears to have resulted in the normalization of insulin sensitivity.

The initial goal of nutritional therapy and supplementation was to enhance the immune response to assist the body in eliminating or causing latency of the herpes virus. Specific supplementation was continued even after the diagnosis of diabetes. By providing appropriate support for enhanced immune function, the viral infection was eventually controlled and the insulin resistance or antagonism resolved, eliminating the need for insulin therapy. This improved DJ’s quality of life.

This case helps to illustrate the powerful role that concurrent viral or bacterial infections may play in the development of NIDDM and also the value of nutrition and select Protomorphogen™ extracts to support healthy immune and pancreatic function.

As stated previously, NIDDM can transition into IDDM with time and deterioration of islet cell function. Therefore, cellular support utilizing pancreatic Protomorphogen™ extract may be valuable in supporting islet cell function and the overall health of the pancreas. Also, supplementation of specific endocrine tissue Protomorphogen™ extracts would be expected to enable better function and repair in the face of the enhanced pro-inflammatory environment induced by the disease processes and insulin insensitivity.

References


