Appendix III: Protocol for Success in Managing Feline Diabetes

This protocol consists of three indispensable parts: proper diet for the obligatory carnivore that is diabetic, proper drug/hormone therapy (that is, the right insulin), and proper use of that drug therapy and that diet to restore the patient to normal pancreatic function.

I. Diet

Because improper diet is the cause of type II diabetes mellitus in the cat, diet must be the foundation of the management of this disease. Although the veterinary profession has been conditioned to believe that high-fiber dry diets are capable of assisting in the management of feline diabetes, the reality is that this disease has historically been extremely difficult to deal with *because* of this mistaken belief. The practice of using dry form, high-fiber diets for our diabetic patients **is utterly in error.** In fact, high-fiber dry foods have two massive flaws. The first is the high amount of carbohydrate in them (no, they are not immune from the requirement of extruded foods for high cereal content) which promotes high blood glucose notwithstanding the fiber contained in them. These diets are usually "low fat" as well as high-fiber and because of this, much of the usual fat in the formula has been replaced with even more digestible carbohydrate than is present in regular formulas (in the highly mistaken belief that it is dietary fat that makes cats fat).

The second serious flaw is the high fiber itself. As an obligatory carnivore, the cat's GI tract is short compared with that of the dog or humans. During evolution, the cat's gastrointestinal tract adapted to the intake of calorie-dense, vegetation-poor foods by reducing its length and ability to undertake prolonged digestion of fibrous foods.

High fiber foods ignore this fact, providing an unnatural burden on the feline GI tract that results in excessive system bulk and reduced nutrient absorption.

Therefore, to manage feline type II diabetes, the patient *must* be provided a diet that is high in protein, moderate in fat, and ultra low in carbohydrate, especially carbohydrate from extruded cereals and those with high glycemic indices, like corn and potato. No feline diabetic should eat any type or brand of dry food. This includes all of the dry formulas labeled as "for the management of diabetes." Allowable foods include low-fiber canned foods designated "for the management of diabetes," and a number of other brands of canned or pouched foods with low carbohydrate content. Raw meat can also make an excellent diet for cats, diabetic and non-diabetic alike.

To find a good wet commercial food for any cat, be sure to read the label on the can or pouch. If you see ingredients like corn flour, corn grits, corn gluten, rice or rice four, potato, sweet potato, carrots or any kind of fruit, don't feed that food. Cats do not need cereals, vegetables or fruit. These ingredients are included because they appeal to the pet food purchaser. They have nothing whatsoever to do with good feline nutrition. Not only will a low carbohydrate canned food reduce the wide blood glucose swings seen in feline diabetics, it will also reduce the pathologic overeating seen in cats consuming dry foods that provide little or no sense of appetite satisfaction.

I. Proper insulin

Protamine zinc insulin is, by far, the most effective form of insulin available for use in the diabetic cat today. Beef and pork insulin molecules (beef is closer than pork) more closely resemble natural feline insulin and give the greatest response for the lowest

dosages in the vast majority of feline diabetics. It can be dosed at 6-12 hour intervals and, because many canned or pouched cat foods are supportive of low blood glucose from diet, PZI allows good control of the diabetic cat, far superior to that from NPH, Humulin insulin or the newer human products called Lantus (glargine) or Levemir.

Although one small study has shown that Lantus (glargine) can be used to create remission in new diabetics on low-carb (wet only) cat foods, this study does not really prove that Lantus is superior to PZI as the method of use of the PZI in the study was not optimal and considering that brand new diabetics will readily go into remission regardless of the insulin used as long as low-carbohydrate wet foods are fed to these cats. In my experience with this human insulin, the effects of Lantus in the cat are far more unpredictable than that of PZI, making regulation and remission more difficult to achieve. Further, Lantus is a human insulin product and at least theoretically more antigenic (allergy producing) in the cat than the bovine-origin PZI insulins. Bovine insulin has a much closer amino acid structure to the cat's own insulin than does human insulin, a likely explanation for it superior results in managing feline diabetics.

II. Blood glucose control strategy-Tight Regulation

It is "conventional wisdom" that hypoglycemia in the feline diabetic is to be feared more than any other eventuality. Thus, most traditional protocols perpetuate the patients' diabetes because maintaining a patient's blood glucose in the range above normal (greater than 120-150) insures that the cat will never recover from its disease. While hypoglycemic seizures are to be avoided, no question, it is not necessary to keep a patient's blood glucose above 200mg/dl, or even above 150, to accomplish this. Through

its evolved physiology, the cat *prefers* to function at blood glucose levels below 100! In fact, if we could test our healthy patients without the stress of the hospital environment elevating their blood glucose levels in our clinics, we would realize that most cats are perfectly happy with levels around 60! In nature, most of the cats' blood glucose is glucose produced by its liver from protein amino acids on an "as needed" basis. Large sugar surges from dietary carbohydrate intake, well tolerated by omnivores and herbivores, are essentially unknown to the cat in the wild setting and are clearly unwelcome as well.

Elevated blood glucose is either toxic or suppressive (or both) of the feline pancreas, a fact no doubt related to the almost vestigial nature of this function in a species that evolved with little need to process dietary carbohydrate. Therefore, the objective of managing the feline diabetic is to assist the cat's pancreas to resume some or all of its normal function. This is virtually always possible in the cat that has been diabetic for a short period of time. As a matter of fact, brand new diabetics often respond to a change of diet alone, and never need insulin because the pancreas has not really gone "dormant" from chronic hyperglycemia at that point.

Immediate relief from dietary glucose overload can allow immediate reactivation of the cat's own pancreatic capabilities. The cat with acute diabetes, however, like its more chronic colleagues, will **never** be able to consume high carbohydrate (dry) foods again for its entire life, and its owners must understand this. Such a cat will become diabetic very quickly once again if its pancreas is stressed again by high sugar foods, or steroid medications, which are toxic in the previously-diabetic as well as the dry-food-fed cat.

In the more chronic diabetic, diet alone will often not provide immediate cure. Those cats that have been diabetic a long time, especially those that have been poorly controlled with dry foods and insulin types other than PZI, the road to cure will be longer. This is only logical. The intoxication/suppression of the pancreas in these cats has been prolonged and severe, and in some cases there may be no residual function left at all. However, you will not be able to predict with certainty merely from the duration of the cat's disease process whether or not a particular cat can been cured.

We have seen cats with relatively long histories respond well, in time (several months), to proper regulatory efforts. Even those that never come completely off insulin due to the duration of their disease and its improper management are much healthier and more clinically normal on a low carbohydrate diet and PZI insulin at the right dose than they have been previously. **For those cats that do not resume normal pancreatic function with diet alone, the objective of PZI insulin therapy is to bring the cat into a normal range of blood glucose (80-130) and keep it there!** I cannot emphasize this enough.

Because continual high blood glucose perpetuates the pancreatic suppression/toxicity that has caused the diabetes in the first place, cure can only happen if insulin is used to effectively bring the diabetic cat into the normal range for glucose in this species. Most normal cats operate when relaxed between 60-100! As long as you feed low carbohydrate wet foods, you will not cause seizures in your pet. In hundreds of cats that I have put through this protocol using low carbohydrate foods, I have never caused a single one to seizure, despite taking many well below 100 mg/dl. To rescue their pets, diabetic cat owners must give up the fear they have been taught about taking a

diabetic cat into the normal blood glucose range, or the diabetic cat will always be diabetic.

The method of managing the feline diabetic that I use has been called "Tight Regulation." This name describes the fact that this protocol uses proper diet and the correct insulin to bring the cat's blood glucose levels into a tight range around normal for healthy cats. In so doing, it can cause permanent remissions in even chronically ill cats. One of the unique features of this method is the practice of hometesting. I recommend that all owners of diabetic cats purchase a glucometer (the kind human diabetics use to test their own blood sugar levels) at their local pharmacy. Learning to use such a device on a cat is simple and easy; I have never had a client who could not learn to use a glucometer with great skill in a very short time (see www.felinediabetes.com/bg-test.htm). Once you are hometesting, you have all the information you need, at your fingertips, to manage your cat's diabetes, perhaps even managing it right out of existence!

PZI insulin has a peak activity time in most cats at 6-8 hours after injection. This means that the blood glucose level in the diabetic cat will be at its lowest point 6-8 hours after the last dose of insulin. After this time, it will begin to rise again until another dose of insulin is injected. Because of this, I ask my clients to perform a blood glucose test at 6-8 hours after each dose. If the blood glucose is still above the normal range (greater than 150) then another injection of insulin is warranted. In the beginning days of tight regulation, owners typically test three to four times per day and often give insulin, in doses dictated by the blood glucose reading at each test, this often as well.

This may seem very time and effort intensive, and compared to the usual once daily or twice daily "blind" dosing of insulin that traditional protocols call for, it is more

work. However, the benefits of Tight Regulation are huge, and every one of my clients that has tried this method is glad they did. Their cats feel better, are more active and playful, and regain better body condition than they ever experienced using the "old" methods. Further, over a few days or weeks, many cats require smaller and smaller doses of insulin, less often, and the majority go off insulin altogether over time. The extra time and effort invested in the beginning of Tight Regulation is repaid manifold as the patient becomes well again!

The following is a suggested "sliding scale" for the cat just starting Tight Regulation. The protocol asks the owner to test at least twice daily, but optimally three or four times daily (every 6-8 hours), with doses of insulin given according to the reading at each test:

Blood Glucose mg/dl	Units of Insulin to Inject
151-170	.5
171-185	1
186-200	1.5
201-220	2
221-250	2.5
251-290	3
291-350	3.5
351-410	4

Using this protocol, you can expect to start seeing some very "normal" numbers within a few days or weeks of starting. As long as you are feeding your cat ONLY low-carbohydrate foods, you do not need to be fearful of clinical hypoglycemia. In fact, those blood glucose numbers in the 60-120 range are the objective of the protocol. Even if the blood glucose drops to 30-50, do not feed sugar syrup or dry food. A small, high protein wet food meal is all you need for a cat at these numbers and that is more for the owner than the cat. As time passes, smaller doses will achieve the same results that larger ones

once did, and you will even start skipping doses as you test and find the blood glucose is still in the normal range many hours or even days after the last dose of insulin. When this happens, you will know your cat's own pancreas is beginning to function on its own. For more information on this method, see www.yourdiabeticcat.com.

A final note. Some veterinarians use a test called a fructosamine test to determine the level of diabetes control in a particular patient on insulin. This test was valuable before the days when owners started hometesting their own cats. The frucosamine test measures a rough "average" of the amount of glucose in the cat's circulation over the 3 weeks or so preceding the test. If the fructosamine test gives a high value, meaning the cat is not well regulated, a blood glucose curve is then done to determine how to adjust the cat's insulin. Because pet owners who home test are already doing their own curves at home, yielding more precise information for making these insulin on a day to day basis, the fructosamine test gives no useful additional information in such cases.