



SUMMARY

ROYAL CANIN Veterinary Diet^{TM/MC} feline DIABETIC DS 44^{TM/MC} is a complete and balanced diet that has been formulated with high protein, moderate energy, and reduced carbohydrate concentrations to assist with the nutritional management of feline diabetes mellitus.

INDICATIONS

- Diabetes mellitus

CONTRAINDICATIONS

- Renal disease
- Hepatic encephalopathy

NUTRITIONAL DIFFERENCES

(as compared to typical commercial pet foods)

- High protein
- Low levels of carbohydrate
- Low glycemic index carbohydrates
- Enriched with antioxidants
- Moderate amounts of fermentable and viscous fiber
- Supplemented with L-Carnitine

RATIONALE

Diabetes mellitus is a chronic endocrine disorder characterized by an imbalance in the metabolism of carbohydrate, fat and protein.

Type II diabetes mellitus is the most common type of diabetes in the cat. Hallmarks of this disease are impaired insulin secretion and peripheral insulin resistance that may eventually result in pancreatic β -cell exhaustion and absolute insulin deficiency. The absolute or relative insulin deficiency allows uncontrolled glucagon-driven gluconeogenesis by the liver. The increased glucose production by the liver in conjunction with reduced glucose uptake by insulin dependent tissues culminates in hyperglycemia and the clinical signs of polyuria, polydipsia, and weight loss. In addition, the relative or absolute insulin deficiency stimulates the release of free fatty acids by adipose tissue and stimulates protein degradation to release gluconeogenic amino acids.

**FELINE**

Risk factors for diabetes mellitus include obesity, decreased physical activity, genetics, and gender.

It has been shown that obese cats have altered glucose tolerance curves suggestive of a decreased sensitivity to insulin. This decreased insulin sensitivity may progress to overt diabetes mellitus.

Conversely, weight reduction has been shown to improve glycemic control. Indeed, diabetes mellitus may actually resolve in some diabetic cats with correction of the obese state. Therefore, weight maintenance is paramount to the management of feline diabetes mellitus. Moderate energy intake with a low carbohydrate and high protein content should be provided to promote ideal body weight and preservation of lean body mass.

Carnitine, a quaternary amine, is critical for fatty acid metabolism and energy production. L-Carnitine functions as a transport shuttle to move long chain fatty acids into the inner mitochondria membrane for oxidation. In addition, L-carnitine transports toxic compounds out of the mitochondria and modulates the intramitochondrial coenzyme A/acyl-coenzyme A ratio, a key component in the regulation of the citric acid cycle. Carnitine has been shown, in cats, to increase the rate of fatty acid oxidation and accelerate the rate of weight loss. L-carnitine may also promote maintenance of lean body mass during weight reduction.

Both the amount and type of dietary carbohydrate have a significant influence on post-prandial insulin secretion. Diets that are rich in simple sugars should be avoided as they perpetuate post-prandial hyperglycemia.

Traditionally, diets high in complex carbohydrate have been utilized in the management of diabetes mellitus. These high carbohydrate diets induce high post-prandial blood glucose concentrations and place additional stress on exhausted pancreatic β -cells. Carbohydrates such as barley and corn have a low glycemic index producing a smaller post-prandial glucose and insulin rise. Therefore, diets for managing feline diabetes mellitus should contain low concentrations of carbohydrate. The carbohydrate source should have a low glycemic index.

High fiber diets increase the frequency of defecation, may contribute to constipation/obstipation, and are often less palatable which may result in weight loss. However, moderate amounts of fermentable fiber may be beneficial in the management of impaired glucose tolerance. Fermentation of fiber by intestinal bacteria produces short chain fatty acids which stimulate the release of proglucagon from the enterocytes. Proglucagon is broken down to glucagon-like-peptide (GLP-1) which increases insulin secretion from the pancreatic islet cells. In addition, GLP-1 may suppress the appetite. Therefore, fermentable fiber may improve glucose metabolism and induce satiety in diabetic cats.

Mucilages such as psyllium are also beneficial in the management of diabetes mellitus. Mucilages form a viscous gel that is effective in slowing the absorption of carbohydrates by prolonging gastric emptying. Mixing cereals of low glycemic index in conjunction with the gelling action of psyllium mucilages reduces post prandial hyperglycemia, lowers insulin secretory response, and may retard the development of insulin β -cell burnout.

Cats have a high dietary protein requirement and prefer to convert protein to glucose (gluconeogenesis). Therefore, if diabetic cats are provided with high concentrations of protein, the excess protein is used as a substrate for glucose production. The glucose derived from hepatic gluconeogenesis is delivered to the blood stream at a slow, constant rate compared to the glucose derived from dietary carbohydrate. Consequently, high protein diets facilitate optimal blood glucose concentrations and may also be associated with lower insulin concentrations.

Diabetes mellitus is associated with progressive destruction of pancreatic β -cells. A growing body of evidence suggests that reactive oxygen species are involved in both β -cell destruction and the chronic complications of diabetes mellitus. Indeed, the release of cytotoxic reactive oxygen species may be important in beta cell apoptosis and progression to overt diabetes mellitus. Antioxidants are, therefore, indicated in the nutritional management of diabetes mellitus.



GENERAL FEEDING RECOMMENDATIONS

- Daily feeding recommendations may be divided into two to four meals.
- Fresh water should be available at all times.
- Individual requirements may vary depending on breed, age, sex, environment, and activity level.
- Maintain a consistent feeding schedule. The frequency of feeding and the caloric content of each meal should be consistent to enhance the action of insulin and minimize post-prandial hyperglycemia. Food should be offered at the same time each day, ideally, to coincide with the time of the peak insulin activity.
- **Caution** – Feeding DIABETIC DS 44^{TM/MC} diet may increase the cat's sensitivity to insulin. It is strongly recommended to monitor blood glucose concentrations and insulin response when starting DIABETIC DS 44^{TM/MC} diet as frequent adjustments in insulin therapy may be necessary to avoid a hypoglycemic crisis.

FEEDING GUIDE

FEEDING RECOMMENDATIONS FOR FELINE MAINTENANCE

Body Weight		Suggested Caloric Intake kcal/day	Daily Feeding
lb	kg		Dry Only (8-oz cups/day)
5	2.3	136	1/2
7	3.2	191	3/4
9	4.1	245	1
11	5.0	299	1 1/4
13	5.9	354	1 1/2
15	6.8	408	1 2/3
17	7.7	463	1 3/4

PRODUCT DESCRIPTION

ROYAL CANIN Veterinary Diet™/MC feline DIABETIC DS 44™/MC is a complete and balanced diet that has been formulated with high protein, moderate energy, and reduced carbohydrate concentrations to assist with the nutritional management of feline diabetes mellitus.

NUTRITION STATEMENT

DIABETIC DS 44™/MC is formulated to meet the nutritional levels established by the AAFCO Cat Food Nutrient Profiles for adult maintenance.



Moderate energy intake to promote optimal body condition and minimize insulin resistance associated with obesity.



Mixing cereals of low glycemic index (barley, corn) in conjunction with the gelling action of psyllium mucilages reduces postprandial hyperglycemia.



High protein content to promote slow, steady glucose production via gluconeogenesis.



Naturally preserved with mixed tocopherols, rosemary extract, and citric acid.

GUARANTEED ANALYSIS

Crude Protein, (min)	44.0%
Crude Fat, (min)	10.0%
Crude Fiber, (max)	6.0%
Moisture, (max)	8.5%

METABOLIZABLE ENERGY

From Protein	47.5%
From Fat	27.9%
From Carbohydrate	24.6%

Approximately 247 kcal per 8-oz cup; 387 kcal per 100 g; 64 g per cup.

INGREDIENTS

CHICKEN MEAL, CORN GLUTEN MEAL, GROUND BARLEY, SOY PROTEIN ISOLATE, GROUND CORN, NATURAL FLAVORS, CELLULOSE POWDER, CHICKEN FAT, BROWN RICE, BEET PULP, FISH OIL, VEGETABLE OIL, GROUND PSYLLIUM SEED, POTASSIUM CHLORIDE, INULIN, CHOLINE CHLORIDE, POTASSIUM CITRATE, TAURINE, GREEN TEA EXTRACT, SODIUM CHLORIDE, VITAMINS [DL-ALPHA TOCOPHEROL (SOURCE OF VITAMIN E), L-ASCORBYL-2-POLYPHOSPHATE (SOURCE OF VITAMIN C*), NIACIN, BIOTIN, RIBOFLAVIN (VITAMIN B2), D-CALCIUM PANTOTHENATE, PYRIDOXINE HYDROCHLORIDE (VITAMIN B6), THIAMINE MONONITRATE (VITAMIN B1), VITAMIN B12 SUPPLEMENT, VITAMIN A ACETATE, VITAMIN D3 SUPPLEMENT, FOLIC ACID], L-CARNITINE*, TRACE MINERALS [ZINC OXIDE, ZINC AMINO ACID CHELATE, FERROUS SULFATE, COPPER SULFATE, COPPER AMINO ACID CHELATE, MANGANOUS OXIDE, MANGANESE AMINO ACID CHELATE, SODIUM SELENITE, CALCIUM IODATE], MARIGOLD EXTRACT, PRESERVED WITH NATURAL MIXED TOCOPHEROLS, ROSEMARY EXTRACT, AND CITRIC ACID.

*Not recognized as an essential nutrient by the AAFCO Cat Food Nutrient Profiles.



FELINE

TYPICAL ANALYSIS

Nutrient	Unit	Per 100 g as fed	Per 1000 kcal
Moisture	g	7	
Protein	g	46.0	118.8
Fat	g	12.0	31.0
Carbohydrate	g	23.8	61.5
Ash	g	6.2	16.0
Crude Fiber	g	5.0	12.9
Total Dietary Fiber	g	10.0	25.8
Minerals			
Calcium	g	0.90	2.32
Phosphorus	g	0.85	2.20
Sodium	g	0.40	1.03
Chloride	g	0.75	1.94
Potassium	g	0.95	2.45
Magnesium	g	0.09	0.23
Copper	mg	3.0	7.7
Iron	mg	21.0	54.2
Zinc	mg	19.5	50.4
Manganese	mg	5.5	14.2
Iodine	mg	0.30	0.77
Selenium	mg	0.020	0.052
Vitamins			
Vitamin A	IU	2500	6457
Vitamin D3	IU	130	336
Vitamin E	mg	55	142.05
Thiamine (B1)	mg	3.4	8.8
Riboflavin (B2)	mg	7.0	18.1
Niacin	mg	24.0	62.0
Pyridoxine (B6)	mg	6.0	15.5
Pantothenic Acid	mg	8.0	20.7
Folic Acid	mg	1.75	4.5
Cobalamin (B12)	mg	0.03	0.077
Biotin	mg	0.44	1.14
Choline	mg	400	1033
Fatty Acids			
Linoleic acid	g	3.1	8.0
Arachidonic acid	g	0.06	0.15
Amino Acids			
Arginine	g	2.45	6.3
Lysine	g	1.9	4.9
Methionine	g	1.0	2.6
Methionine + Cystine	g	1.6	4.1
Taurine	g	0.23	0.6



ORDERING INFORMATION

Bag Size	Weight		Item Code
	lb	kg	
Small	2	0.91	29202
Medium	5	2.27	29205
Large	n/a	n/a	n/a



REFERENCES

- Biourge V, Nelson RW, Feldman EC, et al. Effect of weight gain and subsequent weight loss on glucose tolerance and insulin response in healthy cats. *J Vet Intern Med* 1997;11:86-91.

