

SUMMARY

ROYAL CANIN Veterinary Diet^{TM/MC} canine HEPATIC LS 14^{TM/MC} is a highly palatable, digestible, low copper, modified vegetable protein diet formulated to aid the dietary management of hepatic disease in dogs.

INDICATIONS

- Hepatic insufficiency
- Hepatic disease
- Hepatic encephalopathy
- Portosystemic shunts
- Disorders of copper metabolism

CONTRAINDICATIONS

- Growing puppies
- Pregnant or lactating bitches
- Dogs with high energy requirements (e.g., working dogs)

NUTRITIONAL DIFFERENCES

(as compared to typical commercial pet foods)

- High energy density from non-protein sources
- Restricted levels of high quality vegetable protein (soy protein isolate)
- Highly digestible complex carbohydrates
- Elevated levels of dietary fiber from both soluble and insoluble fibers
- Increased zinc content
- Restricted copper content
- Moderately restricted sodium content
- Enhanced levels of B-vitamins
- Enriched with antioxidants
- Enriched with ω -3 fatty acids



RATIONALE

The liver performs many vital functions with respect to nutrient digestion and metabolism (homeostasis of blood glucose, amino acids, and trace elements), detoxification, excretion, hematology, coagulation, and hormonal balance. These functions are impaired to varying degrees in dogs with hepatic insufficiency as the result of either loss of functional tissue mass or portosystemic shunting. Nutritional support in liver disease is based on several primary factors:

- Reducing the metabolic demands placed upon the liver
- Maintaining optimal body weight and lean body mass while avoiding hepatic encephalopathy
- Overcoming nutritional deficiencies due to loss of hepatic function
- Protecting against ongoing hepatocellular damage
- Providing nutrients for hepatocyte regeneration and repair
- Minimizing inflammation, fibrosis, and complications such as ascites

HEPATIC LS 14^{TM/MC} is formulated to meet these objectives with modified levels of protein, carbohydrate, fiber, zinc, copper, sodium, B vitamins and antioxidants.

Protein

The liver is the major site of protein synthesis, amino acid metabolism, and the detoxification of nitrogenous waste products. Liver disease is typically associated with reduced synthesis of serum proteins and reduced ability to detoxify and excrete nitrogenous waste products such as ammonia. Protein malnutrition is common and manifests as weight loss, loss of muscle tissue, and hypoalbuminemia. Therefore, a sufficient supply of protein is necessary to maintain lean body mass and protein synthesis.

Excessive protein intake should be avoided as it is associated with increased production of ammonia potentially precipitating hepatic encephalopathy. A moderate reduction in protein intake is, therefore, recommended to prevent or reduce the clinical signs of hepatic encephalopathy. Furthermore, the type of protein fed can influence this risk. Poor quality proteins and meat based proteins have been suggested to exacerbate hepatic encephalopathy. Conversely, vegetable proteins such as soy protein isolate are high quality proteins containing lower concentrations of nitrogenous compounds (e.g. RNA, DNA etc). Hence, because of these virtues, soy protein isolate is recommended in liver disease.

Energy

Hepatocellular dysfunction is accompanied by derangements in carbohydrate metabolism that result in glucose intolerance and inability to maintain blood glucose concentrations. This dysfunction can stimulate catabolism of muscle proteins for gluconeogenesis. To avoid skeletal muscle wasting, it is vital to provide sufficient energy in the form of dietary fat and carbohydrates to prevent skeletal muscle catabolism. Dietary provision of complex carbohydrates, rather than simple sugars, can be of benefit by smoothing the postprandial glycemic response, reducing insulin requirements, and the glucose load presented to the liver. Carbohydrates also promote an insulin to glucagon ratio that favors an anabolic state in which amino acids absorbed from the small intestine are converted to protein rather than glucose. This also reduces the production of ammonia that accompanies the utilization of amino acids for gluconeogenesis.

Fiber

Dietary fiber can modify the production, absorption, and elimination of ammonia and other neurotoxic microbial by-products from the large intestine. Fermentable fibers such as beet pulp and fructo-oligosaccharides (FOS) stimulate the incorporation of nitrogenous waste products into intestinal bacteria. Bacterial fermentation of fiber can also alter the colonic pH and reduce the production and absorption of ammonia. Through these dual mechanisms, fiber may reduce the risk of hepatic encephalopathy. HEPATIC LS 14™^{TM/MC} contains a blend of soluble and insoluble fiber, and adequate dietary protein for the control of hepatic encephalopathy.

Minerals

Zinc deficiency may occur due to poor dietary intake, reduced intestinal absorption, and increased urinary losses. Zinc is an important cofactor involved in the detoxification of ammonia via the urea cycle. Zinc deficiency may result in increased blood ammonia concentrations. Dietary zinc supplementation may inhibit collagen production in the liver and reduce hepatic fibrosis. Zinc may also protect hepatocytes from free radical injury. Most importantly, zinc inhibits the absorption of copper from the small intestine through induction of metallothionein.

Metallothionein is a protein that irreversibly chelates copper. The chelated complex is then excreted in the feces. With chronic hepatic disease and copper storage diseases, copper accumulates within the liver. The accumulation of copper within hepatocytes initiates free radical generation, oxidative injury, and activation of collagen synthesis. The ultimate result is hepatocellular necrosis, sustained inflammation, and progressive fibrosis. Restriction of dietary copper intake, along with zinc supplementation, will reduce copper accumulation and its associated effects in dogs with chronic liver disease.

Excessive dietary sodium, particularly in patients with hypoalbuminemia or portal hypertension, can precipitate the formation of ascites. Therefore, dietary intakes of sodium should be moderate in patients with liver disease. HEPATIC LS 14™^{TM/MC} is supplemented with zinc, enriched with antioxidants, moderately restricted in sodium, and severely restricted in copper.

Antioxidants

There is evidence that free radicals play an important role in the pathogenesis of liver disease. Antioxidant supplementation may help to minimize hepatocellular necrosis, reduce inflammation, slow fibrosis, and, hence, minimize progression.



GENERAL FEEDING RECOMMENDATIONS

- Daily feeding recommendations may be divided into two to four meals. Frequent feedings will help to maximize energy intake in anorectic patients, optimize nutrient digestion and uptake, and afford better protein and glucose tolerance.
- Fresh water should be available at all times.
- Individual requirements may vary depending on breed, age, sex, environment, and activity level.

FEEDING GUIDE

FEEDING RECOMMENDATIONS FOR ADULT DOG MAINTENANCE

Body Weight		Suggested Caloric Intake	Daily Feeding
lb	kg	kcal/day	Dry Only (8-oz cups/day)
5	2.3	231	2/3
10	4.5	389	1 1/4
20	9.1	653	2
30	13.6	886	2 2/3
40	18.1	1099	3 1/4
50	22.7	1299	3 3/4
60	27.2	1489	4 1/3
70	31.8	1672	5
80	36.3	1848	5 1/3
90	40.8	2019	6
100	45.4	2185	6 1/3
110	49.9	2347	6 3/4
120	54.4	2505	7 1/3
130	59.0	2660	7 3/4
140	63.5	2812	8 1/4
150	68.0	2961	8 2/3

PRODUCT DESCRIPTION

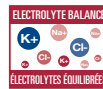
ROYAL CANIN Veterinary Diet™/MC canine HEPATIC LS 14™/MC is a complete food intended for adult dogs with hepatic disease. It contains a moderate level of high quality vegetable protein, elevated levels of dietary fiber, increased zinc, and restricted copper. The diet is enriched with antioxidants.

NUTRITION STATEMENT

HEPATIC LS 14™/MC is intended for intermittent or supplemental feeding only.



Low copper and increased zinc content minimizes both copper accumulation in the hepatocytes and intracellular lesions caused by cholestasis.



Limited sodium intake decreases portal hypertension and reduces extravascular water flow.



Contains highly digestible vegetable protein (soy protein isolate), which is better tolerated in dogs with hepatic encephalopathy.



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

GUARANTEED ANALYSIS

Crude Protein, (min)	14%
Crude Fat, (min)	14%
Crude Fiber, (max)	3.7%
Moisture, (max)	10.5%

METABOLIZABLE ENERGY

From Protein	15.5%
From Fat	34.8%
From Carbohydrate	49.7%

Approximately 342 kcal per 8-oz cup; 413 kcal per 100 g; 83 g per 8-oz cup.

INGREDIENTS

RICE, GROUND CORN, CHICKEN FAT, SOY PROTEIN ISOLATE, NATURAL FLAVORS, DRIED BEET PULP, CALCIUM CARBONATE, POTASSIUM CHLORIDE, INULIN, VEGETABLE OIL, DICALCIUM PHOSPHATE, FISH OIL, DL-METHIONINE, CHOLINE CHLORIDE, L-LYSINE, TAURINE*, MONOSODIUM PHOSPHATE, VITAMINS [DL-ALPHA TOCOPHEROL ACETATE (SOURCE OF VITAMIN E), L-ASCORBYL-2-POLYPHOSPHATE (SOURCE OF VITAMIN C*), BIOTIN, D-CALCIUM PANTOTHENATE, NIACIN, PYRIDOXINE HYDROCHLORIDE (VITAMIN B6), VITAMIN A ACETATE, VITAMIN D3 SUPPLEMENT, THIAMINE MONONITRATE (VITAMIN B1), VITAMIN B12 SUPPLEMENT, RIBOFLAVIN (VITAMIN B2), VITAMIN K SUPPLEMENT, FOLIC ACID], L-CARNITINE*, MARIGOLD EXTRACT, TRACE MINERALS [FERROUS SULFATE, ZINC OXIDE, MANGANOUS OXIDE, SODIUM SELENITE, CALCIUM IODATE], PRESERVED WITH NATURAL MIXED TOCOPHEROL, ROSEMARY EXTRACT, AND CITRIC ACID.

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



CANINE

TYPICAL ANALYSIS

Nutrient	Unit	Per 100 g as fed	Per 1000 kcal
Moisture	g	9	
Protein	g	16.0	38.7
Fat	g	16.0	38.7
Carbohydrate	g	51.4	124.3
Ash	g	4.9	11.8
Crude Fiber	g	2.7	6.5
Total Dietary Fiber	g	7.5	18.1
Minerals			
Calcium	g	0.70	1.69
Phosphorus	g	0.50	1.21
Sodium	g	0.19	0.46
Chloride	g	0.66	1.60
Potassium	g	0.80	1.93
Magnesium	g	0.07	0.17
Copper	mg	0.4	1.0
Iron	mg	17.0	41.1
Zinc	mg	23.0	55.6
Manganese	mg	6.2	15.0
Iodine	mg	0.51	1.23
Selenium	mg	0.045	0.109
Vitamins			
Vitamin A	IU	1300	3143
Vitamin D3	IU	45	109
Vitamin E	mg	60	145
Thiamine (B1)	mg	1.2	2.9
Riboflavin (B2)	mg	0.7	1.7
Niacin	mg	4.5	10.9
Pyridoxine (B6)	mg	1.2	2.9
Pantothenic Acid	mg	3.5	8.5
Folic Acid	mg	0.13	0.3
Cobalamin (B12)	mg	0.013	0.031
Biotin	mg	0.12	0.29
Choline	mg	300	725
Fatty Acids			
Linoleic acid	g	4.0	9.7
Arachidonic acid	g	0.06	0.15
Amino Acids			
Arginine	g	1.0	2.4
Lysine	g	1.0	2.4
Methionine	g	0.72	1.7
Methionine + Cystine	g	1.0	2.4
Taurine	g	0.2	0.5



ORDERING INFORMATION

Bag Size	Weight		Item Code
	lb	kg	
Small	n/a	n/a	n/a
Medium	6	2.72	29006
Large	17.5	7.95	29018
Extra Large	n/a	n/a	n/a

REFERENCES

- Watson TDG. Nutritional management of canine liver disease. Proceedings of the Waltham Symposium on liver disease. 1996; p42-46.
- Biourge V. Nutrition and Liver disease. Seminars in Veterinary Medicine and Surgery (Small Animal) 1997;12:34-44.

