Canine Nutrition:

A Practical Approach

Relatively speaking, most dogs today eat a more nutritional diet than their owners do

Nutritional Requirements of the Dog

- Though a carnivore, the dog utilizes a wide variety of foodstuffs efficiently and can meet nutritional requirements from a diversity of diets
- Dogs regulate their food intake to meet energy requirements

  proper diets incorporate exact daily nutritional requirements into the amount of food consumed each day for energy

Factors Affecting the Dietary Needs of Dogs

Stages of the Life Cycle

- Growth requires about 2 X the intake of nutrients (per pound of body weight) compared to adult maintenance
- From the 6th week of gestation, nutritional requirements of the pregnant bitch gradually increase to about 1.6 X normal maintenance levels by the 8th week
- By the 4th week of lactation, nutritional requirements of the bitch peak at 2-4 X normal maintenance levels (litter size, temp, activity)

Environment

- Seasonal variations in environmental temperatures influence dietary intake

- Winter energy requirements may be as much as 2X the summer energy requirements

Exercise

- Working dogs (hunting dogs,sled dogs, racing dogs, herding dogs) may require up to 4X the maintenance energy requirements

- Dogs with limited exercise will require restricted calories to maintain fitness

Increased Metabolism

- Conditions such as hyperthyroidism, tissue injury, and fever increase metabolic rate and produce increased nutritional demands

Malnutrition and Weight Deficiency

- Dogs suffering from neglect, illness, or experiencing convalescence require up to 1.7X normal maintenance energy requirements

- Increases should be made gradually, utilizing small frequent feedings

Obesity and Excessive Weight

- Overindulged dogs receiving little exercise and fed poorly balanced diets (too many "people" treats) high in sugars and fats will benefit from restricted diets supplying only 0.6X maintenance energy levels
- Adding fiber to the diet (8% on a dry matter basis) may help to provide a "full" feeling despite decreasing rations

Disease

- Many diseases require modification of diet and maintenance energy requirements
- Chronic renal disease, congestive heart failure and gastrointestinal disorders are a few examples of diseases that require special nutritional considerations while compensating for metabolic or organ dysfunction

Determining Nutritional Requirements of the Dog

- The National Research Council provides guidelines for the daily nutrient intake for proper growth and maintenance of dogs in their *Nutrient Requirements of Dogs* (NRC) publication
- Nutrient profile, however, is NOT an indication of quality and digestibility and provides no assurance of a utilizable diet
- A more reliable assurance of nutritional quality is given by labels that state that the food has passed American Association of Feed Control Officials' (AAFCO) feeding trials

Determining Metabolizable Energy in Dog Foods

Examples of how ME values appear on labels

Dog Food

Calorie Content:
Metabolizable Energy (calculated):
3900 kcal/kg
3.90 kcal/g
936 kcal/cup

Required

Optional

Dog Food

Calorie Content:
Metabolizable Energy:
3900 kcal/kg
3.90 kcal/g
936 kcal/cup

This ME is determined by metabolic trial

Comparison of ME Values in some Dog Food Brands

AAFCO Designation	# Brands Surveyed	Average ME (kcal/g)	Range (kcal/g)
Maintenance: Science Diet, Innova Senior, Pro Plan Adult, Eukanuba Maintenance, Nutro, Nutro Max, Purina ONE Reduced, Nature's Recipe, Purina Senior	20	3.92	3.10 – 4.59
All Life Stages: Eukanuba Premium, Pro Plan Performance, Purina ONE, Iams, Pedigree Mealtime, Innova Dog/Puppy, Purina Dog Chow L ittle Bites, California Natural, Nutro Natural, Purina Hi-Pro, Purina ONE Puppy, Nutro Max, Alpo	25	4.13	3.59 – 4.82

Average Daily Calories Required by Pregnant and Lactating Bitches

Body Weight (lb)	***Multiples of Maintenance (kcal ME/day)***						
	1.0	***1.5***	***2.0***	***2.5***	***3.0***	***3.5***	***4.0***
2.5	145	218	290	363	436	508	581
5	244	366	487	611	733	855	977
7.5	331	497	662	828	994	1159	1325
10	411	616	822	1027	1233	1438	1644
15	557	835	1114	1392	1671	1949	2228
20	691	1037	1382	1728	2073	2419	2764
25	817	1225	1634	2042	2451	2859	3268
30	937	1405	1873	2342	2810	3278	3747
40	1162	1743	2324	2906	3487	4068	4649
50	1374	2061	2748	3435	4122	4809	5496
60	1575	2363	3151	3938	4726	5514	6301
70	1768	2652	3537	4421	5305	6189	7074
80	1955	2932	3909	4887	5864	6841	7819
90	2135	3202	4270	5338	6405	7473	8541
100	2311	3466	4622	5777	6932	8088	9243
120	2649	3974	5299	6623	7948	9273	10597
140	2974	4461	5948	7435	8922	10409	11896
160	3287	4931	6575	8218	9862	11506	13149

Example of ME Requirements Recommended for a CKCS Bitch During Various Life Stages

AAFCO Designation	ME (kcal/cup)	Growth (# cups/day)	Maintenance (# cups/day)	Pregnancy (# cups/day)	Lactation (# cups/day)
All Life Stages	1000	1/4 to 1	1/2	1	1-2/3
Maintenance	940	NR	2/3	NR	NR

* Estimated for a 15 pound CKCS

Protein Requirements

- Provides essential amino acids for growth and tissue repair
- Dogs require a minimum of 22% (G&R) or 18% (M) good quality protein, on a dry-matter basis
- The higher the quality of protein fed, the lower the % total protein needed in the diet
- Highly digested protein results in free amino acids and small peptides that are poorly antigenic (reduced risk of protein-related food allergy)
- Protein sources: meal, corn, eggs, dairy products, muscle or organ meats

Fat Requirements

- Supplies concentrated energy for growth, reproduction, and maintenance of healthy skin and coat
- Needed for inflammatory and other immune responses (including prostaglandin synthesis)
- Dogs require a minimum of 8% (G&R) or 5% (M) dietary fat, on a dry-matter basis (at least 1% from linoleic acid)

Vitamin Requirements

Vitamin	*Minimum*	*Maximum*
Vitamin A (IU/kg)	5000	250000
Vitamin D (IU/kg)	500	5000
Vitamin E(IU/kg)	50	1000
Thiamine (mg/kg)	1.0	
Riboflavin (mg/kg)	2.2	
Pantothenic Acid (mg/kg)	10	
Niacin (mg/kg)	11.4	
Pyridoxine (mg/kg)	1.0	
Folic Acid (mg/kg)	0.18	
Vitamin B12 (mg/kg)	0.022	
Choline (mg/kg)	1200	

Mineral Requirements

Mineral	*Minimum (G & R)*	*Minimum (M)*	*Maximum*
Calcium (%)	1.0	0.6	2.5
Phosphorus (%)	0.8	0.5	1.6
Ca:P ratio	1:1	1:1	2:1
Potassium (%)	0.6	0.6	
Sodium (%)	0.3	0.06	
Chloride (%)	0.45	0.09	
Magnesium (%)	0.04	0.04	0.3
Iron (mg/kg)	80	80	3000
Copper (mg/kg)	7.3	7.3	250
Manganese (mg/kg)	5.0	5.0	
Zinc (mg/kg)	120	120	1000
Iodine (mg/kg)	1.5	1.5	50
Selenium (mg/kg)	0.11	0.11	2

Evaluating Nutritional Quality

A. "Meets or Exceeds NRC requirements for Nutrient Requirements of the Dog"

B. "Formulated to meet the nutritional needs established by AAFCO dog food profiles for growth, gestation, and lactation" or "maintenance" or "all life stages"

C. "Has passed AAFCO animal feeding trials for providing complete and balanced nutrition for all life stages"

Answer

C. “Has passed AAFCO animal feeding trials for providing complete and balanced nutrition for all life stages”

AAFCO Diets

- Commercial diets passing AAFCO trials provide the strongest assurance of complete and balanced nutrition for the indicated life stage
- Natural diets are also available that not only meet AAFCO nutritional requirements but also must meet AAFCO standards for “natural” labeling (some “Natural” diets may contain chemically synthesized preservatives even though their primary ingredients are natural)

AAFCO's Requirements for "Natural Diet"

- " A feed or ingredient derived solely from plant, animal or mined sources, either in its unprocessed state or having been subjected to physical processing, heat processing, rendering, purification extraction, hydrolysis, enzymolysis or fermentation, but not having been produced by or subject to a chemically synthetic process and not containing any additives or processing aids that are chemically synthetic except in amounts as might occur unavoidably in good manufacturing practices."
- The only exception to this is that AAFCO does allow for certain synthetic vitamins and mineral additives to these dog foods (but no synthetic preservatives).

The Limitations of Homemade Diets

- When feeding homemade diets there is a greater risk for incomplete nutrition because many will not meet the daily requirements of the dog
- There is a greater risk for nutrient imbalance, particularly for those diets which must be supplemented with excessive amounts of vitamins and minerals

The Dangers of Nutritional Deficiencies

Energy Deficiency

- Signs: Thin, pot-bellied with poor muscle tone
- Causes include:
- low dietary-caloric density of food

  (most common in puppies or lactating bitches fed "light/lite" foods)
- high energy expenditure

  (most common in working dogs or lactating bitches on diets that insufficiently compensate for increases in energy demands)

Increase feeding frequency and caloric intake to ≥ 2-3X maintenance levels

Protein Deficiency

- Signs: Poor growth and condition, pot-belly, poor muscle tone or development, anemia, reduced immunity, poor wound healing
- Caused by:
- Unpalatable diet of low-protein concentration
- Poor quality dietary protein resulting in decreased digestibility
- Dietary imbalance (too much fat or carbohydrates in diet)

Dietary protein should be derived from high quality mixed plant and animal origin and should supply not less than 22% of the total calories

Fat Deficiency

- Signs: Hair loss, flaky skin, increased susceptibility to infection, impaired reproduction
- Caused by:
- Diets deficient in unsaturated fats

Dietary fat should supply not less than than 5% (8% during growth or reproduction) of the total calories

Vitamin Deficiencies

- Causes:
- Processing and storage of food leads to loss of vitamins thus requiring post-processing analysis to ensure nutritional adequacy
- Exogenous supplementation of balanced diets may lead to inhibition of absorption or destruction of certain vitamins

Vitamin A Deficiency

- Signs: stillbirths, spontaneous abortions, birth defects, blindness, deafness, ataxia
- Rare; dogs can convert carotene in vegetable matter to vitamin A if needed
- Dogs store vitamin A in their liver, kidney and fat so prolonged dietary deficiency must occur before symptoms appear
- Too high concentrations of fatty acids or rancid fat supplement will destroy vitamin A

Vitamin E Deficiency

- Signs: stillbirths, fading-puppies, muscular dystrophies, cardiac insufficiency, poor coat
- Show dogs fed excessive diets of polyunsaturated fats, especially fish-oils, to improve coats will show opposite results
- Too high a fat diet or rancid fat destroys vitamin E

Vitamin D Deficiency

- Signs: Bone abnormalities, calcification of soft tissue, muscular dystrophies
- Occurs in association with calcium or phosphorus deficiency or imbalance
- Most often attributed to over-supplementation (exogenous vitamin D or fish oil supplements) rather than deficient dietary formulation

Vitamin B Deficiency

- Signs: Decreased appetite, constipation, weight loss, weakness, drowsiness, paralysis, seizures, anxiety

- Raw fish contains thiaminase, which destroys thiamin (vitamin B1) and leads to paralytic syndrome in dogs; cooking the fish destroys the enzyme

Vitamin C Deficiency

- Dogs make their own Vitamin C and do not require a dietary source of Vitamin C

Mineral Deficiencies

- Dietary mineral deficiencies most commonly occur due to dietary imbalances or oversupplementation
- Most evident in growing puppies and lactating bitches

Calcium and Phosphorus Deficiencies

- Signs: bone dystrophies, slow growth, spontaneous fractures, bone demineralization
- Caused by imbalance of the calcium to phosphorus ratio
- Diets too high in meat disrupt the optimum ratio of 1.2-1.4 parts calcium to 1 part phosphorus
- To bring meat supplements into calcium balance, 2-3 g of calcium carbonate is mixed with each pound of meat

Zinc Deficiency

- Signs: hyperkeratosis, pyoderma, lymphadenopathy
- Most often caused by oversupplementation with calcium
- Calcium inhibits natural absorption of zinc

Selenium Deficiency

- Signs: Infertility
- Selenium plays a role in many biochemical pathways including immune response and prevention of cellular damage from reactive oxygen species; it may also play a role in cancer prevention
- Selenium deficiency may occur from low dietary levels or from supplementation with Vitamin C (which inhibits selenium absorption)

The Dangers of Overnutrition

Excessive Protein

- There is limited storage of proteins by the body, excess protein is therefore rapidly degraded to provide energy (from carbon) and unusable protein (nitrogen) is filtered by the kidneys and excreted

- Protein intake directly affects growth rate and high protein intake has been linked indirectly to increased risk for skeletal diseases in medium, large and giant breeds

Excessive Fat

- Increased dietary fat increases incidence and growth of spontaneous or chemically induced tumors (lymphocyte inhibition)
- Feeding high fat usually reduces total food intake and may result in nutrient deficiencies
- High fat diets increase risk for obesity, flatulence, and vascular cell degeneration
- Fat oversupplementation may lead to Vitamin A and E deficiencies

Excessive Vitamins

- Greatest risks associated with Vitamin D oversupplementation
- Vitamin D increases absorption of calcium
- Leads to imbalance of the calcium to phosphorus ratio
- Excessive Vitamin C may disturb selenium absorption
- Excessive Vitamin C may not be as benign as originally believed

Excessive Minerals

- High intake calcium inhibits absorption of zinc, copper and iodine
- Calcium fed during pregnancy disrupts normal calcium homeostasis in the bitch and may increase risk for eclampsia at onset of lactation in the bitch or hypocalcemia in pups leading to tetany-related seizures
- High calcium intake during growth periods increases risk for bone deformity and lesions (OCD)
- Avoid dog foods for which proteins are derived primarily from meat and bone meal

Nutrition and Disease

Nutritional Management in the Heart Patient

- Areas for Consideration
  - Nutrient Deficiency
  - Nutrient Excesses
  - Nutrient Interactions with cardiac medications
  - Nutrients as Therapies

Cardiac Cachexia

- Defined as loss of lean body mass (occurs in about 50% of cardiac patients with congestive heart failure)
- Caused by elevations in cytokines (inflammatory mediators) induced by the disease process that cause anorexia, increase energy requirements and breakdown muscle

Nutritional Support for Cardiac Cachexia

- Switching to more palatable food to increase nutrient intake (homemade diets, canned-foods, warming food, adding low-sodium flavor enhancers: soup, tomato sauce, tuna juice, corn syrup)
- Omega-3 fatty acid supplementation decreases cytokine production and their effects and is associated with increased survival of dogs with CHF
- Improves muscle mass and appetite
- Fish oil is high in omega-3 fatty acids

Obesity and the Cardiac Patient

- Many dogs with cardiac disease have concurrent obesity
- Obesity places a strain on the diseased heart
  - Induces blood volume expansion requiring elevated cardiac output
  - Results in increased plasma and extracellular fluid volume
  - Reduces urinary sodium output and water excretion
  - Increases heart rate
  - Produces abnormal systolic and diastolic ventricular function
  - Increases exercise intolerance
  - Increases blood pressure

Nutritional Management of Obesity in the Cardiac Patient

- Dogs with a predisposition for cardiac disease may benefit from early intervention with calorie-restricted food (i.e. when a murmur associated with MVD is first detected)

Nutrient Considerations in the Cardiac Patient

- Low sodium and chloride diets (senior/renal diets=low [0.22%]; cardiac diets= very low [0.10%]; min. sodium allowance = 0.06)
- Potassium and magnesium levels
  - Low levels may potentiate adverse effects of cardiac meds (such as diuretics)
  - Depletions cause arrhythmias, decreased contractility of the heart muscle and generalized muscle weakness

More on Omega-3 Fatty Acids and Cardiac Patients

- Fat content in dog food diets is comprised mostly of omega-6 fatty acids (linoleic, linolenic and arachidonic acids)
- Breakdown products (eicosanoids) of omega-3 rather than omega-6 fatty acids are less potent inflammatory mediators
- Suppress cytokines, have anti-arrhythmic effects, normalize plasma fatty acid abnormalities found in CHF
- Fish oil capsules (no other ingredients), eicosapentaenoic acid (EPA), docohexaenoic acid (DHA)

Nutrient-Drug Interactions in the Cardiac Patient

- Considerations
  - Nutrient--Diuretic Interactions
  - Nutrient--Angiotensin-converting Enzyme Inhibitor (ACEI) Interactions
  - Nutrient--Cardiac Glycoside Interactions

Nutrient--Diuretic Interactions

- Diuretics (i.e. furosemide) may lower magnesium and potassium levels which may contribute to arrhythmias
- Diuretics may increase urinary loss of water-soluble vitamins (i.e. thiamine); cardiac patients on diuretics often require increase in dietary vitamin intake
- Diuretics activate the renin-angiotensin-aldosterone system perpetuating progression of CHF, reduced sodium intake may lower the diuretic dosage requirements and slow the disease process

Nutrient--ACEI Interactions

- ACEIs (captopril, enalapril, lisinopril, etc.) disturb potassium balance by inhibiting angiotensin II and aldosterone (the latter promotes potassium excretion by increasing absorption of sodium and chloride)
- Potassium supplementation or diets high in potassium in dogs receiving ACEIs may induce hyperkalemia (weakness, arrhythmias)

Nutrient--Cardiac Glycoside Interactions

- Examples: Digoxin or Digitoxin
- Administration with food reduces drug serum concentrations up to 50%
- Abnormal serum electrolyte concentrations (particularly hypokalemia) may increase drug toxicity (anorexia, vomiting, diarrhea, ventricular arrhythmias)

Implications of Dietary Management and Therapy for Cardiac Disease

- Early intervention with nutritional support for cachexia or obesity may assist in avoiding later complications associated with these conditions in the heart patient
- Attention to laboratory parameters and adjustment of dietary nutrients accordingly may help to prevent exacerbation of the disease state
- Dietary supplements may provide pharmacologic, as well as physiologic effects in some cardiac patients

Nutrition and the Allergic Patient

- Considerations
  - Nutrition and Atopy
  - Immunologic Reactions to Food
  - Non-immunologic reactions to food
  - Elimination Diets for Determining Adverse Food Reactions

Nutritional Management of Atopy

- Atopy (skin disease caused by environmental allergens) is the most prevalent cause of skin disease in dogs
- Of the 10-30% of the dog population that have food allergies, greater than 80% of these dogs will also have atopy
- Therefore, hypoallergenic diets alone are frequently unsuccessful for managing skin reactions in the dog

EFA Supplements Provide Therapeutic Benefits for Dogs with Atopy

- Dose-related anti-inflammatory effects
- Enhances effects of certain antihistamines
- Completely or significantly reduces glucocorticoid dosing
- Benefits may not be apparent for 3 weeks to 3 months
- Will not be effective if inflammation is severe and complicated by secondary bacterial or other infection

Examples of EFAs

- Efavet Regular (Efamol Vet)
- Dermcaps or 3VCaps (DVM Pharmaceuticals
- EFA-CAPS (Allerderm/Virbac)
- Pet-Derm O.M. CAPS (SmithKline-Beecham)
- Omega-3 Fatty Acid Capsules (Vet Solutions)

- Typical Dosing (per 5 kg body weight every 24 h):

1.35 g Linoleic Acid (LA), 68 mg gamma-linolenic acid (GLA), 34 mg eicosapentaenoic acid (EPA)

Nutritional Considerations for Immunologic Food Reactions

		Incidence
Most Commonly Perceived Allergens	food preservatives, dyes, wheat, beef, chicken egg, corn, poultry, soy, dairy products	
Actual Clinical Allergens	beef, dairy products, wheat	68%
	chicken, chicken egg, lamb, soy	25%

Nutritional Considerations for Non-immunologic Food Reactions

- Mimics food allergy symptoms, but reaction occurs on first exposure
- Food components (additives like dyes or antioxidants) directly cause histamine (vasoactive amines) release from leukocytes (inflammatory response)
- Histamines themselves are also contained in some foods (fish-based or fish-soluble ingredients) and may directly cause reactions
- May lower the threshold level for adverse response to other allergens

The Elimination Diet

- Reduced protein (16-20%); one animal and one vegetable protein source
- High digestibility (>90%)
- No food additives (avoid fish and vasoactive amines)
- Nutritionally complete and balanced for the life stage

Considerations for Homemade Elimination Diets

- Many are nutritionally inadequate for growth or adult maintenance because devised to include a minimum of ingredients
- Calcium to phosphorus ratios (1:10 in some HMDs) result in skeletal disease within 4 weeks in growing puppies
- Require supplementation with a source of calcium (calcium carbonate at 0.7 g/5 kg)
- Require non-flavored, additive-free vitamin and mineral supplements
- Require fatty acid supplementation (vegetable oil; avoid fish oils that may contain trace protein contaminants)

Nutritional Management of Liver Disease

Protein and Hepatic Dysfunction

- The liver produces albumen and numerous transport proteins required for normal cellular function
- Protein production is decreased in patients with liver dysfunction
- Excessive protein restriction in liver patients leads to breakdown of cellular proteins, loss of skeletal mass, increased ammonia production and thus, increased risk for Hepatic Encephalopathy

Protein Recommendations for the Liver Patient

- To prevent Protein Deficiency
  - Avoid protein restriction (feed at least 20% protein)
  - Feed diets with protein sources derived from soybeans or milk which are well tolerated by liver patients
  - Avoid diets with protein sources derived from meat which increase ammonia production during digestion and increase the functional demand on the liver
  - Feed small, frequent meals to avoid prolonged fasting

Implications for Protein Restriction in the Liver Patient

- Hepatic encephalopathy is a complication of liver disease and results in GI and neurological symptoms (anorexia, vomiting, diarrhea, aggression, stupor, ataxia, seizures)
- Believed to occur due to increased ammonia levels in the blood (ammonia produced by bacteria in the gut and during digestion is inadequately filtered from the blood by the dysfunctional liver and acts as a neurotoxin
- HE liver patients benefit from
  - Restricted protein diets (12-16% protein derived from dairy or vegetable)
  - Addition of lactulose or lactitol (beta-galactosidosorbitol; reduces flatulence)which decreases ammonia and may reduce need to restrict protein
  - Vitamins (without methionine)

Other Nutrient Considerations in the Liver Patient

- Avoid diets with excess fat that may result in protein deficiency or exacerbate diarrhea by enhancing malabsorption (feed diets with 10% or less fat content)
- Avoid fasting (many liver patients have reduced glycogen storage and are prone to hypoglycemia)
- Many liver patients will have vitamin and/or mineral deficiencies and may require Vitamin K, Vitamin C (25 mg/kg/day), zinc gluconate (3 mg/kg/day), or potassium

Example Homemade Diet for Liver Patients

Ingredient	Amount		
	Maintenance	Reduced Protein	High Protein
Rice, cooked without salt	2 cups	3 cups	1-3/4 cups
Low-fat cottage cheese	2 cups	1 cup	2 cups
large egg, boiled			1
Soybean oil	1 tbsp	1 tbsp	1 tbsp
Bone meal	1-1/2 tsp	1-1/2 tsp	1-1/2 tsp
Lite salt (KCl)	1/2 tsp	1/2 tsp	1/2 tsp
Administer a multivitamin and mineral supplement daily			
ME = 1000 kcal			

Nutrition and Renal Disease

- There is no clinical data supporting the recommendations for nutrient-restriction in adult or geriatric dogs with regard to minimizing risk of renal disease
- Dietary restriction of protein does not prevent progression of renal disease in affected dogs
- Dietary restriction of protein (to 13-17%) and phosphorus may assist in controlling symptoms associated with excessive uremic toxins (inappetence, vomiting and lethargy)in patients with blood urea nitrogen (BUN) levels above 75 mg/dl (normal = 5.9-27.2 mg/dl)

Nutrition and Seizures: Is there a connection?

- Glutamate (derived from gluten) is an amino acid that is required for protein degradation and energy conversion which is an ammonia-producing reaction
- Glutamate is found in wheat, barley, dairy, soy, corn and rice and may act as a neurostimulant
- High levels of endogenous glutamate can be neurotoxic, particularly to brain cells
- It has been suggested (J.S. Baker DVM/ DogtorJ.com) that high levels of dietary glutamate may cause neurotoxicity leading to seizures in some dogs similar to seizure activity observed in some celiac patients who ingest gluten

Gluten Intolerance and Seizures

- Seizures associated with gluten intolerance do not appear to be related to increase in glutamate in circulation
- Seizures associated with gluten ingestion appear to be immunologically driven (antibodies to gluten appear to target glutamate in neural tissue)
- Therefore, dogs manifesting dietary hypersensitivity to gluten may develop secondary neurological complications
- In his clinical practice, Baker reports that 100% of his epileptic patients respond completely when switched to potato-based commercial dog foods

Summary

- There is no one diet, commercial or natural, that will always meet the nutritional requirements of every dog

Summary

- Proper nutrition assures that the dog's metabolizable energy requirements for a given life stage or condition are met on a daily basis
- When feeding commercial dog foods, including "natural" commercial dog foods, the best assurance of complete and balanced nutrition is provided by a label indicating that the food has passed American Association of Feed Control Officials' (AAFCO) feeding trials

Summary

- Homemade diets may be advantageous for increasing nutrient intake in finicky or health compromised dogs, however, special consideration must be given to the nutritional balance of the various nutrients to prevent nutritional deficiencies

Summary

- Adverse side-effects related to various health disorders may respond positively to nutritional management