

Animal Nutrition

UNIT-IV (NON-RUMINANT NUTRITION)

UG Lecture: 1-2

Nutrient Requirement and Feeding of Dogs & Cats

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UG Lecture: 1

Objective.....

- **Learn about the nutrient requirements and feeding of dogs and cats.**

NUTRIENT REQUIREMENTS

The requirements of various nutrients discussed here are as follows;

- **Energy**
- **Protein**
- **Carbohydrate**
- **Fat**
- **Water**

Energy

Factors influences the energy requirements:

1. Physiological State

- **Compared to adult dog, growing puppies require 2 to 4 times more energy per Kg BW.**
- **As the puppy approaches adulthood, energy requirement is reduced.**
- **Similarly for reproducing females, energy requirements at the end of gestation & during early lactation is 2 to 4 times greater than that of adult maintenance requirements.**

2. Breed Differences

- **Small breed dogs grow to a mature weight, which is up to 30 times greater than their birth weight.**
- **Therefore, small breeds require more food per Kg of BW as compared to large breeds.**
- **To relate energy needs to body size, energy standards for dogs are usually established by body weight.**

Mature body weights	Energy requirement (ME per Kg. of body weight per day).
Less than 10Kg	50 Kcals
Between 10 and 20 Kg	30-40 Kcals
Greater than 20 Kg	20-30 Kcals

3. Environment

- **Dogs housed outdoors & exposed to extreme weather have changes in their caloric requirements.**
- **During hot weather, energy needs decreases & less food may be required.**
- **During cold weather, energy needs increases to maintain body temperature & more food may be required.**

4. Activity

- **During hard work, individual dogs energy requirements will be increased above that of maintenance.**
- **Hard-working dogs require more energy intake per Kg of BW during the periods when they are training or working.**
- **When the animal is not training or working, their energy requirement is lower and a maintenance-type food may be fed.**
- **Feeding of high-calorie, nutrient dense foods to dogs, when they are not training or working could contribute to over weight.**

5. Regulation of feed intake

- **Animals eat to meet their energy needs and the intake of all nutrients is influenced by the amount of energy present in the diet.**
- **The energy content of the diet generally limits the amount of food an animal will consume.**

Calculation of Energy requirements in Dogs

- **Adult Maintenance: ME requirement = $K \times W_{\text{kg}}^{0.67}$**
- **K = 132 (Inactive), 145 (Active), 200 (Very Active), 300 (Endurance performance).**

Post Weaned	2 x Adult maintenance
40 % Adult Body weight	1.6 x Adult maintenance
80 % Adult Body weight	1.2 x Adult maintenance
Late Gestation	1.25 – 1.5 x Adult maintenance
Lactation	3 x Adult maintenance
Prolonged physical work	2 –4 x Adult maintenance
Decreased Environmental temperature	1.2 – 1.8 x Adult maintenance

For Cats

- **Sedentary House cats 60 Kcal ME /Kg Body weight.**
- **Moderately active cats 70 Kcal ME /Kg Body weight.**
- **Very active cats 80 Kcal ME /Kg Body weight.**

Post Weaned	250 Kcal ME /Kg Body weight
20 weeks	130 Kcal ME /Kg Body weight
30 Weeks	100 Kcal ME /Kg Body weight
Late Gestation	1.25 x Adult maintenance
Lactation	3- 4 x Adult maintenance

Protein

- . Dietary proteins, digested in stomach & small intestine are broken down to form free amino acids, then absorbed into the blood stream.**
- . Amino acids are distributed to all cells of the body, where they are utilized to build body tissue.**
- . Out of the 20 amino acids involved in the synthesis of proteins in the body only 10 of these are essential for dogs.**
- . Essential amino acids include: arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine , tryptophan & valine.**

Protein Requirements

- . Dog protein requirement depends on stage of life and activity of dogs.**
- . Puppies need more protein than adult dogs.**
- . Protein needs of a puppy can be met by a high quality protein providing 20 to 25% of dietary calories.**
- . Severe protein deficiency in dogs results in poor food intake, growth retardation or weight loss, muscle wasting, emaciation & death.**
- . Less severe deficiency, causes a rough & dull hair coat, compromised immune system & poor milk production in reproducing bitches.**
- . During periods of stress, the protein requirement may be increased.**
- . If diets containing more protein than required, extra protein metabolized & used for energy.**

Carbohydrates

- . Carbohydrates are sugars, starches and dietary fibres (not completely digestible).**
- . Supplied in the diet by cereal grains and sugars, such as glucose, sucrose and lactose.**
- . When consume more carbohydrates than are needed, excess carbohydrate energy is stored in the form of glycogen in the liver and muscles and is converted to fat and stored in adipose tissues.**
- . During fasting, stress, or exercise, glycogen is broken down to glucose & delivered to the bloodstream where it is distributed to all body tissues.**

Fibres

- . Dietary fibres has numerous effects within the gastrointestinal tract.**
- . Fibres have high water-holding capacity & contribute to easy passage of digesta.**
- . Due to bulkiness, cause stomach distention, which reduce feed intake.**
- . Decreases digestion and absorption of fat, vitamins and minerals.**
- . As a protective mechanism, fibre can bind to some toxins and prevent their absorption into the bloodstream.**
- . Excessive dietary fibre is associated with loose stools, flatulence, increased stool volume & frequency & decreased dietary caloric density.**

Fat

- . Fats are concentrated forms of energy.**
- . Fat digestion is more complex than that of protein or carbohydrates.**
- . Healthy dogs & cats can digest fats with great efficiency, approximately 90-95%.**

Fat Requirement

- . Fat supplies essential fatty acid linoleic acid.**
- . This is essential by dogs for maintaining healthy skin and haircoat & serves as a carrier for fat-soluble vitamins.**
- . Fat also contributes to the palatability.**
- . Animals fed diets too low in fat may develop dry, coarse hair, dry & thickened skin.**

Water

- . Water requirement is determined by the amount of food that the animal consumes.**
- . A general, animals require 1 ml of water for each kcal of energy.**
- . If a dog requires 1000 kcals per day, therefore, it requires 1000 ml of water.**
- . As food intake increases, water intake also increases.**
- . When the water content of a diet increases, animal drinks less water.**

NUTRIENT CONTENT FOR DOG FOODS

(As per Association of American Feed Control Officials)

Nutrients	DM Basis	Growth Reproduction	Maintenance
	Units		
Protein	%	22	18
Fat	%	8.0	5.0
Linoleic Acid 18:2	%	1	1
Arginine	%	0.62	0.51
Histidine	%	0.22	0.18
Isoleucine	%	0.45	0.37
Leucine	%	0.72	0.59
Lysine	%	0.77	0.63
Methionine + Cystine	%	0.53	0.43
Phenylalanine + Tyrosine	%	0.89	0.73
Threonine	%	0.58	0.48
Tryptophan	%	0.20	0.16
Valine	%	0.48	0.39

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Nutrients	DM Basis	Growth Reproduction	Maintenance
	Units		
Minerals			
Calcium	%	1.0	0.6
Phosphorus	%	0.8	0.5
Ca:P Ratio		1 to 1	1 to 1
Potassium	%	0.6	0.6
Sodium	%	0.3	0.06
Chloride	%	0.45	0.09
Magnesium	%	0.04	0.04
Iron	mg/kg	80	80
Copper	mg/kg	7.3	7.3
Manganese	mg/kg	5	5
Zinc	mg/kg	120	120
Iodine	mg/kg	1.5	1.5
Selenium	mg/kg	0.11	0.11

Nutrients	DM Basis	Growth Reproduction	Maintenance
	Units		
Vitamins			
Vitamin A	IU/kg	5000	5000
Vitamin D	IU/kg	500	500
Vitamin E	IU/kg	50	50
Vitamin B₁ (Thiamine)	mg/kg	1.0	1
Vitamin B₂ (Riboflavin)	mg/kg	2.2	2.2
Pantothenic Acid	mg/kg	10	10
Niacin mg	mg/kg	11.4	11.4
Vitamin B₆ Pyridoxine)	mg/kg	1.0	1.0
Folic Acid	mg/kg	0.18	0.18
Vitamin B₁₂	mg/kg	0.022	0.022
Choline	mg/kg	1200	1200

Recommended Nutrient Concentration For Dog and Cat Foods (AAFCO)

Nutrient (%)	DOG Energy density 3.5Kcal ME/g DM		CAT Energy density 4.0 Kcal ME/g DM	
	Growth and Reproduction (Min)	Adult Maintenance (Min)	Growth and Reproduction (Min)	Adult Maintenance (Min)
Protein	22	18	30	26
Fat	8	5	9	9
Linoleic acid	1	1	0.5	0.5
Arachidonic acid			0.02	0.02
Vitamin A IU	5000	5000	9000	5000
Taurine			0.10 - 0.20	0.10 - 0.20
Calcium	1.1		1	
Phosphorous	0.9		0.8	

Discussions.....

Questions, if any.....??

THANKS

UG Lecture: 2

Objective.....

- **To describes the common feed stuffs and feeding practices in dogs & cats.**

COMMON FEEDSTUFF USED FOR DOGS

Meat and meat by-products

- **Raw lean meat:** Contain water 70-67%, protein 20-22% & fat 2-9%, it is also a good source of minerals.
- **Offal meat:** Include liver, kidney and spleen, meat but nutrient content is variable, low in calcium, adverse Ca:P ratio (1:15 to 1:30) however, liver is a good source of Vitamin A, D & B Complex with good quality protein.
- **Fish:** fish has 5-18% fat & has good quality protein, high iodine content & better Ca:P ratio.

Other animal by-products

- Includes blood meal, meat meal, meat-cum-bone meal but protein quality is variable depending upon the raw material & extent of heat treatment.**
- Ash and mineral content are also variable, sterilized bone meal is commonly used & contains 32% Ca and 14% P.**

Dairy products

- Includes cream, skimmed milk, whey, cheese, etc.**
- Lactose present in dairy products are not well digested due to less enzyme lactase activity.**
- Hence dairy products in dog & cat food should not be included at high level & are also poor in Fe and vitamin D.**

Eggs

- **Good source of Fe, B₂, folic acid, B₁₂, Vitamin A and D but do not have Vitamin C & less carbohydrate.**
- **Eggs are also poor source of Niacin and raw egg white contains Avidin.**

Cereals and cereal by-products

- **Includes rice, barley, oats, wheat and corn.**
- **Contains 9-14% protein, 2-5% fat and about 70-80% carbohydrate as starch.**
- **Cereals are rich in thiamine and Niacin.**
- **Phosphorus is in the form of phytase & not available to the extent of 70%.**

Fat and oils

- **Fats & oils have high energy & animal fats are liked by cats and dogs.**
- **Add flavor & palatability to other foods & vegetable oils are rich in vitamin E.**

Vegetables

- ***Green leafy vegetables:*** Like Cabbage, cauliflower have high water and fibre content, are good source of B vitamin, however cooking destroys it.
- ***Roots and tubers:*** Includes potatoes, carrots, turnip, tapioca, rich in starch and can be cooked and fed.
- ***Leguminous vegetables:*** Rich in protein, good source of B complex vitamin but anti nutritional factors like Trypsin inhibitors, Hemagglutinin are present in some of them but are destroyed by heat treatment.

TYPES OF DOG FOOD

- **Prepared foods are some times fed to companion animals & can be classified on the basis of its moisture percent such as;**
 - **Dry food (5-12%)**
 - **Semi-moist food (15-30%)**
 - **Canned food (70-85%).**

Dry food

- **Dry foods (biscuits, mixtures & meal or flakes) are available for different physiological status.**
- **May be complete food or complementary food, formulated as mixers intended for feeding as part of the diet with protein rich foods such as fish meats, fish.**
- **They are generally rich in carbohydrates.**
- **Crude fat content is 5-10% on dry basis.**
- **Mixtures are generally cereal based with very little protein concentrates may or may not be supplemented with minerals / vitamins.**
- **Have long shelf- life provided properly stored.**
- **The concentration of nutrients is high and feed intake is less.**
- **Digestibility is acceptable but less than semi-moist or canned foods.**
- **The main disadvantage of the dry food is that they are much less palatable than moist foods.**
- **Cats may accept extruded biscuit forms but not meals or flakes.**

Semi-moist food

- . Has good digestibility (80-85%).**
- . Meat & vegetable protein are included.**
- . Protected from spoilage with addition of glycerol or propylene glycol.**
- . Most acceptable to dogs and cats.**
- . It can be stored for several months with reduced water activity.**
- . Meat, meat by-products, soya, vegetable protein concentrates, cereals, fats and sugars are used in these type of products.**

Canned food

- **Most convenient to use, highly attractive for dogs and cat.**
- **Canned products are primarily meat or fish / meat product, fish & cereal products.**
- **These food are reliable, safe and convenient to serve.**
- **Highly palatable, particularly when carbohydrate is less.**
- **Separate foods for dog and cat are available.**
- **Cat foods can be given to dogs but not vice-versa.**
- **Most canned foods are balanced foods.**
- **Digestibility is good but nutrient density is low because of high moisture content.**
- **Generally not given as a sole food but given mixed with biscuits or mixtures.**
- **Safe and have long shelf life.**
- **Meat, meat by-product, vegetable protein, cereals, are the main ingredients.**

Home made foods

- . Feeding of companion animals with commercial foods are not popular for economic reasons in developing countries.**
- . Pets are fed with home made foods or left overs of food consumed in a family.**
- . So, essential to ensure that the dietary nutrient requirements are met through such feeding practice.**
- . Judicious inclusion of supplemental nutrients, deficit in the home made or left over food can overcome nutritional deficiency disorders & support healthier life.**

Example of home made food for dog

Food item	Body diet		
	20kg	25kg	30 kg
Egg	2	2	2
Milk (ml)	200	250	300
Beef (g)	200	300	400
Rice (g)	150	200	200
Vitamin A, D	+	+	+
B complex	+	+	+
Salt iodized (g)	2.5	2.5	2.5

Home made vegetarian dog food

- A 100 % vegetarian dog food may be prepared provided it satisfies all the essential nutrient requirement for the dog.

Food item	Quantity
Soy protein meal / pulses (g)	200
Milk (ml)	200
Rice (g)	200
Vitamin A, D	+
B complex	+
Salt iodized (g)	2.5

Classification of pet food based on the nutrient content

- ***Complete food:*** Complete food is a food that provides all the nutrients required by the animal for 24 hours.
- ***Complementary food:*** Complementary food is a food that provides only a part of the nutrients required by the animal for 24 hours and the rest is met from additional supplement.
- ***Mixer biscuit:*** Mixer biscuit provides only essential nutrients.
- ***Snack / treat:*** Snack / treat are foods to entertain / reward pet animals.

FEEDING SCHEDULE OF DOGS

Puppy feeding schedule

- . Puppies may get enough nutrients from milk during the first 3 or 4 wks of life.**
- . Cows milk is not a substitute as the composition varies.**
- . But orphan puppy or kitten, feeding puppy or kitten under insufficient mother's milk, cow milk can be used with appropriate modification to simulate mother's milk.**
- . Young puppies should be fed 4 or 6 times daily at equal time intervals.**

Age in days	Frequency of feeding	Milk g / day as per body weight (Kg)					
		0.5	1	2	3	4	5
1-7	Once in 2 hours	45	90	180	270	360	450
7-14	Once in 3 hours	60	120	240	330	480	570
14-21	Once in 3 hours till evening	75	150	300	450	600	750
21 and above	Once in 3 hours omit evening feeding	75	150	300	450	600	750

Milk substitute

Cow milk	800 ml
Cream	200 ml
Egg yolk	1 no.
Steamed bone meal	6 gram
Vitamin A	2000 IU
Vitamin D	500 IU
Citric acid	4 gram

Calculating the volume of milk to feed an orphan pup

Age	Volume to feed per 100g of body weight		Body Weight	=	Volume / day		No of feedings /day	=	Volume per feeding
10 days	15 ml/100 g	X	200 g	=	30 ml		5	=	6 ml
20 days	20 ml/100 g	X	300 g	=	60 ml		5	=	12 ml

FEEDING OF DOGS

Weight of Dogs	Frequency of Feeding/day	Feed offered
2-5 kg	Twice a day	100 gm cereals (cooked) 100 gm meat (cooked) 100 ml milk + biscuits
5-10 kg	Twice a day	200 gm cereals (cooked) 200 gm meat (cooked) 150 ml milk + biscuits
10-20 kg	Twice a day	500 gm cereals (cooked) 500 gm meat (cooked) 300 ml milk + biscuits
Puppies After weaning	3-4	½ Adult feed
Older pups	2	½ Adult feed (gradually increase frequency of feeding)

Cereals: Cooked rice, bread, chapathi

Meat: Beef, mutton, chicken, fish or egg

Pregnant, lactating bitches: Increase cereals 100-200 gm/ day

Feeding frequency

3 weeks to 3 months	4-5 times feeding/day
3-5 months	3 times a day
5-10 months	2 times a day
Adult dogs	Once a day for maintenance
Lactating animal	Increased energy, protein, etc.
Old dogs	Digestion is poor, improve the quality of feed, decreased quantity

Average daily consumption of food for dogs

Body weight	Dry matter
2.5–5 kg	3–3.5 %
5– 10 kg	2.5–3%
10 kg and above	2–2.5%

FEEDING MANAGEMENT OF DOGS

- . Make sure that puppies consume colostrum within the first 36 to 48 hours after birth.**
- . Feed at same place, by same person at same time.**
- . Left over should be removed after half an hour.**
- . Water should be available throughout the feeding time.**
- . No snack is to be fed. Young and lactating should be fed separately.**
- . Avoid sudden changes in food.**
- . Feeding and watering vessels should be clean.**
- . Make sure that the label in commercially manufactured foods has the guarantee of any regulating agency.**

- **If the dog has a special dietary requirement that cannot be met by commercial foods, consider feeding homemade diets.**
- **Feed the dog according to correct body weight and condition, and consider factors such as growth, adult maintenance, level of activity, gestation, lactation, and age.**
- **When changing foods, mix 1/4 of the new food to 3/4 of the old food, and increase gradually to prevent gastric upsets.**
- **Watch the dog's stool, weight, and coat while changing foods.**
- **Allow approximately 20 minutes for the dog to clean the bowl.**
- **Be certain that the food has an expiration date.**
- **Store food in a sealed container in a cool, dry place.**

Cat –an obligate carnivores?

- An obligate carnivore is a predator that eats meat out of biological necessity.
- Although cats can digest plant material safely, but are **unable to meet all of their nutritional needs** on a strictly plant-based diet.
- Cats have the **shortest digestive tract** to body size ratio of any mammal which result, less fermenting bacteria to help them break down plant material and derive nutrients from it.
- Cats, cannot make beta-carotene conversion due to lack of enzyme, hence, require **vitamin A** from animal source.
- Plant sources are deficiency in **taurine** and cat require taurine (dark meat rich in taurine) to support eyesight, nerve function, immune system and heart.

- Cats have a **limited delta-6-desaturase activity**, enzyme is necessary for conversion of linoleic acid and alfa-linolenic acid to arachidonic acid, EPA and DHA.
- Diets deficient in preformed long-chain PUFA but containing linoleic acid and alfa-linolenic acid results in symptoms such as a dry coat, changes in platelet aggregation and an enlarged fatty liver.
- The limited delta-6-desaturase activity can be sufficient for maintenance and conception in adult cats, but for gestation, lactation and growth a dietary supply of **arachidonic acid (meat source)** is required.

Some Important differences between Dog & Cat Nutrition

- **Cat food contains a higher level of protein when compared to dog food.**
- **Cats need more protein because they use the proteins as an energy source.**
- **Cats have 12 essential amino acids while dogs only have 11.**
- **Taurine is an amino acid that is essential for cats but non-essential for dogs.**
- **Dogs can convert beta carotene into vitamin A within their bodies but cats can't.**
- **Cats also require five times more thiamine in their diets than do dogs.**
- **Arachidonic acid is an essential fatty acid that cats cannot manufacture, while dogs are able.**

Discussions.....

Questions, if any.....??

THANKS