



## Part 1

# Life-stage nutrition for dogs and cats

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**ABSTRACT** Dogs and cats have unique nutritional requirements that vary throughout life, highlighting the importance of feeding a diet suited to their age and physiological state. The plethora of pet foods makes it challenging for owners to decide what and how much to feed. Therefore, the veterinary healthcare team must be able to provide accurate advice regarding optimal life-stage nutrition.

Part 1 of this article introduces nutritional assessment guidelines for small animals and explores the terms commonly used to describe canine and feline life stages. It also considers the dietary adaptations required during adulthood, gestation and lactation.

**Keywords** companion animal nutrition, life stage, dietary requirements, canine, feline

## Introduction

The majority of pet owners consider their pets as family members and strive to ensure they have a long and healthy life (Cohen, 2002; Bontempo, 2005; Carlisle-Frank & Frank, 2006). As one of the most important considerations in the maintenance of health, nutrition plays a critical role in the management of many diseases – a reflection of its acknowledgement as the fifth vital assessment, after temperature, pulse, respiration and pain (Freeman et al., 2011).

Prior to domestication, dogs and cats were primarily kept as working animals, living outside and being fed raw meat or table scraps. Numerous developments in companion animal nutrition, together with the current notion of dogs and cats as pets and family members, have resulted in the development of a wide array of foods. The UK pet-food market is currently worth £3.2 billion (PFMA, 2021).

The provision of correct nutrition is an essential component of responsible pet ownership, and owners are becoming increasingly aware that it is a key factor in optimising pet health and wellbeing. With the current availability of such a broad range of pet foods, owners can select the food they believe to be most appropriate for their pet, taking into account a number of considerations, including personal preferences and circumstances. Yet, considerable confusion and misinformation exist regarding nutritional facts and dietary choices. The appealing marketing strategies and health claims can make diet selection challenging, with many owners finding this the most difficult aspect of pet ownership (Schleicher et al., 2019).

The primary role of diet is to provide sufficient nutrients to meet metabolic requirements while giving the consumer a feeling of wellbeing (Bontempo, 2005). An overall goal of veterinary nutrition is to feed for ideal health, performance and longevity. Life stages for cats and dogs are identified in **Table 1**. However, cats and dogs age at varying rates. Although age designations can help identify the physical and behavioural changes associated with different life stages, these are influenced by many factors and are not absolutes.

Normative and developmental stage thresholds have recently been identified by Harvey (2021) using chronological categories. These represent normative cognitive and neurological ageing in domestic family dogs, and capture age-related developmental trajectories for the majority of dog breeds. A longer lifespan is expected in smaller breeds of dogs than larger breeds, yet individual variation increases toward the latter years, with biological age potentially differing from chronological age (FEDIAF, 2017). As a result, precise age delineations are not proposed for the life stages of mature adult and senior dogs (Creevy et al., 2019).

Table 1. Definition of life stages for cats and dogs (Creevy et al., 2019; Quimby et al., 2021).

Species	Kitten/puppy	Young adult	Mature adult	Senior	End of life
<b>Cats</b>	Birth to 1 year <sup>a</sup>	1–6 years <sup>a</sup>	7–10 years <sup>a</sup>	>10 years <sup>a</sup>	Terminal stage
<b>Dogs</b>	Birth to reproductive maturation and cessation of rapid growth. Generally, 12–24 months, varying with breed and size.	Cessation of rapid growth to completion of physical and social maturation, which occurs in most dogs by 3–4 years old.	Completion of physical and social maturation until the last 25% of estimated lifespan (breed and size dependent). <sup>b</sup>	The last 25% of estimated lifespan through to the end of life. <sup>b</sup>	For <b>cats and dogs</b> , the initiation and duration of this period is variable and dependent on specific pathologies.

<sup>a</sup> Note that age designations are influenced by many factors and are not absolutes.

<sup>b</sup> The onset of ageing is heavily influenced by a variety of factors, including size and breed, therefore precise age delineations are not proposed by Creevy et al. (2019) for mature adult and senior dogs.

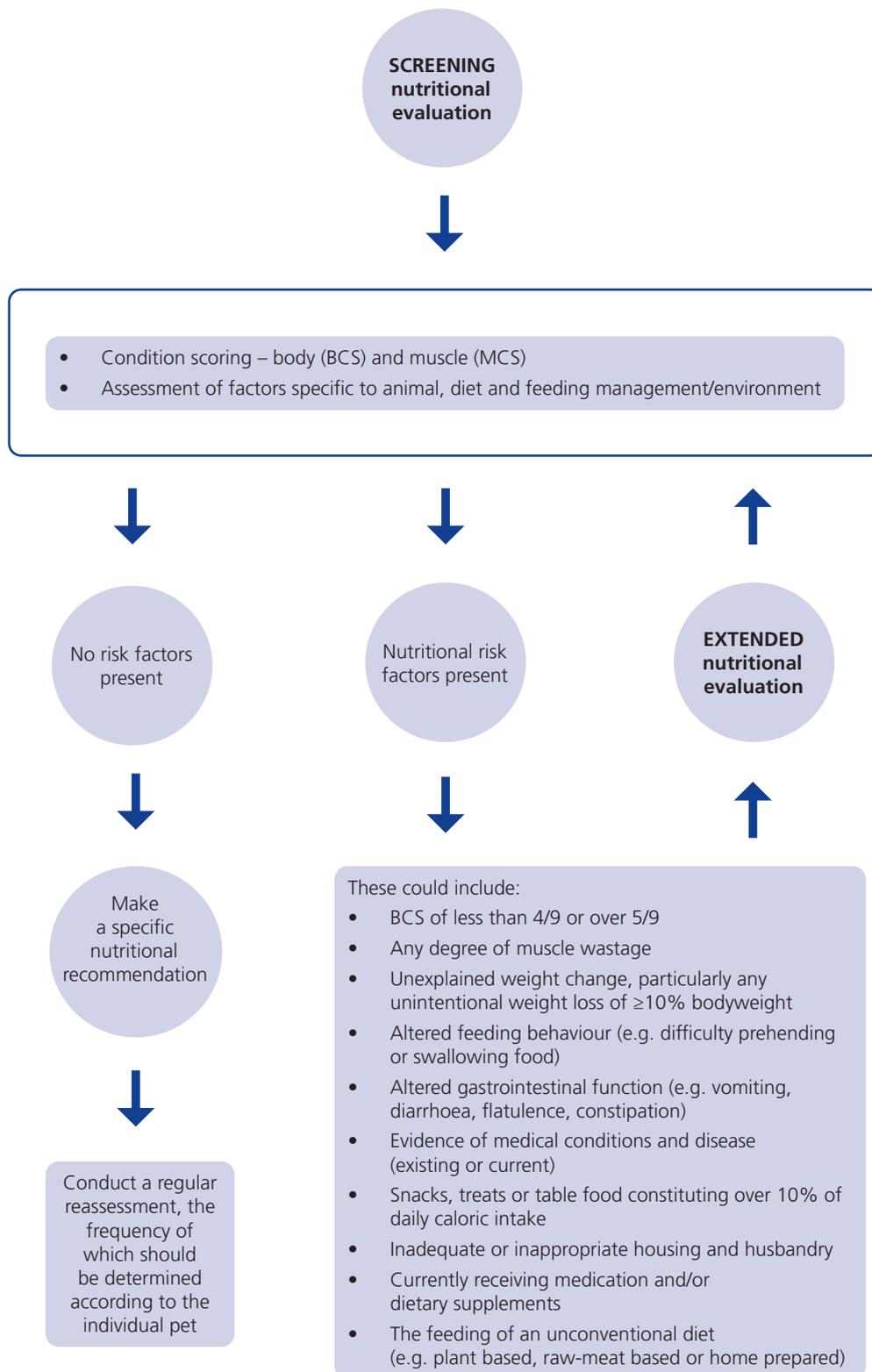


Figure 1. The nutritional assessment process using the WSAVA Nutritional Assessment Guidelines for Dogs and Cats (modified from Freeman et al., 2011 and reproduced from Lumbis & Rinkinen, 2022).

The life-stage nutrition concept recognises the need for dietary adjustment as pets age (FEDIAF, 2021). Feeding below or above an optimal nutrient range can have a negative effect on biological performance, health and life expectancy (Pet Nutrition Alliance, 2017). Therefore, a diet should maintain a lean body condition and meet the individual needs of the animal – taking into consideration the species, age and physiological status, and the reduction in disease-risk factors. A one-size-fits-all approach is not appropriate, and diets labelled ‘for all life stages’ are formulated for reproduction and growth.

Continued expansion of the pet food market may prohibit thorough knowledge of every available diet, but the veterinary healthcare team should at least be able to provide advice on basic and life-stage nutritional requirements.

## Nutritional assessment

Regardless of age and life stage, a nutritional assessment should be conducted on every dog and cat at every visit to the veterinary practice and is something in which pet owners should be actively involved.

In 2011, the World Small Animal Veterinary Association (WSAVA) Global Nutrition Committee launched Nutritional Assessment Guidelines for Dogs and Cats to help the veterinary healthcare team and pet owners ensure that dogs and cats receive optimal nutrition tailored to their needs (Freeman et al., 2011). These guidelines provide a framework for the veterinary healthcare team to assist them in making a nutritional assessment, and specific nutritional recommendations, for every patient at every visit (**Figure 1**).

An initial screening evaluation involves the review and evaluation of animal-specific factors, diet-specific factors, feeding management and environmental factors. If any nutrition-related risk factors are identified, a follow-up extended evaluation must be conducted, a framework for which is published online (AAHA, 2010). Life stage may influence the approach taken to conducting a nutritional assessment of a dog or cat, with specific considerations for each stage outlined by the American Animal Hospital Association (AAHA, 2021a; AAHA, 2021b).

While awareness of the concept of nutritional assessment is apparent, consistent implementation of this in practice is lacking (Lumbis & De Scally, 2020). The veterinary consultation is identified as a primary contact point for nutritional discussion with a client (Lumbis & de Scally, 2020), yet nutrition is not discussed at most veterinary appointments (Bergler et al., 2016; Morgan et al., 2017). A reported 57–90% of pet owners believe a nutritional recommendation from the veterinary healthcare team to be important, but only 15–23% perceive they have received one (AAHA, 2003; Flocke et al., 2013). Teaching owners how to assess their pet’s body condition and muscle condition accurately and objectively, alongside other important factors, is crucial to the early detection of secondary health conditions in all life stages.

A consistent and detailed approach, involving all members of the veterinary healthcare team, is fundamental to effective nutritional assessment and the provision of dietary recommendations and protocols. Identification, training and utilisation of a nutrition “champion” can further promote the inclusion of nutrition as a standard component of patient care, and help reinforce good nutritional practice throughout the veterinary clinic (Creevy et al., 2019). A wide range of non-branded practical aids have been developed by the WSAVA for the veterinary healthcare team, to help address nutrition at every patient visit and make nutritional assessment and recommendations more efficient. Non-branded educational materials are also available for pet owners (WSAVA, 2021). Diet choice should maximise longevity and quality of life, and contain the recommended nutrient levels for the life stage and lifestyle of the pet.

## Feeding during adulthood

The adult life stage begins once animals have reached maturity. For cats and small- to medium-sized dogs, this is generally around 12 months of age, but can be from 18 to 24 months in large and giant breeds of dog. Cats and dogs should be fed a complete and nutritionally formulated diet that will meet the appropriate nutritional requirements for adult life stage and individual lifestyle, and also maintain a lean body condition. The latter has proven benefits in dogs, including improved longevity and quality of life (Kealy et al., 2002; Salt et al., 2019) and is surmised to have similar health benefits in cats (Fascetti & Delaney, 2012).

Routine supplementation is not required, and treats should be limited to less than 10% of daily calorific intake (Freeman et al., 2011). The breed and size of pet should be evaluated for targeted and precise nutrition, along with the identification of an optimal weight range, body condition and muscle condition (Creevy et al., 2019). Obesity is an inflammatory condition resulting in oxidative stress and secondary health conditions, the prevalence of which is rising at an alarming rate. Each unit increase above ideal (a score of 5) on a 9-point body condition score (BCS) equates to 10–15% excess bodyweight. Therefore, regardless of age, a weight-loss programme should be instigated in animals with a BCS over 5. Similarly, animals with a below-ideal BCS, and those with an unintentional weight loss of 10% or more, should be investigated as a priority.

Where appropriate, adult maintenance diets formulated for neutered animals, the prevention of weight gain, and canine work and performance should be recommended. Providing ongoing advice to owners regarding enrichment, play and exercise is also key (Quimby et al., 2021). Species-specific key nutritional factors and energy requirements of adult cats and dogs can be found, respectively, in **Table 2** and **Table 3** (overleaf). Predictions of energy requirements that consider husbandry, neuter status and, possibly, activity level may be more accurate than those based on bodyweight and age alone (Bermingham et al., 2010; Bermingham et al., 2014).

Table 2. Key nutritional factors of young healthy adult cats and dogs (FEDIAF, 2021). Unless otherwise stated, minimum recommended nutrient levels are provided, with units expressed per 100 g dry matter. MER, Maintenance energy requirement.

Key nutritional factor	Cats		Dogs	
	75 kcal/kg <sup>0.67</sup>	100 kcal/kg <sup>0.67</sup>	95 kcal/kg <sup>0.75</sup>	110 kcal/kg <sup>0.75</sup>
<b>Water</b>	Animals should have unlimited access to clean, fresh water. The daily fluid requirement can be calculated using one of the following formulas: 50–60 ml/kg/day or 1–2 ml/kg/hour.			
<b>Protein</b>	33.3 g	25 g	21 g	18 g
<b>Fat</b>	9.0 g	9.0 g	5.5 g	5.5 g
<b>Calcium (Ca)</b>	0.53 g	0.40 g	0.58 g	0.5 g
<b>Phosphorus (P)</b>	0.35 g	0.26 g	0.46 g	0.4 g
<b>Ca:P ratio</b>	1:1 (min)–2:1 (max)		1:1 (min)–2:1 (max)	
<b>Potassium</b>	0.80 g	0.60 g	0.58 g	0.50 g
<b>Sodium</b>	0.10 g	0.08 g	0.12 g	0.10 g
<b>Chloride</b>	0.15 g	0.11 g	0.17 g	0.15 g
<b>Magnesium</b>	0.05 g	0.04 g	0.08 g	0.07 g

Table 3. Daily energy requirement (DER) and maintenance energy requirement (MER) of healthy adult cats and dogs (FEDIAF, 2021). Recommendations may overestimate energy needs by 10–60% (National Research Council, 2006). These amounts should therefore be starting points, rather than absolute requirements, and must be modified for each animal, taking into account animal, dietary and environment-related factors. ME, Metabolisable energy.

Species	Neuter status and activity level	Average DER (kcal/kg BW <sup>0.67</sup> )
<b>Cats</b>	Neutered and/or indoor cats	52–75
	Active cats in lean body condition	100
<b>Dogs</b>	<b>Age (years)</b>	<b>Average MER (kcal ME/kg<sup>0.75</sup>)</b>
	1–2	130 (125–140)
	3–7	110 (95–130)
	>7	95 (80–120)
	<b>Activity level</b>	<b>Average DER (kcal ME/kg<sup>0.75</sup>)</b>
	Obese-prone	≤90
	Low activity (<1 hour/day) (e.g. walking on the lead)	95
	Moderate activity (1–3 hours/day) (low-impact activity)	110
	Moderate activity (1–3 hours/day) (high-impact activity)	125
	High activity (3–6 hours/day) (working dogs, e.g. sheepdogs)	150–175
High activity under extreme conditions (racing sled dogs 168 km/day in extreme, cold conditions)	860–1240	
<b>Breed-specific differences</b>		
Great Danes	200 (200–250)	
Newfoundlands	105 (80–132)	

## Feeding for gestation and lactation

This life stage is considered to be the most physically challenging, with significant nutritional demand placed on the dam and offspring, both of which are in a positive energy and nitrogen balance (Fascetti & Delaney, 2012). A bitch or queen should be an ideal weight and body condition before breeding and fed an appropriate complete diet. Dietary intake should provide all necessary energy and nutrient requirements to support maintenance and milk production of the bitch or queen, in addition to the growth and development of puppies or kittens. Provided the diet is of good quality and is specifically formulated for the required species and life stage, routine supplementation is not required and can be detrimental to the dam and foetus.

Key nutritional factors of healthy cats and dogs during reproduction can be found in **Table 4**, with energy requirements for both species outlined in **Table 5** (overleaf). Immediately before and post parturition, food intake may reduce, but lactation is considered to be the most demanding life stage, prompting a rapid increase in food and energy requirements. Fresh food and water should be easily accessible (**Figure 2**).

### Cats

Energy intake increases shortly after conception, so queens should be fed a diet formulated for growth before breeding and this diet should be continued until weaning. Throughout gestation, energy requirements increase by an estimated 25–50% (Gross et al., 2010). A suitable diet



**Figure 2.** Lactation is the most physically demanding life-stage, requiring easily accessible fresh food and water. Photo courtesy of Harry Bardsley.

will be energy-dense, highly digestible and palatable, and should be fed ad libitum (Fascetti & Delaney, 2012) with close monitoring of body condition. Following weaning, a diet suitable for the adult life stage should be reintroduced, feeding an appropriate quantity for maintenance energy requirements (MER) (Fascetti & Delaney, 2012).

**Table 4.** Key nutritional factors of healthy cats and dogs during reproduction (FEDIAF, 2021). Unless otherwise stated, minimum recommended nutrient levels are provided, with units expressed per 100 g dry matter.

Key nutritional factor	Cats	Dogs
<b>Water</b>	Water requirements increase significantly during this life stage, particularly during lactation, so animals should have unlimited access to clean, fresh water. Some animals may be reluctant to leave the nest box in the post-partum period, so water should also be readily accessible. Requirements will vary according to maintenance needs, type of food (moist/dry) and milk production.  The daily fluid requirement can be calculated using one of the following formulas: 50–60 ml/kg/day or 1–2 ml/kg/hour.	
<b>Protein</b>	30 g	25 g
<b>Fat</b>	9 g	8.5 g
<b>Calcium (Ca)</b>	1.0 g (min)	1.0 g (min)–1.6 g (max)
<b>Phosphorus (P)</b>	0.84 g	0.9 g
<b>Ca:P ratio</b>	1:1 (min)	1:1 (min)–1.6:1 (max)
<b>Potassium</b>	0.6 g	0.44 g
<b>Sodium</b>	0.16 g	0.22 g
<b>Chloride</b>	0.24 g	0.33 g
<b>Magnesium</b>	0.05 g	0.04 g

Table 5. Daily energy requirements of the healthy queen and bitch during gestation and lactation (FEDIAF, 2021). These should be used as guidelines rather than absolute requirements and must be modified according to each animal, taking into account body condition and weight.

	Life stage		Energy requirement
<b>Cats</b>	Gestation		140 kcal/kg BW <sup>0.67</sup>
	Lactation (no. of kittens)	<3	100 kcal/kg BW <sup>0.67</sup> + 18 kcal × kg BW × L
		3–4	100 kcal/kg BW <sup>0.67</sup> + 60 kcal × kg BW × L
		>4	100 kcal/kg BW <sup>0.67</sup> + 70 kcal × kg BW × L
L = 0.9 in weeks 1–2 of lactation; 1.2 in weeks 3–4; 1.1 in week 5; 1 in week 6; 0.8 in week 7.			
<b>Dogs</b>	Gestation	0–5 weeks	132 kcal/kg BW <sup>0.75</sup>
		>5 weeks	132 kcal/kg BW <sup>0.75</sup> + 26 kcal/kg BW
	Lactation (no. of puppies)	1–4	145 kcal/kg BW <sup>0.75</sup> + 24 n × kg BW × L
		5–8	145 kcal/kg BW <sup>0.75</sup> + (96 + 12 n) × kg BW × L
n = number of puppies; L = 0.75 in week 1 of lactation; 0.95 in week 2; 1.1 in week 3; 1.2 in week 4.			

## Dogs

Canine gestation is an average of 63 days in length, split into three trimesters. Unlike queens, the energy requirements of bitches do not increase until the final trimester of gestation. A complete commercial diet designed specifically for canine adult life-stage should be fed during the first two trimesters to maintain optimum body condition. During the final trimester, calorie intake increases by 30–60%, depending on litter size, and can be met by switching to a complete commercial diet designed for canine growth. Large-breed growth diets are formulated to slow growth and prevent developmental orthopaedic disease, so contain limited fat and energy and controlled levels of calcium, making them unsuitable for feeding during pregnancy and lactation. Adequately fed bitches gain 15–25% more than their pre-breeding weight during gestation and 5–10% more during the post-partum period (Debraekeleer et al., 2010).

## Conclusion

Appropriate feeding protocols and diet choice play a critical role in the care and clinical outcome of healthy and clinically affected companion animals. The veterinary healthcare team plays a fundamental role in providing optimal nutrition-related support and owner education, appropriate to the species, life stage and health status of pets. Life-stage nutrition tailors dietary requirements to optimise longevity, performance and health, and to prevent disease. A one-size-fits-all approach to the nutritional support of cats and dogs is not appropriate, and a nutritional assessment, with identification of any risk factors, is essential as part of wider regular health screening.

Part 2 of this article (in a future issue of *VNJ*) will review the appropriate species-specific nutritional adaptations required during growth and senior stages of life, and will consider how these can be met through dietary provision. It will also examine the vital role veterinary nurses play in educating pet owners about optimal nutrition and dietary choices.

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## Multiple-choice questions

### 1. What is the correct order of the five vital assessments?

- Nutrition, temperature, respiration, pulse, pain
- Pain, nutrition, pulse, respiration, temperature
- Temperature, pulse, respiration, pain, nutrition
- Respiration, pulse, temperature, nutrition, pain
- Pulse, temperature, respiration, pain, nutrition

### 2. Which life stage is considered to be the most physically challenging?

- Growth
- Young adult
- Mature adult
- Lactation
- Senior

### 3. Which of the following is the recommended daily energy requirement of a healthy queen during gestation?

- 75 kcal/kg BW<sup>0.75</sup>
- 100 kcal/kg BW<sup>0.67</sup>
- 132 kcal/kg BW<sup>0.75</sup>
- 140 kcal/kg BW<sup>0.67</sup>
- 145 kcal/kg BW<sup>0.75</sup>

### 4. Large-breed growth diets contain:

- Limited fat, moderate energy, controlled levels of calcium
- Moderate fat, controlled levels of energy, limited calcium
- Limited fat and energy and controlled levels of calcium
- Controlled fat and moderate levels of energy and calcium
- Moderate fat and energy and limited levels of calcium

### 5. The recommended Ca:P ratio for a healthy adult dog or cat is:

- 1:1
- 1:1–1.6:1
- 1:1–1.8:1
- 1:1–2:1
- 2:1

Answers: 1. c 2. d 3. d 4. c 5. d

Reflective professional development notes. To access hyperlinks to the references, scan the QR code on page 3.