



WALTHAM®
pocket book of
healthy weight maintenance
for cats and dogs
(2nd Edition)



Edited by Dr. Alex German
and Dr. Richard Butterwick



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Foreword

Obesity – not just a nutritional disorder

For many years, textbooks and review articles have stated that obesity is the most common nutritional disorder that faces domesticated pets. Despite the fact that I am writing a foreword to what is ostensibly a nutrition text, I would like to disagree with this sentiment. I feel that classing obesity simply as a nutritional disorder very much understates its true importance and significance in veterinary medicine. As in humans, we now recognise obesity as the most important medical disease that affects our companion animals.

Approximately 75% of human adults in the westernised world are now either overweight or obese, and this condition has recently overtaken cigarette smoking as the leading cause of preventable disease in this geographical region. In the USA, spending on obesity is predicted to be approximately \$344 billion by 2018, consuming over 20% of the annual healthcare budget. Compared with humans, current prevalence estimates are that a smaller proportion (~40%) of pet dogs and cats are overweight or obese. However, there is no room for complacency. Urgent action is needed in order to raise awareness of both the causes and consequences of obesity, and also in implementing strategies to prevent this problem reaching the epidemic proportions we see in human medicine.

One of the key hurdles that we face in this fight is a lack of awareness of the importance of obesity, and particularly a lack of useable information on prevention. With that in mind, I welcome this new publication from WALTHAM®. I believe that it provides an excellent up to date summary of key information, and will be useful for veterinary staff, nutritional experts and researchers alike.

Preventing obesity is all about promoting responsible pet ownership, and key factors include awareness of what constitutes optimal body condition (Page 6), together with an understanding of the consequences of excess weight (Page 13). As in humans, companion animal obesity is associated with numerous diseases including diabetes mellitus, orthopaedic disease and respiratory problems. Furthermore, long-term overfeeding predisposes to excess body weight, and can shorten lifespan. For me, this is a key message we need to communicate to the pet-owning public. As we know, owners are very dedicated to their pets, commonly seeing them as a member of their family or even their own child, and they frequently put their pet's health above that of their own. Responsible pet-ownership, which encompasses avoidance of overfeeding and ensuring an active lifestyle, is a small price to pay for improving the likelihood of a longer, healthy life for a beloved pet.

The first law of thermodynamics states that energy can be neither created nor destroyed. From a biological perspective, energy and nutrient intake must balance energy utilisation in order to maintain a stable optimal weight. Although a simple concept, providing balance over the long-term is a major challenge and requires an understanding of energy requirements (Page 15), accurate feeding in terms of type of diet (Page 19) and amount to be fed (Page 18). However, energy utilisation is also important, most commonly by ensuring regular exercise and activity (Page 21). Nonetheless, requirements can vary considerably over the pet's life, most notably if the pet's circumstances change (e.g. dietary change, or development of a disease limiting physical activity). Even subtle errors in energy balance can lead to insidious weight gain.

A key factor in pet ownership is providing rewards, which can strengthen the bond between owner and their pet and thus improve the wellbeing of both parties. Rewards are most commonly given in the form of treats and food rewards (Page 20). Unfortunately, irresponsible treating practices can adversely affect pet health, and are known to predispose pets to obesity. Thus, treat feeding must be considered within the context of the daily energy and nutrition balance. Further, many people do not fully exploit other methods of rewarding their pet such as grooming, play and exercise; all have a positive impact on the animal-owner bond, without the potential to contribute to overfeeding.

Understanding cat and dog behaviour (Page 23) is also fundamental to any strategy of obesity prevention and, in fact, misreading behaviour can be a major problem, particularly with regard to feeding behaviour. In cats feeding is not a social activity and they, therefore, have no behavioural need of owner contact at this time. Commonly, if a cat makes affectionate contact with their owner around a perceived mealtime, the owner will assume that the behaviour is driven by hunger and 'begging'. Whilst this is not the case initially, crafty cats will rapidly learn that affectionate behaviour will elicit a food reward. This both contributes to weight gain and can prove to be a key challenge, which can derail a weight management programme (Page 25).

In summary, this text provides valuable information on the fundamental companion animal health issue of our time. It is both succinct and readable and I hope you enjoy reading it, as much as we have all enjoyed working on it!

Dr. Alex German
Senior Lecturer in Small Animal Medicine
University of Liverpool School in Veterinary Science





WALTHAM®

High quality innovative science, conducted in a caring way

For nearly 50 years WALTHAM® has been a leading authority within the field of cat and dog nutrition. WALTHAM® science and publications have been instrumental in helping define the nutrient requirements of cats and dogs. However, delivering these nutrients within the daily calorie requirement is of equal, if not greater, importance. For this reason WALTHAM® continues to invest in research to understand energy requirements and factors contributing to healthy weight maintenance of dogs and cats.

WALTHAM® scientists work in partnership with the pets at the WALTHAM® Centre for Pet Nutrition, to conduct pet-focused research to support Mars Petcare. As a result, WALTHAM® delivers scientific breakthroughs in the areas of pet nutrition, health, wellbeing and behaviour.

In collaboration with global scientific institutes and experts, the WALTHAM® team of pet carers and scientists support leading Mars Petcare brands such as Whiskas®, Pedigree®, Trill®, Cesar®, Sheba®, Kitekat®, Aquarian®, Winergy®, Nutro®, Banfield Pet Hospital® and Royal Canin.

Today, obesity is more prevalent than ever in pets. This booklet aims to provide a valuable introduction to healthy weight maintenance, the consequences of obesity, risk factors and practical advice for everyone interested in pets, from pet owners to those working within the pet food industry.

www.waltham.com



Introduction

The importance of healthy weight maintenance

Recently, it has been estimated that approximately 40% of cats and dogs exceed their ideal weight. Being overweight can have serious health consequences for cats and dogs, just as this condition does for humans. Many owners appear to have difficulty recognising that their pet is overweight. There is, therefore, a need to educate owners about the importance of regularly monitoring the weight and body condition of their pet and to offer simple solutions to ensure they remain within the ideal range¹.

Obesity is an accumulation of excessive amounts of body fat. Cats and dogs are defined as overweight if their body weight is 15% above ideal, and classed as obese if more than 30% above their ideal weight. Various methods exist to enable veterinarians and owners to identify whether cats and dogs are their ideal weight, overweight or obese.



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Determining healthy weight

How to assess the current status of a cat or dog

There are a number of different tools that can be used to determine whether a pet is overweight. Some of these are suitable for use by owners whilst others require veterinary expertise.

Body weight measurement

This is a very simple measure that is often forgotten. It provides a good reference point and allows both the owner and pet care professional to track growth as well as adult body weight changes over time.

Ideally cats and dogs should be weighed regularly (at least once per month) at home. However, it may be easier and more accurate to use weighing scales that have been specifically designed for pets. Wherever possible, the same scales should be used to ensure a consistent measurement. Most veterinary clinics are equipped to provide body weight measurements and owners should make a point of weighing their pet at each visit.

Body condition scoring

Body condition scoring is a method of evaluating body composition that is quick and simple to perform. There are a number of different systems all using the appearance and feel of the animal to assess body condition. Examples include the 5-point and 9-point systems and WALTHAM® S.H.A.P.E.™ guide.

Body condition scoring is a very useful technique to measure overall current status and to monitor changes over time. There are, however, some limitations such as differences in scores between users.

The 5-point and 9-point systems

The 5-point system and the 9-point system are both commonly used. Both systems use written descriptions and pictures to categorise cats and dogs according to body condition. In the 9-point system a score of 4 or 5 is ideal², whereas in the 5-point system a score of 3 is ideal. Given that half points are often employed in the 5-point scale, these two systems are virtually equivalent. Both systems use technical language and may therefore be more suited for use by veterinarians rather than owners.






Grades	Criteria
1 Emaciated 	Ribcage, spine, shoulder blades and pelvis easily visible (short hair) Obvious loss of muscle mass No palpable fat on rib cage
2 Thin 	Ribcage, spine, shoulder blades and pelvis easily visible Obvious abdominal tuck (waist) Minimal abdominal fat
3 Ideal 	Ribcage, spine not visible but easily palpable Obvious abdominal tuck (waist) Little abdominal fat
4 Overweight 	Ribcage, spine not easily palpable Abdominal tuck (waist) absent Obvious abdominal distension
5 Obese 	Massive thoracic, spinal and abdominal fat deposits Massive abdominal distension

Figure 1: The five point body condition scoring system for cats



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Determining healthy weight

How to assess the current status of a cat or dog






Grades	Criteria
1 Emaciated 	Ribcage, spine, shoulder blades and pelvis easily visible (short hair) Obvious loss of muscle mass No palpable fat on rib cage
2 Thin 	Ribcage, spine, shoulder blades and pelvis easily visible Obvious abdominal tuck (waist) Minimal abdominal fat
3 Ideal 	Ribcage, spine not visible but easily palpable Obvious abdominal tuck (waist) Little abdominal fat
4 Overweight 	Ribcage, spine not easily palpable Abdominal tuck (waist) absent Obvious abdominal distension
5 Obese 	Massive thoracic, spinal and abdominal fat deposits Massive abdominal distension

Figure 2: The five point body condition scoring system for dogs



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Determining healthy weight

How to assess the current status of a cat or dog

The WALTHAM® S.H.A.P.E.™ guide

The WALTHAM® S.H.A.P.E.™ guide uses a flowchart to classify pets into one of seven categories. This approach is specifically designed to be used by owners with no

prior experience or training and has been successfully validated against clinical measures of body composition.

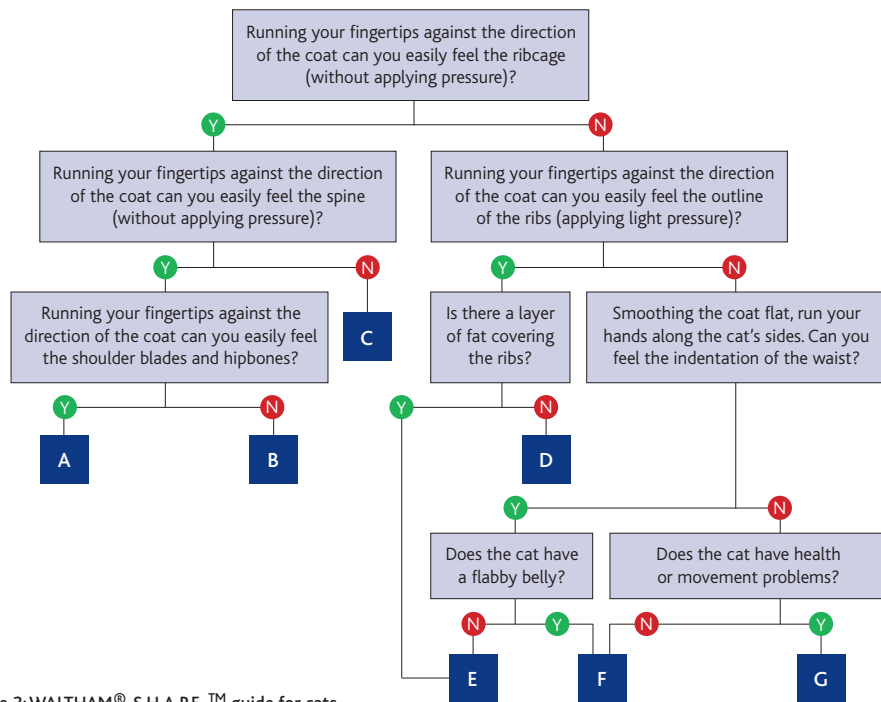


Figure 3: WALTHAM® S.H.A.P.E.™ guide for cats

S.H.A.P.E.™ Score	Description
A	Extremely thin – your cat has a very small amount or no total body fat. Recommendation: seek veterinary advice promptly.
B	Thin – your cat has only a small amount of total body fat. Recommendation: seek veterinary advice to ensure your cat is being offered the appropriate amount of food. Reassess using the S.H.A.P.E.™ chart every 2 weeks.
C	Lean – your cat is at the low end of the ideal range with less than normal body fat. Recommendation: increase food offered by a small amount. Monitor monthly using the S.H.A.P.E.™ chart and seek veterinary advice if no change.
D	Ideal – your cat has an ideal amount of total body fat. Recommendation: monitor monthly to ensure your cat remains in this category and have him/her checked by the veterinarian at your next visit.
E	Mildly overweight – your cat is at the upper end of the ideal range with a small amount of excess body fat. Recommendation: seek veterinary advice to ensure your cat is being offered the appropriate amount of food and try to increase activity levels. Avoid excessive treats and monitor monthly using the S.H.A.P.E.™ chart.
F	Moderately overweight – your cat has an excess of total body fat. Recommendation: seek veterinary advice to implement safely an appropriate weight loss plan including increasing activity levels. Reassess using the S.H.A.P.E.™ chart every 2 weeks.
G	Severely overweight – your cat has a large amount of excess total body fat that is affecting its health and well being. Recommendation: seek veterinary advice promptly to introduce a weight loss plan to reduce your cat's weight, increase activity levels and improve overall health.

NB: Some breeds and different life-stages may have different ideal S.H.A.P.E.™ scores. Consult your veterinarian if you are unsure.



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Determining healthy weight

How to assess the current status of a cat or dog

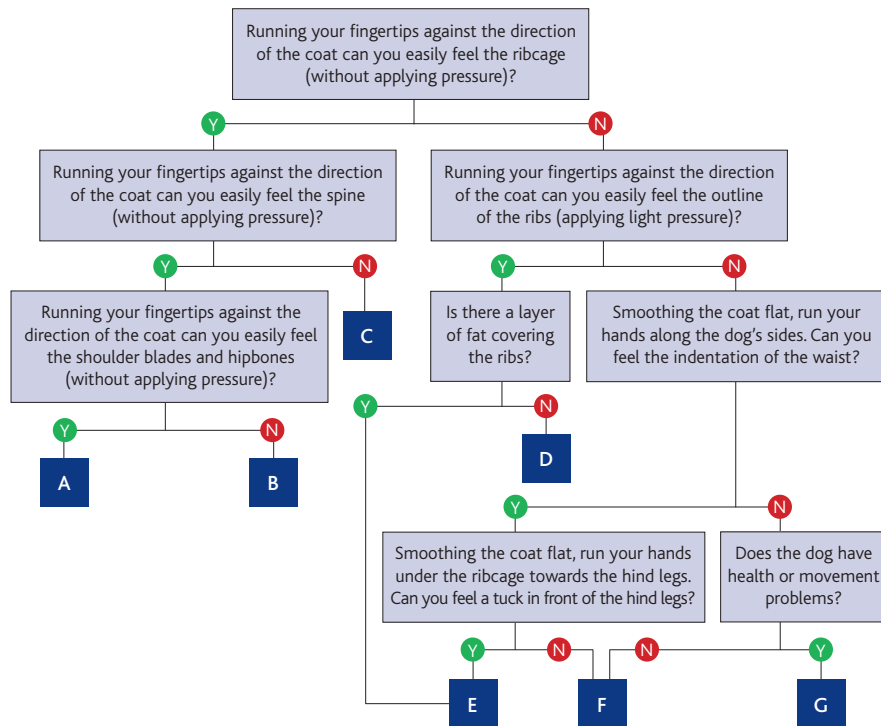


Figure 4: WALTHAM® S.H.A.P.E.™ guide for dogs

S.H.A.P.E.™ Score	Description
A	Extremely thin – your dog has a very small amount or no total body fat. Recommendation: seek veterinary advice promptly.
B	Thin – your dog has only a small amount of total body fat. Recommendation: seek veterinary advice to ensure your dog is being offered the appropriate amount of food. Reassess using the S.H.A.P.E.™ chart every 2 weeks.
C	Lean – your dog is at the low end of the ideal range with less than normal body fat. Recommendation: increase food offered by a small amount. Monitor monthly using the S.H.A.P.E.™ chart and seek veterinary advice if no change.
D	Ideal – your dog has an ideal amount of total body fat. Recommendation: monitor monthly to ensure your dog remains in this category and have him/her checked by the veterinarian at your next visit.
E	Mildly overweight – your dog is at the upper end of the ideal range with a small amount of excess body fat. Recommendation: seek veterinary advice to ensure your dog is being offered the appropriate amount of food and consider increasing activity levels. Avoid excessive treats and monitor monthly using the S.H.A.P.E.™ chart.
F	Moderately overweight – your dog has an excess of total body fat. Recommendation: seek veterinary advice to implement safely an appropriate weight loss plan including increasing activity levels. Reassess using the S.H.A.P.E.™ chart every 2 weeks.
G	Severely overweight – your dog has a large amount of excess total body fat that is affecting its health and well being. Recommendation: seek veterinary advice promptly to introduce a weight loss plan to reduce your dog's weight, increase activity levels and improve health.

NB: Some breeds and different life-stages may have different ideal S.H.A.P.E.™ scores. Consult your veterinarian if you are unsure.



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Determining healthy weight

How to assess the current status of a cat or dog

Other measures

There are several more specialised clinical measures that may be employed by clinicians or veterinarian referral clinics during weight loss programmes.

These include:

- Dual energy X-ray absorption (DXA) where a precise measure of body fat and lean tissue can be determined.
- Bioelectrical impedance analysis where body composition is determined by measuring the nature of conductance of an applied electrical current.
- Zoometry, which involves taking a number of measurements such as hind limb and body length and entering them into an equation that calculates body condition. A good example of this is the Feline Body Mass Index (BMI).

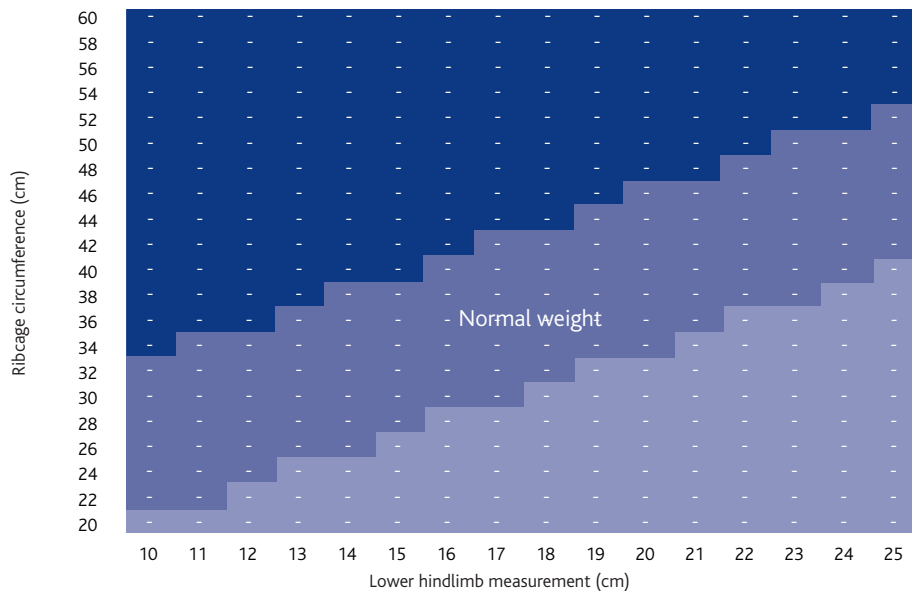


Figure 5: Feline Body Mass Index (FBMI)

Feline BMI™

The Feline BMI™ is designed to predict the levels of body fat in a cat. This is calculated using the following equation, which uses ribcage circumference and the lower hindlimb measurement (LIM) (in cm). LIM is defined as from the middle of the patella to the dorsal tip of the calcaneal process.

$$\text{Percentage body fat} = \left[\frac{\left(\frac{\text{rib cage}}{0.7062} \right) - \text{LIM}}{0.9156} \right] - \text{LIM}$$



Figure 6: Measurement of ribcage circumference



Figure 7: Measurement of the length of the lower leg (LIM) from the middle of the patella



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Factors affecting healthy weight maintenance

Healthy weight maintenance: nature or nurture?

In simple terms, excess body weight is caused by a pet consuming more calories than required. However, there are a number of factors that can influence the ability of a pet to maintain a healthy weight. Some of these are innate and others are determined by the pet's environment.

Breed

Certain breeds of dog have a predisposition to weight gain, examples of which include the Beagle, Bernese Mountain Dog, Collie, Labrador Retriever, Cairn Terrier and King Charles Spaniel. In cats, mixed breeds are approximately twice as likely to be overweight when compared to pure-bred varieties.

Genetics

Although poorly understood in companion animals, genetic factors may be involved in determining whether an animal becomes overweight, with a number of different genes playing a role. Although certain breeds appear to be predisposed to weight gain, there is also individual variation within a breed in terms of their tendency to gain weight. This breed-independent variation indicates the existence of a complex set of genetic elements involved in determining healthy weight maintenance.

Age

As pets age, their likelihood of becoming overweight increases. Estimates suggest that 20% of dogs aged less than 4 years are overweight. This increases to 50% in the 7-8 year old category³. Cats are particularly at risk of weight gain during middle age, with one in three cats in the 6-8 year old range being classed as overweight⁴.

Gender and neuter status

Female dogs appear to be more predisposed to obesity than male dogs, with neutering increasing the frequency of obesity in both sexes. Irrespective of gender, neutering is a major risk factor for obesity in cats.





Factors affecting healthy weight maintenance

Healthy weight maintenance: nature or nurture?

Pet-owner relationship

The relationship between the pet and owner has a significant impact on healthy weight maintenance. Owners often use food as a form of interaction with their pet even though the animal may be initiating social contact and would benefit from a session of active play. Some owners tend to humanise their cat or dog, substituting them for human companionship, and this anthropomorphic behaviour has been associated with companion animal obesity. Involvement with family mealtimes, such as being present during preparation and eating of the meal can lead to a pet receiving extra treats in addition to their recommended allowance ⁵.

Other owner effects

Research shows that owners of overweight pets are more likely to be overweight themselves and may not recognise the issue in their pet. Increased prevalence of pet obesity has also been noted in pets whose owners are older than 55 years. Lifestyle of the owner is also important in determining healthy weight maintenance of the pet, with more time spent at home being a factor associated with an overweight pet, as well as lack of physical activity in the owner ⁶.

Dietary factors

Feeding cats and dogs *ad libitum* facilitates over-eating and has been associated with weight gain. Dividing the daily food allowance into more than one meal does not in itself cause weight gain. Surveys show, however, that dogs fed more than once a day are more likely to be offered excess calories that can result in weight gain. In addition to feeding patterns, the types of food offered are important in determining maintenance of a healthy weight.

Excessive feeding of table scraps and human foods to cats and dogs makes them more likely to gain weight. A recent study carried out on behalf of the Pet Food Manufacturers Association (PFMA) found that feeding table scraps was one of the biggest contributors to pet obesity ⁷.

Although there are many anecdotal suggestions that feeding a high-carbohydrate diet to cats predisposes to obesity, there is currently no evidence to support this assertion. Unlike humans, cats are able to consume a diet relatively high in fat without raising cholesterol levels. As long as a cat's daily calorie intake remains constant, increasing the proportion of fat in the diet will not affect the likelihood of weight gain ²⁰. High fat diets, however, can increase the risk of overfeeding as they are more energy dense. Undoubtedly, feeding treats in excess of recommended amounts is linked to weight gain.

Activity

There is no doubt that regular physical exercise is a key factor in the prevention of obesity. Owners of dogs are conditioned to providing regular walks and sessions of play as part of the normal care routine of their pet. However, many cat owners do not initiate play sessions with their pet, which would contribute towards sufficient daily activity levels. Indoor cats are more prone to weight gain than cats that spend time outdoors, due to a less active lifestyle. However, outdoor cats may still require encouragement to participate in sufficient physical activity to maintain a healthy weight.



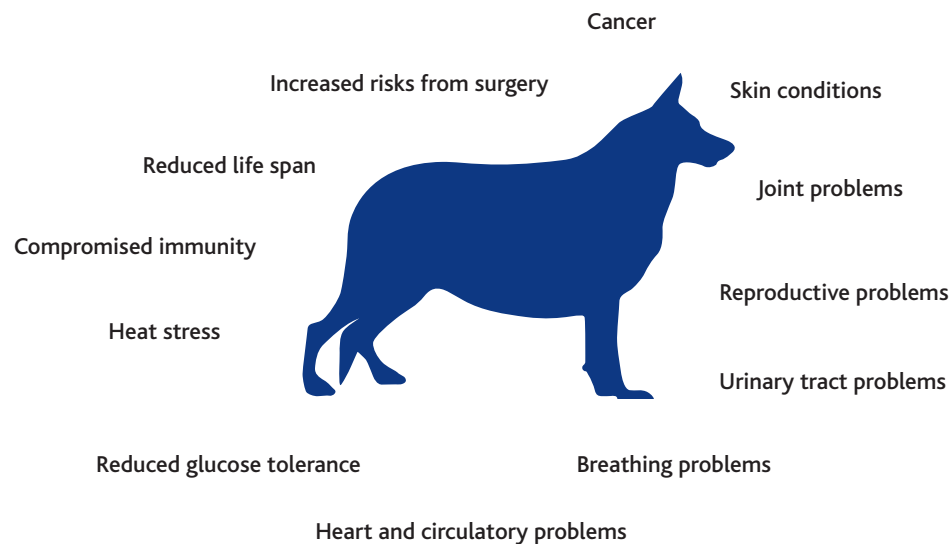


Health risks of obesity

Excess body weight can have a detrimental effect

As with humans, obesity in cats and dogs is associated with, and in some cases may be the cause of, a number of health risks. These range from conditions which may cause discomfort to the pet to serious conditions which may be life threatening. In addition, obesity may exacerbate existing medical conditions in pets.

Health risks of obesity for dogs



Breathing problems

One of the most common signs associated with obesity in dogs is a reduced tolerance to physical exertion. This can result in excessive panting and even tracheal collapse. Following weight loss, a large number of owners report an increase in the ability of their pets to play.

Joint problems

Excess body weight puts increased stress on the joints. Overweight puppies are more likely to suffer from hip dysplasia, and older dogs may suffer with osteoarthritis. Overweight dogs are more likely to tear ligaments and fracture bones, requiring surgery. Reduced mobility will reduce the energy requirements of the pet and, if the daily food allowance is not adjusted, will lead to further weight gain.

Skin conditions

Overweight dogs may not be able to groom themselves properly and this may lead to poor coat condition, and increased body odour. In extreme cases the dog may suffer hair loss, sores and ultimately the development of dermatitis.

Heat stress

As fat acts as an insulator, overweight dogs are more likely to suffer from heat exhaustion than their healthy weight counterparts. This will further reduce their ability to exercise on warm days and can lead to further weight gain.

Heart and circulatory problems

Overweight dogs are more prone to develop certain types of blood clot⁸, raised blood pressure⁹ and are more likely to suffer damage to the heart.

Compromised immunity

Overweight and obese dogs, particularly if fed a high fat diet, have a reduced resistance to infection and therefore may be more prone to illness¹⁰.

Urinary tract problems

Obese dogs are more likely to suffer from bladder stone formation¹¹ and overweight female dogs are more likely to be incontinent¹².

Cancer

Obesity has been linked to certain types of cancer, such as mammary tumours in dogs.

Reproductive problems

Dogs suffer from reduced fertility and an increased risk of birth complications when they are overweight or obese.

Reduced glucose tolerance

Obese dogs have a decreased ability to metabolise glucose as their cells are more resistant to the effects of insulin¹³. Although type II diabetes mellitus is not recognised in dogs, there is an association between dogs being overweight and suffering from type I diabetes.

Increased risks from surgery

A number of conditions, resulting from obesity, can require veterinary intervention. Taking blood samples and feeling for abnormalities is more difficult when body fat levels are increased. Overweight dogs have an increased risk of complications during anaesthesia, whilst operations may take longer and be more difficult. For example, neutering of an overweight female dog can take up to a third longer than the same operation on a dog of ideal weight.

Reduced life span

Increased body weight can reduce the lifespan of dogs. In large breed dogs, the lifespan is reduced by an average of two years as a result of obesity¹⁴.

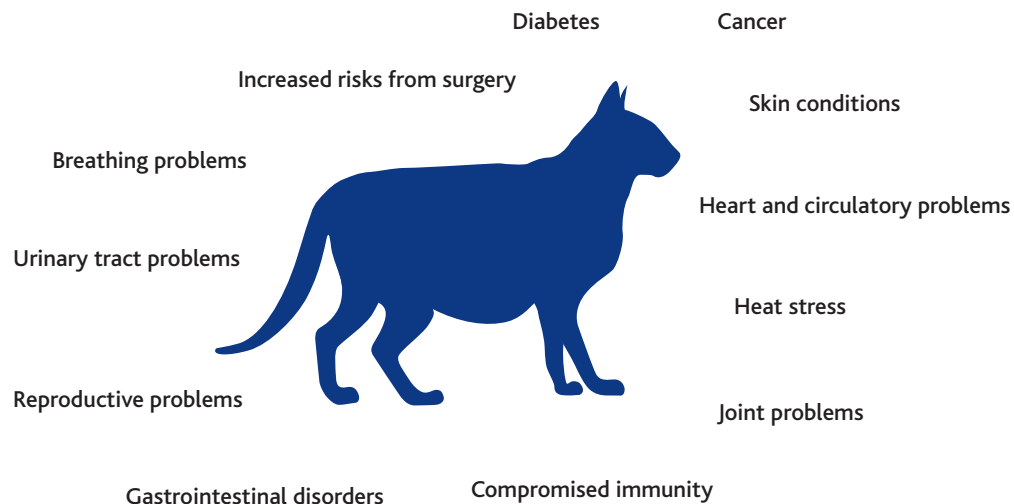




Health risks of obesity

Excess body weight can have a detrimental effect

Health risks of obesity for cats



Skin conditions

Overweight cats may not be able to groom themselves properly and this may lead to poor coat condition, and increased body odour. In extreme cases the cat may suffer hair loss, sores and ultimately the development of dermatitis.

Breathing problems

One of the most common signs associated with obesity in cats is a reduced tolerance to exertion. This may manifest as rapid breathing. Following weight loss, a large number of owners report an increase in the ability of their pets to play.

Joint problems

Excess body weight puts increased stress on the joints. Older cats may suffer with osteoarthritis. Overweight cats are five times more likely to limp. Reduced mobility will reduce the energy requirements of the pet and if the daily food allowance is not adjusted will lead to further weight gain.

Gastrointestinal disorders

Overweight cats are more likely to suffer from diarrhoea, anal sac disease, constipation and inflammatory bowel disease. Combined with an inability to groom effectively, this can result in increased odour and poor hygiene¹⁵.

Heat stress

As fat acts as an insulator, overweight cats are more likely to suffer from heat exhaustion than their healthy weight counterparts. This will further reduce their ability to exercise on warm days and can lead to further weight gain.

Heart and circulatory problems

In cats, excess body weight can affect the rhythm of the heart, the volume of blood the heart can pump and can increase blood pressure.

Compromised immunity

Overweight and obese cats, particularly when fed a high fat diet, have a reduced resistance to infection and therefore may be more prone to illness.

Urinary tract problems

Obese cats are more likely to suffer from feline lower urinary tract diseases, such as cystitis, bladder stones and blockage of the urinary tract which can ultimately lead to kidney failure¹⁵.

Cancer

Obesity has been linked to a general increase in the risk of cancer in cats. In addition, excess weight in cats is linked to an increased risk of adenocarcinoma, fibrosarcoma, lipoma, lymphoma and basal cell carcinoma¹⁵.

Reproductive problems

Cats suffer from reduced fertility and an increased risk of birth complications when they are overweight or obese.

Diabetes

Obese cats have a decreased ability to metabolise glucose as their cells are more resistant to the effects of insulin. This can result in type II diabetes¹⁶.

Increased risks from surgery

A number of conditions, resulting from obesity, can require veterinary intervention. Taking blood samples and feeling for abnormalities is more difficult when body fat levels are increased. Overweight cats have an increased risk of complications during anaesthesia, whilst operations may take longer and be more difficult.





Energy requirements

Balancing intake with expenditure

All animals require energy to sustain life and for normal functioning of body systems. In order to maintain a healthy body weight, the energy intake provided by the diet should be balanced with the energy expenditure of the pet. The amount of energy an individual requires is dependent on a number of factors including lifestage and lifestyle.

Energy utilisation

Energy is provided in the diet through protein, fat and carbohydrate and is expressed either in kilocalories (kcal) or kilojoules (kJ). Energy is required by adult pets for three main reasons:

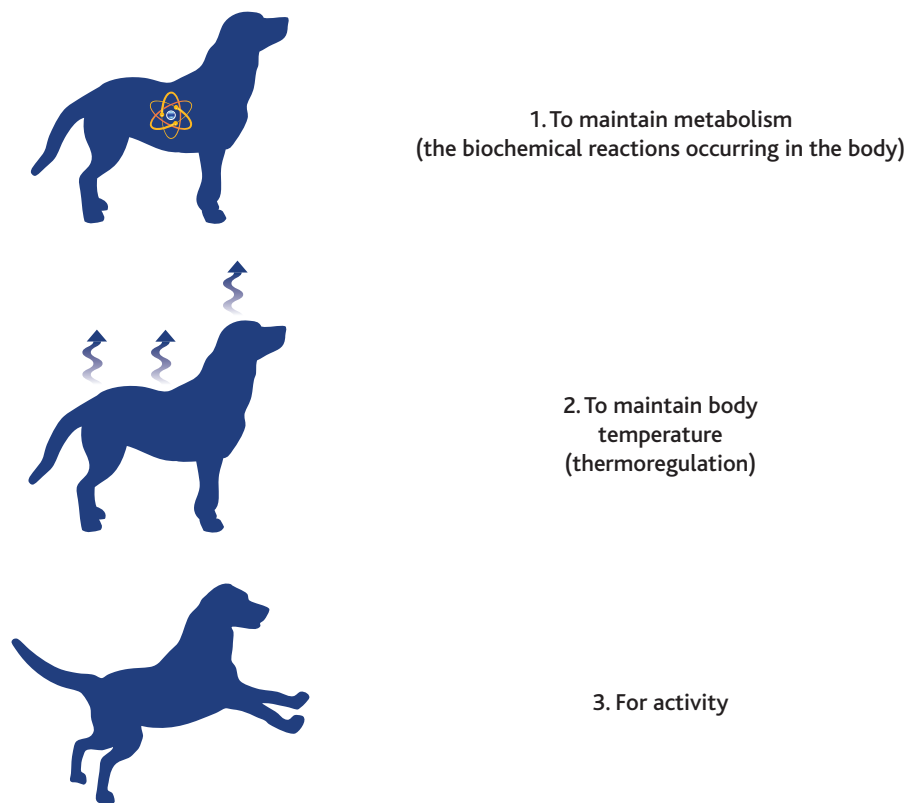


Figure 8: Types of energy expenditure

Energy balance

It is important that the energy intake and expenditure remain balanced. An intake of energy greater than required leads to weight gain and, conversely, when energy intake is lower than required the consequence is weight loss.

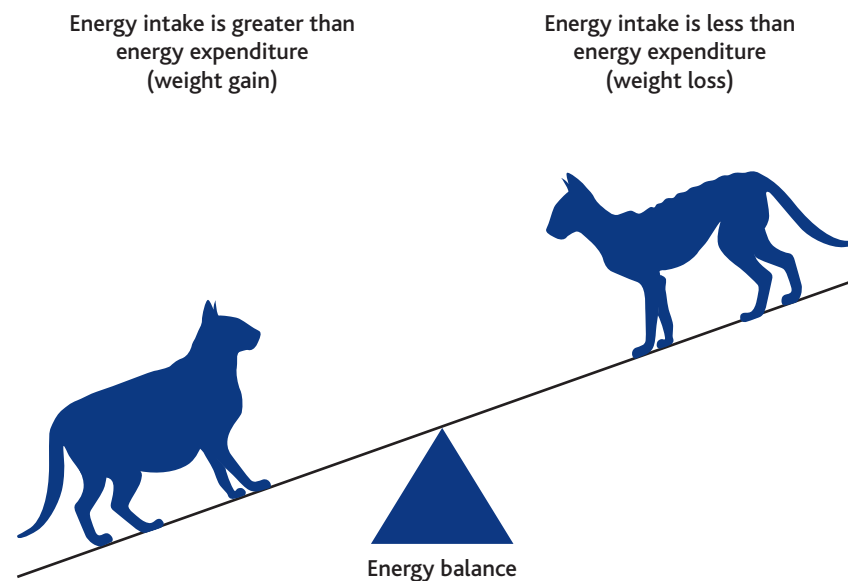


Figure 9: Balance between energy intake and energy expenditure



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Energy requirements

Balancing intake with expenditure

Energy from food

The gross energy (GE) of a food is the amount of chemical energy released when that food undergoes complete combustion in a bomb calorimeter. The GE values of protein, fat and carbohydrate are 5.7 kcal g⁻¹, 9.4 kcal g⁻¹ and 4.1 kcal g⁻¹ respectively¹⁷. This means that fat delivers approximately double the energy per gram when compared with either protein or carbohydrate.

When food is ingested, the majority of GE is utilised by the pet (termed digestible energy) but some is lost in faeces. When further losses of energy in urine and gas are taken into account, the result is metabolisable energy (ME); this is energy available for metabolism. When nutritional requirements are stated for an animal, they are expressed per 1000 kcal ME.

Calculating energy requirements

The daily energy requirement of a cat or a dog is calculated according to their body weight. As energy requirement does not have a linear relationship with body weight, a mathematical function, derived from scientific evidence, must be applied to the body weight to give the following equations. It is important to note that the formulae apply to healthy adult pets. Different formulae exist for puppies, kittens, gestating or lactating mothers, senior or overweight pets (Appendix 1, page 26).

Adult cat

To calculate the daily energy requirements for the average pet cat the following equation must be applied to the body weight:

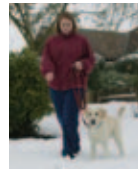
$$\text{Energy} = 77.6W^{0.711}$$

Adult dog

The daily energy requirement for dogs is based on the level of daily activity.

Low activity

Less than 1 hour per day, e.g. walking on the lead.
Energy = 95W^{0.75}



Moderate activity

1-3 hours per day, e.g. playing off the lead.
Energy = 110W^{0.75}



High activity

Over 3 hours per day, e.g. working dogs, agility.
Energy = 125W^{0.75}



(where W = body weight in kg)

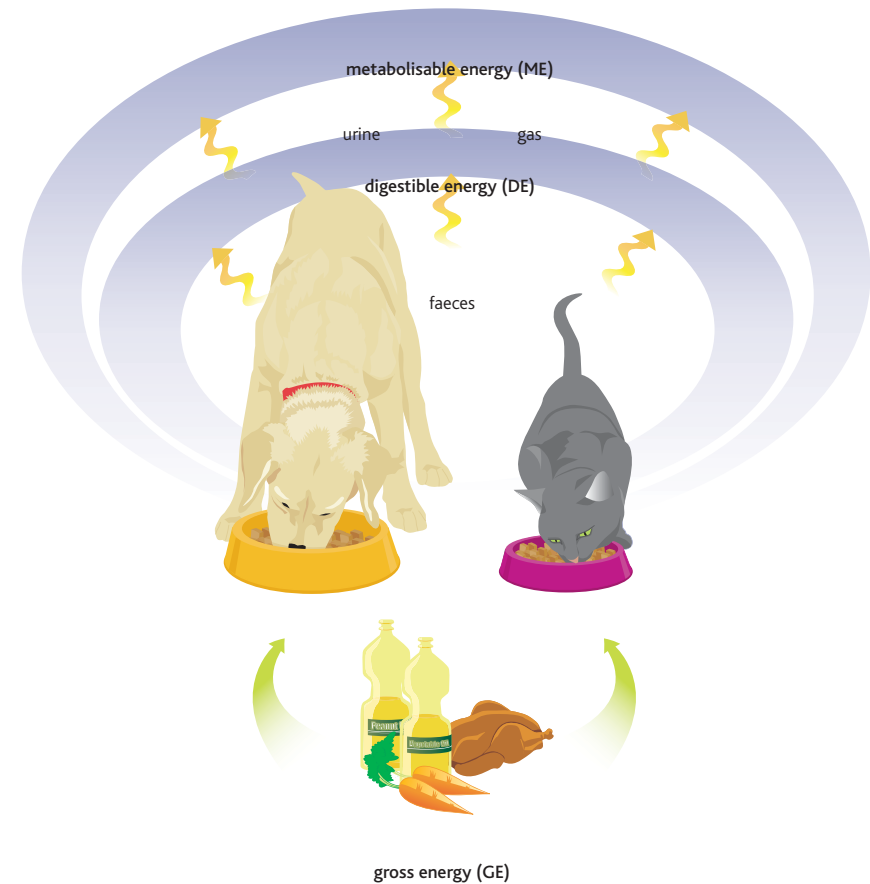


Figure 10: Energy utilisation in the cat and dog





Energy requirements

Balancing intake with expenditure

Factors affecting energy requirements

In addition to body weight, there are a number of factors that may affect the energy requirement of a pet. These include their physical activity, body condition, neuter status, lifestage and environmental conditions, as well as some breed and individual differences. Due to these factors, some pets require less than the average amount of energy whereas others may require more. Therefore, the energy requirement formulae must be applied and adjusted accordingly for the individual pet.

Activity level

Pet cats and dogs have been shown to have significantly reduced activity levels when compared with working animals. Owners often overestimate the activity levels of their pets. The average pet cat or dog typically engages in exercise for less than one hour a day and therefore requires a relatively small amount of food.

Neutering

Neutered pets tend to be less active and due to hormone changes may be more prone to laying down fat.

Body condition

The quantity of muscle a pet has also affects energy requirements. Adipose (fat) tissue is metabolically less active than muscle tissue and, therefore, pets with a smaller muscle mass have lower energy requirements.

Lifestage

Puppies and kittens require more energy than adults of equivalent size to enable healthy growth. Pregnant and lactating mothers also require additional calories due to the energy demands of producing and feeding offspring. Senior cats and dogs often require less energy due to a more sedentary lifestyle.





Feeding guides

Enabling responsible feeding

Pet food feeding guides are based on the calories provided by the food, whether wet, dry or semi-ashould offer their pet based on size, age and activity level. The feeding guide should be used as the foundation for estimating how much food to offer, but the exact amount must be tailored according to individual pet requirements.

How feeding guides are calculated

Feeding guides are calculated by dividing the pet's daily energy requirement (see page 16) by the energy density of the food.

A typical dry food contains between 350 and 450 kcal per 100g. A typical wet food contains between 75 and 100 kcal per 100g. For most reputable pet food companies, the energy densities of their pet foods are available from customer care lines or on websites.

Step 1	Step 2
Calculate pet's energy needs per day from bodyweight (kcal)	$\frac{\text{Pet energy needs}}{\text{Energy density of food}} \times 100 = \text{Daily amount of food per day (g)}$
Determine energy density of the food (kcal /100g diet)	

Table 1: How feeding guides are calculated

How to use feeding guides

To maintain a healthy body weight pet owners should feed a nutritionally complete and balanced diet and follow the recommended feeding guides.

Owners should feed according to the ideal weight of their pet rather than the current weight. A veterinarian can provide advice on the ideal weight for an individual pet.

Feeding guides have been carefully calculated but, as the name suggests, they are a guide and feeding amounts may need to be adjusted depending on the specific pet's energy requirements.

Different dietary formats have different energy density; therefore, it is important to weigh food and not estimate the quantity.

A pet's weight and body condition should be monitored regularly, and any necessary adjustments made in order to ensure that the pet stays in ideal body condition.

If treats are fed, an owner should ensure that the energy supplied contributes no more than 10% of total daily calories.

If a pet's energy requirements change, for example, due to illness or injury, the food should be adjusted accordingly.







						
Weight of dog (kg)	5	10	15	20	25	30
Amount of food (g)	85	140	190	240	280	325

Table 2: Example of typical feeding guide for dry dog food



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Food type

Wet food is less calorie dense than dry

When fed correctly, wet, dry and semi-moist diets are all carefully designed to provide the right nutrients in the right amounts. However, it is important to understand the relative calorie density of each.

The influence of pet food formats

When compared by weight, wet commercial pet foods contain approximately a quarter of the number of calories of dry pet foods, due to the increased moisture content. A typical wet food contains approximately 100kcal per 100g, whereas a dry food contains around 400kcal per 100g, although there are variations between individual products.

The correct portion size of dry foods may appear to be very small to the owner, causing them to feed more calories than required, particularly for cats and small breed dogs. The risk of overfeeding wet foods is reduced due to their lower caloric density. When considering the energy requirements of a 10kg dog, 10g extra dry food is equivalent to an extra 8% of its daily calorie requirement, whereas an extra 10g of wet food is only equivalent to a 2% excess.

There is also evidence that feeding cats a diet with a higher moisture content can help reduce the risk of weight gain. A WALTHAM® study demonstrated that cats fed a diet with a high moisture content gained less weight, per calorie consumed, compared with cats fed the same diet with a lower water content. This effect was attributed to an increase in the cats' voluntary physical activity²¹.

Home-prepared diets

Feeding home-prepared diets or table scraps has been linked to an increased risk of pet obesity⁷. This may partly be because there is no feeding guide for the owners to follow to ensure they feed the correct amount for their pet. In addition, unless properly formulated, home-prepared diets may not be complete and balanced, or may contain potentially harmful ingredients.

100g dry = approximately 400kcal

400g wet = approximately 400kcal

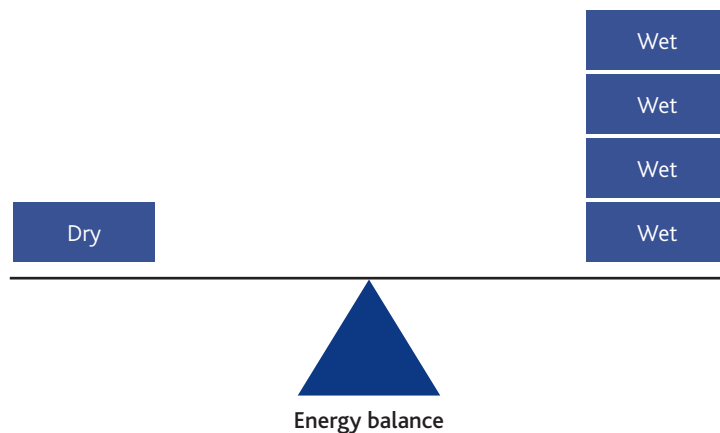


Figure 11: A comparison of calorie density between dry and wet pet foods



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Responsible treating

Making treats part of a healthy diet

Treats provide an important mechanism for strengthening the bond between a pet and owner and are frequently used as a motivating tool for training. In addition, some treats have positive effects in areas such as oral health and joint health.

The energy consumption from treats contributes to a pet's daily energy intake and therefore must be accounted for within the daily calorie intake. In addition, many snacks and treats do not deliver all the essential nutrients a pet requires. It is, therefore, important that the energy intake from snacks and treats does not exceed 10% of daily energy requirements. Feeding in excess of this amount may result in nutritional deficiencies.

Some owners give table scraps or human snacks as treats to their pets. This can lead to problems as human snacks are typically more calorie dense than pet snacks and treats.

	Food type	kcal	% Daily allowance	Equivalent kcal intake for an average woman	Equivalent to human snacks
Cat (4kg)	1 Egg	70	33	666	
Cat	1 Tin tuna	140	67	1352	
Dog (15kg)	1 Bag crisps	130	18	360	
Dog	2 Sausages	275	38	760	
Dog	2 Biscuits	120	8	160	

Table 3: Impact of feeding human foods on daily calorie intake of pets

Tips for healthy treating

- Treats should not account for more than 10% of the daily energy requirement
- Always use treats designed for pets
- A portion of the pet's normal dry ration may be used as treats during training or play
- Break larger treats up into several small pieces. This is not recommended for dental chews as this may reduce their effectiveness
- Non-food based rewards should also be considered such as toys or play
- Take care to ensure functional treats (e.g. joint health treats) are fed at the recommended daily amount.





Exercise

An important factor in healthy weight maintenance

Exercise increases energy expenditure, helps to burn fat and helps build muscle mass. In addition, exercise can benefit the general wellbeing of the pet. Dogs and cats are intelligent animals and require mental stimulation. Exercise is a good way of fulfilling this need, and is important for all pets but particularly for highly active or working dog breeds such as collies.

Exercising cats

Exercising cats can be achieved by stimulating their hunting instinct. Often cats are reluctant to exercise themselves. Here are some tips to encourage a cat to exercise.

Tips for exercising cats

- The use of toys is often very successful, particularly the fishing rod type toys as well as small toys that can be thrown for cats to chase, such as ping-pong balls
- Cats rapidly become bored with the same toys, so it is important to provide as much variety as possible
- Cats are physiologically suited to short, rapid bursts of activity, rather than sustained exercise. Therefore, it is usually better to use a number of short play sessions rather than a single prolonged period
- Structures such as climbing and scratching posts can also be beneficial in stimulating exercise
- Cheap everyday items (such as paper bags, toilet roll inners and cardboard boxes) all provide additional stimuli that may encourage a cat to play.



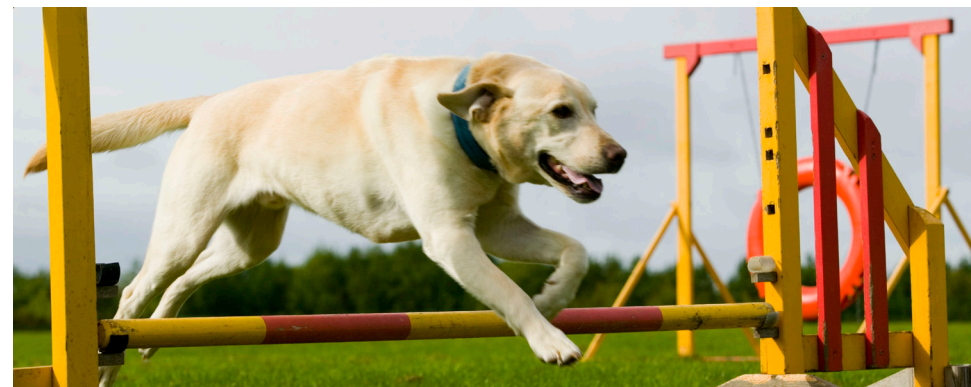
Exercising dogs

Ideally, owners should exercise their dogs at least twice daily. The amount of exercise required depends on the individual and is not always related to size. Often it is related to the lifestyle or characteristics of the breed.

Off-lead exercise enables dogs to move at their own speed and they are likely to walk further as they investigate the environment. Simply letting a dog outside may not provide suitable exercise as many dogs will not exercise at sufficient intensity unless encouraged by an owner.

Tips for exercising dogs

- Walking or running with their owner
- Swimming, where it is safe to do so or dog hydrotherapy pools
- Interactive play with other dogs of suitable size and character
- Throwing toys designed for dogs to fetch (the use of sticks or stones is not recommended as they might damage dogs' teeth)
- Canine sports such as agility and obedience training can provide a useful and social method of exercising a dog.





Exercise

An important factor in healthy weight maintenance

Precautions

- It is not a good idea to exercise a pet immediately after a meal. A rest period of at least 30 minutes after eating is recommended due to the risks of stomach upset and, in some breeds, bloat (a gaseous distension and potential twisting of the stomach that can be painful and even fatal)
- If a pet has health issues, it is recommended to seek veterinary advice as to the types of exercise that are safe for them to undertake
- It is better to maintain a regular daily pattern of exercise, rather than exercising a pet sporadically
- If a pet is overweight or very old, exercise may need to be increased gradually
- Pets should be allowed to rest after prolonged exercise
- On hot days pets, in particular those that are overweight, should be exercised in the morning or evening to help prevent heat exhaustion.



Enriched feeding

Enriched feeding, which requires the pet to work for food, can provide mental stimulation and encourage physical activity by extending the duration of the feeding moment. When using enriched feeding the food used should represent a portion of the pet's daily energy requirement.

Enriched Feeding Options

- Place food in a feeding ball or a plastic bottle with the lid off or a small hole cut in the side to allow kibbles to fall out
- Place pet food in a hollow toy. This method is particularly suited to wet food or soaked dry food
- Hide food for cats in a cardboard tube
- Scatter, hide or throw dry food around the room (ensuring that all food has been found at the end of the play session for hygiene reasons)
- Varying the place where the pet is fed can encourage seeking behaviour
- Divide the daily food ration into several bowls and place in different areas
- Place food for cats on scratching posts to encourage climbing.





Natural feeding behaviour

Learning from the ancestors

An appreciation of the natural feeding patterns in the wild ancestors of the domesticated dog and cat provides a basis for establishing suitable mealtime routines in the home.

Natural feeding behaviour of dogs

Wolves (*Canis lupus*), the wild ancestors of the domestic dog, are able to eat up to one fifth of their body weight in a single meal. However, they may go several days after this without eating. Dogs are also naturally gorge feeders and are adapted to eat one or two meals per day. Although classed as carnivores, dogs are opportunistic feeders and have adapted to eat both meat and vegetables. Dogs have evolved to also obtain food by scavenging.

This opportunistic feeding behaviour helps to explain why many dogs have a tendency to eat any food provided, even if it is in excess of their requirements.



Figure 12: Wolf (*Canis lupus*)

Natural feeding behaviour of cats

In contrast to dogs, cats are strict carnivores, and therefore must eat meat every day. The African wildcat (*Felis silvestris lybica*), the ancestor of the domestic cat, eats several small birds or mammals throughout the day. Domestic cats, therefore, naturally prefer to eat many small meals at frequent intervals. This natural behaviour may encourage cats to over eat when offered more food than they need. Feeding the amount of food a

cat requires split into several small meals per day will allow a cat to maintain its natural behaviour while maintaining a healthy weight.

Cats are motivated to hunt even when they are not hungry, demonstrating a need for this activity, which is not necessarily based on calorie-seeking. Food is not the only way to meet a cat's natural desire to hunt. This can also be achieved through play.



Figure 13: African wildcat (*Felis silvestris lybica*)





Dietary factors

Additional support

Calorie control and appropriate exercise are the most important factors influencing maintenance of a healthy body weight. However, certain dietary ingredients and strategies have been used to help support healthy weight maintenance. This section reviews the most common approaches.

Lower energy diets (light diets, clinical weight loss diets)



These diets have lower energy density to enable an animal to receive fewer calories when fed a given volume of food. These diets have increased levels of essential nutrients to prevent nutritional deficiencies during reduced feeding. Clinical weight loss diets are designed to deliver very low levels of calories per kg body weight and therefore must only be fed under veterinary supervision. Light diets, however, can be fed by the owner according to the feeding guide.

Protein



Protein is the most satiating macronutrient and, therefore, may help prevent over-feeding of pets by reducing begging behaviour. Studies have shown that increasing the protein content of foods allows pets to lose more of their excess body weight as fat rather than muscle tissue, provided overall calorie intake is controlled¹⁸.

Fibre



Increasing the level of non-digestible fibre (roughage) in the diet has been shown to help both weight loss and weight maintenance in cats and dogs. Fibre helps healthy weight maintenance by decreasing the calorie density of the food, so that fewer calories are consumed for the same volume of food. Increasing the fibre level in foods, in conjunction with increased protein, also acts to increase satiety in both dogs and cats and reduces begging behaviour¹⁸.

Reduced fat



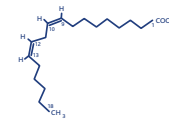
Dietary fat contains approximately double the amount of calories per gram compared with protein and carbohydrate. By reducing the level of fat in a diet, fewer calories are consumed in a given portion of food, and owners are less likely to over-feed their pet. Care should be taken, however, to maintain the species-specific minimum fat requirements.

Water



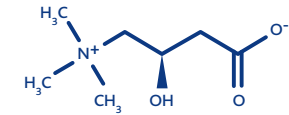
Water affects weight maintenance in two ways. Firstly, by increasing the water content of a diet, a greater volume of food can be offered for the same number of calories. This has been shown to reduce calorie intake in cats. In addition, research has shown that adding water to dry food increases the spontaneous activity levels in cats resulting in greater calorie expenditure, although the mechanism by which this occurs is unknown.

Conjugated Linoleic Acid



Evidence from other species suggests that conjugated linoleic acid (CLA) may have benefits in reducing body fat and body weight. However, recent evidence suggests that feeding CLA has no significant effects on energy expenditure or weight maintenance in cats and dogs.

L-Carnitine



In cats, L-carnitine has been shown to increase weight loss by increasing the proportion of fat used for energy production. L-carnitine has only been shown to be effective when used in conjunction with an energy-restricted diet¹⁹.

Omega 3 fats



Based on *in vitro* evidence, cats and dogs do not as readily store the omega 3 fats DHA, EPA and ALA when compared to other fat types. Evidence from other species suggests that increased intake of these fat types could reduce the risk of fat gain.



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Weight loss

Correcting the energy balance

Whilst small adjustments to a cat or dog's calorie intake can be conducted at home to maintain a healthy body weight, weight loss programmes should be conducted in consultation with a veterinarian to prevent adverse health effects.

For pets that are only slightly overweight (S.H.A.P.E.™ guide score: E) an owner should:

- Check all sources of calories and ensure that treats and food scraps are accounted for as part of the daily intake
- Check the feeding guide and weigh out food using scales to ensure the pet is receiving the correct amount
- Adjust the feeding amount to no lower than the lowest level on the feeding guide
- Consider feeding a light diet
- Increase physical activity (extra walk for dog, extra play session for cat)
- Pets are likely to be observed to exhibit increased begging behaviour. However, this should reduce over time. As weight loss continues, owners may also notice that their pet becomes more active and may require more exercise
- Agree with all members of the household to follow the plan
- Monitor body weight on a weekly basis and seek veterinary advice if no change is observed.

For pets that are moderately to severely overweight (S.H.A.P.E.™ guide score: F or G) a weight loss programme under veterinary supervision may be necessary.

A veterinarian would normally:

- Check for any clinical abnormalities that might account for weight gain
- Agree an ideal body weight target with the owner
- Recommend a specific weight loss diet
- Recommend a suitable feeding amount
- Monitor body weight changes every four weeks and adjust feeding amounts accordingly.





Appendix 1

Energy requirements for gestation, lactation and growth

The following formulae are recommended by the National Research Council (NRC) ¹⁷ for daily energy requirements (kcal) during gestation, lactation and growth.

Dog gestation

The NRC recommends the following energy equation for late gestation (4 weeks after mating):

$$\text{Energy} = 130W^{0.75} + 26W$$

Where W is equal to body weight in kilograms

Lactation

$$\text{Energy} = 145W^{0.75} + W(24n + 12m)L$$

Where W = body weight,
n = number of puppies in litter from 1 to 4,
m = number of puppies from 5 to 8,
L = correction figure for stage of lactation, varying from 0.75 (week 1) to 1.2 (week 4)

Growth (puppy & junior)

$$\text{Energy} = 130W^{0.75} \times 3.2[e^{(-0.87p)} - 0.1]$$

Where W = actual body weight,
Wm = predicted mature adult weight,
p = W/Wm

Cat gestation

$$\text{Energy} = 140W^{0.67}$$

Where W = actual body weight

Lactation

Number of kittens	Energy requirement (kcal day ⁻¹)
<3	$100W^{0.67} + 18WL$
3-4	$100W^{0.67} + 60WL$
>4	$100W^{0.67} + 70WL$

Where W = body weight,
L = stage of lactation factor:

- Weeks 1 & 2 = 0.9
- Weeks 3 & 4 = 1.2
- Week 5 = 1.1
- Week 6 = 1.0
- Week 7 = 0.8

Growth (kitten)

$$\text{Energy} = 100W^{0.67} \times 6.7 [e^{(-0.189p)} - 0.66]$$

Where W = actual body weight,
p = W/Wm,
Wm = expected mature body weight



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Top tips for healthy body weight

A guide for pet owners

Weigh your pet regularly	<p>Aim to weigh your pet regularly, ideally every month.</p> <p>For cats and small dogs you may be able to do this by standing on the scales with and without him, and calculate the difference.</p> <p>Veterinary surgeries have scales designed for dogs. If your dog is too heavy to lift take it to the veterinary surgery.</p>
Check your pet's body condition score	<p>Cats and dogs come in lots of shapes and sizes so measuring body condition score (e.g. using the WALTHAM® S.H.A.P.E.™ guide) can be more helpful than bodyweight</p>
Understand how many calories your pet needs	<p>Every pet is unique and the calories they need will be based on size, age, activity level and whether they are neutered or not.</p>
Understand how many calories you are feeding your pet	<p>Every food is different in terms of how many calories it provides. People are often surprised to learn that dry pet foods have about four times as many calories per gram as wet foods. Treats contain calories too, so account for these as part of your pet's daily intake.</p>
Remove access to the food of other pets	<p>In a household that has more than one pet ensure that each pet only has access to its own food. For example, a dog may try to eat cat food if it is available.</p>

Appoint one member of the household to take responsibility for feeding	<p>It is easy in a busy household to lose track of who is feeding the cat or dog. Make sure that other family members or friends are not also feeding them.</p> <p>Do not leave any food unattended within easy reach of your pet</p> <p>Do not reward your pet for begging for food as this will only reinforce the behaviour.</p> <p>Children often share their food with their pet – so make sure they do not have the opportunity to do so. It may be helpful to remove your pet from the room during the preparation and eating of meals.</p>
Use rewards other than food	<p>There are ways to reward your pet for good behaviour that do not involve eating. For example, most pets love playing. If your pet has a favourite toy you can allow them to play with it for a small amount of time as a reward for good behaviour. Or if they enjoy being groomed, then this can be an alternative.</p> <p>If using treats as rewards ensure these are accounted for as part of the pet's daily calorie intake. Alternatively, a portion of dry kibbles may be removed from the daily allowance for use as rewards.</p>
Keep your pet active	<p>Most pets enjoy being active and this can also be a rewarding experience for the owner. Do what you can to encourage regular activity.</p>
Ask your veterinarian	<p>If you are concerned about your pet's bodyweight visit your veterinarian for further advice.</p>





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Alex German qualified, with honours, from the University of Bristol in 1994. After two years in mixed practice he returned to Bristol to undertake a PhD in canine mucosal immunology, which was awarded in 2000. He subsequently undertook a residency in small animal internal medicine. He moved to the University of Liverpool in October 2002, where he is head of companion animal internal medicine. He became a Diplomat of the European College of Veterinary Internal Medicine in September 2004, and a Royal College of Veterinary Surgeons Recognised Specialist in Internal Medicine in 2006. His clinical and research interests include gastroenterology and comparative obesity biology. In 2004, he set up the Royal Canin Weight Management Clinic (www.pet-slimmers.com), at the University of Liverpool, which provides a referral service for management of obesity and related disorders in cats and dogs.

Dr. Richard Butterwick is Head of Nutrition at the WALTHAM® Centre for Pet Nutrition.

After graduating from the Department of Agricultural Biochemistry and Nutrition, Newcastle University, UK in 1985 Richard was awarded a PhD in 1989. Richard then spent a short sabbatical lecturing pre-clinical studies at the Samora Machel Veterinary School, Lusaka, Zambia, before joining the Department of Paediatric Endocrinology at Saint Bartholomew's Hospital, London where he was part of a clinical research team working on growth disorders in children. In 1991 Richard went on to join the WALTHAM® Centre for Pet Nutrition where he worked on the research and development of veterinary clinical diets, with emphasis on the management of obesity, gastrointestinal disease, neonatal and post-operative nutritional support. Since then he has led a number of research programmes, covering a broad spectrum of nutritional areas in dogs and cats, including energy requirements and obesity, digestive function and health, growth and development, and oral health. Richard has published widely in the field of dog and cat nutrition and is a member of a number of professional bodies.





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