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How fat is that cat?

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Obesity has been defined in man as an increase in body weight of 15% above the normal weight for an individual (Craddock 1969). Until recently, in the companion animal visual observation and assessment (by palpation) of the amount of tissue overlying the rib cage was the easiest and most reliable means for assessing obesity (Markwell & Butterwick 1994).

Obesity is a pathological condition characterised by an accumulation of fat in excess of that necessary for optimal body function (Mayer 1973). Inherent to this definition is that obesity is a condition which is detrimental to the health and well-being of the subject. In man the negative effects of obesity on health have been well documented (Mayer 1973, Dawes 1984, Larsson 1990). The implications of obesity on health and well being in the companion animal are less clear, however, a number of medical conditions have been associated with obesity in the dog and cat (Anderson 1973, Edney & Smith 1986, Rocchini et al 1987, Clutton 1988, Bauer & Schenck 1989, Cornelius & Jacobs 1989, Markwell & Butterwick 1994) (Table 1). Although definitive studies relating to this aspect of obesity in the companion animal are lacking, it is apparent that obesity will affect health and well being qualitatively, if not quantitatively.

Table 1. Medical implications of obesity in the cat

Cat
Diabetes mellitus
Idiopathic hepatic lipidosis
Feline lower urinary tract disease
Skin problems

Table 2. Numerical significance of obesity in dogs and cats

Species	Frequency (%)	Source	Country
Dog	28	Mason 1970	UK
	34	Anderson 1973	UK
	44	Steininger 1981	Austria
	24.3	Edney & Smith 1985	UK
Cat	6–12.5	Anderson 1973	UK
	40	Sloth 1992	Denmark
	25	Scarlett et al 1994	USA

Incidence

Obesity is considered to be the most common form of malnutrition encountered in small animal practice (Table 2). The frequency of observation of obesity in dogs visiting veterinary clinics ranges from 11–44%. There is less information on the frequency of obesity in the domestic cat population, however, a recent North American survey of cats visiting veterinary clinics identified 24% of cats as obese (Scarlett et al 1994).

The frequency with which obesity is observed and its potentially detrimental consequences to the animal's health and quality of life determine that its management is an important challenge to the veterinary profession. However, prevention of obesity (rather than its cure) is clearly the most desirable goal. The frequency of observation indicates that many owners fail to recognise

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either the development or even existence of obesity in their pet. Thus dietary strategies for the prevention of obesity are of considerable practical importance.

Causes of obesity

In most cases obesity is a consequence of energy intake exceeding energy requirement at some time in the animal's life. It can be secondary to a number of other conditions such as endocrine disorders or drug induced polyphagia. However, it has been estimated that this represents less than 5% of the causes of obesity in humans (Armstrong et al 1951), and it is likely that its prevalence is similar in the dog and the cat.

Among the multitude of factors known to prevent or promote obesity, some are inherited and others are strongly related to changes in lifestyle, socio-economic and dietary conditions. Although obesity has a genetic component in humans, it accounts for only 25% of the variability in body mass between individuals and cannot explain the alarming increase in the prevalence of overweight and obesity in the past two decades. Instead, non-genetic influences, particularly the interaction between a sedentary lifestyle and unrestricted access to high energy density foods, are key environmental factors which help to explain the secular trends in obesity (Prentice & Jebb 1995).

Strategies for the prevention of obesity

Dietary strategies for the prevention of obesity are designed to control energy intake such that energy requirement is not exceeded. The following recommendations can help reduce the risk of excess energy intake and subsequent development of obesity.

Quantification of obesity—Feline Body Mass Index

In humans obesity has been defined as an increase in bodyweight of 15% above the normal weight for an individual (Craddock 1969) and a similar definition of obesity has been proposed for the dog and cat (Lewis 1987). The application of a mathematical definition is more appropriate in man, where extensive data exist on optimal height–weight standards (commonly used in life insurance tables). There is limited information on optimal weights for pure-bred cats and none available for cross-bred cats. Thus the proposed definitions for man of 15% above ideal weight, are of limited application in veterinary practice.

While gross obesity in the cat is relatively easy to identify; assessing the degree of obesity is more complex. An ideal system for both assessing and quantifying obesity in the companion animal would measure body composition, allowing quantification of lean and fat tissue. The majority of techniques available to quantify body composition in man are either not applicable, however, or are inappropriate for practical use in cats and dogs.

Until recently, visual observation and physical assessment (by palpation) was the easiest and most reliable means for assessing obesity in the cat (Markwell & Butterwick 1994). However, we have recently developed a method based on simple physical measurements which can be used to predict body fat content in cats (Feline Body Mass Index [FBMI]).

The Feline Body Mass Index can be estimated from two physical (zoometric) measurements. All measurements should be made with the cat in a standing position with legs perpendicular to the ground and the head in an upright position:

1. Ribcage—the circumference in cm at the point of the 9th cranial (or 5th caudal) rib;
2. Leg Index measurement (LIM)—the distance between the patella (knee) and the calcaneal tuber (hock) of the left posterior limb measured in cm.

The percentage body fat content can then be estimated using a look-up table or calculated from Equation 1.

Equation 1:

$$\%\ \text{Body fat} = \left(\frac{\left(\frac{RIBCAGE}{0.7067} \right) - LIM}{0.9156} \right) - LIM$$

Although there is limited information on the relationship between obesity and body composition in cats, available data (Butterwick & Markwell 1996) and clinical experience indicates that cats with a percentage body fat content of 30% or above can be considered overweight or obese and require clinical evaluation and if clinically appropriate weight reduction. Cats with a percentage body fat content of less than 30% and above 10% are considered to be normal weight or non-obese.

Identification and quantification of obesity is a key factor influencing feeding practices. The

feeding strategy for cats that are obese differs from that for non-obese cats. Cats that are diagnosed as obese require clinical evaluation and if appropriate should be placed on a weight reduction programme using an appropriately formulated weight reduction diet.

Accurate feeding guides

Obesity is a consequence of energy intake exceeding requirement/expenditure. In many cases it is a result of incorrect or inappropriate feeding practices, eg, unrestricted access to food, excess feeding of scraps and treats. Although feeding guides are normally provided, the frequency of observation of obesity indicates that either they are not used properly, or they overestimate the energy requirement of the pet population.

Historically the cat was thought to be able to regulate energy (calorie) intake. However, the frequency with which obesity is observed in the feline population suggests that the cat is susceptible to excess energy intake. Provision of accurate feeding guides for the cat can therefore be an important factor in reducing the risk of excess energy intake and subsequent development of obesity. There is, however, limited information on the energy requirement of the domestic cat. Current recommendations (NRC 1986) suggest that adult cats have a daily energy requirement of approximately 80 kcal/kg BW. It should be remembered that these recommendations apply only to active cats. Over recent years, changes in lifestyle may have influenced energy requirement of the domestic cat. A large number of cats have restricted access outside which may limit activity levels and decrease energy requirements. To reflect differences in lifestyle patterns Advance provides feeding guides for active (Equation 2) and inactive cats (Equation 3):

Equation 2 (active): Energy requirement (kcal/d) = 70 × BW (kg)

Equation 3 (inactive): Energy requirement (kcal/d) = 50 × BW (kg)

Effective communication of feeding guides is a potential route for controlling the development of obesity in the companion animal. This approach can be used in combination with the nutritional guidelines provided below. However, the challenge in effectively communicating good feeding practices to owners should not be underestimated.

Treatment of obesity

Dietary treatment of obesity. A reduction in energy intake is the obvious dietary route to achieve weight loss. However, the most appropriate method for reducing energy intake, and the degree of energy restriction required to achieve weight loss, in particular promoting fat loss whilst minimising loss of lean body mass in dogs and cats, in unclear.

Effect of energy restriction on weight loss and body composition in cats. Loss of lean body tissue appears to be an inevitable or an obligatory physiological response to weight reduction in humans (Forbes 1987), however, excessive loss of lean body tissue is not desirable since functional tissue losses will need replacing. In humans initial body weight (or body fat content) and the degree of energy restriction are key factors influencing the composition of weight loss (Forbes 1987, Prentice et al 1991). Whilst severe energy restriction results in rapid weight loss, this is associated with relatively high losses of lean body mass (Prentice et al 1991). In the companion animal, weight reduction programs have been developed principally on the basis of changes in bodyweight and maintenance of good health (Butterwick et al 1994b, Markwell et al 1990). While this has provided information on efficacy and safety of weight reduction regimens for both the dog and the cat, until recently there has been limited data on the effect of weight loss on body composition.

In the cat, moderate energy restriction to approximately 60% of adult maintenance (60%) requirements at target body weight, over an 18 week period results in a weight loss of approximately 1% per week with the majority of weight loss from body fat (90%) and minimal loss of lean body tissue (8%), (Butterwick & Markwell 1996). Increasing energy restriction to 45% of adult maintenance requirements at target body weight (45%) resulted in a greater rate of weight loss, averaging approximately 1.3% over an 18-week period (Butterwick et al 1995). Although this level of energy restriction proved safe in the cat it resulted in an increase in the proportion of weight loss from lean body mass (19%), and a relative decrease in the proportion of weight loss from body fat (80%) compared to cats restricted to 60% of adult maintenance energy requirements at target body weight. These data suggest that higher rates of weight loss in the cat may have an undesirable effect on body composition.

Conclusion

Recent advances in the study of genetics have provided new insights into the genetic basis of obesity, however, considerable effort is required to elucidate the mechanisms underlying the development of obesity. It is clear that obesity is not simply a case of excess energy intake or 'gluttony' since non-dietary factors such as lifestyle behaviours may contribute to the development of this condition. Research in the companion animal has focused on various aspects of the treatment of obesity, such as the effect of energy restriction on body composition and the role of dietary fibre. However, the current epidemic of obesity in humans and the companion animal, and the almost inevitable recidivism that occurs following weight loss in obese subjects, emphasises the need for further research on the prevention of this condition.