

# Calculating the energy content of prepared pet food and daily energy requirements of adult dogs and cats



## Introduction

Providing accurate feeding recommendations remains an ongoing challenge for pet food companies and the feeding guides are intended only as a starting point. Given the many variables affecting the energy requirements of an individual pet, no single formula will allow us to calculate the energy requirements for all dogs or cats<sup>1</sup>. However, the equations provided in nutritional guidelines can predict a theoretical average for a specific group of animals. Using this information as a starting point, each individual animal should be fed to their ideal body condition score. PFMA body condition charts can be found on [www.pfma.org.uk/pet-size-o-meter](http://www.pfma.org.uk/pet-size-o-meter)

### Please note:

- Any analysis of the food provided by the manufacturer will be the most accurate for a specific product and might be slightly different from the amounts calculated using generic formulas.
- The metabolisable energy (ME) of processed pet foods can be calculated using Modified Atwater factors. They are based on an average digestibility of 90% for fat, 85% for carbohydrate (NFE) and 80% for protein (FEDIAF Nutritional Guidelines).
- This information is for maintenance (adult) prepared pet food, and might not be accurate for home-made or other diets.

**Table 1: Caloric Density of Energy Producing Nutrients in Prepared Dog Food** (FEDIAF Nutritional Guidelines 2014, page 57)

Nutrient	ME (Metabolisable Energy) Kcal/g	Energy content of each nutrient in the pack as listed on the label (Kcal/100g food)
<b>Fat</b>	<b>8.5</b>	% fat x 8.5
<b>Protein</b>	<b>3.5</b>	% protein x 3.5
<b>Carbohydrate*</b> (nitrogen free extract or NFE)	<b>3.5</b>	% NFE x 3.5

### Formula 1: Calculating % Carbohydrate (NFE) and % moisture when not listed on the package:

- % Carbohydrate (NFE) = 100 - (% protein + % fat + % fibre + % moisture + % ash)
- It is common for dry pet food that % moisture is not listed on the pack, in which case assume it is 10%

### Formula 2: Calorie content of the whole pack (Kcal/Kg)

(ME fat + ME protein + ME carbohydrate) X 10

### Formula 3: Dogs Daily Energy Requirements (DER)

Average DER for different stages or activity levels (Kcal ME/Kg) X Body weight (kg)<sup>0.75</sup>

### Formula 4: Cats Daily Energy Requirements (DER)

Average DER for different stages or activity levels (Kcal ME/Kg) X Body weight (kg)<sup>0.67</sup>

**A watch out:** We are often contacted by pet owners who have been surfing the net for information and have come across US based sites. It's important to note that the legislation in the UK/Europe is different to the US and it's good to check where the information provider is based. The WSAVA (World Small Animal Veterinary Association) provides great guidance on how to get accurate, professional information on pet care.

<sup>1</sup> Hausner 1991. \*In this sheet the term carbohydrate refers to Nitrogen Free Extract (NFE) which mainly consists of starches and sugars.

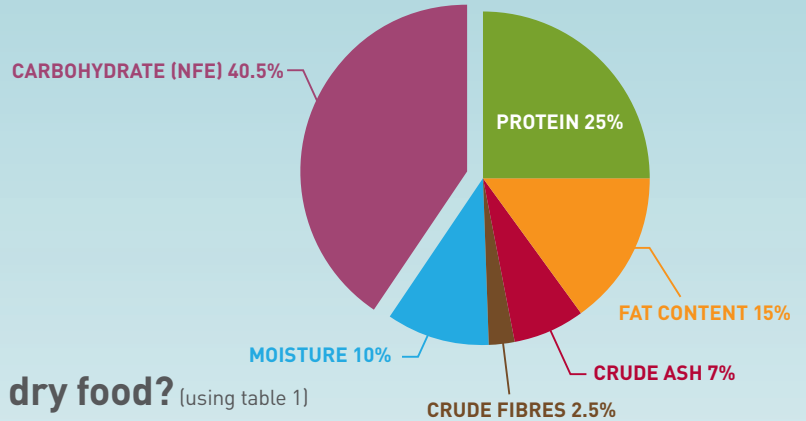


# Example Case Study for Complete Dry Dog Food:

Levin is an adult medium size breed with 13.5 kg body weight and low activity (up to one hour per day low impact activity, mainly walking on the lead). His diet is the following dry complete product:



Analytical Constituents of the product:	
Crude Protein	25%
Fat Content	15%
Crude Ash	7%
Crude Fibres	2.5%
Calcium	1.2%
Phosphorous	0.75%
Omega-3	0.93%
Omega-6	1.08%



## What is the calorie content of Levin's dry food? (using table 1)

Nutrient	Energy (ME) content of each nutrient in the pack (Kcal/100g food)	ME Density of the product (Kcal/kg)
Protein: 25%	25 x 3.5 = 87.5	(using formula 2)
Fat: 15%	15 x 8.5 = 127.5	(87.5 + 127.5 + 143.5) x 10 = 3585
Carbohydrate (nitrogen free extract or NFE): 41% (using formula 1)	41 x 3.5 = 143.5	

## What is Levin's daily energy requirement? (DER)

Table 2. Recommended Daily Energy Requirements (DER) in relation to activity (Based on FEDIAF Nutritional Guidelines, P62)

Activity level	kcal ME/kg <sup>0.75</sup>
Low activity (< 1 h/day) (e.g. walking on the lead)	95 ✓
Moderate activity (1 – 3 h/day) (low impact activity)	110
Moderate activity (1 – 3 h/day) (high impact activity)	125
High activity (3 – 6 h/day) (working dogs, e.g. sheep dogs)	150 – 175
High activity under extreme conditions (racing sled dogs 168 km/d in extreme cold)	860 – 1240

We can now use the recommendation from table 2 (Levin's activity level) and his 13.5 kg bodyweight in Formula 3 to calculate how many Kcal ME he needs per day:

**95 kcal x 13.5kg<sup>0.75</sup> = 95 x 7.04 = 668 Kcal ME**

**Levin needs approximately 668 Kcal ME per day**

## How many grams of his food should Levin eat each day?

**Formula 5: Amount of food needed daily (g)**

$$\frac{\text{DER of individual dog} \times 1000}{\text{ME content of the food (Kcal/kg)}} = \frac{668 \times 1000}{3585} = 186\text{g}$$

Levin needs approximately 186 grams of his food per day. This is within the range recommended by the manufacturer, as indicated by the feeding guideline on the pack (highlighted in the following table).

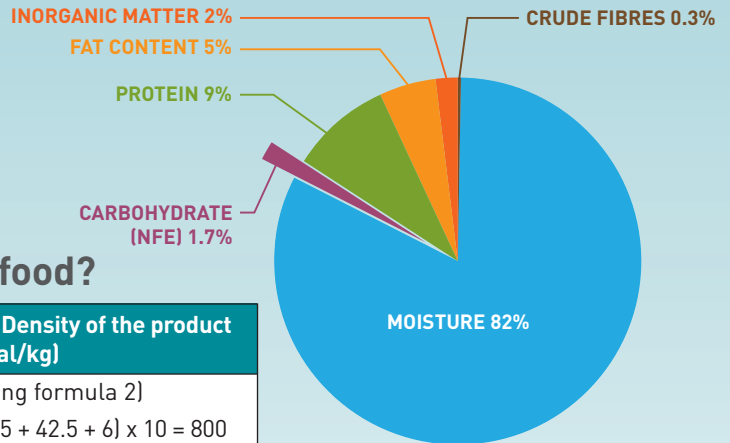
Product's Recommended Feeding Chart					
Weight Kgs	Grams/Day	Weight Kgs	Grams/Day	Weight Kgs	Grams/Day
1 – 3	36 – 73	25 – 30	309–345	55 – 60	520 – 551
3 – 5	73 – 103	30 – 35	345–382	60 – 65	551 – 582
5 – 10	103 – 165	35 – 40	382 – 417	65 – 70	582 – 607
10 – 15	165 – 217 ✓	40 – 45	417 – 453	70 – 75	607 – 639
15 – 20	217 – 263	45 – 50	453 – 490	75 – 80	639 – 669
20 – 25	263 – 309	50 – 55	490 – 520		

# Example Case Study for Complete Wet Cat Food:

Poppy is an adult domestic shorthair cat with 4 kg body weight, and has been neutered. She eats the following complete wet cat food.



Analytical Constituents of the product:	
Protein	9%
Fat Content	5%
Inorganic Matter	2%
Crude Fibres	0.3%
Moisture	82%



## What is the calorie content of Poppy's wet food?

Nutrient	Energy (ME) content of each nutrient in the pack (Kcal/100g food)	ME Density of the product (Kcal/kg)
Protein: 9%	9 x 3.5 = 31.5	(using formula 2)
Fat: 5%	5 x 8.5 = 42.5	(31.5 + 42.5 + 6) x 10 = 800
Carbohydrate (nitrogen free extract or NFE): 1.7% (using formula 1)	1.7 x 3.5 = 6	

## What is Poppy's daily energy requirement? (DER) (using table 1)

Table 3. Average daily energy requirements of adult cats

(Based on FEDIAF Nutritional Guidelines, P64)

Gender / Activity level	kcal ME/kg <sup>0.67</sup>
Neutered and/or indoor cats	52 - 75 ✓
Active cats	100

We can now use the recommendation from table 3 (Poppy is a neutered cat but still relatively active so we use the upper limit of 75 for her) and her 4 kg bodyweight in Formula 4 to calculate how many Kcal ME she needs per day:

$$75 \text{ kcal} \times 4 \text{ kg}^{0.67} = 75 \times 2.53 = 190 \text{ Kcal ME}$$

Poppy needs approximately 190 Kcal ME per day

## How many grams of her wet food should Poppy eat each day?

### Formula 5: Amount of food needed daily

$$\frac{\text{DER of individual cat} \times 1000}{\text{ME content of the food (Kcal/kg)}} = \frac{190 \times 1000}{800} = 237\text{g}$$

Poppy needs approximately 237 grams of her food per day. Each tray of this wet product weighs 85 grams. So Poppy can eat between 2.5 to 3 packs of her food daily. The recommendation on the pack is also 3 trays per day for a 4 kg cat.

### A note on wet food and 'dry matter'

Wet food contains a significantly higher amount of water, compared to dry pet food, and therefore has more overall volume. Wet food is made of around 80% water (on average) and the rest is called 'dry matter'. All the nutrients of the food are in the dry matter, so more wet food is needed to meet the nutritional requirement of pets. For example you may feed around 70 grams per day of dry food to your cat, or around 230 grams of wet food to the same cat, and both these complete diets will provide the same complete and balanced nutrition.

This schematic picture shows that recommended amount of wet food may look a lot more than the recommended amount of dry food, but in fact the dry matter of wet food provides the same nutrients as dry food.



### Top tips:

- Treats and snacks should not form more than 10% of the whole diet's calorie content (meaning a 90% calorie contribution from complete pet food, and up to 10% from treats).
- Pet owners should be encouraged to feed to IDEAL body weight and not actual body weight (unless specified by the manufacturer). This is particularly important if an animal is under or overweight.
- Some pet food companies and pet shops offer measuring cups, but this method of apportioning rations is open to error, unless food is weighed and the cup is marked to the correct amount. Weighing the food is generally the gold standard.

For more information on carbohydrates, different types of fibre and their calorie contribution, light diets, tips on using the formulas, and more references please check:

[www.pfma.org.uk/fact-sheets/](http://www.pfma.org.uk/fact-sheets/)