

Useful Calculation in Clinical Nutrition

CALCULATING ENERGY REQUIREMENTS



Simple equations can be used to calculate a pet's energy requirements. However, the energy needs of dogs and cats are not a linear function of body weight; energy requirements of animals per kilogram of body weight decrease as the size of the animal increases. In addition, adjustments are needed to account for variations in the daily energy needs of dogs and cats due to factors that include age and life stage, breed, activity level, reproductive status, environment, and health status.

- **Metabolizable energy (ME)** is the portion of the total energy available to the body from food, essentially the usable calories and their concentration, or density. ME is typically measured in calories or joules. Calories are stated in terms of metabolizable per kilogram (ME kcal/kg) of food and may also be expressed as calorie per unit of household measure such as per cup or per can. A higher ME indicates a higher concentration of calories, and a more energy-packed food.
- **Energy density refers** to the energy content of the food per unit weight and is usually expressed as kcal/100g.
- **Resting Energy Requirement (RER)** The resting energy requirement is the basic amount of energy used in a day by a pet remaining at rest. For pets weighing between 2 and 45 kg (5-99 pounds), RER, expressed in kilocalories of metabolizable energy (ME) per kilogram body weight per day can be calculated by:
$$\text{RER (kcal/day)} = 30 \times (\text{current body weight in kg}) + 70, \text{ or}$$
$$\text{RER (kcal/day)} = 70 \times (\text{current body weight in kg})^{0.75}$$

(Convert body weight from pounds to kilograms by dividing by 2.2). Any activity other than rest will require an increase in energy and an increase in calories to meet energy needs.

MAINTENANCE ENERGY REQUIREMENT (MER)

The maintenance energy requirement (MER) is based on the RER plus the energy required to move and to digest and absorb food from the intestinal tract. Numerous equations have been developed to calculate MER in healthy dogs and cats but there is no consensus among nutritionists as to which is the most accurate. For an individual animal, the MER provides an initial guideline; ongoing assessment of **Body Condition System™** score (BCS) should be used to adjust food intake up or down as needed.

To calculate MER, individual variables must be accounted for – such as age and life stages, reproductive status (intact vs. neutered), body condition (obese or underweight), gestation and lactation, or illness – by multiplying by a specific factor. For example:

Puppies		Pregnant bitches	RER x 1.3
Birth to half mature weight	RER x 2.2	Lactating bitches	
Half mature weight to adult	RER x 1.5	Up to 1 week post-whelping	RER x 1.2
Neutered adult dog	RER x 1.8	Peak (3-4 weeks post-whelping)	RER x 3.5
Obese-prone adult dog	RER x 1.2 to 1.4	Neutered adult cat	RER x 1.2 to 1.4
		Intact adult cat	RER x 1.2 to 1.6
		Obese-prone adult cat	RER x 1.0

Once an animal's maintenance energy requirement – the number of kilocalories needed per day – has been calculated, the amount of appropriate diet to feed can be determined by checking for the number of kcal/cup or kcal/can on the pet food label and calculating the serving size to meet those needs.