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You are what you eat – nutrigenomics and obesity

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ABSTRACT: It is well known that overweight pets do not live as long as leaner pets, and as little as a 20 per cent increase in body weight can increase the risk of conditions such as diabetes, osteoarthritis, cardiovascular and respiratory diseases, leading to a reduction in the lifespan of a well-loved pet.

In cases of obesity, specific genes associated with fat burning are down-regulated, and this results in the storage of excess fat. Specialised diets are now available that consist of nutrients which are able to change the metabolic profile of an obese animal to that of a lean animal. These diets also help to regulate the appetite and reduce the inflammatory responses that occur as a consequence of the effects of obesity.

Gene expression

Nutrigenomics is an area of study where pet nutritionists look at how foods or individual nutrients interact with an animal's genome (genes, DNA and RNA) to control the expression of genes. When nutrients affect gene expression, the results can be seen in the animal's metabolic gene profiles. It describes how specific nutrients can impact the health of an animal.

This means that nutrigenomics can be used to formulate diets that can help to support the health of pets – this applies to recent advances in weight loss and weight maintenance foods (**Figure 1**).

Deoxyribonucleic Acid (DNA) holds the genetic information used in the development and functioning of all known living organisms. DNA functions by producing proteins. A gene is fully expressed when it is producing the maximum amount of its protein, conversely where there is no protein production then a gene is not expressed.

Partial gene expression is also possible; for example, a gene could be producing proteins at half of its capability. Genes can shift from being 'more expressed' to 'less expressed' in reaction to changes in the environment, such as availability of nutrients. When this shift occurs, we say the gene is down-regulated. When gene

Figure 1. Nutrigenomics is used to formulate diets that help to support the health of pets



To cite this editorial use either
DOI: 10.1111/vnj.12040 or Veterinary Nursing
Journal Vol 28 pp190-191

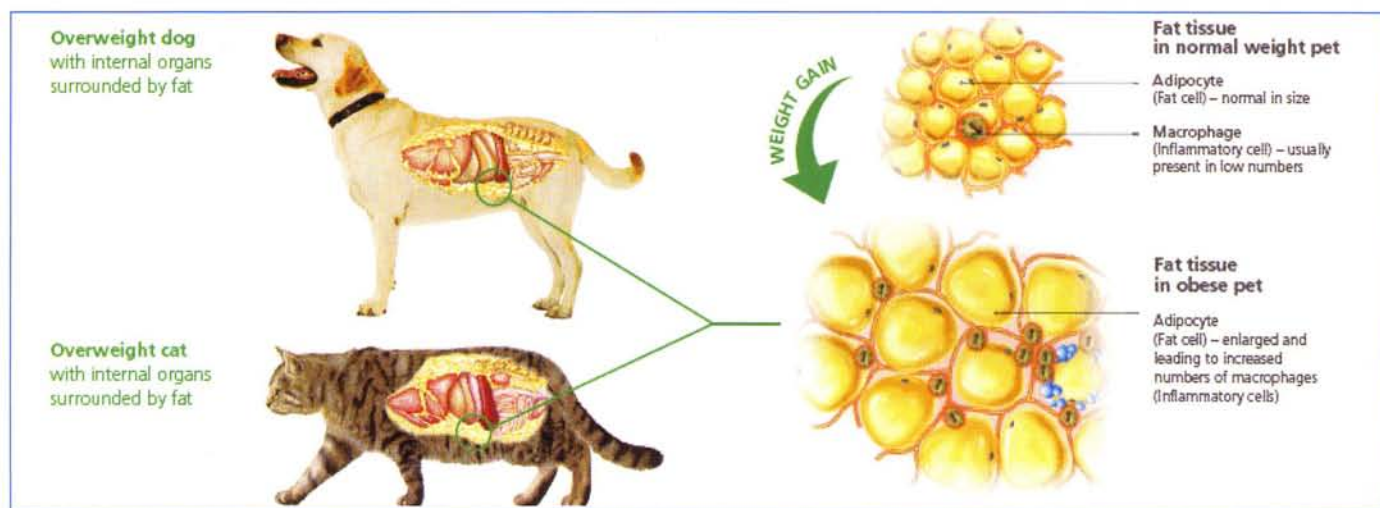


Figure 2. Obese pets show different profiles of gene expression compared to lean pets

expression shifts from being less to more we say that the gene is up-regulated.

Scientists have found differences in gene expression that relate to obesity in dogs and cats; obese dogs and cats show different profiles of gene expression compared to lean dogs and cats (Figure 2).

It has been shown that by feeding a precise combination of nutrients or ingredients, the gene expression profiles of obese animals change to that of lean animals. The gene expression profiles identified showed a down-regulation of genes associated with fat accumulation once the dogs and cats had lost weight.

Studies have also shown that diets enriched with a higher lysine:calorie ratio, L-carnitine and fibre, aid weight loss in obese and overweight dogs, whilst maintaining lean muscle mass. A change in metabolism from fat storing to fat burning can be achieved by feeding a precise combination of nutrients or ingredients.

How can we use this information in practice?

Nutrition should be identified as the fifth vital assessment to be assessed in combination with temperature, cardiovascular function, respiratory function and pain assessment.

In order to make the correct dietary recommendation and identify a suitable feeding amount, the cat or dog must be weighed and a full history relating to diet and medical background should be recorded.

A full history from the pet owner should include asking the following questions:

- What food are you currently feeding your pet?
- How much of this food are you feeding and how is it measured? (guesstimate, measuring cup, scales etc.)
- How often are you feeding this food? (once/ twice/ many times a day versus ad lib)
- What other food sources are available to your pet? (treats, scraps, other pet's food)
- How many people are involved in feeding your pet? Does this vary on a daily or weekly basis?
- What do you give your pet to drink? (Additional fluid intake in the form of milk or milky tea, for instance, will add to calorific intake.)

By asking these questions, factors relating to an excess intake of calories may easily be accounted for, and a solution may be found – using a set of scales to precisely measure the appropriate amount of food out per day, for example.

Progress may be made through educating the owner:

- it is useful to calculate a pet's percentage of weight gain and its body fat index and/or body condition score. This also allows you to have a base line measurement against which to make comparisons in future reviews.
- discuss the risks and diseases related to obesity in pets and the health benefits of weight loss, such as living a longer and higher quality of life.
- choose a suitable diet and calculate a plan to include the estimated weight

loss per week and the time expected to achieve the calculated target weight.

- organise follow-up appointments in order to monitor the pet and mentor the pet owner.

Discussion

Emerging advanced weight-loss diets differ from existing weight-loss foods and have been developed using knowledge of nutrigenomic studies which utilise a nutrient complex that works synergistically to boost fat burning.

Obesity is an increasingly common problem seen in practice and it has a substantial impact on the health and quality of life of cats and dogs. But there is help in the form of new advanced weight-reducing and weight-maintenance diets, composed of specific nutrients that are able to change the individual's metabolism from fat storing to fat burning, thus giving rise to a leaner profile. [10](#)

Suggested reading

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