Evaluation of lysine damage in commercial dog and cat foods in the Netherlands

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Introduction

Lysine is an essential and limiting amino acid for cats and dogs. Heat treatment during pet food production can induce the Maillard reaction, in which a reducing sugar binds to the reactive amino group of lysine[1]. This reaction may make a percentage of the lysine unavailable for the animal[2]. The reduction in available lysine and subsequent decrease in protein digestibility reduces the nutritive value of the food. Standard amino acid analysis quantifies "total" lysine and may lead to an over estimation of reactive (undamaged) lysine available in processed foods. Recent studies using a new method based on the determination of reactive lysine contents in processed feedstuffs have shown that up to 56% of the lysine was damaged in dry pet foods[3-5]. Whether reactive lysine levels of commercial foods meet nutritional requirements of pet foods is unknown. The objective of this study was to survey the lysine damage in commercial pet foods in the Netherlands. In addition, reactive lysine contents of foods were compared with nutrient guidelines for growing and adult dogs and cats.

Material and Methods

A dataset was created from extruded, pelleted and canned foods commercially available in the Netherlands. Food types were categorised in foods for growing and adult dogs and cats. From each food type and category, five foods (single batch) were randomly selected for analyses. All samples were analysed for total lysine using traditional amino acid analysis[6] and reactive (undamaged) lysine after guanidination followed by homoarginine analysis[7]. Lysine damage (%) was calculated as reactive lysine / total lysine. This percentage of reactive lysine with respect to total lysine in each product demonstrates how much lysine has become modified through the Maillard reaction. Metabolisable energy (ME) was calculated as 10 (3.5 * CP + 8.5 * EE + 3.5 *NFE), with NFE = 100 –moisture – CP – EE – Cfibre - Ash as indicated by the manufacturers. Total and reactive lysine was expressed on ME basis and compared with the nutritional guidelines of NRC[8].

Results and Discussion

Statistically significant lysine damage was seen in 45% of the diets analysed. Highest lysine damage in the analysed dog foods was up to 24% and the cat foods up to 34% (Figure 1). Pellets contain on average the most lysine damage (15%), followed by extruded (8%) and canned (7%) foods, although variation between brands is high. The variation in reactive lysine content between diet type (i.e. pelleted, extruded, canned) and between different brands may be due to the use of different processing techniques, as well as the use of different ingredients. As the pet foods used in this study are commercially obtained pet foods, there is no information about the processing conditions and the origin of the ingredients. There was no significant difference in lysine damage found between growing and maintenance diets.

When comparing the total and reactive lysine results to the recommended allowance (RA)[8] for lysine foods for adult dogs, adult cats and growing cats have reactive lysine levels above the RA, indicating these diets will not cause lysine deficiencies. Reactive lysine levels in several foods for growing dogs, however, are close to the RA for growing puppies from 4-14 weeks old (i.e. 2.2g / 1000 kcal ME). Rutherfurd *et al.*[4] showed that digestibility of reactive lysine in pet foods is not 100%, indicating that lysine available to the animal may be lower than the reactive lysine results suggest. It is unlikely however, that severe lysine deficiencies would occur, as the RA is based on the minimal requirement

data plus a bio-availability factor of 25% to account for digestibility[8]. These data highlight the importance of the prevention of lysine damage during pet food manufacturing, especially in growing diets for dogs. Future research on the effect of processing on lysine damage in pet foods, as well as choice of ingredients and ingredient processing are required to understand how to produce high quality diets that meet the pet's nutritional needs.

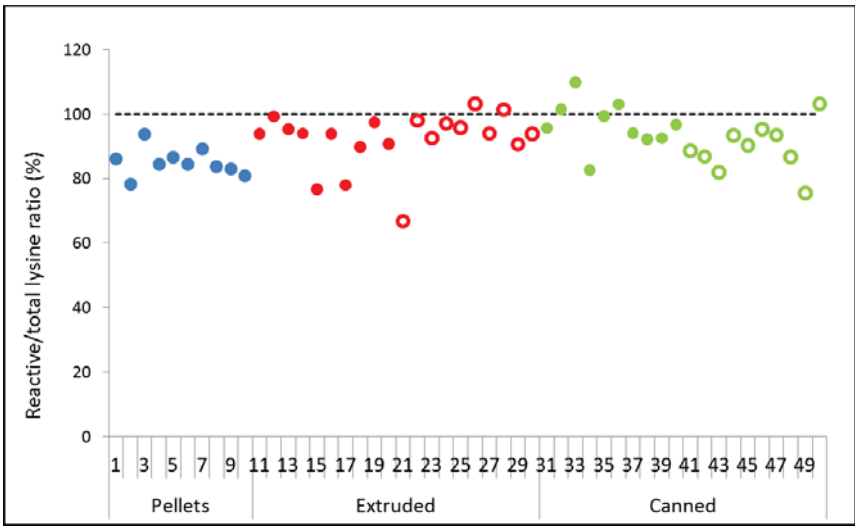

Figure 1 – Lysine damage in commercial pet foods
● Ratio RL/TL dog foods ○ Ratio RL/TL cat foods

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