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Investigations into Feline (*Felis catus*) Palatability

A thesis presented in partial fulfilment
of the requirements for the degree of

MASTER OF SCIENCE in Nutritional Science

at Massey University, Palmerston North,
New Zealand.

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2004

Acknowledgements

I thank my supervisor, Dr Wouter Hendriks, for his encouragement and for sharing with me his vast knowledge in the area of companion animal nutrition. I would also like to thank Mr Shane Rutherford for his help with laboratory work and for his willingness to listen and offer advice anytime it was needed.

I would like to acknowledge the team at the nutrition laboratory, including Fliss Jackson, Leiza Turnbull and Maggie Zou for the laboratory analyses they conducted on my behalf. I am also grateful for the use of the Centre for Feline Nutrition, where I conducted my trials and thank Heather Nicol, Rachael Richardson and Karin Weidgraaf for their time and help with trial work.

I thank Ron Wong from Crop & Food Research in Albany for supplying the fish waste used in trials and Mark Brown and Atul Rege from Heinz Wattie's in Hastings for their help in preparing the commercial diets used in my studies.

In June 2003 I was awarded a Massey University Affinity Card Alumni Scholarship, which has been a huge aid financially and for which I am extremely grateful. I would like to say a big thank you to my family for their encouragement and for offering to help wherever they could. Finally I thank my partner, Aaron for helping to keep me motivated and for the many sacrifices he has made during my studies.

Abstract

Due to the finicky nature of the domestic cats' feeding habits, palatability is a highly complex area of feline nutrition, but one which is vitally important, with pet owners today selecting a brand based on palatability rather than nutritional value (Trivedi and Benning 1999).

To date there is little published literature about the specific compounds and ingredients responsible for the palatability of cat foods, however, some animal by-products, particularly fish offals have been reported as being highly palatable to the cat (MacDonald *et al.* 1984). There is much interest in the use of synthetic diets for palatability testing because these diets can be easily manipulated to control specific properties of the diet.

The aims of this study, using the domestic cat as the test species were to: (1) test the efficacy of using synthetic diets in palatability trials, (2) determine the palatability of various fish by-products when included in synthetic and commercially canned diets, (3) develop a method suitable for fractionating fish by-products and fractionate selected by-products, (4) determine the palatability of the fish by-product fractions obtained and (5) determine the palatability of various pure compounds when dissolved in pet milk.

All palatability trials carried out used the two bowl free choice testing method. The freeze dried forms of hoki, mussel, salmon and jack mackerel by-products were included in a synthetic diet and compared to an un-supplemented synthetic diet. Hoki, mussel, salmon and barracouta by-products and the three fish by-product fractions (salmon oil, salmon water and barracouta water) were included fresh in commercially made canned diets and compared to a common commercial diet (control). Finally various pure compounds (amino acids, malic acid, salts, urea, creatinine, creatine, etc.) were dissolved in pet milk and compared to un-supplemented pet milk (control). Feed intakes were recorded daily for all of the trials.

The test animals used were domestic short haired cats obtained from the Centre for Feline Nutrition (Massey University, Palmerston North, New Zealand) and all were in excellent health before testing began. The panels of cats used were either all castrated males aged three to nine years old, or a mixture of castrated males, entire females and entire males aged two to eleven years old.

The feed intake data collected during the trials were analysed using t tests, and repeat measures ANOVA. Feed intakes were low overall during the synthetic trial due to the

un-supplemented control diet itself not being very palatable. These low feed intakes resulted in weight losses in the cats and the study has to be abandoned prematurely. Therefore, the results are only based on a sample size of two and are of limited value as such. The other three trials were highly successful, with all cats remaining healthy, apart from two which were taken from the milk trial due to health reasons unrelated to these trials. Salmon and jack mackerel by-products were both significantly ($P < 0.01$ and $P < 0.001$ respectively) more palatable than the control diet, hoki by-product was significantly ($P < 0.001$) less palatable than the control and mussel by-product was not significantly different ($P > 0.05$) from the control when they were included in synthetic diets. When the fish by-products were included in commercial diets, the salmon and mussel by-products were the most palatable of the test diets, however, the salmon, mussel and barracouta by-products were not significantly different ($P > 0.05$) from the control in terms of palatability. The hoki by-product was significantly ($P < 0.001$) less palatable than the control. The trials using the fish by-product fractions illustrated that salmon oil containing diet was significantly ($P < 0.05$) more palatable than the control diet. The salmon water and barracouta water containing diets were not significantly ($P > 0.05$) different from the control in terms of palatability. Lastly, the trials involving the testing of pure compounds highlighted that at the 0.3% dose proline, lysine (lysine hydrochloride), histidine, cysteine (cysteine hydrochloride), glycine and sodium dihydrogen phosphate were all significantly ($P < 0.001$) more palatable than the un-supplemented pet milk. At the 0.3% dose, other compounds investigated were no more palatable than the un-supplemented control milk. Proline and lysine (lysine hydrochloride) were also significantly ($P < 0.001$) more palatable than the control at the 0.6% dose, however, histidine was no more palatable ($P > 0.05$) than the control at this inclusion level.

In conclusion, salmon by-product was liked and hoki by-product was disliked by the cats when included in both synthetic and commercial diets. Mussel by-product was palatable when included in the commercial diets, but was no more palatable than the control when tested in the synthetic diet. Jack mackerel by-product was palatable in the synthetic diet and barracouta by-product was no more palatable than the control in the commercial diet. Salmon oil and the compounds proline, lysine hydrochloride, histidine, glycine, cysteine hydrochloride and sodium dihydrogen phosphate were highly palatable to the cat.

If future work with synthetic diets occurs it needs to be aimed at pre-weaned kittens as it would be easier to wean young inexperienced kittens onto a synthetic diet than older cats which are used to receiving a commercially made diet. The fish by-products tested here, along with other New Zealand fish species need to be further investigated. It may also be of use to test the fish by-products and their fractions in a different type of base diet in order to determine how this affects their palatability. The dose dependency of the compounds found palatable in the milk trials also needs to be established, in order to find an optimum dose for them to be used as palatability enhancers.

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General Introduction

The domestic cat (*Felis catus*) belongs to the Felidae family, with its original ancestor believed to be the African wildcat (*Felis sylvestris libyca*). The cat was domesticated approximately 8000 years ago, making it one of the most recently domesticated species of all the mammals and, therefore, the least altered in terms of morphology and behaviour (Hart 1985). The domestic cat is an obligate carnivore, as it is believed to have evolved on a diet consisting entirely of animal tissues.

Nowadays the international pet food industry is large, very competitive and rapidly growing, with a large proportion of people owning at least one cat. Cats have very distinctive feeding preferences and are well known for their fussy and finicky eating habits (Bradshaw *et al.* 1996). They are in fact highly sensitive to minute changes in the sensory properties of their food (Hirsch *et al.* 1978) and can therefore be very difficult to feed.

Palatability can be defined as the relative attractiveness, acceptability or preference for a particular food. Alternatively, palatability can simply mean “pleasant to the taste” (Tartelin 1997). Cats like humans have very different individual food likes and dislikes. The concept of palatability as it relates to pet food is therefore very complex, but one which is vitally important, because a nutritionally “complete and balanced” diet is useless to the animal if they will not ingest it. However, despite this, little has been written on palatability in cat foods and there is a dearth of information about specific compounds and ingredients cats find palatable.

Previous studies have reported that cats find protein hydrolysates, meat extracts, fats and some free amino acids palatable (MacDonald *et al.* 1984). It is also a commonly held belief that cats prefer fish over other meats (Hegsted *et al.* 1956, Houpt and Smith 1981). Fish by-products offer a relatively cheap source of protein if found to be palatable to the majority of cats. New Zealand fish species have not yet been tested for their palatability enhancing properties and therefore, if found to be palatable they could provide a unique product for the New Zealand pet food industry.

The objectives of this study were two-fold. The first part aimed to determine the palatability of various fish by-products using the cat as the test animal species, to test the efficacy of using synthetic diets containing fish by-products in palatability trials, to develop a fractionation method for fish by-products and to determine the palatability of

fish by-product fractions. A second aim of this thesis was to establish the palatability of various synthetic compounds when dissolved in pet milk.