Journal of Feline Medicine and Surgery (2002) **4**, 185–188
doi:10.000/jfms.2001.0193, available online at http://www.idealibrary.com on IDEAL®

jfms

Double-blind evaluation of two commercial hypoallergenic diets in cats with adverse food reactions

M Leistra, T Willemse*

Department of Clinical Sciences of Companion Animals, Faculty of Veterinary Medicine, Utrecht University, The Netherlands

The aim of this study was to evaluate two commercially available selected-protein-source diets as maintenance diets in cats with dermatological manifestations of adverse food reactions. Twenty cats with a confirmed adverse food reaction were tested in a double-blind manner. An adverse food reaction was diagnosed when, after recovery with a home-cooked elimination diet, the signs relapsed after a challenge with their previous dietary components, and re-disappeared on a second elimination diet period. Hereafter the cats were blind and randomly challenged with two commercial hypoallergenic diets. Relapse of the clinical signs was seen in eight cats (40%) on a lamb and rice diet and in 13 cats (65%) on a chicken and rice diet ($P>0.05$).

Neither one of the commercial diets was as effective in controlling the skin problems as the home-cooked elimination diet. The study confirms that commercial hypoallergenic diets are adequate for maintenance.

Date accepted: 26 July 2002

© 2002 ESFM and AAFP. Published by Elsevier Science Ltd. All rights reserved.

Adverse food reactions are defined as any aberrant reaction after the ingestion of a food or food additive. An adverse reaction to dietary ingredients is classified into one of two categories: food allergy or food intolerance. Food allergy is an immunologically based reaction to food components, whereas food intolerance is an adverse reaction to food with a non-immunologic basis (Sampson 1999). Type I, III and IV hypersensitivity reactions have been associated with food allergies. Immune complex formation, complement deposition, and cell-mediated immune reactions have been documented in food allergy, particularly food protein enteropathies (Crowe & Perdue 1992, White & Sequoia 1989). Delayed responses develop within several hours to days (Wills & Harvey 1994).

Dietary allergens are usually water-soluble glycoproteins that are stable despite heating, acids, or digestive enzymes (Taylor & Lehrer 1996). The most commonly reported allergens in cats are fish, beef, eggs, chicken, pork, cow's milk, rabbit, and whale meat (Reedy 1994). In the USA, dietary challenge revealed that fish in 42% of the cases, and dairy products in 14% of the cats were food allergens (White & Sequoia 1989). Non-protein allergens include fungi, preservatives and colourings.

In the cats no breed, age or sex predisposition have been noted (White and Sequoia 1989). Although more common in younger animals, adverse food reactions can develop at any age. In cats, ages of reported cases ranged from 3 months to 11 years of age, with a mean age of 4 to 5 years (Rosser 1998).

Most food-sensitive animals develop dermatological signs, including pruritus of varying severity, miliary dermatitis, facial and neck dermatitis, exfoliative dermatitis, alopecia, angioedema, urticaria, eosinophilic plaque, and otitis externa (Reedy et al 1997, Scott et al 2001, Wills & Harvey 1994, White & Sequoia 1989). Gastrointestinal, respiratory and neurological signs, and some abnormal behavioural signs, seizures and malaise may occur (Carlotti et al 1990, Wills & Harvey 1994, White & Sequoia 1989). Gastrointestinal signs include vomiting, abdominal

*E-mail: a.willemse@vet.uu.nl

This study was financially supported by Leo Pharma B.V., The Netherlands.

1098–612X/02/040185+04 $35.00/0 © 2002 ESFM and AAFP. Published by Elsevier Science Ltd. All rights reserved.

Downloaded from jfm.sagepub.com at PENNSYLVANIA STATE UNIV on May 10, 2016

pain, watery diarrhoea, and inflammatory bowel disease, including lymphocytic–plasmacytic colitis (White & Sequoia 1989, Medleau et al 1986). In a recent study, five of 22 cats showed both gastrointestinal and dermatological signs (Guilford et al 1998). Adverse food reactions in general cause non-seasonal clinical symptoms. Episodic signs could be caused by cross-reactivity between inhaled and ingested allergens, or by periodical ingestion of the allergen. In humans cross-reactions between grass pollens, various fruits and cereal grains are common, but these reactions are poorly documented in animals (White & Sequoia 1989).

The diagnosis of adverse food reactions is based on the history, the physical examination, and the effect of a restricted diet (White & Sequoia 1989; Rosser 1998). At present time, intradermal skin testing, in vitro serum testing, and gastroscopic food sensitivity testing (endoscopic challenge test) are unreliable for detecting food adverse reactions in animals (Guilford et al 1994).

The purpose of the study reported here was to evaluate two commercially available selected-protein-source diets as maintenance diets in cats with dermatological manifestations of adverse food reactions.

Materials and methods

Animals

Twenty-seven cats with recurrent, non-seasonal pruritus were referred to the Utrecht University Department of Clinical Sciences of Companion Animals. Medical therapy was discontinued 6 weeks prior to referral. The cats had to be older than 6 months of age. A full physical examination was performed and infectious cutaneous diseases were excluded by routine methods. A rigorous flea control programme was continued throughout the trial.

Dietary inclusion tests

An adverse reaction to food was confirmed using diet elimination and challenge studies. A home-cooked elimination diet was used for this process, with the ingredients selected on the basis of each cat's history. The elimination diet was fed for 6 to 10 weeks pending cessation of pruritus, followed by challenge with the original diet for a maximum of 3 weeks. If pruritus recurred during the challenge, the elimination diet was again fed to the cat until clinical signs resolved. No other foods were permitted during the elimination–challenge period except for tap water. Those cats with no cutaneous signs and pruritus after the first and second elimination diet and a relapse during the challenge period were considered to have adverse food reactions.

Challenge with commercial diets

Cats fulfilling the inclusion criteria were subsequently challenged with two commercial canned diets with protein and carbohydrate sources limited to lamb and rice or chicken and rice (Leo FDW® and Whiskas® Waltham Veterinary Diet, respectively). Each diet was fed for a maximum of 3 weeks. The order in which both diets were offered to each cat was randomised and the diets were coded and dispensed by the faculty pharmacist so that cat owners and clinicians were unaware in which order each cat received both diets. The amount of food offered to each cat was calculated by use of the estimated energy requirement necessary to maintain body weight.

The cats were not permitted to go out during the test period, except for the balcony or to the garden under guidance. The double blind food challenges were conducted on an outpatient basis. After completion of the trial and evaluation of the data the diets were decoded.

A physical examination was performed at the beginning and end of each phase of the trial. Information on alterations in faecal consistency, the occurrence of flatulence and vomiting, and the palatability of the two diets were noted.

If no clinical signs developed after the 3 weeks provocation with a test diet, the second diet was introduced without a wash-out period. If skin lesions or pruritus developed after introduction of a test diet, the next test diet was introduced only if these clinical signs were again eliminated by feeding the home-cooked diet.

Results

Twenty of the 27 cats fulfilled the inclusion criteria. The remaining seven cats cured on the elimination diet, but signs did not relapse after a 3-week challenge with their previous dietary components.

The group of 20 cats consisted of eight neutered male cats and 12 female cats (two intact and ten spayed). Eighteen of the cats were

Downloaded from jfm.sagepub.com at PENNSYLVANIA STATE UNIV on May 10, 2016

domestic short hair cats, one was a European short hair, and one cat was a British short hair. The age of onset of the clinical signs varied from 2.5 months to 10 years (mean 3.7 years).

The pruritus and lesions at time of referral varied. The following locations were noticed in various combinations: the back (12 times), head (11 times), abdomen (five times), medial thighs (five times), neck (four times), perineum (three times), extremities (two times), and chest and flank (once). Generalised pruritus was seen in one cat. Only one animal developed an eosinophilic plaque on the medial thigh, and another an eosinophilic granuloma on the upper lip. Urticaria was seen in two cats, and one cat had a history of additional hyperactive behaviour.

During the elimination diet used for inclusion and based on each cat's history, 13 cats were fed goat meat, four cats lamb, and three cats turkey. Their previous diets were mainly based on a variety of canned and dry commercial foods, with occasionally supplements including little amounts of milk, cheese, meat, or fish. At the onset of signs none of the cats had eaten either one of the protein sources used for inclusion.

The time period required for a relapse of the clinical signs after provocation with the original dietary components ranged between 1 day and 18 days. Recurrence of pruritus and scratch lesions were the first signs at this stage.

The cats re-stabilised on the second elimination diet subsequent to the provocation test after a period that ranged between 1 and 4 weeks (mean: 2 weeks).

Evaluation of the blind challenge with the two commercial hypoallergenic diets revealed that relapse of pruritus was seen in 13 cats on the chicken and rice, in eight cats on the lamb and rice test diet, including three on both diets (Fischers exact test; $P>0.05$). From the 13 cats which were included in the study by means of a goat meat-based elimination diet, six cats developed recurrence of pruritus on the lamb and rice commercial diet and eight cats on the chicken and rice diet (Table 1).

The time between the first day on the commercial diet and the onset of the relapse of signs varied from 1 day to 3 weeks (mean: 12 days). Palatability was good to excellent for both diets, and the cat's bodyweight was maintained in both trials. Two cats manifested flatulence on the lamb variety. Vomiting and diarrhoea were not noted. The flatulence was not concurrent with the pruritus.

Table 1. Number of cats with cutaneous adverse food reactions with recurrence of pruritus after blind and random challenge with a commercially available chicken and rice and lamb and rice diet

Challenge diet	Protein source elimination diet		
	Goat (n=13)	Lamb (n=4)	Turkey (n=3)
Lamb and rice	6	2	0
Chicken and rice	8	2	3

Table 2. Percentage of fatty acid methyl esters and n6:n3 ratio in two commercial hypoallergenic diets

	Chicken diet	Lamb diet
n-6	22.94%	11.26%
n-3	2.04%	5.61%
18:2 n-6	22.38%	10.30%
20:4 n-6	0.80%	0.73%
n6:n3	11.25	2.01

Discussion

In 20 of the 27 cats (74%) an adverse reaction to food was confirmed. It is unclear why the remaining seven cats showed improvement of the pruritus whilst receiving the elimination diet, followed by a negative challenge with the original dietary components for a period of 3 weeks. A similar percentage was found in another study with cats (Guilford et al 1998). An explanation may be that the owner did not challenge with all original food components, and thus cats were not fed with the allergen to which they are sensitive. It could also be explained by a coincidental, simultaneous change in the cat's environment, temporary idiosyncrasy or pharmacological reactions, or spontaneous recovery.

It is apparent that none of the commercial diets had a response as good as the home-cooked elimination diet: eight cats (40%) had a recurrence of pruritus on the lamb and rice diet and 13 cats (65%) developed clinical signs on the chicken and rice diet.

In addition the study showed that the tested commercial hypoallergenic diets can successfully be used as a maintenance diet. Only three of 20 cats (15%) had a recurrence of the clinical signs on both of the tested diets.

The higher number of cats developing a relapse on the chicken and rice diet than on the

Downloaded from jfm.sagepub.com at PENNSYLVANIA STATE UNIV on May 10, 2016

lamb and rice diet may be explained by the protein source used in these diets. Lamb is more likely a novel protein for the cats than the chicken meat. Chicken is known as a common protein source in cat food. However, an explanation for this difference in relapses may also be found in the polyunsaturated essential fatty acid (PUFA) content (Chew 2000). Normally, the cat is not able to synthesise sufficient arachidonic acid from linoleic acid due to minimal delta-6-desaturase activity and thus are cats dependent upon a dietary source of arachidonic acid in addition to linoleic acid (Guilford et al 1998, McDonald & Anderson 1984). Although arachidonic acid is present in animal tissues, both test diets contained low levels (C20: 4n-6; 0.14 and 0.00% respectively), in addition to high linoleic acid (C18:2 n-6; 22.38% and 10.30% respectively) contents, especially in the chicken selected protein referral diet. The anti-inflammatory effect of n-3 PUFA-rich diets was confirmed in a study in cats fed fish oil and flaxseed oil (Chew 2000). The n-3 PUFA contents of the investigated lamb variety is 5.61 versus 2.04 in the chicken variety. Based on these results one would expect a better response to the lamb and rice diet in our study. An explanation for the relapse of two cats on the commercial lamb and rice diet after elimination of signs on a home-cooked lamb diet, may be found in allergenic components other than meat proteins in the commercial diet.

In conclusion, this study demonstrated that neither one of the commercial diets was as effective in controlling the skin problems as the home-cooked elimination. Additionally, commercial hypoallergenic diets with selected proteins are viable for long term management.

Acknowledgement

The authors wish to thank Dr S. Mesu (veterinary pharmacy) for her skilful assistance.

References

Carlotti D, Remy I, Prost C (1990) Food allergy in dogs and cats: a review and report of 43 cases. *Veterinary Dermatology* **1,** 55–62

Chew B (2000) Role of omega-3 fatty acids on immunity and inflammation in cats. In: *Recent Advantages in Canine and Feline Nutrition*, vol. III. Reinhart GA, Carey DP (eds). Wilmington, Ohio, USA: Orange Frazer Press, pp. 55–67

Crowe S, Perdue M (1992) Gastrointestinal food hypersensitivity: basic mechanisms of pathophysiology. *Gastroenterology* **103,** 1075–1095

Guilford WG, Strombeck DR, Rogers Q, Frick OL, Lawoko C (1994) Development of gastroscopic food sensitivity testing in dogs. *Journal of Veterinary Internal Medicine* **8**(6), 414–422

Guilford WG, Markwell PJ, Jones BR, Harte JG, Wills JM (1998) Prevalence and causes of food sensitivity in cats with chronic pruritus, vomiting and diarrhea. *Journal of Nutrition* **128**(suppl), 270S–271S

McDonald ML, Anderson BC (1984) Essential fatty acid requirements of cats: pathology of essential fatty acid deficiency. *American Journal of Veterinary Research* **45,** 1310–1317

Medleau L, Latimer K, Duncan R (1986) Food hypersensitivity in a cat. *Journal of the American Veterinary Medical Association* **189**(6), 692–694

Reedy LM (1994) Food hypersensitivity to lamb in a cat. *Journal of the American Veterinary Medical Association* **204**(7), 1039–1040

Reedy LM, Miller H, Willemse T (1997) *Allergic Skin Diseases of Dogs and Cats*, 2nd edn. London: WB Saunders, pp. 173–188

Rosser EJ (1998) Food allergy in dogs and cats: a review. *Veterinary Allergy and Clinical Immunology* **6**(1), 21–35

Sampson HA (1999) Food allergy part 1: immunopathogenesis and clinical disorders. *The Journal of Allergy and Clinical Immunology* **103**(5), 717–728

Scott DW, Miller WH, Griffin CE (2001) *Muller and Kirk's Small Animal Dermatology*, 6th edn. Philadelphia: WB Saunders, pp. 624–627

Taylor SL, Lehrer SB (1996) Principles and characteristics of food allergens. *Critical Reviews in Food Science and Nutrition* **36**(S), 91–118

White SD, Sequoia D (1989) Food hypersensitivity in cats: 14 cases (1982–1987). *Journal of the American Veterinary Medical Association* **194**(5), 692–695

Wills J, Harvey R (1994) Diagnosis and management of food allergy and intolerance in dogs and cats. *Australian Veterinary Journal* **71**(10), 322–325

Downloaded from jfm.sagepub.com at PENNSYLVANIA STATE UNIV on May 10, 2016