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FOOD ALLERGY IN THE CAT
A diagnosis by elimination

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Practical relevance Food allergy is recognized as a cause of non-seasonal dermatologic disease and pruritus in cats, though its exact prevalence remains unknown. Feline food allergy can also be associated with gastrointestinal, neurologic, respiratory and behavioral components.

Patient group There are no breed, sex or age predispositions for developing food allergy, though there is some evidence that the Siamese and its crosses may be at increased risk.

Clinical challenges Food allergy cannot be diagnosed simply on the basis of the distribution of pruritus, and many of the dermatologic reaction patterns observed in affected cats, such as miliary dermatitis, eosinophilic granuloma complex and alopecia, may be seen in cats with flea allergy and atopy; in some cases, cats may have concurrent allergic conditions. The only way to definitively diagnose food allergy is to identify a causative food component through a food elimination trial. However, palatability and client compliance can each be a problem; specifically, many owners are unwilling to perform a provocation challenge, which is required to confirm a suspected food allergy. For cats in which the existence of a food allergy is confirmed, a suitable maintenance diet then needs to be fed for the remainder of the patient's life.

Evidence base Recent literature has revealed that there is marked variability in the clinical picture, response to treatment and outcome in food-allergic cats. This article reviews published literature and highlights clinically relevant observations pertinent to feline food allergy.

Food allergy and cats – a brief digest

Adverse reactions, or hypersensitivity, to food were described in the cat as early as 1933, and have also been reported in humans, dogs, cattle, pigs and horses.

A reported 1–6% of all feline dermatologic diseases and 11% of cases of miliary dermatitis are due to food allergy,[1–3] which is a condition that has year-round clinical signs. Year-round signs with seasonal worsening may be due to concurrent allergic conditions such as flea allergy or atopy. The exact mechanism behind food allergy is not well described but is thought to involve a type I, III or IV hypersensitivity reaction.[2–4,6,10,12,13] The sensitization period is thought to involve a long refractory period of up to 2 or more years before clinical signs may be seen;[1–3,6] however, this does not explain the observation that a number of cats develop clinical signs when less than 1 year of age.

Which cats?
There are no sex, breed or age predilections for developing food allergy;[1,3–11] however, two studies have suggested that the Siamese and its crosses may be at increased risk.[1,9] Food allergy tends to be more common in younger animals but may occur in patients of any age.

Which foods?
In most cases of feline food allergy, the allergen is a protein. Foods associated with allergy in cats include fish, beef, eggs, chicken, pork, dairy products, lamb and rabbit.[1–5,12,13]

Most cats that have an underlying food allergy develop dermatologic signs – including pruritus of varied severity, miliary or exfoliative dermatitis, alopecia, eosinophilic plaque, self-mutilation and otitis externa.[1,4–7,9,11,12] Gastrointestinal signs including vomiting, diarrhea, inflammatory bowel disease and lymphoplasmacytic colitis can also occur.[1,2,4,6,11] More rarely, feline patients with food allergy may exhibit abnormal respiratory, behavioral or neurologic signs.[1,3]

A diagnosis of food allergy is based on the history, physical examination, and results of a food elimination trial. Intradermal skin testing, serum allergy testing and gastroscopic food sensitivity testing are unreliable for detecting adverse reactions in food-allergic patients.[2–4,8,13] The suspicion of food allergy is supported by improvement while receiving the elimination trial diet. A diagnosis of food allergy is confirmed with return of clinical signs upon reintroducing the patient's original diet. A long term diet can then be recommended based on the patient's history.

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Is the history compatible with food allergy?

The published literature shows that the age of onset of food allergy in feline patients ranges from 3 months to 11 years, with a mean age of 4–5 years.[1,4,6] Typically, a cat with suspected food allergy presents with a non-seasonal and persistent pruritus.[4,6] If the patient is not currently being treated with symptomatic therapy, the level of pruritus tends to be constant from day to day. This is likely due to the fact that food-allergic animals tend to consume consistent amounts of food from day to day, and thus the amount of the offending agent remains constant. Asking owners to grade the itch of their potentially food-allergic patient on a scale from 0 to 10 may also give additional insight into a possible food allergy, demonstrating the lack of fluctuation in pruritus. Rarely, a food-allergic cat may exhibit clinical signs such as erythema and pruritus within 24 h of ingesting the offending allergen.[1] The time period between ingestion and onset of clinical signs may depend on the type of hypersensitivity reaction that is involved.[1]

Glucocorticoids may or may not minimize the degree of pruritus associated with food allergy.[1,8] Eleven of 13 food-allergic cats in one study received prednisone or prednisolone at 1 mg/kg q12–24h. Seven cats (64%) showed complete resolution of clinical signs, one cat (9%) showed a partial response, and three cats (27%) did not respond.[9] Similarly, Guaguere reported an average to good response to glucocorticoids in 10 out of 14 food-allergic cats and a poor response in four cats.[4] By contrast, another study involving 10 food-allergic cats showed that none of the cats responded to injectable, long-acting steroids.[1]

A complete and thorough dietary history is crucial in investigating a potential food allergy. Some patients may have been on a diet long term, while others may have changed diets several times in an attempt to avoid potential allergens. It is important to note that many of the commercial diets have similar ingredients, making avoidance of potential allergens difficult. Therefore, diet changes that simply involve switching commercial diets seldom result in clinical improvement. In a study in the United States, 42% of cats were shown to be allergic to fish, 28% to any commercial diet they were fed and 14% to dairy products.[6] Other common food allergens include beef, chicken, eggs, pork and rabbit.[3–5,12,13] Even lamb has been associated with food allergy in some cats.[6,12]

FIG 1 Seven-year-old female spayed domestic shorthair cat with concurrent food allergy and atopy. (a) The patient has marked self-inflicted trauma to the face due to severe pruritus. (b) The facial lesions resolved 1 month following introduction of a rabbit and green pea strict novel protein diet trial

FIG 2 Food-allergic 2-year-old female spayed domestic shorthair cat with intense pruritus of the neck resulting in erosions and ulcerations

FIG 3 Plasma cell pododermatitis, secondary to food allergy, in a 3-year-old male neutered domestic shorthair cat

Asking owners to grade the itch of their cat on a scale from 0 to 10 may give insight into a possible food allergy, by demonstrating a lack of fluctuation in pruritus.

Food allergy in cats cannot be diagnosed simply on the basis of the distribution of pruritus.

Do the clinical signs further raise the index of suspicion?

The most common distribution of pruritus in food-allergic cats involves the anterior third of the body, including the preaural region, ear pinnae, neck, periorbital region and face (Fig 1). In studies describing food-allergic cats, the frequency of localization to the head and neck ranged from 30–65%.[1,4,6] Other, less commonly affected areas include all four legs, axilla, chin, dorsal thoracic area, feet, inguinal region, medial thighs, lateral shoulder and tail base. In some cats, pruritus is generalized.[1–10,12,13] Therefore, food allergy in cats cannot be diagnosed simply on the basis of the distribution of pruritus.

As with flea allergy, the most common reaction pattern seen in cats with food allergy is miliary dermatitis. Excoriations may be associated with any of the reaction patterns secondary to pruritus (see right), and can be severe, resulting in large areas of erosions and ulcerations (Fig 2). Less common clinical signs include angioedema, urticaria and conjunctivitis.[4,5,9]

Food-allergic cats can also present with unusual manifestations including plasma cell or erythematous pododermatitis. A confirmed case of plasma cell pododermatitis secondary to food allergy was presented to the University of Tennessee in 2003 (Fig 3). The patient's clinical signs resolved during a strict venison and pea diet trial and recurred when the patient was challenged with tuna. Chin acne and conjunctivitis have also been described in food-allergic cats.[4,9]

Cats with food allergy usually present with either dermatologic or gastrointestinal signs; however, a food allergy should be considered in a patient with concurrent gastrointestinal signs and pruritus. While uncommon, concurrent dermatologic and gastrointestinal signs have been reported in about 10–15% of food-allergic cats.[2] Some gastrointestinal signs may be attributed to dietary changes, especially during the food elimination and challenge trial, rather than representing a primary food-allergic response. Occasionally, food-allergic patients may exhibit behavioral, neurologic and respiratory clinical signs.[1,3]

Clinical conundrums: other feline dermatoses that present similarly

Many of the dermatologic reaction patterns observed in cats with food allergy, such as miliary dermatitis, eosinophilic granuloma complex and alopecia, may be seen in cats with flea allergy and atopy. Dermatologic reaction patterns in food-allergic cats can also resemble dermatophytosis, parasitic infestation and psychogenic alopecia.[1,2]

Diagnostic testing – what is the gold standard?

The most reliable form of testing for food allergy in the cat is with the use of an elimination diet containing a protein and carbohydrate source to which the animal has yet to be exposed. There is nothing inherently hypoallergenic about a given protein.[10] Therefore, a thorough dietary history is needed in order to determine the best diet choice.

Hydrolyzed diets, in which the protein source is broken down into small pieces, making them less antigenic, are not necessarily the best options for diagnosing food allergy in cats because the size of the protein molecules can vary substantially.[14] Therefore, if the cat is allergic to the parent protein, such as chicken, it may be allergic to the hydrolyzed diet.[15] Also, hydrolyzed diets tend to be less palatable.[14] Thus, in the authors' opinion, the gold standard for the food elimination trial is a home-cooked novel protein diet because the veterinarian controls what ingredients are included in the diet and problems that could occur during manufacturing a commercial diet are eliminated.

Guidance on how to proceed with a dietary trial, and some practical issues to consider, are given on page 864.

FIG 4 Seven-year-old female spayed domestic shorthair cat with food allergy and secondary pyoderma. Before (a) and after (b) treatment with a novel protein diet and antibiotics

While uncommon, concurrent dermatologic and gastrointestinal signs have been reported in about 10–15% of food-allergic cats.

Elimination and challenge – the basis of a dietary trial

A dietary trial should be conducted for a minimum of 8 weeks. It may take some animals as long as 12 weeks before a noticeable improvement in clinical signs is apparent; in others, clinical improvement may take as little as 2–3 weeks.[1–4,6,8–13] In one study involving 17 food-allergic cats improvement was seen anywhere between 1 and 8 weeks.[4]

The presence of bacterial or yeast skin and/or ear infections should be assessed by performing skin and otic cytologies. Any secondary infections (Fig 4) should be treated early in the food elimination trial. If these are not addressed, it will be difficult to assess the cat's response to the food trial; any failure to diagnose food allergy because of concurrent infections might then necessitate another food trial in the future. It is important for the trial to be continued for 2 weeks beyond the discontinuation of any adjunctive treatments for skin infections in order to effectively evaluate the influence of the diet on the clinical signs. All treats, flavored toys, flavored medications, toothpaste, etc, must also be eliminated during the trial.

If clinical signs are severe, it may be advantageous to start a short course of tapering steroids or an antihistamine trial of about 2–3 weeks' duration to alleviate the pruritus at the start of the food elimination trial.[3,4] The dietary trial will, similarly, need to extend beyond the use of the antipruritics to allow for an accurate assessment.

Once considerable improvement on the elimination diet has been shown, the patient can then be challenged with the previous diet for 10–14 days to evaluate for return of clinical signs. A patient can also be challenged with treats, flavored medications, etc, always allowing 10–14 day intervals between the reintroduction of items. If only a partial improvement in pruritus is seen, this could indicate that the patient has another underlying pruritic skin disease that has not been entirely addressed.[1] Concurrent atopy, contact hypersensitivity or flea-allergic dermatitis has been previously reported in up to approximately 20–30% of food-allergic cats.[6,9]

If a patient relapses while being challenged with the previous diet, the first step is to place the cat back on the elimination diet until the clinical signs have again abated. The next step, if the owner is willing, is to introduce single components of foods fed in the patient's history in order to identify the precise allergen to which the patient is allergic.

Each major protein or carbohydrate source is fed one at a time for anywhere between 5–14 days.[2–4,6,8,10] We usually recommend 10–14 day intervals between the introduction of a new food component in order to accurately determine which food is associated with an increase in pruritus. If the cat experiences a flare-up on introducing a protein or carbohydrate source, it is placed back on the elimination diet until clinical signs have regressed and the dietary challenge is again resumed. Each time the clinical signs recur, a new allergen is thus identified. In practice, many owners are not willing to perform a food provocation trial and are content to know their animal has a suspected food allergy.

In 10 cats with food allergy that were challenged with their previous diet, recurrence of pruritus occurred anywhere between 1 and 7 days.[4] The provocation challenge identified four cats that were allergic to beef, three cats that were allergic to milk, two that were allergic to fish, and one that was allergic to egg. In another study, six cats were determined to be allergic to fish (two specifically to tuna) and two cats to dairy products.[6]

Allergies to multiple food components are considered uncommon.

Some practical considerations

Client compliance

Many clients may not be compliant with a home-cooked diet, but there are several commercial novel protein diets available. It is important to remember that no commercial diet is 100% hypoallergenic.[13] Therefore, if a food allergy is strongly suspected, and the cat does not respond to the initial diet choice, another dietary trial should be considered using a different protein source. Examples of novel proteins include rabbit, kangaroo, vegetable protein, venison, duck and lamb.

Palatability

Cats tend to be very finicky when it comes to initiating an elimination diet. In one study of 10 food-allergic cats, the majority refused to eat a vegetarian diet.[1] This study and others had good success using a lamb-based diet, which showed good to excellent palatability in approximately half of the cats.[1,7] Unfortunately, lamb has become a common protein source for many over-the-counter commercial diets, diminishing the chances of it being a novel protein for a food elimination trial. Furthermore, allergy to lamb in the cat has been described.[6,12] In our experience, rabbit and venison may be more palatable than some of the other novel protein diets in cats. Cats may also refuse a diet depending on the carbohydrate source.

Supplements

For home-cooked diets, supplements do not need to be added during the period of the elimination dietary trial, especially as some supplements may contain possible offending allergens.[8] Clearly, balancing the diet would be critical for long-term dietary maintenance.

Cross-reactions between allergens

Cross-reaction between common allergens is thought to occur, emphasizing the need for an accurate dietary history. For example, there is some concern that duck may cross react with chicken and beef may cross react with venison. Therefore, if a cat is on a chicken diet, it is best also to avoid duck.

Is there a viable alternative to an elimination diet?

Serum allergy testing, skin allergy testing and gastroscopic food sensitivity testing are also available for diagnosing food allergy. However, the vast majority of veterinary studies investigating these diagnostic tests have been conducted in the dog, and all have concluded that the tests are not reliable for diagnosing food allergy.[2,16] Although there are not many studies that have looked at these tests in cats, the results of such tests in the cat are generally regarded as inaccurate.[2,8] While the convenience of a serum allergy test cannot be denied, the only way to diagnose food allergy definitively is with an elimination diet.

Histopathology is of no diagnostic value with regard to food allergy and will only suggest an underlying allergy.[1,2,4,6] The most common inflammatory cells observed in cats with allergic dermatitis are eosinophils and mast cells in a perivascular to diffuse pattern. Varying numbers of neutrophils may be seen, reflecting the degree of self-trauma.[1]

Food allergy is confirmed – what next?

Once a diagnosis of food allergy is confirmed, the food-allergic patient should be fed a commercially prepared and balanced diet that controls the associated clinical signs. Ideally, the maintenance diet should contain the same protein and carbohydrate source as the diet used during the food elimination trial, and this diet should be fed for the remainder of the food-allergic patient's life. If a commercial maintenance diet cannot be identified, a home-cooked diet needs to be formulated. This process needs to involve a veterinary nutritionist, as many home-made diets are nutritionally inadequate. Palatability is also an important factor when choosing a maintenance diet in food-allergic cats. Factors that can affect the palatability of a particular diet include not only its ingredients, but its odor, temperature and texture.[7,14]

In a study involving 20 cats confirmed as being food allergic, based on a home-cooked elimination diet and challenge trial, two limited ingredient commercial foods were fed as maintenance diets. The diets chosen were either a lamb and rice or chicken and rice based diet. Pruritus recurred in 13 (65%) cats after being fed the chicken and rice diet and in eight (40%) cats after being fed the lamb and rice diet. Three cats developed pruritus with both diets. The higher percentage of patients reacting to the chicken-based diet can be explained by the fact that chicken is more commonly found in commercial cat foods. Both diets, however, were determined to be inadequate for maintenance in food-allergic patients.[5]

While uncommon, there is also the possibility that a food-allergic patient can develop an allergy to the diet used for maintenance.[10] A single case of a cat with pruritus associated with a fish-based canned food has been described.[12] This cat was free of clinical signs when maintained on a lamb-based diet for 2 years, but then developed pruritus similar to that seen at initial presentation. The cat was subsequently changed to a turkey-based baby food. Within 3 weeks, the clinical signs resolved but recurred within 3 days of challenging with tuna and lamb.

Clearly, other pruritic dermatoses affecting a food-allergic cat, such as flea allergy and secondary bacterial or yeast infections, should also be identified and controlled to decrease the chance of a relapse in clinical signs.

KEY POINTS

- The exact prevalence of food allergy in the cat remains unknown.
- There are no breed, sex or age predispositions although the Siamese cat and its crosses have been reported as being at risk for developing food allergy.
- Non-seasonal pruritus is the most common clinical sign associated with food allergy in cats.
- Cats can have concurrent allergic conditions, such as flea allergy or atopy.
- Secondary infections due to trauma are more common than previously thought.
- A compatible history and clinical suspicion of food allergy in a cat warrants testing for this condition with a food elimination trial.
- Options for this trial include novel protein diets that are either home cooked or commercially available.
- Improvement during the trial further supports a diagnosis of food allergy.
- The only way to identify a causative food component is through a provocation trial.
- After confirming the existence of a food allergy, a maintenance diet should be formulated to be fed for the remainder of the patient's life.

References

1 Carlotti DN, Remy I, Prost C. Food allergy in dogs and cats. A review and report of 43 cases. *Vet Dermatol* 1990; **1:** 55–62.

2 Muller GH, Kirk RW, Scott DW. Feline food hypersensitivity. In: Small animal dermatology, 6th edn. Philadelphia: WB Saunders, 2001: 624–27.

3 Wills J, Harvey R. Diagnosis and management of food allergy and intolerance in dogs and cats. *Aust Vet J* 1993; **71:** 322–26.

4 Guaguere E. Food intolerance in cats with cutaneous manifestations: a review of 17 cases. *Vet Allergy Clin Immunol* 1996; **4:** 90–98.

5 Leistra M, Willemse T. Double-blind evaluation of two commercial hypoallergenic diets in cats with cutaneous adverse food reactions. *J Feline Med Surg* 2002; **4:** 185–88.

6 White SD, Sequoia D. Food hypersensitivity in cats: 14 cases (1982–1987).

Case notes

Little Bit, a 3-year-old female spayed domestic shorthair cat, was referred for allergy work-up with a history of unresponsive facial pruritus.

History Prior to referral, Little Bit had undergone a trial consisting of three treatments, 2 weeks apart, of a selamectin antiparasitic (Revolution; Pfizer) to rule out ectoparasites, as well as weekly lime sulfur dips to rule out *Demodex gatoi* specifically. She also had a history of being placed on a novel protein food allergy trial with a commercial rabbit and green pea diet and had shown some improvement in her facial pruritus. Her owner ran out of the trial diet and Little Bit was switched to another brand rabbit and green pea diet. On switching, her facial pruritus increased. She was subsequently put back on the original novel protein diet and was referred to the authors' clinic.

Case work-up No major abnormalities were noted on general physical examination. Dermatologic examination revealed areas of alopecia, erythema, crusting and excoriation on the chin and periocular locations. No fleas were seen on examination.

Deep skin scrapings and cytology of the chin was performed. The scrapings were negative for *Demodex* species mites. The cytology from the face revealed no bacteria but the presence of occasional neutrophils. A dermatophyte culture was submitted to rule out dermatophytosis as a complicating factor.

Intradermal and serum allergy testing were performed. With the exception of our positive control (histamine), the intradermal allergy test was negative for all reactions. Pending the results of the serum allergy test, Little Bit was discharged with a tapering course of anti-inflammatory prednisolone and trimeprazine (Temaril-P; Pfizer) and was advised to continue the original rabbit and green pea novel protein diet.

The results of the serum test returned positive only for flea saliva antigen. The fungal culture was negative for growth.

Follow-up and treatment Telephone follow-up 1 month after referral revealed that Little Bit's pruritus had resolved while receiving the original diet alone. She had had her last dose of steroids 2 weeks previously.

Little Bit presented for a recheck examination 2 weeks later (6 weeks following referral to the authors). Her owner had again run short of the original rabbit and green pea diet 2 weeks prior to this recheck and, once more, had switched her to the alternative brand rabbit and green pea food (in effect, introducing a challenge diet).

Little Bit at initial presentation (above) and at a recheck 6 weeks later (right)

Within 24 h intense facial pruritus recurred. She was subsequently placed back on the original diet and the pruritus resolved.

Little Bit's owner was advised to continue the original rabbit and green pea diet indefinitely. Little Bit was also continued on Revolution monthly for flea control.

Diagnosis Food allergy with a possible flea allergy component was the final diagnosis.

WHAT THIS CASE DEMONSTRATES

Little Bit's case is an excellent example of how to diagnose a food allergy via a food challenge, albeit this was done inadvertently by her owner. This case also shows that a commercial limited antigen diet can potentially be allergenic in certain individuals and stresses the need for repeat food allergy trials using a different dietary source if food allergy is still strongly suspected. We do not know what component of the challenge diet was allergenic in Little Bit's case and have used this diet successfully to diagnose food allergy in other cats. This case also demonstrates that food-allergic cats may have a concurrent allergy, such as flea allergy (as supported in Little Bit's case by the positive result for flea saliva allergen on serum allergy testing).

J Am Vet Med Assoc 1989; **194:** 692–95.

7 Roudebush P, McKeever PJ. Evaluation of a commercial canned lamb and rice diet for the management of cutaneous adverse reactions to food in cats. *Vet Dermatol* 1993; **4:** 1–4.

8 Rosser EJ. Food allergy in the dog and cat: a review. *Vet Allergy Clin Immunol* 1998; **6:** 21–24.

9 Rosser EJ. Food allergy in the cat: a prospective study of 13 cats. In: Ihrke PJ, Mason IS, White SD, eds. Advances in veterinary dermatology. Vol 2. Oxford: Pergamon Press, 1993: 33–39.

10 Verlinden A, Hesta A, Millet S, Janssens GPJ. Food allergy in dogs and cats: a review. *Crit Rev Food Sci Nutr* 2006; **46:** 259–73.

11 O'Dair, HA, Markwell PJ, Maskell IE. An open prospective investigation into the aetiology in a group of cats with suspected allergic skin disease. *Vet Dermatol* 1996; **7:** 193–202.

12 Reedy LM. Food hypersensitivity to lamb in a cat. *J Am Vet Med Assoc* 1994; **204:** 1039–40.

13 Brown CM, Armstrong PJ, Globus, H. Nutritional management of food allergy in dogs and cats. *Compend Contin Educ Pract Vet* 1995; **17:** 637–58.

14 Cave N. Hydrolyzed protein diets for dogs and cats. *Vet Clin North Am Small Anim Pract* 2006; **36:** 1251–68.

15 Ricci R, Hammerberg B, Paps J, Contiero B, Jackson H. A comparison of the clinical manifestations of feeding whole and hydrolysed chicken to dogs with hypersensitivity to the native protein. *Vet Dermatol* 2010; **21:** 358–65.

16 Olivry T, DeBoer DJ, Favrot C, et al. Treatment of atopic dermatitis: 2010 clinical practice guidelines from the International Task Force on Canine Atopic Dermatitis. *Vet Dermatol* 2010; **21:** 233–48.

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