

DIETARY SENSITIVITY IN THE DOG



From The WALTHAM Course on Dog and Cat Nutrition.
© 1999 WALTHAM.

Key Points

- **Dietary hypersensitivity is an immune-mediated phenomenon, whereas food intolerance denotes any other abnormal reaction to food.**
- **Any basic dietary ingredient can cause dietary sensitivity; however, most hypersensitivity reactions are associated with proteins.**
- **Clinical signs may involve the skin and/or gastrointestinal tract, but most dogs present with a nonseasonal pruritic skin disorder.**
- **Clinical improvement after feeding an elimination diet for up to 10 weeks is suggestive of dietary sensitivity.**
- **Diagnosis can be confirmed only if a relapse occurs following challenge with the original diet.**
- **Subsequently, provocation with individual protein sources can help to identify the offending ingredient(s).**
- **Long-term management involves the feeding of a nutritionally complete and balanced diet, which does not contain the allergen(s) to which the dog is sensitive.**

Dietary sensitivity describes any clinically abnormal response to an ingested dietary component and may be further classified as:

- Food hypersensitivity (true food allergy)
- Food intolerance (any other adverse reaction to food).

With some exceptions, the presenting clinical signs of food intolerance may be indistinguishable from those of food hypersensitivity, and, occasionally, the clinical picture may be confused by the presence of both immunologic and metabolic reactions. Whatever the etiology of the reaction, management protocols are similar for all cases of dietary sensitivity.

INCIDENCE

Although there are variations in the reported incidence, most authors agree that dietary sensitivity is rare in dogs. It has been estimated that food sensitivity accounts for:

- 1% of all canine dermatoses in general practice (Walton 1967)
- 10% of all nonseasonal dermatitis (Baker 1975)
- 10% of all canine allergic skin diseases excluding flea allergic dermatitis (Scott 1978)
- 10-20% of allergic dermatoses seen by referral dermatologists

Reactions to ingested food components can affect a number of different body systems other than the skin, including the gastrointestinal tract, the respiratory tract, and the central nervous system. A combination of gastrointestinal and dermatologic signs is reported to occur in 10-15% of dogs with food hypersensitivity (Wills and Halliwell 1994). Gastrointestinal signs of dietary sensitivity often go unreported because the owner may associate diet with disease and remove the offending food without seeking veterinary advice.

The true incidence of dietary sensitivity may be difficult to establish because of the inherent problems in reaching a definitive diagnosis. In practice, the condition may be overdiagnosed because of an unwillingness to rechallenge with the original diet.

FOOD HYPERSENSITIVITY

True dietary hypersensitivity (food allergy) is an immunologically mediated phenomenon. Where an immune mechanism cannot be demonstrated, the term “food hypersensitivity” should, strictly speaking, not be used. However, common usage in veterinary medicine has been to describe any abnormal reaction to food as a “food allergy,” regardless of the etiology. The inciting, or sensitizing, agent is commonly referred to as an “allergen,” although hypersensitivity may not always be involved.

Although animals are exposed daily to a great variety of potential dietary allergens, only a small number will develop an abnormal immune response to a particular dietary ingredient. Once sensitized, further exposure to the allergen results in the development of clinical signs.

Pathophysiology

The gastrointestinal mucosa presents a barrier that limits absorption of the vast array of potential allergens contained within the digesta. However, this mechanism is imperfect and a significant proportion of dietary antigens may be absorbed across both the healthy and the abnormal gut.

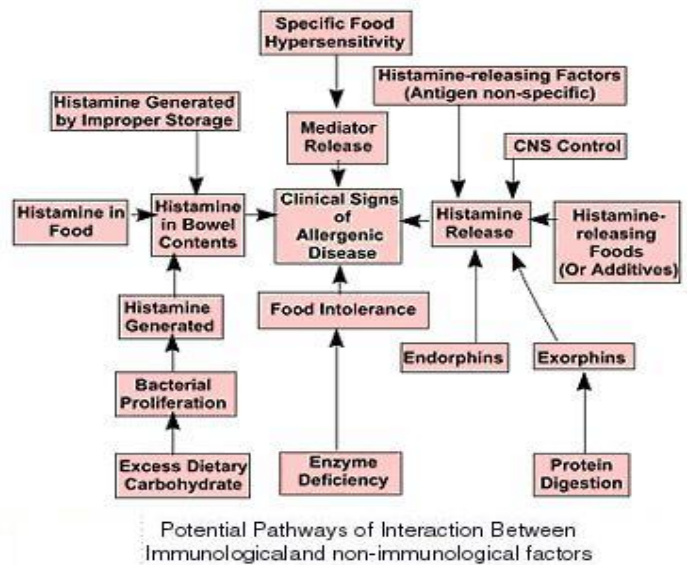
Absorption is limited by the local immune response involving, predominantly, the production of IgA antibody. Back-up mechanisms help to clear the system of any antigenic material that is absorbed, including the formation of immune complexes with IgA antibodies, which are transported to the liver, secreted in bile, and returned to the intestine. A systemic response involving IgG antibodies may also occur but, in normal individuals, this is not associated with adverse clinical effects.

The local immune response may be enhanced by immunization, which limits absorption of macromolecules. Conversely, absorption may be increased as a result of local vasodilatation, such as that which may occur with allergic or other inflammatory gastrointestinal disease.

Some individuals may develop an immune response to specific dietary antigens which activates one or more immunopathogenic pathways leading to inflammation and the development of clinical signs. The abnormal immune response can be:

- Antibody mediated
- Immune complex mediated
- Cell mediated

Most cases of food hypersensitivity in dogs are thought to involve the production of IgE (reaginic) antibody.



Local hypersensitivity reactions may account for gastrointestinal signs in some sensitized individuals. A systemic response necessitates the absorption of dietary allergen which, in turn, is facilitated by local vasodilatation associated with an allergic gastrointestinal response. It is thought that the cutaneous inflammatory response may result from:

- Local degranulation of antibody-bound mast cells
- Local deposition of immune complexes
- Effects of inflammatory mediators generated elsewhere in the body

Hypersensitivity reactions to dietary allergens may be

- Immediate, occurring within minutes to hours (types I and III)
- Delayed, occurring within several hours or days (type IV)

An additional complicating factor in the timing of the reaction may be the presence histamine-releasing factors, which have been identified in humans with food allergy. These cytokines, derived from mononuclear cells, are generated in a range of allergic diseases and may continue to be induced for some time after removal of the allergen. If present, they may account for the

relatively slow improvement of some affected canine patients following exclusion of the implicated dietary allergen.

FOOD INTOLERANCE

Food intolerance denotes a nonimmunologic abnormal response to a food that results from:

- Dietary idiosyncrasy due to an inability to adequately digest the food
- Pharmacologic reactions
- Metabolic reactions
- Toxic reactions

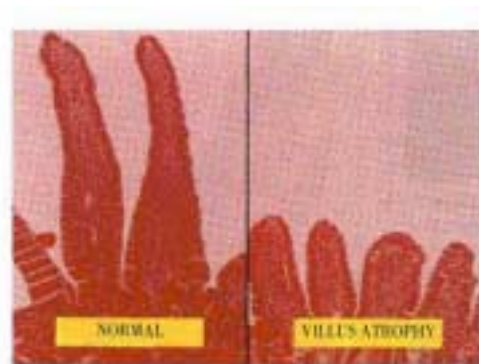
Although a number of specific clinical syndromes have been identified, many of the reactions involved in food intolerance lead to the development of inflammation and the production of clinical signs that are indistinguishable from those resulting from allergic disease.

Dietary Idiosyncrasy

Food intolerance in some animals may result from an inability to digest a particular dietary ingredient, usually because they lack a specific digestive enzyme. Lactose intolerance is a common example of this and occurs in dogs with low levels of small intestinal lactase activity. In many individuals, brush border lactase activity falls after weaning, resulting in a limited ability to digest lactose in milk and other dairy products. Excessive milk intake may therefore result in the production of osmotic diarrhea, but the clinical picture may be complicated in some individuals that are also allergic to casein or other milk proteins.

A secondary intolerance of lactose and other carbohydrates may follow any form of inflammatory small intestinal disease, which similarly reduces brush border disaccharidase activity.

Gluten-sensitive enteropathy of Irish Setters is a malabsorption syndrome. Affected dogs fed on gluten-containing diets develop an impairment of the mucosal barrier with partial villi atrophy. These morphologic changes respond to removal of wheat (and hence gluten) from the diet and can be reversed by feeding a gluten-free diet. It is not yet clear whether this has an immunologic basis or if it is attributable mainly to other mechanisms of food intolerance. Gluten-sensitive enteropathy shows similarities to



celiac disease in humans, where the pathogenesis involves interactions between genetic and environmental factors. These include genetic predisposition, enteric infections, type and quantity of gluten, and age of first gluten intake.

Pharmacologic Reactions

In some cases, certain foods may contain a pharmacologically active chemical or may cause the release of inflammatory mediators, such as histamine. Examples of foods that are known to cause a non-immune-mediated release of histamine from mast cells include:

- Egg white
- Shellfish
- Chocolate
- Fish
- Alcohol
- Strawberries
- Tomatoes

Although adverse reactions to certain food additives have been reported in humans, their importance in veterinary medicine is unclear. There are no definite reports of adverse reactions to food additives in animals; however, some patients with pruritic skin disease may show an improvement when food additives are eliminated from their diet.

Food Toxicity

Food toxicity may result from the presence of toxic substances within the food or because of contamination. The mechanism of action varies with each toxin, but toxicities may arise with:

- The intake of toxic levels of individual nutrients, such as vitamins A and D
- Contamination with microorganisms, such as bacteria and fungi as a result of improper storage
- The intake of contaminants from scavenging
- Foods containing potentially toxic substances that are not destroyed as a result of inadequate preparation, such as thiamine in raw fish
- The intake of excessive amounts of specific foods, such as onions or chocolate, which can cause poisoning if fed in excess

Chocolate and cocoa contain theobromine, which can cause toxicity in dogs, leading to vomiting, diarrhea, and even collapse and death. Dogs should therefore be given snacks designed for dogs rather than chocolates designed for human consumption.

CLINICAL DISORDERS

Reactions to ingested food components can affect many body systems and can produce signs involving the:

- Skin
- Gastrointestinal tract
- Respiratory tract
- Central nervous system

In the dog, adverse reactions to food usually manifest as skin or gastrointestinal disorders and a small proportion of cases will present with signs involving both systems. Gastrointestinal signs have been reported in 10-15% of dogs with skin lesions associated with food sensitivity (Wills and Halliwell 1994).

Many cases of food intolerance present with clinical signs that are compatible with allergic disease and in practice, a distinction between the two is seldom made.

Allergenic Sources

Most basic food ingredients, including proteins, lipoproteins, glycoproteins, lipopolysaccharides and carbohydrates, have the potential to induce an allergic response. However, the majority of reported reactions seem to be caused by proteins.

Many dietary items have been reported to cause food sensitivity in dogs, but the most commonly reported allergens include cow's milk, beef or cereal, either alone or in combination. The majority of animals with dietary sensitivity react to major components of the diet.

DOG	CAT
COW'S MILK	COW'S MILK
BEEF	BEEF
MUTTON	MUTTON
PORK	PORK
CHICKEN	CHICKEN
RABBIT	RABBIT
HORSE MEAT	HORSE MEAT
FISH	FISH
EGGS	EGGS
OATMEAL	COD LIVER OIL
WHEAT	MINCE
CORN	BENZOIC ACID
SOY	
RICE FLOUR	
POTATOES	
KIDNEY BEANS	

DIETARY ITEMS REPORTED TO HAVE CAUSED FOOD SENSITIVITY IN THE DOG AND CAT

The frequency with which ingredients have been implicated may simply reflect their common use in traditional commercial and home-prepared canine diets and their exposure to the dog population. The degree to which certain ingredients cause sensitivity reactions may therefore vary geographically.

Dermatologic Signs

The major presenting sign of food sensitivity in dogs is pruritic skin disorder. The response to the pruritus results in a gradation of signs ranging from saliva staining of the hair to severe self-trauma and a variety of secondary skin lesions.

The condition may mimic other dermatoses, including atopic disease, allergic contact dermatitis, and flea allergy. Furthermore, allergic skin disease may be multifactorial and clinical signs can be a manifestation of more than one underlying mechanism. In this case, removal of one of these contributory factors may be sufficient to take the patient below the symptomatic threshold and render it asymptomatic.

Primary Lesions

- Pruritus is seen in almost all cases and may be regional (including the feet or axilla) or generalized in distribution:
- Erythema is often marked and may be regional or generalized.
- Papular eruptions are common and often associated with a secondary staphylococcal folliculitis, which may be difficult to control with antibiotic therapy; some cases may present with recurrent superficial pyoderma only.
- Unilateral or bilateral otitis externa may be a feature and may occur in the absence of other signs of skin disease; characteristically, an allergic otitis externa presents initially as an erythema involving the pinna and the vertical canal, although the horizontal canal may be affected in chronic cases as a result of secondary infection.
- Urticaria may be seen with or without other signs in a small number of cases, but when it does occur, it is highly suggestive of food hypersensitivity.
- Occasionally, dogs will be nonpruritic and exhibit only seborrhea.



Regional Primary Lesion in a Dog



Otitis Externa

Secondary Lesions

Secondary lesions associated with self inflicted trauma in pruritic cases include:

- Excoriation
- Alopecia
- Secondary superficial pyoderma

Chronic changes that may be observed in long-standing cases include:

- Seborrhea
- hyperpigmentation
- Lichenification



Dog Showing Signs of Alopecia

Gastrointestinal Signs

Gastrointestinal signs, including vomiting and diarrhea, may occur in dogs with dietary sensitivity, either concurrently with skin lesions or as a separate entity. In some cases, the owner may make the association without veterinary advice and initiate the necessary dietary changes.

Certain forms of food intolerance, notably lactose and gluten-sensitive enteropathy, usually manifest as diarrhea. In addition, a number of chronic inflammatory conditions of the gastrointestinal tract are reported in which dietary hypersensitivity may play a role, including:

- Canine lymphocytic-plasmacytic enteritis
- Canine eosinophilic gastroenteritis
- Canine idiopathic chronic colitis

It has also been noted that recurrent bouts of hemorrhagic gastroenteritis can, in some cases, be managed by dietary manipulation, suggesting a possible involvement of dietary sensitivity in at least some instances.

Other Signs

Respiratory and neurologic signs are rare manifestations of dietary sensitivity in the dog. Signs that have been attributed to dietary sensitivity in dogs include hyperesthesia, hyperactivity, and epileptiform seizures.

DIAGNOSIS

The diagnosis of food sensitivity can be challenging and requires a methodic approach based on:

- Accurate clinical history
- Full clinical examination
- Dietary investigation in the form of elimination diets and test meals

A number of additional diagnostic criteria have been used, but with varying degrees of success. The histopathologic changes in the skin are usually non-diagnostic, although examination of intestinal biopsies may prove more rewarding, and there are no consistent laboratory findings.

History and Clinical Signs

Clinical signs of food sensitivity in the dog vary widely according to the individual response of affected animals. Nevertheless, most cases present with dermatologic signs (especially pruritus), gastrointestinal signs or a combination of the two.

Key diagnostic points for dietary sensitivity in the dog may be summarized as follows:

- Onset of pruritus not related to parasitic infection or other obvious causes in a young animal (< 1 year) is suggestive of dietary hypersensitivity; one study showed that a third of the dogs were less than a year old at the onset of signs (Rosser1990).
- A diagnosis of food sensitivity should not be discounted when the animal's diet has not changed recently. In many cases, the animal has been eating the allergen for a number of years.
- Nonseasonal pruritus, unless the sensitivity is to a seasonally-available food.
- Generalized urticaria.
- Concurrent gastrointestinal and dermatologic signs.
- Variable response to corticosteroid therapy, with cessation of therapy resulting in relapse.
- Recurrent or chronic nature of signs, such as superficial pyoderma, otitis externa, diarrhea, or vomiting.
- Single member of group affected, making contagious disease unlikely.
- Response to elimination diet and subsequent dietary rechallenge, which provides a definitive diagnosis.

Laboratory Tests

There is no single test available to confirm or refute the presence of food sensitivity. Intradermal skin tests and in vitro measurement of IgE antibody by either the radioallergosorbent test (RAST) or enzyme-linked immunosorbent assay (ELISA) have been used to demonstrate the presence of hypersensitivity and are commercially available in some countries.

However, these tests are thought to be unreliable in companion animals. Although they may help to rule out a specific diagnosis, it appears that their positive predictive value is low. Possible reasons for this include:

- The conditions are not always immune-mediated.
- The conditions are immune mediated, but IgE is not always involved.
- The allergenic extracts employed in diagnosis differ from those responsible for the disease.

Other techniques that have been employed in dogs with varying degrees of success include:

- Basophil degranulation test
- Differential sugar absorption test
- Gastroscopic food testing

Elimination and Provocation Diets

The most useful and reliable method of diagnosing dietary sensitivity is to feed an elimination diet with a restricted number of ingredients, followed by dietary challenge with a test meal. Whenever possible, elimination diets should be individualized on the basis of the patient's dietary history.

Diet Selection

A detailed list of the animal's diet, including everything that the dog has eaten in the preceding 4 weeks and an outline of what it has eaten during its lifetime, should be compiled. By studying the list, it may be possible to identify foods that have not previously been fed and that may form the basis of a "hypoallergenic" diet for that individual.

If it is not possible to formulate a suitable elimination diet, then a more general restricted diet may be used that contains only one or two potential allergens, preferably ones that the dog has not eaten in the preceding month.

Elimination diets that have been successfully used in dogs include chicken, rabbit, lamb, horsemeat, and fish as sources of protein; these are typically fed with rice, potatoes, or another source of carbohydrate. There is no single diet that will be "hypoallergenic" for all patients; however, certain ingredients such as chicken and rice are highly digestible and therefore have a low allergic potential.

A small number of animals will react to commercially prepared elimination diets but not to home-prepared diets with the same ingredients. It is important to stress to pet owners that the same source of protein and carbohydrate must be used for every meal when preparing a home-cooked diet, including the same type of fish. So, if the chosen diet is based on cod and rice, for example, it is crucial that cod is used consistently and not replaced by another type of white fish throughout the trial. It may therefore be necessary to stock up on more exotic ingredients.

As elimination diets may be fed over a period of up to 10 weeks, it is important to ensure that they are balanced, particularly when used in young, immature animals. Nutritional deficiencies can be irreversible and may only manifest at a much later stage, possibly even after the patient has returned to eating a complete and balanced diet, and it is therefore crucial to ensure a balanced intake of all nutrients. Home-prepared diets usually require appropriate supplementation with vitamins and minerals. The minimum number of ancillary ingredients should be used since they can also be implicated in sensitivity reactions, and it should be ensured that they do not contaminate the diet with additional sources of protein or carbohydrate.

Avoidance of Other Allergenic Sources

During the diagnostic period, there should be no access to any other source of nutrients, including treats or chews. In those parts of the world where *Dirofilaria immitis* is endemic in dogs, consideration should be given to using an alternative preventive medication for the duration of the trial.

Distilled or bottled drinking water is preferable to tap water in this diagnostic phase, as fungal contaminants and chemicals in tap water are potential allergens.

Owner compliance is the cornerstone in feeding elimination diets, and it is crucial that owners fully understand why food intake is restricted to a number of selected ingredients and no other foods must be consumed. Spending time with owners discussing these issues can help ensure full compliance.

Timing of Response

Elimination diets must be fed for a sufficient period of time. Previously, a period of 3 weeks had been claimed adequate; however, it has been shown that a significant number of dogs require 4-6 weeks, and even up to 10 weeks, to respond to elimination diets (Rosser 1990). Most dogs will respond early in the elimination trial or at least show an initial improvement of the clinical signs.

Failure to respond within this time suggests that either:

- Dietary sensitivity is not involved
- Other factors may be contributing to the clinical disease
- The animal is sensitive to the protein in the elimination diet
- There may be poor owner compliance

Provocation Diets

If clinical improvement occurs, a diagnosis of dietary sensitivity may be confirmed by challenging with the original diet and demonstrating an exacerbation of clinical signs, particularly pruritus. Clinical signs should reappear within 1-3 days and exacerbate within 7-14 days (Rosser 1990). This procedure not only helps to establish a diagnosis, but also helps to assess the time interval between challenge and relapse. However, many owners are unwilling to rechallenge with the original diet since they are reluctant to subject the animal to a reoccurrence of clinical signs.

Reintroduction of the elimination diet should result in an improvement in signs. If a home-cooked meal has been used, it may now be possible to introduce a commercially prepared diet with the same ingredients, which may be more suitable for long-term feeding.

The elimination diet will form the basal diet for subsequent test meals. Individual protein sources can now be introduced at weekly intervals (or longer, depending on the previously determined challenge to relapse interval to identify specific dietary allergens that should be avoided).

Once a diagnosis has been established, it is usually possible to manage cases of dietary sensitivity using commercial diets with novel, restricted protein sources. Alternatively, it may be possible to identify a range of standard products that the animal is able to tolerate.

MANAGEMENT

The management of confirmed cases of dietary sensitivity is usually relatively simple, particularly if it has been possible to identify the offending allergen(s). In most cases, the dog will remain free of clinical signs provided the dietary allergen can be avoided. Rarely, formulation of a suitable diet may be difficult because the animal develops multiple sensitivities to proteins as they are sequentially introduced into the diet.

Anti-inflammatory agents, such as corticosteroids or antihistamines, may initially be necessary in order to break the initial “itch-scratch-lick” cycle with severe pruritus. Once a diagnosis has been

established and the appropriate dietary modifications made, there are few indications for the continued use of these drugs. However, they may be required with poor owner compliance, when patients develop multiple food sensitivities, or with other concurrent allergic diseases.

Dietary Management

The primary goal in the treatment of dietary hypersensitivity and intolerance is to institute a diet that is balanced and on which the patient is asymptomatic. This involves identification of the offending allergen and its removal from the diet.

Most cases can be managed with a commercial diet, which is not only nutritionally balanced and complete but is also more convenient for the owner and improves owner compliance. A commercial diet formulated with a minimum number of sources of potential allergens may be employed in the long-term management of dietary sensitivity in dogs, particularly where the offending ingredient cannot be specified. Alternatively, it may be possible to identify a range of standard products that can be tolerated.

The small number of cases that cannot tolerate any commercial diet must be maintained indefinitely on a home-prepared diet on which they are asymptomatic, but care must be taken to ensure that the diet is nutritionally balanced and complete.

Dietary sensitivity should be regarded as a dynamic and fluctuating condition. Some patients may subsequently develop additional sensitivities necessitating a further change of diet, whereas in others, it is possible for the sensitivity to diminish or disappear.

SUMMARY

Dietary sensitivity describes any clinically abnormal response to a dietary component and may be further classified as food hypersensitivity (an immunologic phenomenon) or food intolerance (any other adverse reaction to food). Any dietary ingredient may provoke a sensitivity reaction but, in dogs, reactions to beef, milk, and cereal are most common. The condition is considered comparatively rare in dogs.

Many cases of food intolerance produce clinical signs, which are indistinguishable from those of allergic disease, involving mainly the skin and/or gastrointestinal tract. Most affected dogs present with a nonseasonal pruritic skin disorder. Diagnosis of food sensitivity can be difficult and is based on history and clinical signs combined with the feeding of an elimination diet based on previous dietary history and subsequent dietary challenge with a test meal. Exacerbation of clinical signs following rechallenge with the original diet confirms the diagnosis.

If possible, the elimination diet should contain no dietary ingredients previously consumed by the dog and should be formulated using single sources of protein and carbohydrate. Once the diagnosis is confirmed, the offending allergen may be identified by sequentially adding individual protein sources to the elimination diet and monitoring the animal's response.

Long-term management involves the provision of a diet which is nutritionally balanced and complete, but which does not contain the offending ingredient.

REFERENCES

Baker E. Food allergy in a cat. *Feline Practice*. 1975; 5:18-26.

Rosser EJ. Data presented at the 1990 meeting of the American College of Veterinary Dermatology. San Francisco; 1990.

Scott DW. Immunologic skin disorders in the dog and cat. *Vet Clin North Am*. 1978, 8; 641-664.

Walton GS. Skin responses in the dog and cat to ingested allergens. *Vet Rec*. 1967; 81; 709-713

Wills JM, Halliwell REW (1994). Dietary Sensitivity. *WALTHAM Book of Clinical Nutrition of the Dog and Cat* (Editors: Wills and Simpson, Pergamon Press, Oxford). Chapter 12, 167-188.