Canine Nutrition NEWSLETTER

April 2010

In this Issue

The digestive tract is bombarded with potential allergens every day, not just in the form of proteins in the foods that a dog eats, but also in the form of millions of bacteria that naturally inhabit the digestive tract. How does the body distinguish between a safe protein of nutritional value and a harmful protein that is a bacteria, parasite or toxin? Why are some dogs allergic to some foods, whereas other dogs are not? There are two factors that are essential to preventing the development of food allergies: healthy protein digestion and a healthy gut barrier. For more information, see:

Limited antigen home-made recipes are often used for the management of food allergies, but they are often overlooked as a tool for managing atopy (inhalant allergies). Limited antigen recipes have been shown to reduce allergic symptoms in dogs with atopy even in the absence of identified food allergies. This may be linked to allergen cross-reactivity and/or allergen threshold. For more information, see:

Limited antigen home-made recipes and elimination feeding trials are the gold standard for diagnosing and managing food allergies in dogs. Unfortunately elimination trials often fail because they are ended prematurely. Only 25% of food allergic dogs will respond to a limited antigen recipe within 3 weeks of starting on the diet. More than 25% of food allergic dogs will take more than 7 weeks to respond to a limited antigen recipe. As well, failure to provide 100% complete and balanced nutrition for the duration of the trial can lead to degradation of the epidermal skin barrier, further exacerbating allergic symptoms and masking a positive response to the limited antigen diet. For more information, see:

Although limited antigen home-made recipes are not generally recommended for gastroenteritis, if damage to the digestive process or gut barrier is likely to be prolonged, feeding a limited antigen recipe will result in the dog developing allergies only to "sacrificial proteins" and not to the more common ingredients in common pet foods. For more info, see:

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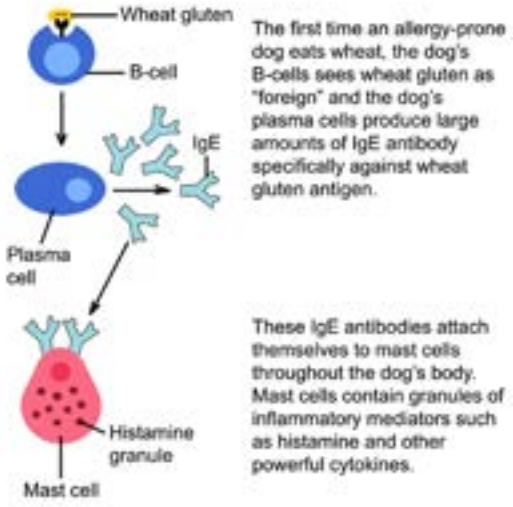
Food Allergies in Dogs

By Elizabeth Pask (PhD. Candidate)

Food allergies are a rising concern with dog owners. Food allergies are different from food intolerance. Food intolerance is the result of incorrect digestion such as lactose intolerance. People and dogs with lactose intolerance are either missing or have low levels of lactase (milk digesting enzyme). This is often confused with a milk allergy because the symptoms are very similar. Food allergies involve the immune system. With food allergies, the immune system mistakes a food protein for a harmful foreign invader and attacks the invader in the same way it would attack a harmful parasite, bacteria or toxin. Food allergies are called type 1 hypersensitivities and they involve the production of inflammatory immune cells called IgE antibodies.



Physical Characteristics of a Food Allergen

We can create a profile of what a common allergen looks like. Allergens have to be large enough to bind to 2 adjacent IgE antibodies on a mast cell in order to produce allergic symptoms (see diagram). Most allergenic proteins are between 10-70 kDa (kilodaltons - A Dalton is a measure of protein size). As well, allergenic proteins must contain amino acid sequences that can bind to IgE. Of the more than 10,000 different families of proteins, only 24 protein families have been shown to have amino acid sequences that can bind to IgE (for more information, see the article on Managing Atopy). Therefore, only certain specific food proteins have the potential of becoming allergenic in allergy-prone dogs.

Considering the number and variety of proteins consumed by a dog each day, it's amazing that more dogs aren't allergic to the foods they eat. How does the body distinguish between harmless food proteins and harmful parasite or toxins? How is it that some dogs develop allergies to foods, while other dogs do not? Two critical mechanisms prevent the development of food allergies: healthy food digestion and a healthy gut barrier.

The Genesis of Food Allergies

One of the most critical points to remember is that proteins must be a certain size in order to bind to two adjacent IgE antibodies. Individual amino acids, di-peptides and small proteins are not large enough to bind two IgE antibodies. In other words, if the digestive process is working properly and large proteins are being fully broken down into constituent amino acids in the digestive tract, there should be no proteins entering the body that are large enough to elicit an immune response. Prevention and treatment of food allergies therefore begins with healthy protein digestion.

Protein Digestion in the Stomach

Dogs consume food as a meal and as such the stomach acts as a muscular storage vat allowing nutrients to enter the small intestine in a controlled manner. The stomach is the site of the initial stages of protein digestion. The food is mixed with mucus, stomach acid (hydrochloric acid) and a protein digesting enzyme called pepsin. Stomach acid plays a major role in unraveling complex protein structures in food into less complex, smaller protein structures thus making it more digestible for pepsin which then breaks the protein down

farther. When the stomach contents are small enough they enter the small intestine for further digestion.

Protein Digestion in the Small Intestine

The small intestine is comprised of three regions: the duodenum which is closest to the stomach; the jejunum which comes after the duodenum and the ileum which is the last region in the small intestine. The majority if the digestion occurs in the duodenum while the majority of nutrient absorption occurs in the jejunum. The food that empties from the stomach into the duodenum undergoes farther digestion to break the large protein chains into constituent amino acids. Amino acids are readily absorbed from the jejunum into the dog's blood.

The enzymes necessary for the break down of protein in the intestines come from the pancreas. The pancreas secretes enzymes called proteases into the duodenum. As well, intestinal cells called enterocytes also secrete enzymes into the lumen of the digestive tract. In the duodenum the food is mixed with these digestive enzymes and the large protein molecules are broken down into smaller and smaller chains of amino acids until only single amino acids and pairs of amino acids remain. These amino acids are then absorbed into the enterocytes and from there they pass into the dog's blood stream.

In order for a food allergy to develop, two things must occur. First, large protein molecules must escape complete digestion. Second, these large undigested proteins must somehow cross the gut lining and enter the dog's body. In healthy dogs, large proteins are prevented from entering the body by the gut's immune system.

The Gut's Immune System

The digestive tract is always full of potential allergens. Not only is the gut bombarded by proteins and protein fragments every time a dog eats a meal, the gut is also home to millions of bacteria representing hundreds of different species. How does the body know the difference between a protein fragment that is a healthy nutrient versus a protein that is a harmful bacteria, parasite or toxin?

The immune system is designed to identify and distinguish between harmful proteins and safe proteins. Approximately 70% of the body's entire immune system is centered in the gastrointestinal tract. This immune system is called gut associated lymphoid tissue (GALT). There are four mechanisms that ensure that the dog's body absorbs the nutrients it needs while preventing harmful proteins from entering the body:

1) ***the mucosal barrier which is comprised of intestinal skin cells called epithelial cells (enterocytes are one type of gut epithelial cells) acts as a physical barrier;***
2) ***the production of IgA (anti-inflammatory) antibodies in response to harmless proteins;***
3) ***the elimination of antigens that breach the gut's defenses; and***
4) ***the tolerance of foreign substances that are the nutrients our dog's body needs.***

Immune System and the Mucosal Barrier

The successful ability of the intestinal tract to prevent the absorption of large proteins is dependant on the health and integrity of the mucosal barrier. It is the proverbial guardian of the body at the gastrointestinal gate. The mucosal barrier is comprised of both structural components and immune system components. The structural components physically prevent the absorption of large proteins. The immune system component is responsible for recognizing potentially harmful contents of the gastrointestinal tract. The health and integrity of the gastrointestinal tract is dependant on the correct structure and function of the enterocytes, effective protein digestion, the presence of anti-inflammatory immune cells (called IgA antibodies) in the gastrointestinal tract.

IgA is a type of antibody that is secreted into the intestinal tract where it attaches to and neutralizes undigested proteins. IgA is different from IgE in that IgA is not inflammatory. IgA helps to suppress inflammatory reactions to proteins in the gut. Some IgA will float freely in the contents of the intestine while other IgA attaches to the wall of the intestine to prevent whole protein from coming in contact with the intestinal wall. The more effective protein digestion in the stomach and duodenum is, the smaller the proteins are that come in contact with the IgA. Small proteins and single amino acids do not bind to IgA and are allowed to pass by the IgA and be absorbed into the body as nutrients. Some dogs with food allergies have much lower production of IgA than healthy dogs. Some types of probiotics can enhance gut health by stimulating the production of IgA antibodies.

Malnutrition can affect enterocyte structure and function. A poorly functioning or a malformed enterocyte can let whole proteins into the body. Gastroenteritis, ie inflammation of the gastrointestinal tract, can damage the mucosal barrier and this damage, in combination with reduced digestive enzyme production, can result in larger proteins breaching the gut lining and eliciting an allergic response. Feeding a limited antigen diet while treating acute gastroenteritis can help to prevent the development of allergies to more common pet food ingredients.

While a healthy intestinal barrier and the adequate production of IgA are the first lines of defense, occasionally a large protein may still breach the gut's defenses, in which case GALT takes over. This breaching of defenses can happen many times without food allergies developing. GALT can suppress the body's natural immune response to a foreign protein. This is called "oral tolerance". The classic example of oral tolerance is in a newborn puppy who consumes antibodies in the mother's milk hours after birth. These antibodies are very large proteins that cross the gut lining and enter the puppy's blood, conveying passive immunity from mother to puppy. Oral tolerance allows these very large proteins to enter the puppy's body without eliciting an immune response.

In the case of food allergies oral tolerance does not occur. Instead the food protein is recognized by immune cells as a foreign invader and IgE antibodies are produced specific to that protein. Unfortunately the more the dog consumes that protein, the greater the immune response. So continuing to consume the diet that caused the allergic response results in a greater and greater response every time.

Maintaining a healthy mucosal barrier and promoting effective protein digestion are both key to minimizing the chances of your dog developing a food allergy. Dogs with acute gastroenteritis should be fed limited antigen diets until the integrity of the gut barrier is restored. Dogs with food allergies should be fed supplemental enzymes to promote the full digestion of the proteins in the foods they consume. Identifying and eliminating allergenic proteins from the dog's diet is the best way to ensure that allergic symptoms are avoided in that dog.

Cooper (gold), Carson (silver) and Crosby (bronze): The official Olympics photo!

Testimonial

Thank goodness for HILARY'S BLEND supplement – and the Complete & Balanced cookbook! Hilary offers a convenient and easy guide to feeding your dog. This was a very welcome change after months of frustration trying to research home made meals. Although we have only been using the recipes/supplement for a few weeks, two of our golden retrievers (3 1/2 & 2 1/2) have shown overwhelming improvement in their energy levels. Also, their coats are amazingly beautiful. We are currently in the beginner stages of introducing the menu to our 9 month old puppy.

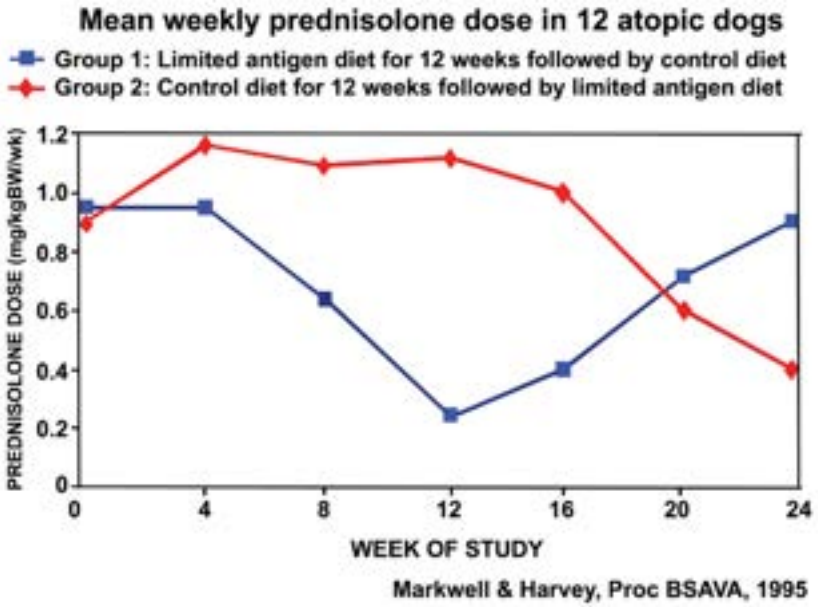
The immense research and development of HILARY'S BLEND supplement and Complete & Balanced cookbook has given us the peace of mind we were hoping for. Nothing but the best for our boys!

Pat & Randy Kingshott
Bracebridge, Ontario

Limited Antigen Diets for the Management of Dogs with Atopy

By Hilary Watson BSc

The graph below is from a study involving dogs with atopy (not food allergies). This study showed that limited antigen diets can help control allergic symptoms in dogs with ***inhalant*** allergies. If you're not using limited antigen diets to help manage atopic dermatitis, you're missing an important and effective tool for controlling allergic symptoms in atopic dogs.



The above study is a double-blind, placebo-control crossover study. A group of dogs with atopy (inhalant allergies) was split into two groups. Group 1 was fed a limited antigen diet for 12 weeks, followed by a premium kibble, ie the "control diet". Group 2 were started on the control diet for 12 weeks, then fed the limited antigen diet for the next 12 weeks. The researchers recorded how much anti-inflammatory medication (prednisolone) was needed to control allergy symptoms. This well-designed study very clearly demonstrated that a ***limited antigen diet*** can reduce an allergic dog's steroid requirements in dogs that are allergic to **inhalant allergens.** Why is this the case?

The answer relates to two concepts: "allergen cross-reactivity" and "allergen threshold".

Allergen Cross-reactivity

Almost all allergies are allergies to specific individual proteins. Consider this example: there are more than 40 different proteins in egg. Thirteen distinct proteins make up 95% of the protein in egg white: ovalbumin, ovotransferrin, ovomucoid, ovoglobulin G2, ovoglobulin G3, ovomucin, lysozyme, ovoinhibitor, ovoglycoprotein, flavoprotein, ovomacroglobulin, avidin, cystatin. Three distinct proteins are the most prevalent proteins in egg yolk: apovitellenins I, apovitellenins VI and phosvitin. However, of the more than 40 individual proteins in eggs, only four are potentially allergenic: ovalbumin, ovotransferrin, ovomucoid and lysozyme. A dog that is allergic to eggs is really only allergic to one or more of these four proteins.

Proteins can be grouped into families according to their amino acid sequences. There are more than 10,000 different protein families. However, only 24 families are potentially allergenic, meaning that only 24 protein families have been shown to be of a size and structure that can bind IgE.

Proteins in the same protein family have similar amino acid sequencing. The allergenic proteins in pollens, danders, molds and other inhalant allergens can be in the same protein family as the allergenic proteins in food ingredients. For example, "Bet v 1" is the allergenic protein in birch tree pollen. Celery, carrots, strawberries, soybean, apple, apricots, cherries, peaches, pears and raspberries all contain proteins that are members of the "Bet v 1-related protein family". Dogs who are allergic to birch pollen are more likely to also be allergic to these foods. This concept is called "cross-reactivity". Cross-reactivity means that antibodies originally created against one allergen in the body are capable of responding to a different allergen because of similarities in their protein structures. Allergies to pollens can lead to allergies to certain foods, even though the dog may never have been exposed to those particular foods. About 40% of children with atopic dermatitis also suffer from food allergies. There are no comparable studies in dogs, however it is likely that a significant percentage of dogs with atopic dermatitis also suffer from food allergies.

As mentioned above, 24 different protein families are potentially allergenic. Table 1 below shows 4 of these families and provides examples of food allergens and inhalant allergens that belong to the same family. Cross-reactivity is not guaranteed – a person who is allergic to cat dander is not necessarily allergic to dog dander even though these allergens are members of the same protein family. However, cross reactivity is more likely to occur between proteins within the same protein family.

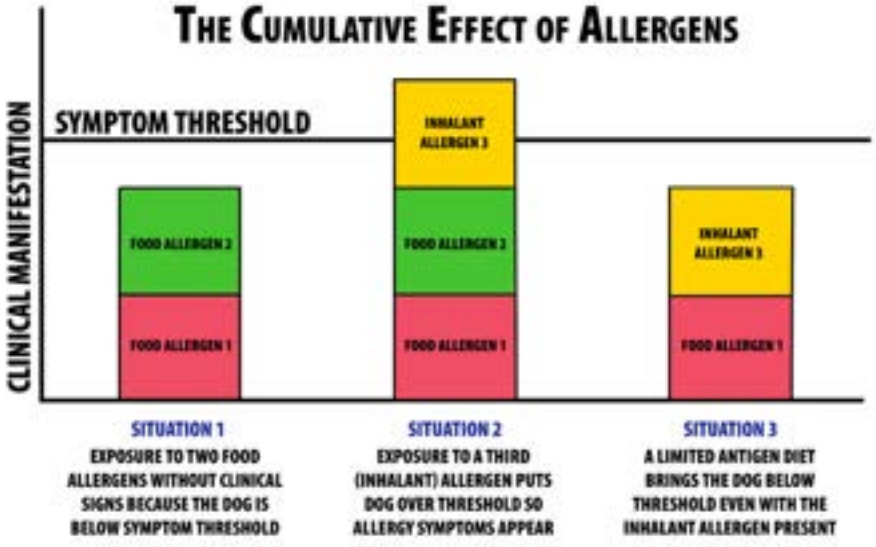
Protein family name	Member proteins that are food allergens	Member proteins that are inhalant allergens
Bet v 1 – related proteins	Api g 1 (celery) Ara h 8 (peanut) Cas s 1 (chestnut) Cor a 1 (hazelnut) Dau c 1 (carrot) Fra a 1 (strawberry) Gly m 4 (soybean) Mal d 1 (apple) Pru ar 1 (apricot) Pru av 1 (cherry) Pru p 1 (peach) Pyr c 1 (pear) Rub l 1 (raspberry)	Aln g 1 (alder) Bet v 1 (birch) Cas s 1 (chestnut) Cor a 1 (hazel) Fag s 1 (beech) Que a 1 (oak)
EF hand domain	Cyp c 1 (carp) Gad m 1 (cod) Hom a 6 (lobster) Lit v 4 (shrimp) Sal s 1 (salmon) Sco j 1 (mackerel) Xip g 1 (swordfish)	Amb a 10 (ragweed) Bet v 3 (birch) Bos d 3 (cow dander) Bra n 4 (rapeseed) Bra r 4 (turnip) Cyn d 7 (Bermuda grass) Syr v 3 (lilac)
Tropomyosin	Cha f 1 (crab) Cra g 1 (oyster) Myt e 1 (mussel) Oct v 1 (octopus)	Aca s 10 (dust mite) Ale o 10 (grain mite) Lep s 1 (silverfish) Per a 7 (cockroach)
Lipocalin	Bos d 5 (beef) Cap h BLG (goat meat) Equ c BLG (horse meat) Ovi a BLG (mutton) Ran t BLG (venison)	Aca s 13 (dust mite) Bos d 2 (cow dander) Can f 1 (dog dander) Equ c 1 (horse dander) Fel d 4 (cat dander)

This partially explains why limited antigen diets may be useful in the management of dogs with atopy. However the concept of "allergy threshold" is also important.

Allergen Threshold

Allergy threshold refers to the level of exposure that is required to elicit allergic symptoms. When allergen exposure is below threshold, there are no allergic symptoms. When allergen exposure is above threshold, allergic symptoms are present. A person who is allergic to horse dander may be able to ride outside in fresh air (allergen exposure is below threshold) but may experience allergic symptoms when grooming horses in a barn (allergen exposure is above threshold). A person with cat allergies may be fine in a home with one cat but may experience allergy symptoms in a house with several cats. A person who is allergic to milk may be able to tolerate cream in their coffee but not be able to eat ice cream. The entire premise of "allergy shots" is based on the concept of allergy thresholds. When a dog or person receives allergy shots, they are receiving increasing doses of the allergenic protein in order to raise their threshold tolerance to that allergen. This same principle can be used to help manage dogs with allergies.

More than a decade ago, I owned a Border Collie who is featured is on the cover of my cookbook. Orion suffered from atopic dermatitis during pollen season. I discovered that if I switched him to a limited antigen diet just prior to the onset of pollen season, he was able to go through the entire season without requiring anti-inflammatory medication. If he was kept on his regular diet during pollen season, he developed allergy symptoms that needed to be controlled with corticosteroids. Orion never exhibited allergic symptoms outside of pollen season. He was fed a variety of different diets outside of pollen season and never had an allergic reaction to any food that he ate. But by switching him to a limited antigen food prior to pollen season, his pollen allergies stayed below threshold. This concept is illustrated in the graph below.



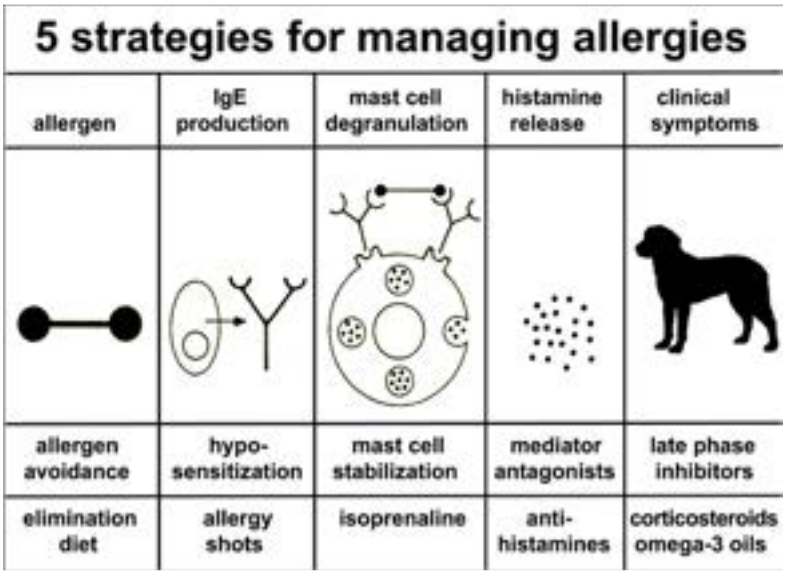
One Final Point

Refer again to the graph at the beginning of this article. Note that both groups of atopic dogs experienced a significant drop in their steroid requirements when they were fed a limited antigen diet. But also note that the first reduction in steroid dose did not occur until at least 4-8 weeks of feeding. Patience and perseverance are critical in managing dogs with allergies. It will take at least a month before a limited antigen diet will have a visible effect on a dog with atopic symptoms. This is why it's best to switch to a limited antigen diet prior to the onset of pollen season. By starting the limited antigen prior to the onset of symptoms, it may be possible to keep the dog below allergen threshold for the entire season and avoid the use of corticosteroids altogether.

Limited Antigen Recipes for the Diagnosis and Management of Food Allergies in Dogs

By Hilary Watson BSc

The graphic below shows five strategies for managing allergies.



Corticosteroids and omega-3 fatty acids are "late phase inhibitors" used to control symptoms after they appear. Mediator antagonists are anti-histamines that counteract the pro-inflammatory effects of histamine. Mast cell stabilizers like isoprenaline prevent mast cell degranulation and the subsequent release of histamine from mast cells. Hyposensitization (in the form of "allergy shots") involves gradually increasing the dog's exposure to offending allergens in order to increase the dog's tolerance to that allergen (see the article on managing atopy for more on allergen thresholds). Hyposensitization can be an effective way of managing atopy (allergies to pollens and other inhalant allergens) but it is not effective in managing food allergies. The gold standard for managing food allergies is the elimination diet. Elimination diets are used both to alleviate allergic symptoms by removing all suspected allergens from the dog's diet, and also to test a range of foods to determine which foods are safe to feed the dog.

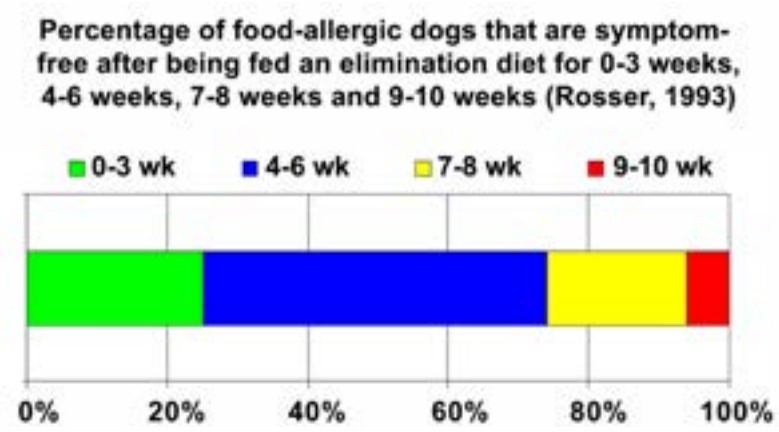
Elimination diets, also called limited antigen diets, are diets that contain one novel protein source and one novel carbohydrate source. By "novel", we mean foods that the dog has never eaten before. In an elimination trial, the limited antigen food is fed for a minimum of 12 weeks. Home-made recipes are preferred. Once the dog is symptom-free, food challenges can be conducted. Food challenges are the gold standard for diagnosing of food allergies, and they can also be used to detect food intolerances (adverse reactions that are not IgE-mediated. For food challenges, dogs are fed the elimination diet as the base diet, but new foods are introduced one at a time to see whether the dog reacts to that new food.

The three most common reasons that elimination trials fail are:

1) **The elimination trial is terminated too soon**
2) **The dog is allowed to eat foods other than the elimination diet**
3) **The dog is fed an elimination diet that is not 100% complete and balanced**

Elimination Trial Terminated too Early

The graph below is from a clinical trial by Rosser in 1993. In this trial, dogs with known food allergies were fed an elimination diet until their symptoms abated. Many owners expect their dogs to be free of symptoms within 2-3 weeks of feeding an elimination diet, but Rosser found that only 25% of dogs were symptom-free within 3 weeks of starting the elimination trial. This study showed that more than 25% of dogs did not respond for more than 7-8 weeks. If an elimination diet is fed for less than 8 weeks, a significant percentage of food-allergic dogs may be missed.



The Dog Eats Foods Other than the Elimination Diet

Twelve weeks is a long time for a dog to be fed only the elimination diet. Dogs cannot be fed treats or flavoured medications during this time. As well, the dog must not be allowed to consume anything while out exercising or visiting friends. It is a challenge for the owner to ensure that the dog only eats the elimination diet and nothing else for 12 weeks. Failure to keep to this strict diet can undermine the validity of the trial results. This is one of the most common reasons that food allergies are misdiagnosed.

Complete & Balanced Nutrition: Supporting Skin Barrier Repair

The March issue of the newsletter has an article about the importance of certain B-vitamins for skin barrier integrity. Dogs with allergic dermatitis have itchy skin, most commonly on the face, feet, ears, legs or anus. This itchiness causes the dog to scratch, lick and bite himself which damages the skin. Bacteria present on the skin surface infiltrate the damaged skin causing chronic skin infections and inflammation. Providing nutritional support in the form of 100% complete and balanced nutrition is critical to skin barrier integrity. Failure to provide complete and balanced nutrition for the duration of the elimination trial can not only prevent the skin from repairing itself, it can also lead to skin disease that was not present at the start of the trial. This can mask the effectiveness of the elimination trial and lead to the wrong conclusion that the elimination diet did not alleviate allergic symptoms.

My cookbook *"Complete & Balanced: 101 Healthy Home-made Meals for Dogs"* contains 7 limited antigen recipes using novel meat proteins such as rabbit, venison and goat; and 5 limited antigen recipes using novel fish proteins such as trout, catfish and halibut. These 12 limited antigen recipes all include HILARY'S BLEND supplement, a vitamin-mineral-prebiotic supplement that balances these recipes so that they deliver 100% complete and balanced nutrition. HILARY'S BLEND supplement contains no protein. Its carrier is chicory root extract, a pre-biotic fibre extract. The other ingredients in the supplement are all essential vitamins and minerals. This supplement is 100% hypoallergenic so it may be safely fed as part of an elimination feeding trial. With all essential nutrients at levels that support a healthy skin barrier, these home-made limited antigen recipes represent the gold standard for diagnosing and managing food-allergies in dogs.

Limited Antigen Recipes for the Management of Gastroenteritis

By Hilary Watson BSc

This article will be short because limited antigen recipes are not typically recommended for dogs with gastroenteritis. However, in cases of gastroenteritis that don't resolve quickly, limited antigen diets may be beneficial so that the dog is exposed to a few "sacrificial proteins" as long as the gut barrier integrity is compromised.

The first article in this newsletter explains how healthy protein digestion and a healthy gut barrier are both essential in preventing food allergies from developing. The corollary of that premise is that any time protein digestion is impaired or the gut barrier is damaged, there is an increased risk that food allergies will develop since larger proteins may be able to cross the gut barrier and enter the dog's body.

In cases of acute gastroenteritis which are quickly resolved, this is a minimal risk. However, for a dog dealing with an impaired gut barrier combined with reduced digestive capacity for a prolonged period (ie parvovirus, SIBO, persistent unresolved enteritis etc), the risk of developing food allergies increases. In this situation, feeding a limited antigen diet will not prevent food allergies from developing, but it will limit the dog's exposure to those few antigens present in the limited antigen diet. This is the meaning of "sacrificial protein". Sacrificial proteins are those proteins present in the limited antigen diet which may become allergenic to the dog as a result of a "leaky" gut barrier, which can then be easily avoided by the owner after the integrity of the gut barrier has been restored.

Since most cases of gastroenteritis respond best to low fat recipes, here are two low fat recipes that are also limited antigen recipes.

Limited Antigen Recipe Novel 7 (R84)	Limited Antigen Custom Recipe
5 g cod liver oil	5 g cod liver oil
422 g goat meat (cooked weight)	520 g turkey meat (cooked weight)
544 g potatoes	450 g potatoes
9 g safflower oil	5 g safflower oil
20 g HILARY'S BLEND supplement	20 g HILARY'S BLEND supplement
121 kcal/100g 22.6 g fat/1000 kcal	119 kcal/100g 11.8 g fat/1000 kcal

Each month, we'll review one nutrition research study published within the last 2 months. These reviews won't be limited to canine nutrition. We may review human, equine, livestock and zoo animal nutrition research if we find it interesting and relevant. The common denominator is that each study will be recently published in a peer-reviewed scientific journal and they will all provide new insight into some concept of nutrition.

Research Study of the Month

By Laura Scott MSc

Title of study:	*Animal models of protein allergenicity: potential benefits, pitfalls and challenges*
Authors:	*R.J. Dearman and I. Kimber*
Journal:	*Clinical and Experimental Allergy*
Issue:	*Issue 39, pages 458-468, April 2009*
Species:	*Humans, Mice, Rats, Dogs and Pigs*
Link:	*doi 10.1111/j.1365-2222.2008.03194.x*

Background information

A food allergy is defined as the induction of a specific immune response, and is different from food intolerance, where the development is non-immunological. Novel proteins are being introduced into our diets from foods derived through biotechnology and by greater availability of imported foods. Food allergies caused by proteins are a serious health concern for people and for our pets. Being able to assess the safety of a novel protein source with respect to allergies is very important and animal models have been used to understand the immunological and pathophysiological mechanisms which are involved in food allergic responses. A single animal model will not likely be able to predict all allergies as food allergies are multifaceted – there are genetic, environment and exposure factors that affect the allergic response.

Purpose of this study and study design

Animal models of allergenicity are used to identify proteins that have the ability to induce allergic sensitization, and to tell the difference from those proteins that are non-allergenic and do not have the sensitizing activity. An animal model does not need to completely recreate the human response, but can be used with other information to make decisions about the safety of a new protein.
This study reviewed the published literature on the types of animal models currently used to assess allergenicity and examined the benefits and shortfalls of the various species. The focus on the use of these animal models was for safety assessments of new proteins which may be introduced into human diets.

Study results

Mice – the most commonly favoured model because they are readily available and fairly inexpensive. Mice also have similar immune regulation mechanisms to humans. However, some strains may give false negatives which can severely limit this models use.

Rats – their large size means this species can be used to assess more aspects of allergenicity than the mouse. One of the big drawbacks to the rat is that to get a good response at least two generations must be free of the antigen under investigation. This means a longer time lag before investigations can begin which increases the expense.

Dogs and Pigs – less commonly used models, there are some real benefits as they have a gut anatomy and nutritional requirements similar to humans. The large size and associated expense of these models has contributed to its lack of use and there is limited information to validate these models. In addition, there is great intra-species variation which makes it difficult to predict results.

My thoughts

Animal models play an important role in assessing allergenicity, but there are limitations to the information an animal model can provide. In addition, not all animal models accurately reflect what will happen in

people or other species, so although an animal model may give a starting point for determining allergenicity, it is by no means an absolute answer. What is interesting is that dogs can be used as a model for human allergic reactions. If further developed, this may also give us more information about true food allergies in dogs and allow for an accurate testing method. Until we have more data, the best method for determining allergies in dogs remains an elimination diet and feeding trial.

3 year old Shih Tzu Léo

Testimonial

Léo is a little Shih-Tzu, now three years old. He began scratching at 10 months old. At the first visit to the vet, nothing was found wrong with his skin. I was told it was probably allergies – environmental and/or food allergies. As he scratched so much, we began allergy shots, and I was told to change his food. I tried every kibble on the market, nothing seemed to help. My vet suggested a home-made limited antigen diet. So I began to cook for my little dog. He was feeling better, nice fur, no more vomiting ... it was time to add a vitamin-mineral supplement to his diet. He reacted badly to every one I tried (and I tried a lot). He would begin to vomit again ... One day, my vet spoke to me about HILARY'S BLEND supplement and the recipe book! One recipe was almost identical to the recipe Léo was eating (novel protein). And here was a supplement to fulfill all his needs! I was so excited and happy!

Since then, (now 8 months) Léo is doing very well with HILARY'S BLEND supplement. He has a lot of energy! And he is always happy to eat! (he was a very picky eater before). As he was allergic to fish oil, Hilary suggested we replace cod liver oil in the recipe with another oil and supplement with vitamin A and D to complete his needs. I wouldn't change anything as I am so happy with the results! And Léo too!

Francine Labonté
Longueuil, Quebec

Allergy Glossary

Allergen	Antigen capable of stimulating a type 1 hypersensitivity reaction (ie an allergic reaction involving IgE antibodies)
Antibody	Also known as immunoglobulins are gamma globulin proteins produced by plasma cells (a type of white blood cells). Antibodies identify and neutralize foreign invaders (called antigens) such as bacteria and viruses. Five different antibody isotypes are known in dogs (IgA, IgG, IgE, IgM, IgD)
Antigen	Any substance, generally a protein, regarded by the body as foreign that provokes a specific immune response, ie antibody production. Examples of antigens include toxins, bacteria, and the cells of transplanted organs. Antigens which are normally harmless but are mistaken for foreign invaders in allergic dogs are called "allergens".
Atopic dermatitis	One of the most common skin diseases in dogs. It is defined as a genetically predisposed inflammatory and pruritic allergic skin disease associated with IgE antibodies and usually directed against environmental (inhalant) allergens. Pruritis (itchiness) often leads to scratching which causes the breakdown of the skin barrier allowing the entry of environmental allergens and bacteria into the epidermis which perpetuates chronic skin inflammation. Several studies have established that food allergies can play a role and food allergy and atopic dermatitis often occur together.
Atopy	An allergic type 1 hypersensitivity generally against environmental (inhalant) allergens such as pollens, dander, dust mites, molds, weeds, and grasses. Atopy has a hereditary component and food allergies can also play a role. See also Atopic Dermatitis.
Cross-reactivity	Antibodies originally created against a given allergen that respond to a different but similar allergen. Common examples are fish allergies, shellfish allergies and nut allergies where exposure to one food allergen can lead to reactivity to a allergen in the same biological family even without previous exposure to that allergen.
Elimination trials	A feeding trial in which the dog is fed a diet based on one novel protein source and one novel carbohydrate source for a minimum of 12 weeks. Novel sources are foods that the dog has never eaten before. Elimination trials are the most reliable way of diagnosing and identifying food allergies. Home-made diets are preferred. See also Food Challenges.
Food allergies	Type 1 (IgE-mediated) hypersensitivity reaction to a consumed food. Food allergies account for about 10% of all the allergies seen in dogs. Flea bite allergies and atopy are more common than food allergies.
Food challenges	Food challenges, especially double-blind placebo-controlled food challenges, are the gold standard for identifying the underlyin cause of adverse reactions to food, including both IgE-mediated reactions (food allergies) and non-IgE mediated reactions (food intolerances). Food challenges are generally conducted while the dog is on an elimination diet. Dogs are fed one new food at a time and observed for signs or symptoms of an allergic reaction.
Food intolerances	Non-allergic (ie non IgE-mediated) adverse reactions to food. Examples include lactose intolerance, toxicological reaction to chocolate, pharmacological reactions to certain seafoods. Food intolerances are more likely to cause gastrointestinal symptoms (diarrhea/vomiting) than skin symptoms.

Allergy Glossary Cont'd

IgA	Immunoglobulin A is a class of antibodies that plays a role in mucosal immunity. IgA is the main immunoglobulin found in the secretions of the digestive tract, the respiratory tract, and the urinary tract. IgA suppresses immune reactivity in the gut and lungs and helps to prevent allergic reactions to food and airborne antigens.
IgE	Immunoglobulin E is an inflammatory class of antibodies associated with type 1 hypersensitivity (allergies).
Immunotherapy	Therapy for allergic disorders in which the dog is vaccinated with increasingly larger doses of an allergen with the aim of inducing immune tolerance to that allergen. Much more effective for managing atopy (inhalant allergies) than food allergies. Also called allergen immunotherapy, hyposensitization therapy, immunologic desensitization or allergen-specific immunotherapy.
Intradermal skin test (IDST)	Diagnostic test in which a suspected allergen is injected into the dog's skin and the dog is observed for an allergic reaction. A reliable diagnostic tool for atopy (inhalant allergies), IDST is considered by most veterinary dermatologists to be unreliable for diagnosing food allergies.
RAST test	RadioAllergoSorbent Test is a blood test used to detect and measure specific IgE antibodies to known allergens. Considered a useful diagnostic tool for atopy but not considered reliable for diagnosing food allergies in dogs.
Tolerance	Also called immune tolerance or immunological tolerance is the term for the absence of an immunological response to an antigen. "Oral tolerance" refers to the suppression of immune reactivity to food and bacterial antigens in the digestive tract. Failure of oral tolerance is attributed to the development of several immunologically based diseases, including inflammatory bowel disease and ulcerative colitis.

Ask the Pet Nutritionist

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