

DIAGNOSTIC METHODS AND THERAPEUTIC OPTIONS IN DOG SKIN ALLERGIES - A SHORT REVIEW

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Abstract

Allergy is an exaggerated reaction of the body, which occurs after the contact with various substances that the immune system considers foreign and acts against them. Like humans, dogs can be allergic to various substances which, when inhaled or absorbed through the skin, airways or gastrointestinal tract, stimulate the immune system by releasing histamine that induces inflammation, erythema, edema and itching. It is considered that all the cases of allergies, whether low, moderate or severe, are genetic in nature. Dogs that become allergic to drugs, vaccines, food, dust, pollen, fleas, various household substances, etc., are "genetically programmed" to have an immune system capable of producing an allergic reaction. The allergic reaction is not due to medication, biological products, food or the environment, but it is considered to be a genetic trait inherited from parents. Because there are different types of allergies and many conditions that can cause skin problems in dogs, the symptoms they present differ from one allergy to another, from one patient to another, requiring both diagnosis and treatment to be made differential for each type of allergy and for each individual. The symptoms of allergic reactions can be diagnosed through allergic tests (intradermal or blood tests), the individual removal of allergens from the dog's living environment (in case of parasitic allergy), or by reagent therapy. Fighting allergies involves the use of antihistamines, anti-inflammatory corticosteroids, topical antipruritic substances, leukotrienes inhibitors, as well as various plant extracts with antiallergic effect.

Keywords: allergens, allergic reaction, antihistamines, corticosteroids

Introduction

Allergy is defined as a hypersensitivity or abnormal reactivity of the immune system to a particular substance. A large number of substances can act as allergens, most of which are represented by various drugs, insect proteins (flea saliva or mosquito bites), animal or vegetable proteins (food, pollen, mold spores, dust particles), immunological factors but also chemicals (for household use) that can cause allergies.

Most often the contact with the allergen causes local or systemic inflammatory reactions that determine the clinical symptoms of the allergy. The organs most commonly affected are the ones representing the entrance for the allergen (the so-called target organs: skin and mucous membranes, respiratory tract and digestive tract). Symptoms can be local or systemic, of varying intensity and severity, sometimes even lethal. Systemic reactions also occur when allergens are introduced directly into the bloodstream (through injections, infusions, transfusions, insect bites, etc.).

Allergies are quite common in dogs, regardless of breed, and the most common symptom associated with allergies is itchy skin, either localized (in a certain area) or generalized (all over the body) (Bensignor E, 2013, Bruet V et al., 2012). In some cases, the symptoms involve the respiratory system with manifestations of coughing, sneezing, shortness of breath or in other cases, allergic symptoms may begin with digestive disorders, manifested by vomiting and diarrhea.

Many experts believe that some allergies in animals are inherited (Eichenfield LE et al., 2014; Merryman-Simpson AE et al., 2008; Sander I, et al, 2015). An inherited allergy is atopy or allergies to

pollen and plants. It is believed that certain breeds of dogs, both males and females are genetically predisposed to become sensitive to environmental allergens (*Marsella R. et al., 2012*). Among the breeds prone to the development of allergies we can list: American Hairless Terrier, American Pit Bull Terrier, Bichon Frise, Bohemian Terrier, Boxer, Brussels Griffon, Bull Terrier, Bulldog, Chinese Crested, Dalmatian, English Cocker Spaniel, German Shepherd, Golden Retriever, Irish Setter, Labrador Retriever, Lhasa Apso, Maltese, Miniature Schnauzer, Pekingese, Poodle, Pug, Shar-pei, Shih Tzu, Scottish Terriers. However, any dog of any breed (or mixed-breed) can be allergic, and the age at which the allergy occurs for the first time is generally between 6 months and 3 years. Clinical signs may appear seasonally, but can sometimes be seen throughout the year. Itching is the most typical sign, and the face, ears, front legs, armpits, abdomen and tail base are the most commonly affected areas, but the scratches caused by intense itching can be found all over the body. Scratching can lead to secondary signs of wounds, scabs, skin and ear infections, hair loss and scaling. The skin is the main target of atopic dermatitis, but about 15% of the affected dogs also develop nasal inflammation (rhinitis) and asthma. Long-term or recurrent ear infections may be the only sign in a small number of dogs.

Although initially they appear to be harmless, skin allergies present a real risk of subsequent infection, which can lead to complications, because as the itching occurs, the animal scratches, bites or licks its skin frequently, leading to its sensitization and the appearance of local irritations, being more prone to infection with different bacteria (*Constantin C., et al., 2009*). The essential role of the skin for the dog's health is already well known, it has different functions such as defense against harmful environmental factors, thermoregulatory role to maintain a constant body temperature, the role of ensuring cognitive functions that together with the fur, sebaceous and sweat glands helps the dog to integrate into the environment and also to influence its sexual behavior, but the skin also has a mitigating role in case of trauma due to its elasticity (*Miller WH., et al., 2013*).

Thus, it is important to know the causes that can lead to skin diseases, the general signs that indicate a dermatological allergy, the diagnostic methods and the most effective treatment depending on the type of allergy.

Allergies classification

There are different types of allergies, each with its own symptoms, classified according to the type of allergen and the areas of the body it affects.

Allergic reactions or hypersensitivity reactions (immune mediated) are classified according to their type:

Type 1 or immediate type (also called acute anaphylaxis), is common in dogs and can be caused by various proteins. This category includes allergies induced by insect bites, food allergies, various medications, allergic rhinitis and it usually begins with edema of the head and ears, urticaria, anaphylaxis and even death. Allergic shock, also called anaphylactic shock, is the most dangerous manifestation of an allergic reaction of this type, because it can cause death.

Type 2 or cytotoxic induces reactions like immune-mediated hemolytic anemia and immune-mediated thrombocytopenia, being rare and caused by drugs.

Type 3 or the immune complex is triggered by antibodies that come in contact with various substances which dissolve in the blood and form aggregates on the vascular walls. Type III allergies can trigger an inflammatory reaction, manifested by rash and itching. One can also observe an ischemic cutaneous vasculopathy that can appear after an injectable administration of some drugs (vaccines, antibiotics, etc.) but which has an affinity for additional places compared to the injection site.

Type 4 or delayed type hypersensitivity is represented by cell-mediated reactions with a delayed reaction with an average time of 2 weeks and which includes erythema and contact dermatitis as clinical signs.

There are various other ways to classify allergies, and some of them include: allergy to insects (fleas) or food allergy caused by a certain type of allergen, with clinical signs of allergic dermatitis manifested by urticaria, pruritus, irritation; inhalation allergy or allergy induced by the skin contact with the passage of the allergen in the body, manifested by dermatitis or allergic bronchitis; immunological factors that induce type I hypersensitivity which may lead to anaphylaxis or shock and delayed type hypersensitivity, depending on the time required for the immune response; genetic factors (in inherited forms) with manifestations of atopy or seasonal allergies.

Another classification of skin allergies, depending on the substance causing the reaction and the symptoms it causes, is: food allergy - caused by substances in certain foods: meat, eggs, dairy, fruit; drug allergy - when the body reacts to certain pharmaceuticals; allergy to insect bites - occurs as a result of insect bites - such as fleas, mosquitoes, bees or wasps; contact allergy - as a reaction after the contact between the skin and an allergen, such as household cleaners, disinfectants, pollen, feathers, various plants.

Flea bite allergy can be easily diagnosed because, in most cases, both fleas and their dirt can be seen on the animal's fur. Most dogs experience minor local irritation (especially at the base of the tail) due to flea bites, but in sensitive dogs an allergy to insect bites can induce an exaggerated inflammatory response, with flea saliva being one of the most commonly incriminated allergens in this pathology, causing flea allergic dermatitis. In the latter, the bite of a single flea can induce a severe local reaction with intense itching, which will cause the dog to bite and scratch, leading to the removal of a large amount of hair from the affected area (*Foster A, Foil C., 2003*). In areas with damaged skin there is a risk of developing a secondary bacterial infection.

Food allergy, also called food hypersensitivity can occur in almost any protein or carbohydrate component in a dog's diet (*Gaschen FP. et al., 2011; Carrión, P. A et al., 2014*). Food allergies can be caused either by predisposing factors, represented by the genetic disposition of some dog breeds such as German Shepherd, Cocker, Golden Retriever, Labrador, Bichon, Peckinese, Bulldog, or by triggers, represented by meat or dairy proteins, but also certain substances in spices and additives present in dog food. Allergic responses to dairy proteins, cereal gluten, chocolate, egg proteins, beef, pork, chicken, lamb or soy-containing foods were most commonly observed (*Pucheu-Haston CM., 2016*). All of these have been commonly associated with food allergies in dogs. Allergic phenomena given by certain foods can occur at any age and can produce mild clinical signs to intense clinical signs, especially when associated with atopy, which makes the diagnosis difficult to establish (*Craig J. M., 2016; Chandler, M. L., 2013*).

Allergy induced by various inhalants in dogs is often used as a synonym for atopy. The main inhalant allergens are pollen (plants - ragweed; trees - linden, oak, cedar, ash; grass), mold and dust mites. Many of these allergies occur at certain times of the year (seasonally during the flowering of ragweed, trees and grass), and allergies to mold and dust mites occur throughout the year (*Guaguère E, Prélaud P., 2006*). In humans, allergies that occur after inhaling allergens are generally manifested by upper respiratory signs such as sneezing, runny nose and eyes, coughing, redness of the face, etc. In dogs, inhalant allergy is manifested by itchy skin and very rarely by allergic rhinitis or bronchitis. Most dogs that manifest inhalation allergies begin to show signs between one and three years old. Affected dogs will often react to more allergens and will often associate flea or food allergies.

Contact allergy (contact dermatitis) occurs quite rarely in dogs and it results from direct contact with allergens, such as household substances, pyrethrins, pesticides used on lawn, various plants, materials such as wool or synthetic materials used in carpets or bedding, etc. Contact dermatitis can be of two types: *irritating*, which occurs from the first exposure to various allergens (detergents, soaps, cosmetics, solvents, acids, plants) and leads to skin lesions that appear immediately after contact or a few hours later; *allergic* which is a manifestation of a delayed hypersensitivity reaction, type IV, which intervenes when repeated contact with a substance that has produced sensitization occurs (metals, plastic, various plants, local anesthetics). In this last type of dermatitis, the immune system is involved with the formation of Memory T lymphocytes, and the symptoms appear hours or days after re-exposure (Gedon Natalie *et al.* 2018).

Contact allergies can develop in virtually any dog breed and at any age and will manifest as skin irritation, redness, swelling, thickening of the skin and itching at the site of contact, but along with the removal of the allergen (when it has been identified), the dogs will recover, without the need for a specific therapy. Because most of these allergens come from the environment, their identification is difficult to achieve and it is possible for recurrences to occur after a certain period, by permanently exposing the dog to the allergen. If the allergen or allergens have been identified by intradermal skin tests or blood tests, the dog should be protected as much as possible from exposure to them.

Exposure to allergens over a long period of time sensitizes the immune system, and subsequent exposure to the same allergen or a related allergen causes an excessive reaction. Normally, the immune system protects against infections and diseases, but in the case of allergens the immune response triggers an exaggerated reaction that can be harmful to the body. The immune reactions involved in allergies are quite complex (Reedy L.M. *et al.*, 1997). Most reactions involve allergenic protein molecules that combine with antibodies in the blood and then attach to mast cells, which are found in various tissues in the body. When the antigen and antibody react with mast cells, they release histamine, which induces local inflammation manifested by redness, edema and pruritus. It often happens that antibodies act in case of an allergic reaction to the saliva of insects that bite the animal, inhaled dust, pollen, food proteins, cleaning products, etc. When white blood cells (or leukocytes - the cells of the immune system that protect the body from foreign bodies) consider the above substances to be dangerous, they do not hesitate to attack in order to protect the body.

Genetic factors have been described in some papers as having led to the development of allergies, this being a predisposition inherited by some dog breeds from parents with a genetic background to atopy. Thus it is considered that the allergy is an acquired reaction of the immune system, which is genetically programmed and transmitted from generation to generation to several breeds. Although the pathogenesis of a genetic background is not fully understood, there is various evidence showing genetic abnormalities, a modified immune system that causes skin inflammation, and a skin barrier defect (Bizikova P., *et al.*, 2015; Morar N. *et al.*, 2006).

The prevalence of atopic dermatitis is estimated today worldwide at about 25% of all diseases encountered in dogs. Although the pathogenesis of allergies is not fully known, in the case of such a condition in a dog, a laborious diagnosis is necessary to establish an appropriate treatment for the type of allergy.

Diagnostic methods of skin allergies in dogs

An accurate diagnosis of the causes of a skin disease requires a detailed history, physical examination and appropriate diagnostic tests. Many skin diseases have similar signs and an

immediate diagnosis may not be possible. Different laboratory procedures can be established based on the dog's history and physical examination. These may include microscopic analysis of skin and hair scratches, hair cultures or skin swabs, specialized skin tests, blood and urine tests, and even biopsies. It may take several days for laboratory results to be available. For an accurate diagnosis, several examinations and evaluation of the response to the applied treatment are often necessary.

The diagnosis of skin allergies is sometimes difficult to make, so a differential diagnosis is needed depending on location, age of onset, breed, clinical signs and history of the disease. Thus, hypersensitivity to ectoparasites (given by flea bites) must be differentiated from food hypersensitivity (given by meat proteins and certain constituents in food) and atopic dermatitis (given by environmental allergens). Dog allergy testing cannot diagnose the type of allergy, but it is useful to identify the allergen or allergens and to institute a specific treatment (Hill PB, et al., 2006; Miller WH et al., 2013).

The main sign of an allergy is skin irritation, manifested by intense itching, bites on the legs, skin lesions that appear through scratches, agitation and anxiety.

Flea dermatitis is an exaggerated allergic reaction of the immune system after the contact with certain components of the flea saliva. It is the most common allergy found in dogs and it is a disease that produces severe itching (pruritic disease) and predisposes to the development of secondary skin infections. The diagnosis of flea allergy is made based on the symptoms, the antecedents, the clinical signs (frequently tail lesions) and the positive reaction to the flea control methods (Bruet V et al., 2012). The diagnosis of allergic dermatitis in flea bites is also based on the highlighting of fleas or flea feces.

Reactions to food intolerance in humans and animals are variable, usually dose-dependent, and can occur at any age (Valenta R, et al., 2015). Food allergy includes immunologically mediated reactions to food proteins, in which numerous immune cells and molecular mediators participate.

Signs may appear at any time, sometimes a few hours or days after consuming the incriminated food product and can last for hours or days. The differential diagnosis of food intolerance is broad (Carrión, P. A., Thompson, L., 2014), there are no specific diagnostic tests, and identifying the culprit foods can be a challenge, as several food groups may be involved in the same individual. Objective testing of food intolerance requires a double-blind, placebo-controlled food challenge, but it is rarely used (Craig J. M., 2016).

The International Committee on Allergic Diseases of Animals has developed a set of practical guidelines that can be used to help diagnose atopic dermatitis as effectively as possible (Olivry T et al., 2013). These sets provide an overview of the diagnosis of atopic dermatitis and involve three distinct approaches, such as: eliminating other skin conditions that overlap with atopic dermatitis, with similar clinical signs; evaluation and detailed interpretation of the clinical history of skin diseases; evaluation of skin reactivity by intracutaneous testing or by serological determination of allergen-specific IgE (Ciprandi G., 2017).

The diagnosis of allergies is often based on demonstrating a correlation between sensitization to a particular allergen, the production of specific IgE and the history of symptoms that occur after the exposure to that allergen. In patients with suspected IgE-mediated reactions or conditions, the diagnostic algorithm should include clinical evaluation and molecular allergen sensitization evaluation tests (Ciprandi G., 2017; Harvey N. D. et al., 2019).

In human medicine, there is used in the case of allergies the molecular diagnosis, which has been improved in recent years due to the production of standardized test material. Molecular diagnosis of allergies already provides valuable information on patients' individual sensitivities,

which, when combined with history and objective examination, may be relevant to clinical decision making. Molecular diagnosis contributes to the identification of different phenotypes of allergic populations and supplements tests for the determination of specific serum IgE in allergen extracts (Ciprandi G., 2017). Conventional tests, which use whole proteins, have the advantage of including most relevant allergens, which are mainly stable and found in large quantities in allergen sources, and are also useful if the relevant molecular allergens are not yet commercially available.

For a correct diagnosis of food allergies, it is necessary to evaluate both the positive or negative values of molecular allergens, along with the overview. Factors leading to the loss of oral tolerance and the onset of food allergy in some sensitized individuals are currently vaguely defined, but the loss of immunological tolerance is known to be based on several biological pathways, with inflammation mediated by T helper 2 (Th2) lymphocytes representing the key element in food allergy (FA). FA occurs as a result of the development of an abnormal immune response to food antigens and involves a first stage of allergen sensitization (Hill P., 2002). Sensitization may occur in the digestive tract, skin or may be clinically expressed as a cross-reaction in individuals previously sensitized to inhaled allergens. Skin epithelial cells, as well as those in the digestive tract, respond to tissue injury, inflammation or activation of the innate immune response, through the secretion of a network of cytokines that promote allergic inflammation. Recent data (Hensel Patrick et al., 2015; Incorvaia C. et al 2015) suggest that sensitization to trophallergens in the skin may be the central event in inability to obtain or the loss of oral tolerance. The loss of integrity of skin epithelial cells predisposes to sensitization. Skin sensitization appears to prevent the development of oral tolerance by inducing a Th2 response. This may explain the high prevalence of FA in dogs with atopic dermatitis. It has been observed that cutaneous dendritic cell (DC) subtypes are similar to the lamina propria DCs (Incorvaia C. et al 2015). By secreting interleukin-10 (IL-10), macrophages promote the regulatory response mediated by regulatory T lymphocytes (LT reg) (Hensel Patrick et al., 2015; Incorvaia C. et al 2015). LT have been assigned a number of roles in relation to modulating the immune response to food antigens. Intraepithelial lymphocytes appear to have a tolerogenic role, being involved in immune surveillance and in maintaining immune homeostasis.

Allergen sensitization, at the skin or digestive level, leads to the failure of the installation and maintenance of immune tolerance and this is the *primum movens* in the development of FA (Outerbridge C., 2013). The elucidation of the pathological mechanisms involved in the sensitization process is the starting point in identifying the factors that determine the immunological tolerance sustained naturally or induced by treatment.

The evaluation of a dog with allergic dermatitis requires a step-by-step evaluation for a more concrete diagnosis. A differential diagnosis is needed to highlight the factors that led to the disease (Hensel Patrick et al., 2015) (Table no 1).

Table 1
Important differential diagnoses for pruritic skin diseases in dogs
(After Hensel et al. BMC Veterinary Research)

Ectoparasitic skin diseases

Fleas

Scabies (<i>Sarcoptes scabiei</i>)
Demodicosis
Cheyletiellosis
Pediculosis

	Otoacariasis (<i>Otodectes cynotis</i>)
	Trombiculiasis
	Nasal mites (<i>Pneumonyssus caninum</i>)
Microbial skin infections	<i>Staphylococcal pyoderma</i>
	<i>Malassezia dermatitis</i>
Allergic skin diseases	Flea allergy dermatitis
	Atopic dermatitis
	Food intolerance/allergy
	Insect bite hypersensitivity
	Contact dermatitis
Neoplastic disease	Cutaneous lymphoma

The usual methods of diagnosing skin allergies are most often based on the skin areas where the signs appear, but these elements may not always indicate the type of allergy, so differentiation techniques are needed such as hair combing to highlight possible fleas, scraping of the damaged skin, tearing of hair from the injured area and cytological examination.

Depending on the situation, the clinician may consider certain steps, namely: in case of flea allergic dermatitis, skin lesions often give the first indication and are often located in the lumbosacral area to the base of the tail and on the inner or outer thighs (fig no. 1); food dermatitis induces pruritus in the facial area (muzzle and around the eyes), on the limbs which will cause intense licking and chewing of this area, pruritus in the anal area, recurrent ear infections, pruritus on the abdomen (fig. no. 2); skin dermatitis caused by fungi with erythematous and hyperpigmented lesions (fig. no. 3); atopic dermatitis with rashes in different regions of the body due to environmental or immunologically induced factors (fig. no. 4).

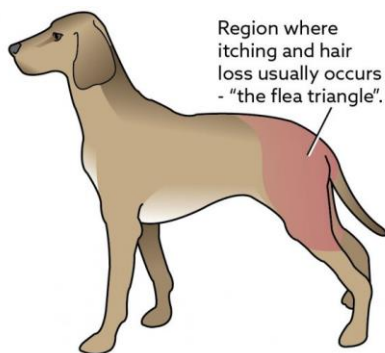


Fig. 1. Distribution of skin lesion and pruritus associated with flea allergy dermatitis (www.vcahospitals.com)

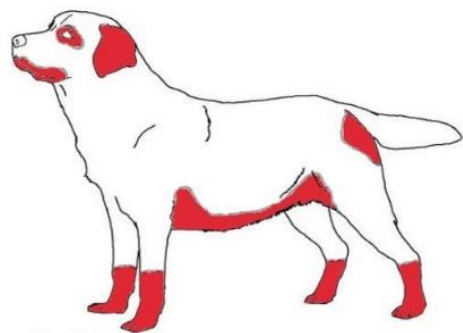


Fig. 2. Common distribution of clinical lesions and pruritus associated with canine atopic dermatitis and food allergy (www.molecarepetvets.com)

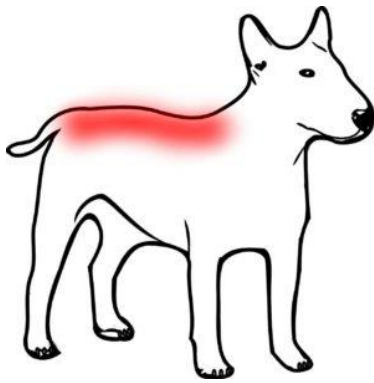


Fig. 3. Distribution of skin lesions and pruritus associated with hypersensitivity or contact allergy (www.walkervillevet.com.au)

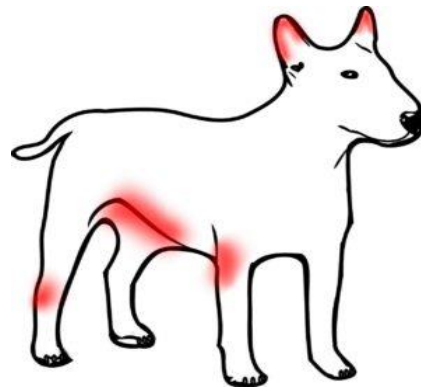


Fig. 4. Distribution of skin lesions and pruritus associated with mite infestation (www.walkervillevet.com.au)

In atopic dermatitis, the clinical overview is polymorphic, with intense itching, which makes the diagnosis to be established by corroborating the anamnestic data, age, the results of clinical and paraclinical examinations, as well as the results of allergic tests. Atopic dermatitis is located especially on the face, abdomen, limbs, axillary area and the generalized form occurs in a small percentage (25-30% of cases of atopic dermatitis) (Hillier A. *et al.*, 2001). Skin lesions vary from case to case, with erythematous and papular dermatitis in the early stages of the disease, accompanied by scratching lesions, abrasions and scaly patches with alopecia. Subsequently, various manifestations of secondary pyoderma are observed, such as pustular impetigo, folliculitis or furunculosis (Hill P., 2002; Schlotter YM., *et al.*, 2011). Progressively, the lesions common to chronic dermatitis are installed: alopecia, hyperkeratosis, hyperpigmentation, seborrhea. Frequently, along with atopic dermatitis, allergic dermatitis caused by flea bites is observed in dogs (with dorso-lumbar location and at the base of the tail), which explains the clinical manifestations of the two forms, leading to a difficulty in establishing the diagnosis.

As manifestations associated with atopic dermatitis found in a large percentage (about 50% of cases) there may be mentioned: bilateral otitis externa, conjunctivitis, chronic rhinitis. Dermatitis is initially seasonal, in 80% of cases starting in the warm season when the main allergens are seasonal pollen, but later the disease is persistent with manifestations throughout the year when allergens persist in the environment (dust mites). Atopic dermatitis usually begins at the age of 6 months to 5 years, certain predisposed breeds being terriers, Spanish cocker, Labrador, Golden retrievers, Shar peis, German Shepherd, but any dog breed may be affected.

The diagnosis of atopy will be made according to the symptoms, seasonality, response to drugs, excluding other similar allergies such as food or parasitic allergies, infections or fungal skin infections (Guaguère E, Prélaud P., 2006).

Cutaneous tests can be done by puncture or intradermally: the puncture test is done by stinging the skin on the dorso-lumbar area with several allergens, in a very small amount. The stung area will turn red if the dog is allergic. The intradermal test can only be used if the puncture test is not conclusive. In this case, the allergen is injected under the first skin layers.

Serological (blood) tests are used especially in patients with severe conditions (superinfections).

Therapeutic options for skin allergies of dogs

The therapy of dermatological diseases does not involve focusing only on the skin, it must be summarized mainly to eliminate the cause that led to the diagnosed condition. Allergies are most often diagnosed after specific tests have been performed.

A good management plan for skin allergies requires the use of different treatments, reasonable understanding and patience from the pet owner because the results can occur after long periods of treatment, frequent assessments of therapeutic progress so that the drug protocol can be adjusted accordingly as required.

The complexity of skin lesions due to intense pruritus, their multitude in different areas, their evolution towards healing or their aggravation towards superinfection but also the variety of medicinal solutions available today make the elaboration and implementation of the therapeutic protocol a challenge. Dermatological pathology is complex, frequent, multifactorial, with clinical manifestations ranging from simple clinical forms to severe forms, which makes the patient's care start from the rules of hygiene and proper skin hydration, the use of drugs with topical or systemic application, and to the use of current products, such as monoclonal antibodies. They are increasingly used because they prove their effectiveness in severe forms of the disease, becoming the medication of choice.

There are various treatment options needed to alleviate or inhibit allergic reactions to allergens (*Olivry, T. et al. 2015*).

Removing parasites from the animal (fleas) by external deworming with the multitude of specific substances existing for dogs but and from the environment in which the animal lives (cage, blanket, basket) by spraying with various specific substances is one of the first steps as a therapeutic option in parasitic dermatitis. The second step is to treat pruritus with corticosteroids and antihistamines for a certain period of time (about two weeks), and in case of bacterial or fungal complications, specific treatment is recommended both locally and systemically.

Food allergy requires primarily the identification of allergenic components (elements) in food, their elimination and the use of a hypoallergenic diet, this being the most balanced method of testing allergies given by the proteins of some foods. Because it takes at least eight weeks for all other foods to be eliminated from the body, the dog should receive a special diet exclusively for eight to twelve weeks until a positive response and clinical signs improve. Dietary dermatitis usually does not respond well to corticosteroids or other medical treatments.

Atopic dermatitis is a condition that the animal may face throughout life, so long-term management and regular veterinary examinations are necessary (*Shaw S., 2013*). Treatment involves a number of options such as avoiding allergens that cause the disease, itching control, improving hygiene and food, controlling parasitic factors, and immunotherapy (for example, an allergy vaccine).

The treatment of skin dermatitis depends largely on the duration of the specific season of allergies and may involve different methods of therapy (*Patel A, Forsythe P, 2008; Solcan Gh., et al., 2003*). Treatment options include therapy of allergic symptoms with topical and oral medication or allergy testing and desensitization injections to treat the leading cause of itching (*Scott DW, et al., 2001*).

Anti-inflammatory therapy with drugs with antiallergic and anti-inflammatory effect, such as corticosteroids (prednisolone-Prednicortone), or antihistamines (Histamine control, Chlorpheniramine, Diphenhydramine-useful and to relieve itching, Ceterizine, Loratidine, Clemastine, Hydroxyzine, Amitroptiline, Cyproheptadine), will quickly block the allergic reaction in most cases. The use of topical corticosteroids is done in order to relieve erythema, inflammation, pain and itching. Steroids used for injectable or oral administration, such as cortisone or

prednisone, act quickly and effectively to relieve pruritus, but their use should be done in the short term because they induce various side effects (increased thirst with frequent urination, insatiability which will lead to weight gain and obesity, increased blood pressure, even skin infections and hair loss). Also, topical steroid products such as hydrocortisone, betamethasone and triamcinolone should be used with caution for short periods of time, as overuse can predispose to skin infections due to the fact that they induce thinning and aging of the skin or create blackheads.

Supplementing the diet with fatty acids can improve the response to steroids and antihistamines in some cases. Omega 3 and 6 are essential fatty acids derived from various sources such as fish oil, flaxseed oil and vegetable oils. They have both a skin softening effect and an anti-inflammatory effect. They require administration for a long period of time, 1-3 months to observe a beneficial effect, fatty acids being ideal, combined with other specific products, for the treatment of allergic dermatitis in dogs, today being available on the market a wide range of products in various commercial forms (capsules, powder, liquid or chewable tablet). Fatty acids work synergistically with antihistamines to help reduce allergic skin inflammation and itching, but are not recommended in cases of dogs with other medical disorders, such as high cholesterol or clotting problems.

There are new alternatives to block specific chemical signs associated with cutaneous pruritus in dogs, which include daily oral medication such as oclacitinib (Apoquel), but also long-acting injections (Cytoint, 30-day effect).

Symptomatic allergic treatment with mild or seasonal clinical signs can be managed by using topical medication such as shampoos, conditioners, sprays or with oral antihistamines, fatty acids (salmon oil), steroids and cyclosporine (Sporimune) (Nuttall T., et al., 2014). Hypoallergenic shampoo therapy can be soothing for the itching and inflammation of the skin. Antimicrobial shampoos (with chlorhexidine) are also used to help prevent scarring from becoming infected. Shampoos, conditioners and sprays used for allergies contain ingredients that help reduce itching, such as topical anesthetics, antihistamines, anti-inflammatories or plant extracts. For dogs with skin allergies, frequent baths are beneficial because they help reduce allergens that accumulate on the skin, but it is essential to use shampoos specially designed for pets due to pH differences. It is important that the shampoos are gentle so as not to induce dry skin and fur, so do not use tar or benzoyl peroxide-based shampoos.

The treatment of contact dermatitis primarily involves identifying the causative agent and stopping the contact with it, as well as avoiding further contact. In addition to pharmacological treatment, you can also use non-pharmacological treatment that aims to fight itching and moisturizes the skin. Bran colloid baths, warm showers, hot compresses and emollients applied after the bath can be used. Pharmacological treatment will be done with astringents (calamine), to reduce suppuration in the lesions and relieve itching.

Hyposensitization or desensitization therapy will be applied if specific antigens are identified by allergy testing and thus the patient may be injected with an allergic serum or anti-allergic vaccine. With this treatment, very small amounts of antigen are injected weekly in repeated doses, which aim to reprogram or desensitize the immune system. The effectiveness rate varies depending on the dog's response. Significant improvements in clinical signs were observed in approximately 50% of the treated dogs, and a reduction in pruritus was observed in approximately 25% of the dogs, which involved a decrease in the dose or in the frequency of corticosteroid use.

Conclusion

The treatment of atopic dermatitis is a complex and long-term one, which requires a diagnosis and a therapy adapted to each individual.

Animals with atopic dermatitis are prone to secondary skin infections, ear infections and fungal infections (*Malassezia*), which will lead to sensitive and damaged skin. For these reasons, flea control, diet control and special shampoo baths should be done regularly, and antibiotics and antifungal medications may be needed to treat any secondary infections.

The treatment of skin allergies will be differentiated depending on the type of allergen and will include external and internal antiparasitics, corticosteroids, antihistamines, antibiotics, antifungals, fatty acids essential, psychotropic, antiseborrheic, a balanced diet, hygiene of the animal but also of the area where it lives.

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