





Underneath the

FUR

Scratching the Surface of Canine Allergies

Colleen M. Brown, DVM

INTRODUCTION

Veterinary medicine is celebrating its 250th anniversary this year, and global leaders have declared 2011 World Veterinary Year. This is an exciting time for the profession, as it will allow for the celebration of the history, advancement, and progression of the art and science of veterinary medicine. It is also an excellent opportunity to bring to light some important issues, educate pet owners on various topics involving pet care, and help strengthen the human-animal bond.

The human-animal bond is an important and strong relationship that benefits both its two-legged and four-legged counterparts. According to the American Veterinary Medical Association (AVMA):

[T]he human-animal bond is a mutually beneficial and dynamic relationship between people and animals that is influenced by behaviors that are essential to the health and well-being of both. This includes, but is not

limited to, emotional, psychological, and physical interactions of people, animals and their environment. The veterinarians' role in the human-animal bond is to maximize the potential of this relationship between people and animals.

Sometimes certain behavioral issues or medical ailments can weaken this bond. In severe cases, pets may not receive proper care, suffer from abandonment, or end up relinquished to local shelters, where they await an uncertain fate.

This article will focus on one of the more challenging aspects dog owners face in veterinary medicine today: canine allergies, a form of canine skin disease. The reason canine allergies can be challenging to both pet owners and veterinarians is due to the fact that an easy diagnosis and cure do not exist. Identifying and treating the secondary infections, addressing the underlying cause, or, more specifically, identifying the allergy versus other causes of skin disease are the key. Lifelong management is the only real treatment.

CANINE SKIN DISEASE

Dermatology, the study of the skin, is a separate field in veterinary medicine just as it is on the human side. Skin-related issues account for one of the most common reasons pet owners visit their local animal hospital or clinic. It may

Above: Dogs absorb allergens through their skin.

Left: Dogs can be allergic to different types of food, mold, dust, and pollen—just like their owners.

COMMON SYMPTOMS OF ALLERGIES

EARS:

Appearance: waxy discharge; redness, odor
Behavior: scratching or rubbing ears with paws or against furniture

SKIN:

Appearance: reddened; possibly with crusts or scales; odor with secondary infections
Behavior: scratching and licking sides/belly, elbows, groin

HAIRCOAT:

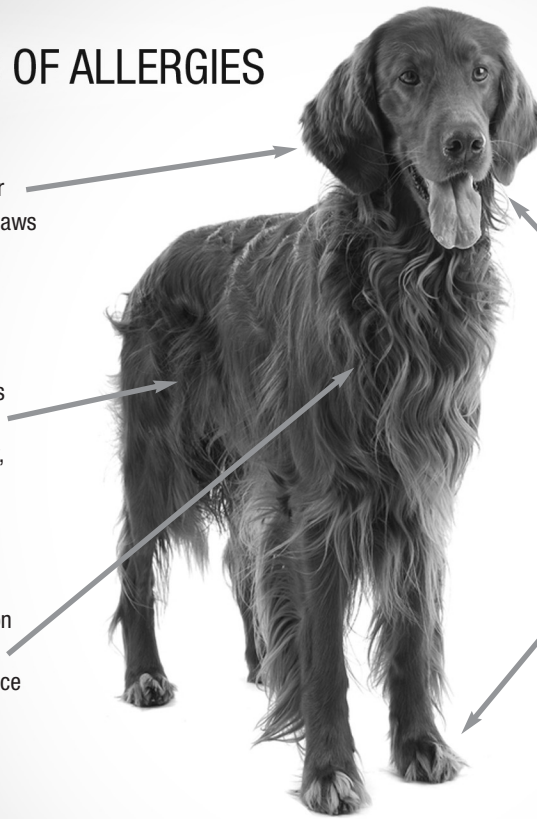
Appearance: bald spots; brown discoloration where licking has occurred
Behavior: scratching sides/belly; rubbing face against furniture or carpet, licking

FACE:

Appearance: muzzle, chin, and areas around the eyes reddened with hair loss
Behavior: scratching or rubbing face with paws or against furniture

FEET:

Appearance: inflammation, redness, odor; brown discoloration where licking has occurred
Behavior: licking and chewing of feet/pads



Skin-related issues are one of the most common reasons pets are taken to their veterinarian.

also even be a reason some pet owners change veterinarians. Several reasons for this exist; dermatitis, or inflammation of the skin, alopecia, or hair loss, despite the underlying causes, tend to mimic each other in appearance and pattern, along with other clinical signs. In order to make a diagnosis, secondary infections need to be identified and treated; underlying endocrine disorders need to be tested for and ruled out; parasite infestations, whether primary or secondary, need to be identified and treated; and other testing or treatment needs to be done in order to differentiate among allergy types. As a result, certain baseline testing is recommended; the same tests may need to be repeated to monitor treatment and response; and other diseases that also cause secondary dermatitis or alopecia may need to be tested for at some point.

Sometimes reaching an official diagnosis is difficult due to cost, communication, and compliance. If an owner's finances are a concern, reasoning behind testing is not explained, and lifelong management is not communicated, then issues such as the pet not receiving proper treatment or the owner becoming frustrated and changing veterinarians may occur. If testing isn't an option, no matter what the reason, response to empirical treatment may lead to a diagnosis of exclusion. Pet owner education by the veterinarian and communication between the pet owner and doctor, along with a team approach to reach compliance of

agreed upon recommendations, are essential to effectively manage canine skin disease and allergies. A pet owner may seek medical advice regarding their dog's skin disease and allergies from either a general veterinary practitioner or a board-certified veterinary dermatologist.

Canine skin disease in general may present as pruritis (itchiness); licking, biting, or chewing; or alopecia (fur loss), just to name a few symptoms. Skin issues in dogs result from a variety of causes but are commonly due to an underlying allergy or endocrine disorder. This article will not delve into endocrine disease, however, some examples of endocrinopathies that may manifest cutaneously include thyroid and adrenal disease.

Dogs that scratch excessively, lick their feet, have hair loss, or suffer from chronic ear infections are exhibiting characteristics of an underlying disease process. As a result of the underlying disorder, secondary infections can and usually occur. The excessive licking, chewing, biting, and scratching lead to the breakdown of the protective barrier of the skin. This allows for proliferation of normal flora (bacteria and other microorganisms) that naturally reside on the skin, causing infection due to overgrowth. Other infectious agents, such as different species of bacteria found in the mouth or other parts of the body, may be introduced from licking and thus take over the normal flora that is meant to protect the dog from such invaders.

Environmental exposure to pathogens that normally would not gain access to intact healthy skin and immune systems may occur as well.

THE INTEGUMENTARY SYSTEM

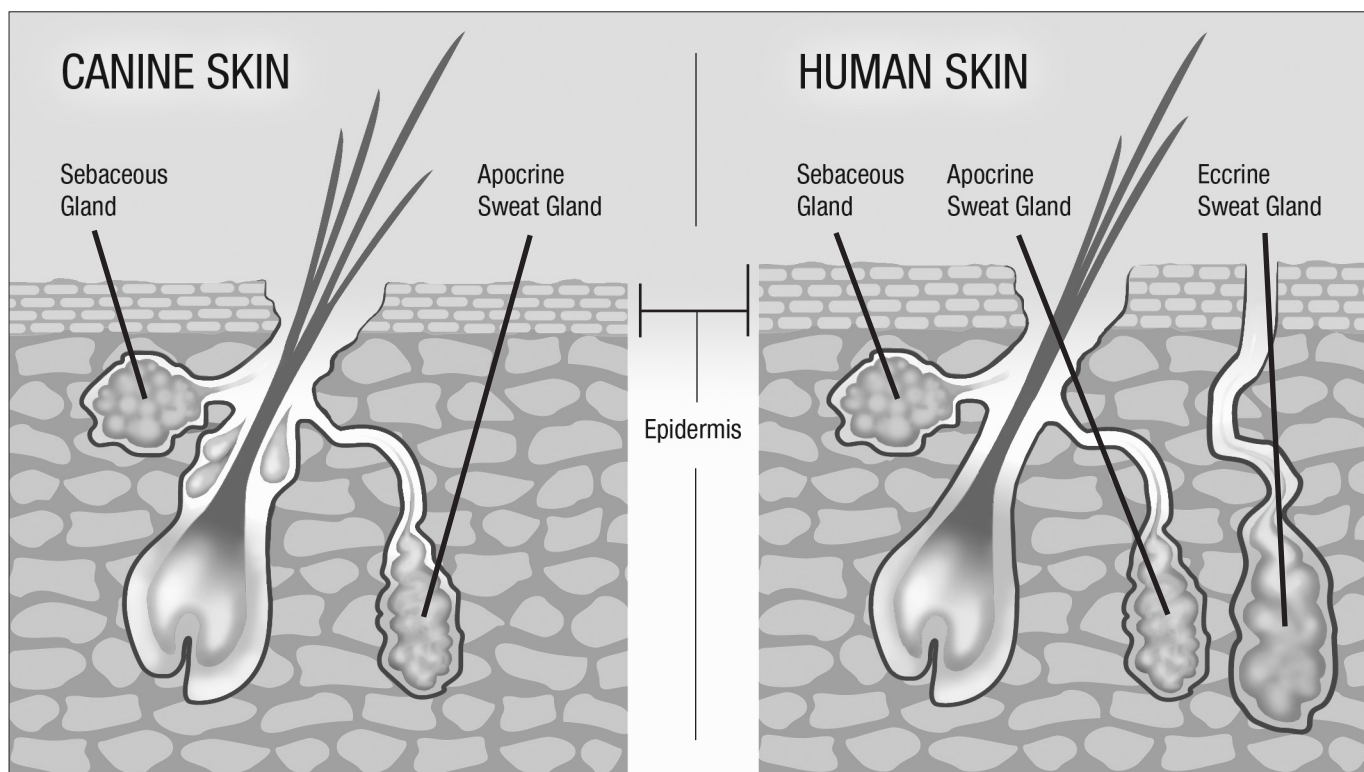
Skin and its accessory structures are collectively known as the integumentary system. Integument or skin is the largest organ of the body for both man and man's best friend and also one of the most important. The main function of skin is protection, although it serves other functions. Skin protects against fluid and electrolyte loss, infectious agents such as bacteria, ultraviolet (UV) light damage, and chemical or physical injury. With the help of natural sunlight, skin also plays an important role in the production of vitamin D. The integument also helps regulate body temperature, stores nutrients, and acts as an absorptive surface.

Underneath all the fur, the skin of dogs is really not all that different from the skin of people. Several similarities and a few differences exist on a cellular or histological level. Just like human skin, the skin of dogs is composed of an epidermis and dermis. It also contains adnexa, or accessory structures, such as glands and hair follicles. The epidermis, the outer covering of the skin made up of several layers, is able to slough off and replace itself. Dogs have a thinner epidermis than people and a slower turnover rate. The pH of skin for people versus dogs is different as well. Dog fur grows in cycles while human hair grows continuously. Dogs pant to cool their bodies, unlike people, who sweat by way of dermal sweat glands. Dogs, however, do have glands in their skin; some specifically produce pheromones.

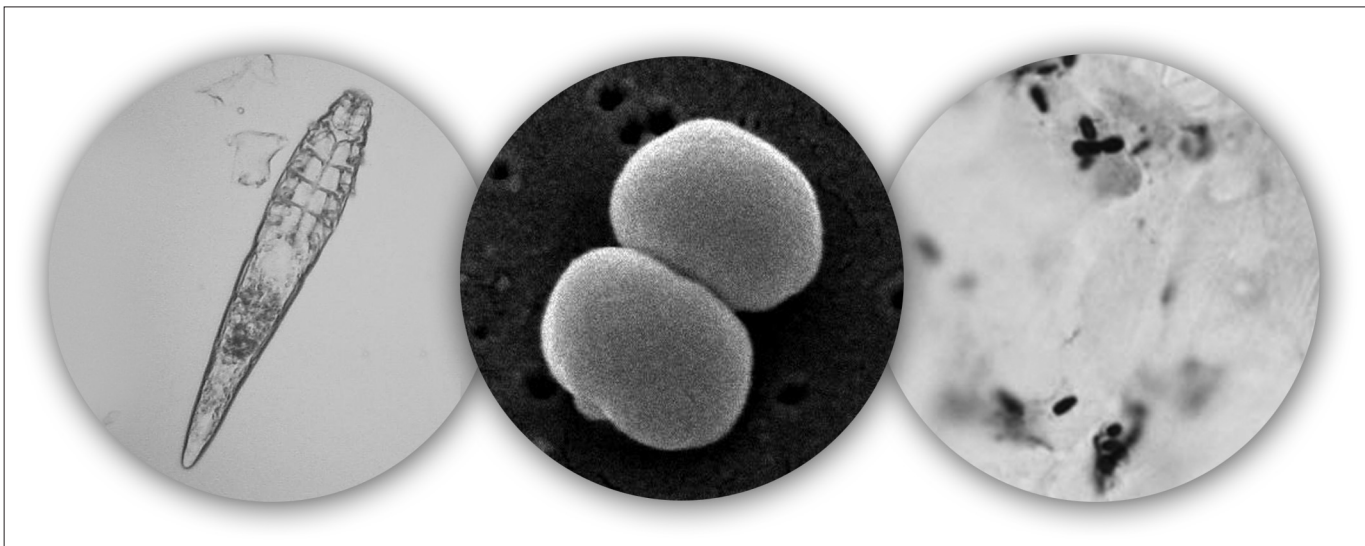
Pheromones are chemical messengers that signal other members of the same species. Pheromones are one way dogs are able to create a territorial marker via their scent.

Another similarity between canine and human skin is that normal flora lives on both. The purpose of normal flora is to help protect against the invasion of pathogenic organisms including other types of bacteria not normally found on the skin. Yet normal flora can become opportunistic and proliferate into a secondary infection if allowed. For example, if a dog becomes immunocompromised for any reason or destruction in the integrity of the skin occurs, then the normal flora seizes this as an opportunity to flourish. The excess proliferation of the organism is one way normal flora can transition into and become a source of a secondary infection. Normal flora on canine skin consists of bacteria, yeast, and mites.

The most common type of normal bacterial flora on canine skin is *Staphylococcus*. This type of bacteria lives on the skin of people as well. Pyoderma or bacterial dermatitis occurs when bacteria invade the skin. Papules and pustules, pimplelike lesions, are seen on the skin. Skin cytology is the method of identifying such organisms. With gentle pressure, a slide is pressed against the skin at the site of infection to obtain a sample. The slide is then stained and viewed under the microscope. Bacteria, white blood cells, and squamous or skin cells are usually seen. Bacterial skin infections are treated with either an oral antibiotic or a topical antibiotic depending on the severity of the infection. Medicated shampoos that contain an antimicrobial are usually recommended as well.



The skin of dogs is not that different from the skin of people.



Left to right: *Demodex canis*, *Staphylococcus*, and *Malassezia pachydermatis*

Malassezia pachydermatis, the most common type of yeast found on dogs, live on the skin as a type of normal fungal flora. Yeast dermatitis is diagnosed the same way as pyoderma, with a skin cytology or impression smear. When yeast grows excessively on the skin, over time, the skin becomes lichenified—thickened and elephantlike. Yeast infections are treated with an antifungal medication. Antifungal medicated shampoos may be recommended as well.

A particular species of mites, *Demodex canis*, also make up the normal flora on canine skin. This type of mite is passed from bitch to puppy. Overgrowth of this normal flora occurs at times when the immune system is weakened. It presents as patchy areas of hair loss and, if not identified and treated, can become diffuse and difficult to treat. This type of infection is normally not itchy unless a secondary bacterial infection exists as well. The infection is identified by what is called a skin scrape. A blade is dulled and gently scraped against the skin while the skin is simultaneously being pinched. These mites live in the hair follicle, so if one does not see a small amount of redness on the skin or blood, then the scrape is not deep enough to gather the mites in order to make a diagnosis. The scrapings are then put on a slide with a small amount of mineral oil and viewed under the microscope. Doctors are able to see both mites and eggs with this technique.

Demodex infection is also referred to as mange or Demodectic mange. However *D. canis* is not considered the contagious form of mange, which is due to the mite of the species *Scabies*. People are also susceptible to scabies infection, but if a person were to come into contact with a dog that has scabies, it will usually cause only a mild, self-limiting form of pruritus or itchiness. This mild infection is due to the fact that the species of mites that affect dogs and the species of mites that affect humans are different. Demodectic mange is treated with an antimiticidal dip or oral medication depending on the severity of infection.

Puppies with only mild infections may self resolve once their immune system matures.

HYPERSENSITIVITY REACTIONS

Both humans and man's best friend suffer from allergies and in fact may even share some of them. By definition, an allergy is a hypersensitivity reaction of the immune system in response to an allergen or antigen. Allergens and antigens are foreign substances that are able to elicit an immune response in the body. Hypersensitivity reactions are divided into four categories based on how the body responds, which is known as the immune response.

Type I and type IV reactions are the most common for the types of allergies that will be discussed in this article. The main differences between the two are that type I reactions elicit an antibody response while type IV reactions elicit a lymphocytic, or white blood cell, response. The diagram on page 16 briefly explains all four types of reactions. Examples of allergens and antigens include pollen, mold, dust, external parasites, and even specific carbohydrate and protein sources in some foods. One main difference between people and dogs is the method of introduction of an allergen: humans inhale allergens such as pollen, dust, or mold while dogs absorb them through their skin.

COMMON CANINE ALLERGIES

Two main types of allergies that affect dogs will be the focus of this article: environmental and food. Contact allergies can occur as well but are less frequent. In certain parts of the country, flea allergy dermatitis is a serious problem as well.

Environmental Allergies

Environmental allergies, also known as atopic dermatitis or atopy, are the canine version of human hay fever and can include dust mites, pollen, grass, mold, insects, dander,

weeds, etc. This type of hypersensitivity reaction usually occurs in dogs in the age range of 1 to 3 years. As with many diseases, atopy may manifest at a later time and/or in combination with other allergies such as food. Environmental allergies usually are seasonal, meaning they flare up or worsen at certain times of the year, just as in people. Several breed predispositions exist, including Labradors and golden retrievers.

As with people, intradermal skin testing, or allergy skin testing, is the most accurate way to diagnosis this type of allergy in dogs and is usually done by a board-certified veterinary dermatologist. The test is accomplished by shaving fur on one side of a dog's abdomen and injecting 70-plus different allergens into the skin. The reaction is then

compared to a control injection in order to determine the degree of reaction or allergy. This information can then be used to create a serum for immunotherapy. Immunotherapy is basically a way of slowly building tolerance and tricking the immune system by repeatedly injecting the exact allergens it has been reacting to. Other treatments of atopy include antihistamines, omega-3 fatty acid fish oil, regular bathing, steroids, and other immunosuppressive drugs similar to steroids but with less side effects.

Food Allergies


Food allergies on the other hand can occur any time during a dog's life. This type of allergy is not due to a specific brand of commercial dog food but to a certain

PEARLS OF WISDOM

- Constant licking of the feet by one's dog doesn't mean he or she is bored but is a strong indication that he or she is itchy and is most likely suffering from an underlying allergy.
- Since dogs absorb allergens through their skin, one step pet owners can take is either daily wiping down their pet with a baby wipe to reduce the allergen load or using cool water rinses to decrease absorption. Remember to dry your dog well, as the dampness may act as a predisposing factor for secondary infection.
- Omega-3 fatty acid fish oil is a natural nonsteroidal antiinflammatory/antioxidant that is recommended for dogs suffering from allergies. Please ask your local veterinarian for a recommended product, and note that these products, categorized as nutraceuticals, are not Food and Drug Administration (FDA)-regulated. Therefore, it is best to use a recommended canine product.
- Always use a canine shampoo, as the pH of canine skin is different from human skin. Human shampoo can further dry out a dog's skin and coat. Ask your local veterinarian for a proper medicated shampoo or a recommended mild oatmeal based canine shampoo.
- Ears are essentially an extension of the skin. Therefore, if your canine family member suffers from chronic ear infections, it is most likely that the chronicity of infections is due to an underlying cause such as a food or environmental allergy.
- Other diseases that should be discussed with your veterinarian which may manifest dermatologically include endocrine diseases such as hypothyroidism, adrenal disease such as Cushing's, immune mediated diseases, neoplasia or skin cancer, and in certain geographical areas such as California and Arizona, sometimes even valley fever (Coccidioidomycosis).



TYPE	IMMUNOLOGIC COMPONENT	ANTIGEN	DISORDER
Type I (Immediate)	Immunoglobulin E (IgE)	Allergens	Allergies/atopy/anaphylaxis
Type II (Antibody-mediated)	IgG and IgM	Cell antigens/receptors	Autoimmune: hemolytic anemia, transfusion reactions, drug reactions, immune-mediated skin disorders (pemphigus)
Type III (Immune complex-mediated)	IgG and IgM	Bacterial and viral antigens	Systemic lupus
Type IV (Cell-mediated)	T- lymphocyte	Bacterial and viral antigens; contact allergens	Contact allergies; chronic allergic disease



HYPERSENSITIVITY REACTIONS

carbohydrate or protein source in the food. The most common and effective way to rule out a food allergy is to do a 6- to 8-week food trial with a novel diet. Food trials are essentially a diagnostic test and should be treated as such. Giving one's dog treats or even flavored medications during a food trial can impair the results. Since dogs get fed daily, it is a relatively simple test to perform.

Choosing the proper elimination diet can be costly and challenging. Both prescription and over-the-counter diets exist. It is important to ask your veterinarian for a recommended diet. As with any trial, sometimes multiple diets need to be tested. A novel diet consists of a food with a carbohydrate or protein source that a dog has not been exposed to—that is, eaten—before.

Other elimination diets available are made of hydrolyzed protein. This is a special process in which the protein source is made so small that the body is unable to elicit an immune response. An important aspect to note is that some food antigens such as poultry can cross-react. This means if a dog is allergic to chicken, it is possible that the same dog may be allergic to duck as well. A food challenge may be performed

after the 6- to 8-week trial by slowly introducing one previously consumed carbohydrate or protein source at a time back into the dog's diet. This way, if the dog has some of its original symptoms return, it can be determined that one specific food source is indeed a culprit.

CONCLUSION

In the 1950s Patti Page performed a song entitled “How Much Is That Doggie in the Window?” Well, if that doggie happens to be an allergic dog, not only can it be very costly, it can also be one of the more challenging and frustrating conditions for both its owner and veterinarian alike. The important point to remember and the take-home message of this article is that there is no single cure or a quick fix for our canine companions who suffer from allergies. There is, however, lifelong management. If addressed properly with trust, understanding, and compliance on the part of the pet own and vet, both the loyal itchy dog and their dedicated human owner can once again enjoy the special bond that they share for years to come.

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Websites

American Veterinary Medical Association

www.avma.org

This site has sections on animal health and public health, as well as information and podcasts on current topics in the news.

Dermatology for Animals

www.dermatologyforanimals.com

The mission of this website is to serve pet owners and veterinarians of the Southwestern U.S. by improving the quality of pets’ lives through specialized knowledge and care in the field of dermatology.

VeterinaryPartner.com

www.veterinarypartner.com

VeterinaryPartner.com supports veterinarians and owners in the care of pets by providing reliable, up-to-date animal health information from the veterinarians and experts of the Veterinary Information Network (VIN), the world's first and largest online veterinary database and community.

World Veterinary Year

www.vet2011.org

This website celebrates the 250th anniversary of the world’s first veterinary school and includes sections on the history of veterinary medicine as well as special events marking this anniversary.



Colleen M. Brown earned a B.A. in biology from Arizona State University and her doctorate of veterinary medicine from Western University of Health Sciences. When she is not making house calls to four-footed patients in the Phoenix, Ariz., area, she is an adjunct professor of biology for Rio Salado College and Central Arizona College. Visit her website (www.brownvetservices.com) for pet tips and more information.