



# The epidemiology of atopic dermatitis

**D**iagnosis and management of canine atopic dermatitis can be frustrating for clients and veterinarians alike. A better understanding of the epidemiology of the disease can lessen this frustration. Large-scale population studies, however, have not been conducted to help define the prevalence of the disease and the Pets at greatest risk. Research has been undertaken to better understand the potential for genetic predisposition for atopy in dogs, although genetic inheritance remains unclear.<sup>1</sup>

Prevalence of canine atopic dermatitis in general clinical populations has been reported to range from 3 percent to 15 percent.<sup>2,3</sup> The highest disease prevalence, 30 percent, has been reported from a canine population referred to specialty dermatol-

ogy practice.<sup>3</sup> A number of breeds have been suspected to be genetically predisposed, including, but not limited to the Boxer, West Highland White Terrier, Labrador Retriever, Golden Retriever, German Shepherd, Cairn Terrier and Fox Terrier.<sup>1</sup> Because environmental influences have been hypothesized as contributing to the increased incidence for atopic disease in people, it is plausible that similar environmental exposures may also impact the canine population at risk for atopy.

In the Banfield population, what is the population prevalence of canine atopic dermatitis? What are the risk factors? Is there a seasonal pattern of occurrence? Has there been an increase in the prevalence of atopic dermatitis over time? In this article, we will shed light on the distribution and risk for atopic disease in the Banfield hospital population. In doing so, we generate evidence to



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## Evidence-Based Medicine Toolkit

**Odds ratio:** A measure of the degree of association (also known as a cross-product ratio or relative odds); for example, the odds of exposure among the cases compared with the odds of exposure among the controls. Both the odds ratio and the relative risk compare the relative likelihood of an event occurring between two distinct groups. Some study designs, however, prevent the calculation of the relative risk, and the odds ratio is used instead to estimate risk.

**Target population:** The population to which research results are to be applied and inferences are made.

**Reference population:** A standard reference for comparison in analysis and necessary for relative risk estimation from logistic regression models.



DataSavant's mission is to:

- Explore the health and well-being of Pet populations
- Evaluate new clinical treatments
- Monitor Pets as sentinels of zoonotic disease in family environments
- Transform Pet medical data into knowledge, *i.e.*, open new windows into Pet health care using the Banfield medical caseload and database.

help better identify our at-risk patients so that we can make a diagnosis, initiate therapy earlier and reduce Pet suffering. This information is also a powerful tool to communicate to our clients, strengthening our bond with the family.

### Methods of analysis

For our population analyses, we selected a series of canine in-patients (cases) seen in 2007 that were any age and had one or more of the following diagnoses entered for the first time in the Pet record:

- Atopy
- Dermatitis, allergic, contact
- Dermatitis, atopic
- Dermatitis, flea allergy
- Dermatitis, food allergy

We compared a subset of these cases (those diagnosed with “atopy” or “atopic dermatitis”) to a set of canine in-patients (controls) that also had been seen in 2007, without any record of the allergic dermatologic diagnoses above.

**We generate evidence to help better identify our at-risk patients so that we can make a diagnosis and initiate therapy earlier and reduce Pet suffering.**

We used a statistical software package called SAS<sup>4</sup> to generate descriptive statistics for mean age, frequency of clinical signs, month of diagnosis and prevalence by year. Chi-square analyses<sup>4</sup> were used to assess potential risk factors (gender/neuter status, breed, region, selected concurrent diagnoses) one variable at a time before using multivariate methods. Logistic regression<sup>4</sup> was employed to determine the risk factors important in predicting which dogs were

likely to be afflicted with atopic dermatitis. Logistic regression is a technique for assessing risk when the outcome is dichotomous (*i.e.*, yes or no). In this analysis, the outcome under consideration is atopic disease. The potential risk factors included in the model were age, breed, gender/neuter status, region and selected concurrent diagnoses. Logistic regression helps reduce the effects of confounding variables on the estimates of disease risk—each factor found to be significantly associated with the outcome can be interpreted as an independent predictor of disease risk for a population.

To quantify risk, we estimated the relative risk (RR) using the odds ratio (OR)<sup>5</sup> for the association between age, breed, gender/neuter status, region, selected concurrent diagnoses and atopic disease. A relative risk greater than 1 suggests a positive association between an outcome and a factor, whereas a relative risk less than 1 suggests an inverse relationship between a factor under study and a disease outcome. A relative risk equal to 1 reflects no association.

For our analysis, we established a cut-off for the P-value of  $\leq 0.05$  to determine statistical significance for our hypotheses. The P-value represents the probability that the association between the outcome (atopic dermatitis) and factor under consideration is at least as great as that generated by logistic regression, assuming the result happened by chance alone. Confidence intervals were estimated for each odds ratio (relative risk). The confidence interval represents the range in the risk estimate variability if the population were sampled numerous times.

### Results

There were 1,345,697 canine in-patients seen in U.S. Banfield hospitals during 2007.



**Table 1: Prevalence and Risk for Concurrent Diagnoses: Dogs with Atopy (Cases) and Without (Controls)—2007 Banfield Population**

Disease	Prevalence—cases	Prevalence—controls	Relative risk (odds ratio*)
Alopecia	36.6%	12.5%	3.6 (3.5, 5.7)
Otitis externa	31.5%	10.6%	3.0 (2.9,3.1)
Superficial pyoderma	4.9%	0.6%	3.4 (3.2, 3.6)
<i>Malassezia</i>	1.4%	0.1%	5.7 (4.6, 7.2)
Sarcoptic mange	0.7%	0.2%	2.8 (2.1, 3.8)
Dermatophytosis	0.6%	0.1%	2.7 (1.9, 3.8)
Food intolerance	0.4%	0.1%	3.8 (2.6, 5.5)
<i>Cheyletiella</i>	0.03%	0.01%	6.2 (1.4, 28.4)

\*Multivariate model

**Table 2: Breeds at Risk for Atopy—2007 Banfield Population**

Common breed	Relative risk (odds ratio*)	Confidence interval
West Highland White Terrier	3.3	2.7, 3.9
Bichon Frise	2.4	2.1, 2.7
Jack Russell Terrier	1.9	1.6, 2.19
English Bulldog	1.8	1.5, 2.1
Staffordshire Terrier	1.8	1.4, 2.4
Rat Terrier	1.7	1.4, 2.0
American Bulldog	1.7	1.3, 2.2
Havanese	1.7	1.0, 2.7
Lhasa Apso	1.6	1.4, 1.9
Cairn Terrier	1.6	1.2, 2.0
Shih Tzu	1.6	1.2, 1.4
Boston Terrier	1.5	1.3, 1.8
Maltese	1.4	1.4, 1.8
Pit Bull	1.3	1.2, 1.5
Pekingese	1.3	1.1, 1.6
Standard Schnauzer	1.3	1.1, 1.6
Miniature Schnauzer	1.3	1.1, 1.5
Boxer	1.2	1.1, 1.3
Yorkshire Terrier	1.2	1.1, 1.3
Shar Pei	1.2	1.0, 1.5

\*Multivariate model

Twenty percent of these dogs presented in 2007 with one or more dermatologic diseases as recorded in PetWare®. Allergic skin disease (allergic contact dermatitis; atopy; atopic dermatitis; flea allergy dermatitis;

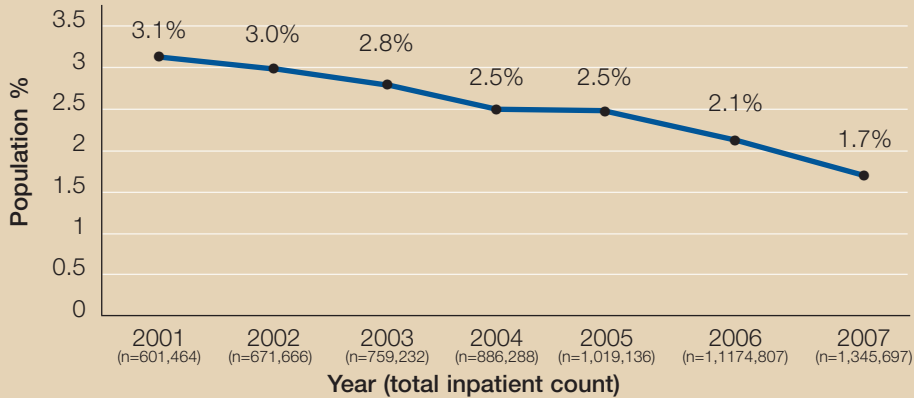
food allergy dermatitis) was diagnosed in 2.7 percent of the population. “Atopy” and “atopic dermatitis” alone were diagnosed in 22,280 dogs from this population, a prevalence of 1.7 percent.

In looking at the concurrent diagnoses that are common to atopic dogs, alopecia was diagnosed in 37 percent, while nearly 32 percent were concurrently diagnosed with otitis externa (*Table 1*). Clinical signs reported in atopic cases included erythema (45.3 percent); excoriations, crusts, scales (25.6 percent); shaking head or scratching ears (15.3 percent); and hyperpigmentation (13.7 percent).

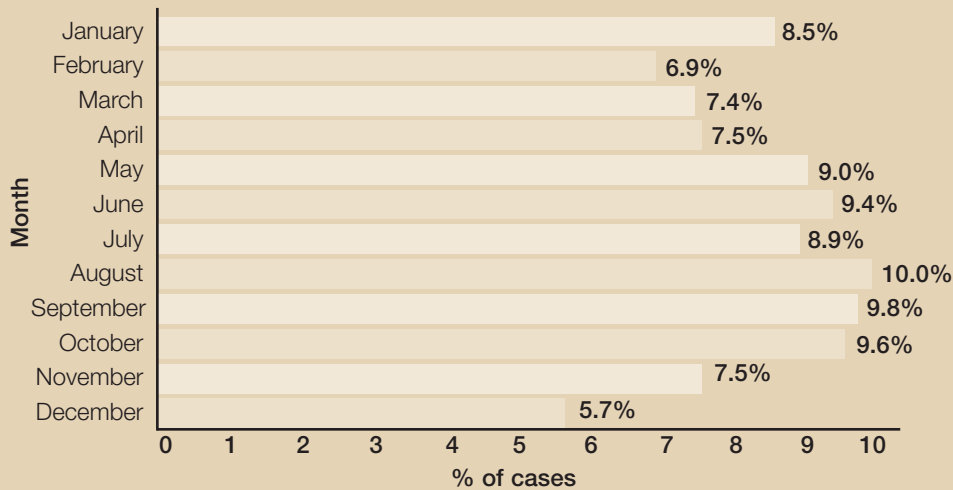
Our analysis revealed statistically significant predictors for atopy of age, gender, neuter status, breed, region and concurrent disease. The mean age of the case group was 4.5 years, while the mean age of the control population (n=72,275) was 3.6 years. Independent of age, neutered dogs had a nearly three-fold greater risk for atopic disease compared with intact canines (RR=3.2). Males were at a slight increase in risk for atopic disease (RR=1.2). Dogs residing in the south central United States were also at increased



**Figure 1: Prevalence of Atopy by Year: Banfield**



**Figure 2: 2007 Banfield Population Distribution of Atopic Diagnoses (First) by Month**



risk (RR=1.2) compared with the northeast United States, which was used as the reference population for region.

Table 2 (page 20) details the breed risk for being newly diagnosed with atopy or atopic dermatitis. The 10 breeds at highest risk are: West Highland White Terrier, Bichon Frise, Jack Russell Terrier, English Bulldog, Staffordshire Terrier, Rat Terrier, American Bulldog, Havanese, Lhasa Apso and Cairn Terrier.

Figure 1 details prevalence of the disease over time in our Banfield population; prevalence of atopic dermatitis has decreased over time from 3.1 percent in 2001 to 1.7 percent in 2007. Figure 2 profiles the monthly distribution of diagnoses made. There is slight variability in the time of year when dogs are likely to be diagnosed with relatively more diagnoses being made in the late spring through late fall.

## Discussion

About one in five dogs seen at Banfield hospitals in 2007 had one or more diagnoses recorded in PetWare from the dermatologic category. Overall prevalence of new cases of atopy and atopic dermatitis in dogs seen at Banfield in 2007 was 1.7 percent, about one in 50 dogs seen in the Banfield population. Based on our multivariate


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analysis, risk for new diagnoses of atopy and atopic dermatitis in primary care practice, our target population, increases slightly with age and is more likely to afflict spayed or neutered Pets. Risk for atopic disease can also be predicted by breed type with West Highland White Terrier, Bichon Frise, English Bulldog, Jack Russell Terrier, Staffordshire Terrier, American Bulldog, Lhasa Apso, Rat Terrier, Havanaes and Cairn Terrier breeds topping the list. Independent of age, breed or neuter status, these Pets are also more likely to be concurrently diagnosed with alopecia, otitis externa, superficial pyoderma or *Malassezia* dermatitis among other conditions.

Although Golden and Labrador Retrievers have been thought to be more likely to have atopic disease, our results don't support an increased risk for these breeds. They are both very popular breeds—consequently, by sheer proportion in our population, we may see more cases of atopic disease in these breeds than high risk breeds of lesser popularity. Although there is evidence that atopy is increasingly diagnosed in people,<sup>3</sup> Banfield reported a decreasing

prevalence in dogs over time. Perhaps allergic cases have been more definitively diagnosed over time in other categories that were historically diagnosed as atopy, for example, food allergy dermatitis.

With results from epidemiologic studies, veterinarians can provide informed diagnostic and treatment strategies for atopic disease. The same evidence can help build strong client relationships as well. For example, the prevalence and risk for concurrent diagnoses in patients with atopy, such as otitis externa, can help a veterinarian be alert to atopy as a potential underlying cause and help the client understand the need for certain diagnostic strategies.

Communicating a Pet's risk can build a foundation of trust and respect with clients as they are more informed about and involved in medical decisions concerning their Pet. 

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