

A case–control study of risk factors for canine atopic dermatitis among boxer, bullterrier and West Highland white terrier dogs in Sweden

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diets [95% confidence interval (CI) of the odds ratio: 1.2–3.8]. The population attributable fraction for not feeding home-made diets to the lactating bitch was estimated as 0.4 (95% CI: 0.04–0.63). Randomized controlled clinical trials are needed to further support the finding of a potential protective role of diet in CAD development.

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What is known about the topic of this paper

- The risk of canine atopic dermatitis may vary between breeds.
- Many similarities exist between human and canine atopic dermatitis.
- Risk factors for human atopy include living in urban parts of developed countries and low microbial exposure during childhood.

What this paper adds to the field of veterinary dermatology

- No difference in the risk of the disease was found between genders.
 - Feeding a home-made diet to the bitch during lactation was found to protect her offspring from subsequently developing canine atopic dermatitis in three high-risk breeds.
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Abstract

Environmental and dietary risk factors for the development of canine atopic dermatitis (CAD) in the high-risk breeds of boxer, bullterrier and West Highland white terrier were assessed in a case–control study. A logistic regression model was developed to evaluate their relative importance in 58 cases from 12 practices in Sweden and 61 unaffected controls, matched to cases by breed and year of birth. The final model included a random error term for ‘examining veterinarian’, as dogs from the same practice were not considered independent. No effect of gender, season of birth, environment, vaccination or de-worming practices on the odds of developing CAD was detected. The main finding was that feeding a diet including noncommercial products to the bitch during lactation had a protective effect on the development of CAD in her offspring; the odds of developing CAD were twice as high among offspring from bitches that were not exposed to home-made/noncommercial

Introduction

Canine atopic dermatitis (CAD), a pruritic skin disease most commonly associated with IgE antibodies to environmental allergens,¹ shares many features with human atopic dermatitis, such as a familial or hereditary predisposition, similar histopathology and pruritus as the predominant clinical sign.² A dramatic increase in the prevalence of human atopic dermatitis in industrialized countries over the past decades has been linked to environmental or lifestyle factors including early diet, infections, allergens, pollutants and tobacco smoke.^{3,4} The so-called ‘hygiene hypothesis’ postulates a relationship between increased occurrence of human atopic dermatitis and decreased environmental pathogen exposure, the general idea being that infections early in life will modulate the immune response towards a predominantly cell-mediated (T_H1) type and away from the humoral (T_H2) response associated with IgE production and allergic disease.⁵ Factors that could be related to a higher load of general microbial exposure such as attendance at day care, presence of pets and high numbers of older siblings were found to be protective against atopic disease in a review of this hypothesis.⁶

The current knowledge of the epidemiology of CAD is limited. Although breed predispositions are seen, the reported high-risk breeds vary among geographical regions, and results regarding sex predilections are conflicting.⁷ A previous study on risk factors for CAD among insured Swedish dogs showed that its occurrence varied greatly by breed, that there was no gender predilection, and that the incidence was highest in young dogs between 1 and 5 years of age, and among dogs living in cities.⁸ In a subsequent study of geographical risk factors, increased incidence was seen with increasing annual rainfall, increasing human population density and among dogs living in the same county as a veterinary dermatologist.⁹ CAD has a strong genetic component, and in a study of golden and Labrador retrievers the heritability of the disease was

estimated as 0.47.¹⁰ It thus seems reasonable to suppose that environmental factors in combination with genetic make-up are important for the development of the disease, as described for the human counterpart. If the hygiene hypothesis holds true for CAD, early parasite load, diet, housing and degree of contact with other animals might affect disease development as may infections and immunizations in the young dog.

Attempts to prevent atopic dermatitis can be classified as primary (preventing the development of disease) or secondary (focused on prevention of symptoms in affected individuals).⁴ Primary prevention is preferred, both from animal welfare and economic points of view. The aim of the current study was therefore to investigate the effect of selected environmental and dietary variables on the risk of canine atopic dermatitis for possible primary prevention. Case-control material consisting of clinical observations and questionnaire data from owners and breeders of dogs belonging to three high-risk breeds (boxer, bullterrier and West Highland white terrier – WHWT) in Sweden was utilized to fulfil the aim.

Materials and methods

Study population

Sample size was based on a reported 2.5 times greater risk of atopic dermatitis in female dogs compared to males.¹¹ With a gender distribution in the target population of 1 : 1, to be 80% sure (power = 0.8) of detecting such a 2.5 times increase in risk associated with being female at a 0.05 significance level, it was computed that 80 cases and 80 controls were needed.¹² For practical reasons, however, the sampling period was set to a maximum of 2 years starting in June 2003.

Case selection

Cases of CAD were recruited among three identified high-risk breeds in Sweden, bullterrier (only English), WHWT and boxer.⁸ Newly diagnosed (incident) cases from practice were collected prospectively by 12 experienced Swedish veterinarians with special interest in

dermatology. To increase the number of eligible subjects, previously diagnosed (prevalent) cases were identified and included following contact with the veterinarian that had examined the case. The inclusion criteria are shown in Table 1, and were a modification of Willemse's criteria.¹³ The clinical signs had to be present after exclusion of ectoparasite infestation and skin infections (bacterial pyoderma or *Malassezia* dermatitis) and the presence of potential cutaneous adverse food reactions by demonstration of a negative response to strict elimination diets (novel protein or hydrolysed) for 8 weeks. Previously diagnosed cases that were successfully managed on allergen-specific immunotherapy (i.e. minimum 50% improvement of clinical signs as judged by the attending veterinarian) were, however, exempted from the compulsory diet trial testing. In addition, all dogs included had to have at least one positive reaction at either intradermal testing (IDT) or to an allergen-specific IgE serology test (ALLERCEPT® Definite Antigen Panels, Heska AG; Fribourg, Switzerland). A positive IDT was defined by erythema in combination with a wheal > (diameter of negative + positive control/2) to a histamine concentration of 0.1 mg mL⁻¹.

Control selection

For each identified case, a population control of the same breed and year of birth was randomly selected (frequency matching) using the Swedish Kennel Club (SKC) registry, which includes dogs from the whole country. Controls were continuously selected following case identification throughout the study period, and to allow for possible nonresponders and exclusions, four were identified per case in the first instance; final selection was achieved following correspondence and telephone contact with the owner of each. These owners were encouraged to visit one of the 12 practices that gave rise to the cases, but if this was impractical a visit with a veterinarian chosen by the owner was arranged. Dogs were excluded from the control group if they had been diagnosed with CAD, had a history of recurrent pruritic skin disease, otitis externa and/or interdigital dermatitis, or showed clinical signs compatible with CAD at physical examination. For controls under 3 years upon inclusion, a follow-up call was made to the owner after the dog had turned 3 years old, to ensure that skin problems had not subsequently developed.

Potential risk factors for CAD

Information on breed, gender, date of birth, colour codes and pedigree for all included dogs was retrieved from the SKC's registry. Colour was re-classified as white or predominantly white vs. coloured or

Table 1. Inclusion and exclusion criteria in a case-control study of risk factors for canine atopic dermatitis among boxers, bullterriers and West Highland white terriers in Sweden (after Willemse, 1986)

Inclusion criteria	
Fulfilment of at least three of the following major criteria:	
• Facial pruritus • Paw pruritus • Pruritic otitis • Pruritic ventral dermatitis • Pruritic general dermatitis	• Interdigital erythema, bilateral • Onset before 3 years of age • Perioral, ophthalmic or otic erythema • Recurring dermatitis > 2 years
Fulfilment of at least three of the following minor criteria:	
• Family history of CAD • Relapse when humid • Urticaria • Rhinitis	• Acral lick granuloma • Hyperhidrosis • Lichenification of tarsal/carpal joints or groin/axillae
Exclusion criteria	
• Evidence of ectoparasites. Exclusion through positive combing, tape-test or skin scrapes; positive serological testing or diagnostic treatment for <i>Sarcoptes scabiei</i>. <i>Sarcoptes</i> mange diagnosed during the 2 months prior to intradermal testing or allergen-specific IgE serology. • Bacterial pyoderma or <i>Malassezia</i> dermatitis. Clinical and/or cytological exclusion. • Ongoing medication. Glucocorticoids, antihistamines, cyclosporine, pentoxifyllin or other nonsteroidal anti-inflammatory drugs (need to be more specific – do you mean Metacam or Rimadyl™ type products or Chinese herbal?) treatment within the 4 weeks prior to intradermal testing or progesterone 90 days pretest. • Cutaneous adverse food reactions as demonstrated by complete response to an 8-week elimination diet with hydrolysed or novel protein.	

CAD, canine atopic dermatitis.

predominantly coloured, based on the assigned SKC codes. The examining veterinarian provided information on the medical history of all cases and controls on standardized forms. The owners completed pretested questionnaires on environmental factors and diet and provided a signed consent form. Permission was asked to contact each dog's breeder for further information about the first 2 months of the puppy's life and if the owner agreed, they were interviewed by telephone about feeding, environment, vaccination and de-worming of the brood bitch and young puppies. The telephone interview was performed with both the breeder and the interviewer blinded to each subject's case status, and all interviews were performed by the same person.

Statistical analysis

Descriptive statistics

Unconditional associations between categorical variables and case status were tested using the Pearson chi-squared statistic. Continuous variables were tested against case status using the Wilcoxon rank-sum (Mann–Whitney) test. All variables were initially screened using a liberal cut-off for significance ($P < 0.25$), while the traditionally used $P < 0.05$ cut-off was applied for the subsequent model-building procedure.

Logistic regression model

Variables with a P -value of < 0.25 in the unconditional analysis were tested in a logistic regression model, after assessment of collinearity between the candidate variables. The presence of collinearity was checked through pairwise correlation of categorical variables, and if the correlation was ≥ 0.7 ($P < 0.05$), the variable with the weakest association to case status was omitted from further analysis. Mantel–Haenszel stratified calculation of odds ratios for the categorical variables was performed to assess the presence of confounding related to the matching variables breed and year of birth.¹⁴ A backward manual elimination process ($P < 0.05$), with re-entry of previously excluded variables, was applied to develop the most parsimonious regression model. Interaction between any variables that remained significant was tested in the model. A conditional logistic regression model was also developed, controlling for breed and birth cohort. Finally, a population averaged model with exchangeable correlation structure between individuals that originated from the same veterinarian was fitted to control for the effect of clinician. Veterinarians who only contributed an individual dog to the study were grouped together in this random effects model for technical reasons. Overall goodness-of-fit of the model was assessed based on Pearson chi-squared and Hosmer–Lemeshow tests, and the predictive ability on an receiver operating characteristic (ROC) curve.¹⁵ Model-based population attributable fraction (PAF) was calculated for factors that remained significant in the final model.¹⁶ Model-checking and PAF calculation were based on a model without the random term for veterinarian for technical reasons. The software package STATA version 9 was used for data handling and analysis (Stata Corporation; College Station, TX, USA.)

Results

Study population

After the preset study period of 2 years, a total of 58 cases and 61 controls had been recruited and included in the analysis. The 12 dermatologists each contributed between one and 22 cases, and a total of 40 different clinicians were involved in the examination of the selected controls ($n = 1$ to $n = 6$). From 27 of the 40 clinicians, only an individual dog (case or control) was included in the study.

Cases

Of the included cases, 54 (93.1%) had undergone strict elimination diets for a minimum of 8 weeks with negative results. Four had improved by more than 50% on allergen-

specific immunotherapy and were judged as most likely being atopic without involvement of adverse food reactions.

Controls

Overall, 212 potential control dogs were randomly selected from the SKC registry giving an inclusion frequency of 28.8%. Of the 151 dogs rejected, 41 (27.2%) were reported by the owner to suffer from pruritic skin problems; three of the 41 were reportedly diagnosed as atopic and six as having nonspecified allergic skin disease.

Descriptive statistics

The breed, sex and season of birth of the included cases and controls are shown in Table 2. No statistically significant differences in any of these parameters were found between the case and control populations. The year of birth ranged from 1994 to 2004, mean and median 1999 for both the cases and the controls. There were four sets of full siblings: two boxer sets (case/case, control/control), a WHWT set (control/control) and an English bullterrier set (case/control). One of the female boxer cases had a healthy control daughter. These familial relationships were ignored in the logistic regression model. All 52 WHWTs were white by definition. Two white boxers were included, both were cases. Out of the 13 bullterriers in the study population, six were white (or predominantly white), five of them being cases, giving an odds of cases being white 12 times that of a control (95% CI: 0.6–706, $P = 0.05$).

The results of the categorical questions in the owner questionnaire are shown in Table 3. Owners were also asked which year their house was built (range 1649–2001 for controls and 1650–1994 for cases, $P = 0.08$), and the answer was re-classified as houses being built before or after 1970 (Table 3). Two other variables were considered significant at a $P < 0.25$ level: 'What kind of building does the dog live in (apartment/house)?' and 'Are there other animals in the household?'. The variables 'What kind of area does the dog live in (city/town/countryside)?' and 'Is the dog mostly inside during the day?' were both significant at the $P < 0.05$ level.

Overall, 78 breeders were interviewed about the early life of 102 of the included dogs, 47 cases and 55 controls. The breeder response rate did not differ based on case status. The range of dogs originating from each of the responding breeders ranged from one to five (median

Table 2. The distribution of breeds, sex and season of birth for the included individuals in a case–control study on risk factors for canine atopic dermatitis

Variable	Value	Cases	Controls
Breed	West Highland white terrier	22	30
	Boxer	29	25
	Bullterrier	7	6
Gender	Male	23	28
	Female	30	28
	Neutered male	3	2
	Neutered female	2	3
Season	Winter (January–March)	13	11
	Spring (April–June)	15	13
	Summer (July–September)	15	15
	Fall (October–December)	15	22
Total		58	61

Question (number of replies)	Cases		Controls	
What kind of area does the dog live in? (<i>n</i> = 117)**				
City (human population > 200 000)	16		4	
Town	21		31	
Countryside	20		25	
Where does the dog sleep at night? (<i>n</i> = 117)				
Separate room	11		7	
Bedroom, with people	18		28	
In bed with people	23		22	
Other	4		4	
What kind of building does the dog live in? (118)*				
Apartment	18		12	
House	39		49	
How is the building heated? (<i>n</i> = 116)				
Firewood	11		13	
Oil	8		9	
Electric	21		21	
Other	17		16	
Was the house built after 1970? (<i>n</i> = 116)*	Yes	No	Yes	No
	18	38	27	33
Have you ever de-wormed your dog? (<i>n</i> = 119)	49	9	52	9
Are there other animals in the household? (<i>n</i> = 118)*	23	35	32	28
Is the dog mostly inside during the day? (<i>n</i> = 118)**	57	0	57	4
Was the dog imported to Sweden from abroad? (<i>n</i> = 119)	2	56	1	60

*chi-squared test significant at $P < 0.25$ level, **chi-squared test significant at $P < 0.05$ level.

Table 3. Results from the owner questionnaire in a case-control study regarding risk factors for canine atopic dermatitis among boxers, bullterriers and West Highland white terrier dogs in Sweden. Only one response was allowed per question

Question	Cases (<i>n</i> = 47)		Controls (<i>n</i> = 55)	
	Yes	No	Yes	No
What did the bitch eat during pregnancy?				
Dry food*	41	6	52	3
Canned food	4	43	3	52
Household leftovers*	8	39	3	52
Home-made diet*	17	30	28	27
What did the bitch eat during lactation?				
Dry food	43	4	52	3
Canned food	3	44	2	53
Household leftovers	4	43	3	52
Home-made diet**	16	31	30	25
What was the puppies' first nonliquid diet?				
Dry food	7	40	10	45
Canned food	3	44	4	50
Home-made diet	41	6	48	7
What did the puppy eat up until 2 months of age?				
Dry food	44	3	50	5
Canned food	2	45	1	54
Household leftovers	2	45	3	52
Home-made diet	33	14	40	15
Was the puppy raised in a kennel?*	1	46	5	50
Was the puppy raised with other dogs, in addition to siblings/bitch?*	25	21	37	17
Was the puppy raised with other animals than dogs?	3	43	7	47
Was the puppy vaccinated prior to leaving the breeder?	43	4	53	2
Was the puppy de-wormed prior to leaving the breeder?	45	2	53	2

*chi-squared test significant at $P < 0.25$ level, **chi-squared test significant at $P < 0.05$ level.

Table 4. Results from the breeder questionnaire (*n* = 102) in a case-control study regarding risk factors for canine atopic dermatitis among boxer, bullterrier and West Highland white terrier dogs in Sweden. More than one response was allowed per question

two). The results of the categorical variables from the breeder questionnaire are shown in Table 4. Only one variable was significantly associated with case status at the $P < 0.05$ level: 'feeding home-made diet to the bitch during lactation'. Five additional variables were considered significant at the liberal $P < 0.25$ level and also went on to be tested in the regression model: 'feeding dry food to the bitch during pregnancy', 'feeding household leftovers to the bitch during pregnancy', 'feeding home-made diet to the bitch during pregnancy', 'raising the puppy in a

kennel' and 'raising the puppy with other dogs, in addition to siblings/bitch'. Breeders were also asked how many weeks prior to whelping the bitch was vaccinated (range 4–50 weeks) and de-wormed (range 0–52), and how many weeks old the puppies were at first vaccination (range 7–12). No significant differences were found between cases and controls regarding these three variables. Finally, no significant difference was observed between cases and controls regarding the number of times a puppy was de-wormed prior to leaving the breeder (range 0–4).

Logistic regression model

For the logistic regression model, only animals from which information was available from both the owner and the breeder questionnaire were included ($n = 101$, 47 cases/54 controls). As mentioned above, 10 of the variables were unconditionally associated with being a CAD case in the initial screening ($P < 0.25$) and each of these were tested in the model, except 'feeding a noncommercial/home-made diet to bitch during pregnancy', which was excluded due to significant collinearity with 'feeding a non-commercial/home-made diet to bitch during lactation'. The final random effects model (controlling for examining veterinarian) included only one significant factor; 'feeding a home-made diet to the bitch during lactation' ($P = 0.02$). The odds of a case coming from a dam not exposed to a noncommercial/home-made diet were twice that of a control (95% CI of the odds ratio: 1.2–3.8). Model-based PAF for not feeding the bitch home-made/noncommercial diet during lactation was 0.40 (95% CI: 0.04–0.63). Neither of the goodness-of-fit tests revealed major shortcomings of the model, and the area under the ROC curve was 0.69, which was judged as an acceptable predictive ability. Furthermore, the Mantel–Haenszel test did not provide evidence of a difference in crude odds across the strata of breeds and year of birth, and the conditional model yielded similar results to the presented unconditional version.

Discussion

Potential risk factors for CAD

Investigation of the effects of the selected environmental and dietary variables on the risk of CAD for possible primary prevention failed to reveal any significant impact of sex, season of birth, environment (housing, geography, animal contacts) and vaccination or de-worming practices on the propensity to CAD. The main finding from the collated data was a protective effect of feeding a home-made diet to the lactating bitch on the subsequent development of CAD in her offspring. The protective effect of home-made diets during pregnancy was not tested in the model for technical reasons, but the results shown in Table 4 indicate that this could also be of importance.

The lack of a significant effect of gender on risk of CAD lends further support to a previous study of over 200 000 insured Swedish dogs, from which the same conclusion was drawn.⁸ According to the published literature, there is conflicting evidence regarding sex predilections for CAD,⁷ but it should be noted that the Swedish canine population is mainly intact, and conclusions about gender effects need to be interpreted with this in mind.

No effect of season of birth was detected in the present case–control study. In the above mentioned study of CAD incidence among insured dogs in Sweden, those born in autumn were at significantly higher risk of having an insurance claim for the disease than all other dogs.⁸ Further research is needed to elucidate this issue.

Although two previous studies of the epidemiology of CAD among insured Swedish dogs have showed the risk of the disease to be higher in major cities or densely populated areas, compared to the rest of the country^{8,9} such a relationship was not confirmed in the current study. This discrepancy might be due to the fact that most of the

veterinary dermatologists in Sweden practise in, or close to, the cities. Moreover, the sample size in the current study was limited and the power to detect a geographical relationship (as well as other environmental effects) could be lacking. Studies on human atopic dermatitis have revealed rural residence as a protective factor for the disease and a similar relationship for dogs cannot be eliminated.^{17,18}

For the included bullterriers, a significantly higher proportion of cases than controls were white, and the odds of a case being white were 12 times that of a control. For the remaining breeds, very little variation existed regarding the colour of the dog's hair coat. All the WHWT were white and very few of the boxers, hence this risk factor could not be included in the logistic regression analysis and no firm conclusions are drawn.

Several dietary factors were included in the analysis, but only the diet of the lactating bitch was significantly associated with case status in the logistic regression model. The odds of a case coming from a bitch that was not exposed to home-made diets were twice that of a control. It should be noted that the variables were coded such that a home-made diet could be fed in combination with the other diets (dry food/canned food/household leftovers). The risk factor is therefore the presence of home-made/noncommercial diet, and not the absence of other varieties of food. The aim of the study was to identify the risk factors for the development of CAD, and because the diet of the lactating bitch precedes the development of the disease, a causal mechanism might be involved that could potentially have applications for primary prevention of CAD. The model-based PAF of 0.4 indicates that if the lack of home-made diets actually causes the disease, then 40% of the CAD cases in the study could be attributed to some breeders not exposing their bitches to home-made diets during lactation.

The indication of home-made diets as protective against development of CAD can be seen as supportive of the hygiene hypothesis. Detailed information about the ingredients in the home-made diets fed to lactating bitches will be presented elsewhere and was not included in the current analysis. However, it might be speculated that such diets will contain microorganisms to a higher degree than dry, commercial dog foods that are basically sterile (until the bag has been opened). Microbial infections early in life have been suggested as a protective factor for the development of atopic disease, as postulated by the hygiene hypothesis. However, this hypothesis has recently been challenged and studies in humans have demonstrated that nonpathogenic bacteria such as *Lactobacillus* (or other 'probiotics') can modulate the immune response in a similar way and hence protect against atopic disease.¹⁹ A recent experimental study where dam and puppies were fed probiotics also suggests a protective effect on development of atopy in dogs, which further strengthens the present finding.²⁰

Randomized controlled clinical trials are needed to determine if the dam's diet can effectively be used for primary prevention of CAD in her offspring. Furthermore, it should be emphasized that the specific dietary requirements of the pregnant and lactating bitch will have to be taken into account if considering a change from purely commercial to more home-made diets for this group of individuals.

For a complex disease such as CAD, a single risk factor is unlikely to fully explain the variations in occurrence. Genetic factors as well as the environment will probably affect disease development in a given individual.²¹ Blood samples from a subset of the included boxers and WHWTs were analysed using a candidate gene known to be associated with increased risk of human atopy, but no association was found.²² Further investigations are needed to increase the knowledge about the gene–environment interactions.

Methodological considerations

Potential limitations of the reported case–control study need to be acknowledged. First of all, due to time constraints only around 60 cases and controls instead of the originally intended 80 of each were included. Due to the reduced sample size, power to detect relationships between risk factors and outcome is limited. The power for the factor ‘Feeding home-made diets to the bitch during lactation’ was estimated to be around 0.55 in the collected material (calculation not shown). This might explain the conflicting results with previous studies on risk factors for CAD among Swedish dogs, where both geography and season of birth affected the incidence.^{8,9}

The included cases were obtained from 12 different veterinary practices, whereas the controls were selected from the SKC registry. It is generally recommended that cases and controls are recruited from the same study base, but the current design was selected for practical reasons. Misclassification bias due to the high number of clinicians was controlled through strict and clearly defined inclusion and exclusion criteria. Both new/incident and existing/prevalent cases were included in the case series, even though the general recommendation is to include incident cases only.²³ This was justified by the fact that the major risk factors for the development of CAD were thought to occur very early in life, and hence were measured through breeder questionnaires on factors that temporally preceded the diagnosis in both prevalent and incident cases.

Matched case–control studies are commonly analysed using a conditional logistic regression approach to control for the matching variables.²⁴ In the current study, frequency matching on birth cohort and breed was performed. Additionally, controls were selected at the same time as cases and this can be seen as matching on ‘time at risk’. A stratified calculation of odds ratios revealed no difference between the strata created by the matching variables, and conditional logistic regression was performed with similar results as the unconditional model reported. Matching is done to control for potential confounders, and since no evidence of a confounding effect was present in the current material the simpler unconditional model was preferred. The necessity of the matching in this case can be questioned. The main reason for matching on breed was for practical purposes and related to the access to the SKC registry, and it can therefore be viewed as a restricted sampling strategy instead of matching per se.

Finally, it should be kept in mind that the results are obtained from three breeds in Sweden and might not be relevant to other populations. Despite the abovementioned limitations, the present study provides valuable new infor-

mation regarding the epidemiology of CAD and indicates dietary effects as an area for future focused research efforts. The strength of evidence provided by case–control studies is weaker than that from randomized controlled clinical trials (and also cohort studies). However, such explanatory observational studies can be used to ‘prove’ causal associations as opposed to the purely descriptive case series that are often published in the veterinary literature. The fact that the presented material was collected prospectively with uniform criteria for inclusion/exclusion provides further strength to the study.

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Résumé Dans cette étude, les facteurs environnementaux et alimentaires responsables de l'apparition d'une dermatite atopique (CAD) ont été évalués dans des races à haut risque, Boxer, Bullterrier et West Highland white terrier. Un modèle de régression logistique a été développé pour évaluer leur importance relative dans 58 cas de 12 cliniques en Suède et 61 cas contrôles, corrélés en terme de race et de date de naissance. Le modèle final incluait un terme d'erreur pour le vétérinaire examinateur, car les chiens de la même clinique n'étaient pas considérés indépendants. Aucun effet du sexe, de la saison de naissance, de l'environnement, de la vaccination ou de la vermifugation sur le développement d'une CAD n'a été noté. La découverte principale était que l'alimentation de la chienne avec des aliments non commerciaux pendant la lactation avait un effet protecteur sur l'apparition de CAD chez les chiots. Le risque de développer une CAD était deux fois plus important chez les chiots des chiennes n'ayant pas été nourries avec un aliment ménager (intervalle de confiance de 95% pour un odds ratio:1.2–3.8). des études randomisées sont nécessaires pour mieux évaluer le potentiel rôle protecteur de l'alimentation pour l'apparition de CAD.

Resumen Se evaluaron en un estudio de casos-control los factores de riesgo ambientales y dietéticos para el desarrollo de dermatitis atópica canina (DAC) en las razas de alto riesgo Boxer, Bullterrier y West Highland White Terrier. Se utilizó un modelo de regresión logística para evaluar su importancia relativa en 58 casos de doce clínicas en Suecia y 61 animales control no afectados, equiparables a los casos en raza y año de nacimiento. El modelo final incluyó un término de error aleatorio para el 'examinador veterinario', ya que los perros de una misma clínica no se consideraron independientes. No se observó ningún efecto del género, estación del año al nacimiento, ambiente, vacunas or prácticas de desparasitación en la probabilidad de desarrollar DAC. El principal hallazgo fue que alimentar a la hembra durante la lactación con productos no comerciales tenía un efecto protector en el desarrollo de DAC en sus crías; la probabilidad de desarrollar DAC fue dos veces más alta entre crías de hembras que no se alimentaron con dietas caseras no comerciales (95% de intervalo de confianza de los cocientes de probabilidad: 1.2–3.8). La fracción de población atribuible por no usar dietas caseras en las hembras lactantes se estimó en 0.4 (95% IC: 0.04–0.63). Estudios clínicos controlados y al azar son necesarios para demostrar el potencial efecto protector de la dieta en el desarrollo de DAC.

Zusammenfassung Umwelt- und fütterungsbedingte Risikofaktoren für die Entwicklung der caninen atopischen Dermatitis (CAD) wurden bei den Rassen mit hohem Risiko wie Boxer, Bullterrier und West Highland White Terrier in einer kontrollierten Fallstudie bewertet. Ein logistisches Regressionsmodell wurde entwickelt, um ihre relative Wichtigkeit bei 58 Fällen aus 12 Praxen in Schweden und 61 gesunden Kontrolltieren, die bezüglich Rasse und Geburtsjahr an die Fälle abgestimmt waren, zu evaluieren. Das Endmodell beinhaltete den Zufallsfehler-Term 'Untersuchender Tierarzt', da die Hunde von derselben Praxis nicht als unabhängig betrachtet wurden. Es wurde kein Einfluss von Geschlecht, Jahreszeit der Geburt, Umwelt, Vakzinierungs- oder Entwurmungspraktiken auf die Wahrscheinlichkeit CAD zu entwickeln, festgestellt. Das wichtigste Ergebnis war die Tatsache, dass die Fütterung der Hündin mit einer Diät ohne kommerzielle Produkte während der Laktation, einen schützenden Einfluss auf die Entwicklung von CAD bei ihren Jungen hatte; die Wahrscheinlichkeit CAD zu entwickeln war bei den Jungen von Hündinnen, die keine hausgemachten/nicht-kommerziellen Diäten erhielten zweimal so hoch (95% Konfidenzintervall mit der Odds Ratio: 1.2–3.8). Die attributable Fraktion der Population (Populations-attributabler Anteil) der laktierenden Hündin keine hausgemachten Diäten zu füttern, wurde mit 0.4 geschätzt (95% KI: 0.04–0.63). Randomisierte kontrollierte klinische Studien sind notwendig, um das Ergebnis einer möglichen schützenden Rolle der Diät auf die Entwicklung von CAD weiter abzusichern.