

Respiratory allergies among veterinarians: two cross-sectional surveys from 2006 to 2012

M. Schelkle¹ · J. Braun² · R. Jörres¹ · R. Schierl¹ · Holger Dressel³

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Abstract

Purpose Animal-related allergy is known to be an occupational hazard among veterinarians; however, there is a lack of data showing to which extent these are affected. We aimed at describing the prevalence of respiratory allergies in this population.

Methods In two repeated cross-sectional surveys in 2006 and 2012 in Bavaria, we examined the prevalence of wheezing, asthma and allergic rhinitis by questionnaires. We additionally performed multiple regression analysis to identify associated factors.

Results Overall participation rate was above 60%, leading to sample sizes of 512 in 2006 and 596 in 2012, respectively. Prevalences of allergic symptoms ranged from 5.1 to 5.6% for asthma, 17.0 to 20.2% for rhinitis, and 11.4 to 14.3% for wheezing, as well as 7.2 to 11.3% for wheezing without having a cold. The percentage of women in this occupation grew between the first and second survey. There were gender differences in both surveys concerning age and

practice type ($p < 0.0001$). Women had a lower mean age (42.1 vs. 53.0 years in 2012) and worked much more often exclusively with small animals (50.2 vs. 15.9% in 2012). There was a borderline significantly higher prevalence for allergic rhinitis in women than in men in 2012 (20.1 vs. 13.7, $p = 0.052$). Having allergic rhinitis was clearly associated with wheezing, wheezing without cold and asthma.

Conclusions In a repeated cross-sectional survey at an interval of 6 years among veterinarians, we found a relatively stable overall prevalence of wheeze, wheeze without having a cold, asthma and allergic rhinitis.

Keywords Occupational allergies · Veterinarians · Allergic rhinitis · Asthma

Introduction

Occupational contact to animals is known to be associated with a higher risk for the development of allergic symptoms (Cockcroft et al. 1981). This has been well described for laboratory animal workers (Bush 2001). In contrast, for the group of veterinarians, data concerning the prevalence of respiratory allergies are scarce (Andersen et al. 2004; Elbers et al. 1996; Langley 1995; Susitaival et al. 2003; Tauscher and Belsito 2002; Tielen et al. 1996). Furthermore, no longitudinal data exist. To investigate the prevalence of respiratory allergies and to identify associated factors, we conducted two questionnaire-based cross-sectional surveys at an interval of 6 years.

Methods

The study was conducted among all practising veterinarians residing in the Bavarian regions of Niederbayern and

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✉ Holger Dressel
holger.dressel@usz.ch

¹ WHO Collaborating Centre for Occupational Health, Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine, University Hospital Munich, Munich, Germany

² Epidemiology, Biostatistics and Prevention Institute (EBPI), University of Zurich, Zurich, Switzerland

³ Division of Occupational and Environmental Medicine, Epidemiology, Biostatistics and Prevention Institute, University of Zurich, University Hospital Zurich, Hirschengraben 84, 8001 Zurich, Switzerland

Schwaben. The addresses were provided by courtesy of the Bavarian association of veterinarians.

The survey was conducted between May and July 2006 and a second time in December and January 2012/13. Data were collected at both time points using a questionnaire, which was sent out to the veterinarians accompanied by a postal free return envelope. The data were entered in a database using the statistical software SPSS, version 20 (SPSS Incorporated, Chicago, IL). After entering all the data, the sample was again checked for plausibility and the consistency with the original data. There were no differences between the questionnaires and the data set in a sample of 50 cases.

Questions concerning asthma and allergic rhinitis were taken from the German version of the European Community Respiratory Health Survey (ECRHS) (Burney et al. 1994; Nowak et al. 1996) and the International Study of Asthma and Allergies in Childhood (ISAAC) (Beasley 1998). Occupational animal contact was assessed. Demographic characteristics comprised age, years in practice and gender. Veterinary work was characterized by the percentage distribution of treated animals and type of practice. Furthermore one question on smoking history was included. The study was approved by the ethics committee of the Ludwig-Maximilians-University Munich (LMU).

Descriptive statistics were used to characterize the study population. In case of missing data, the respective number of subjects with complete data is shown. Prevalence was calculated for the following variables: wheeze, wheeze without having a cold, asthma and allergic rhinitis. For the variable “wheeze” an affirmative answer to the question about the presence of wheeze in the last 12 months was necessary. Wheeze occurring without having a cold was allocated to the variable “wheeze without cold”. Asthma was defined as having had an asthma attack in the last 12 months or/and taking anti-asthmatic drugs currently. Allergic rhinitis was defined as having had attacks of sneezing or a runny blocked nose in the last 12 months accompanied by itchy–watery eyes without having a cold.

Comparisons of continuous variables across two groups were performed using a *t* test for two independent groups. Pearson’s Chi-squared test was used to detect possible relations between two categorical variables. *p* values less than 0.05 were considered statistically significant. Logistic regression analysis was used to evaluate predictors for the outcomes. We looked at two different models: The first (denoted as “model 1”) intended to take into account the role of rhinitis as a risk factor for development for symptoms of the lower respiratory tract adjusting for age, smoking history and sex. The second model (“model 2”) was used to evaluate differences in the proportions of veterinarians with different outcomes

between occupational specialties (small-, mixed- and large animal). All veterinarians were categorized as small-animal, mixed- or large-animal type of practice. Those allocating themselves to more than one of the three categories small-, mixed- and large animal were related to one single category on basis of the percentage of animal contact. A veterinarian was grouped as small- or large animal if more than 95% of treated animals were cats, dogs or other pet animals (small animal) or cattle, horse or swine (large animal). All others were categorized as mixed animal. To find the most suitable model for each of the two tasks, we used the Bayesian information criterion (BIC).

For a joint analysis of the two datasets, generalized linear mixed models were used. These models take into account the fact that some of the data come from the same person at two different time points and are thus not independent any more. We included the same influential variables as in the previous logistic regression models and added an additional variable to account for the two different years. Tables and descriptions of the results of the mixed models are presented in the Online Supplement/Supporting Information. The analyses were conducted using R, version 3.2.0 (R Core Team 2015).

Results

The original number of mailed-out questionnaires was 815 and 934, respectively. Those who were not in practice or changed residence had to be excluded. The total number of eligible veterinarians was 779 (2006) and 926 (2012); 512 and 596 returned a questionnaire resulting in a response rate of 65.7 and 64.4%, respectively. No non-responder analysis could be performed.

General characteristics and prevalence of symptoms are shown in Table 1. For wheezing, wheezing without having cold and allergic rhinitis prevalences were higher in 2006 than in 2012. Only for wheezing without cold this difference turned out to be significant as can be seen in the mixed models.

In 2006 there were more men than women among all participants, whereas in 2012 more than half of the study population was female. Concerning demography, the following significant differences between male and female veterinarians could be found: mean age was higher among male veterinarians, and in 2006 also the mean years in profession were significantly higher in male compared to female veterinarians. In both surveys predominantly female veterinarians dealt with small animals. There were no significant gender-specific differences in respect of prevalence of symptoms. However, allergic rhinitis was more prevalent among women than men in both surveys.

Table 1 Demographic characteristics of study population

	2006				2012			
	Men (<i>n</i> = 304)	Women (<i>n</i> = 208)	<i>p</i>	All (<i>n</i> = 512)	Men (<i>n</i> = 286)	Women (<i>n</i> = 310)	<i>p</i>	All (<i>n</i> = 596)
Mean age (years)	49.9	41.5	<0.0001	46.5	53	42.1	<0.0001	47.3
Mean years in profession	20.3	12.1	0.015	16.9	23.6	13.4	0.169	18.3
Smoking-status (%)			0.247				0.006	
Current smoker	17.1	13.9		15.8	13.3	10.6		11.9
Ex-smoker	28.3	24		26.6	30.4	20.6		25.3
Never	54.6	62		57.6	56.3	68.7		62.8
Practice type (%)			<0.0001				<0.0001	
Large animal	23.8 (<i>n</i> = 303)	10.6 (<i>n</i> = 207)		18.4 (<i>n</i> = 510)	32.9 (<i>n</i> = 283)	15.6 (<i>n</i> = 307)		23.9 (<i>n</i> = 590)
Mixed	61.7	31.4		49.4	51.2	34.2		42.4
Small animal	14.5	58.0		32.2	15.9	50.2		33.7
Prevalence (%)								
Wheezing	13.8	14.9	0.828	14.3	12.6 (<i>n</i> = 285)	10.3	0.450	11.4 (<i>n</i> = 595)
Wheezing without cold	10.5	12.5	0.582	11.3	8.7	5.8	0.221	7.2
Asthma	3.9	6.7	0.229	5.1	7.0	4.2 (<i>n</i> = 308)	0.196	5.6 (<i>n</i> = 594)
Rhinitis	19.5 (<i>n</i> = 302)	21.2	0.738	20.2 (<i>n</i> = 510)	13.7 (<i>n</i> = 284)	20.1 (<i>n</i> = 309)	0.052	17.0 (<i>n</i> = 593)

Current smoking turned out to be associated with wheezing and wheezing without cold (Table 2). Regarding the type of practice we found in the data of 2006 that mixed animal practitioners had a higher prevalence of wheezing than their colleagues. Having allergic rhinitis was strongly correlated with symptoms of the lower respiratory tract, with the highest correlation in asthma. In the mixed models current smoking was strongly and significantly associated with wheeze and wheeze without cold, but not with asthma and rhinitis.

Discussion

In a repeated cross-sectional survey at an interval of 6 years among all practising veterinarians of the Bavarian regions Niederbayern and Schwaben, we found a relatively stable overall prevalence of wheeze, wheeze without having a cold, asthma and allergic rhinitis. The prevalence ranged from 5.1 to 5.6% for asthma, 17.0 to 20.2% for rhinitis, and 11.4 to 14.3% for wheezing, as well as 7.2 to 11.3% for wheezing without having a cold. The prevalences of wheezing, wheezing without having cold and allergic rhinitis were higher in 2006 than in 2012. This might be because in 2006, the survey was carried out during spring/summer but in 2012 during autumn/winter. Seasonal symptoms might have been reported more often in 2006. For wheezing without cold, this difference was statistically significant.

The prevalence of asthma does not seem to underlie such fluctuations.

Allergic rhinitis was the most prevalent symptom, which seems relevant as it might precede symptoms of the lower respiratory tract. In fact for both data-sets, allergic rhinitis was strongly associated with other symptoms such as wheezing or asthma. However, due to our study design, we cannot draw reliable conclusions about the development of allergic symptoms and possible influences on job changes between 2006 and 2012.

Regarding the type of practice, in 2006 mixed-animal practitioners had the highest risk for having symptoms, which was statistically significant for wheezing. Large-animal practitioners had a high risk for having wheezing but a lower risk of rhinitis. This might be because they have no or little contact to small animals like rodents, cats and dogs which are known to be highly allergenic (Susitaival et al. 2003; Will et al. 1987). Correspondingly, small-animal practitioners had the highest risk for allergic rhinitis in 2012. Interestingly, the prevalence of allergic rhinitis was higher in women in both surveys. The difference was borderline statistically significant in 2012. This may be related to the much higher proportion of women exclusively dealing with small animals compared to men. The influence of smoking on symptoms like wheezing was in line with previously reported data (Tielen et al. 1996).

Previous questionnaire-based surveys among veterinarians have reported prevalences for allergic rhinitis of

2006				2012								
Wheezing		Wheezing without cold		Asthma		Wheezing		Wheezing without cold		Asthma		
OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	
Model 1												
Rhinitis												
Having rhinitis	3.97	(2.30–6.83)	6.11	(3.39–11.03)	7.26	(3.16–16.66)	2.54	(1.40–4.60)	4.38	(2.19–8.74)	5.84	(2.77–12.32)
Having no rhinitis	1		1		1		1		1		1	
Gender												
Male	0.86	(0.48–1.52)	0.74	(0.39–1.39)	0.58	(0.24–1.41)	1.17	(0.64–2.12)	1.65	(0.78–3.48)	2.42	(1.03–5.66)
Female	1		1		1		1		1		1	
Smoking-status												
Current smoker	3.41	(1.81–6.41)	2.86	(1.41–5.83)	1.02	(0.34–3.02)	3.84	(2.01–7.34)	3.71	(1.72–7.99)	2.19	(0.85–5.66)
Ex-smoker	1.21	(0.63–2.32)	1.23	(0.59–2.53)	0.87	(0.31–2.38)	1.19	(0.62–2.25)	0.79	(0.33–1.86)	0.95	(0.39–2.34)
Never	1		1		1		1		1		1	
Age in years	1.00	(0.97–1.03)	1.01	(0.98–1.04)	1.00	(0.96–1.05)	1.01	(0.98–1.04)	1.01	(0.98–1.04)	0.99	(0.95–1.02)
2006												
Wheezing		Wheezing without cold		Rhinitis		Wheezing		Wheezing without cold		Rhinitis		
OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	
Model 2												
Practice type												
Large animal	2.04	(0.90–4.63)	1.44	(0.58–3.57)	0.79	(0.19–3.23)	0.60	(0.28–1.28)	1.25	(0.61–2.56)	0.65	(0.22–1.92)
Mixed	2.03	(1.03–4.01)	1.79	(0.87–3.68)	1.38	(0.52–3.61)	1.21	(0.70–2.07)	0.99	(0.52–1.88)	1.11	(0.47–2.62)
Small animal	1		1		1		1		1		1	
Gender												
Male	0.64	(0.34–1.20)	0.61	(0.30–1.21)	0.54	(0.20–1.45)	1.04	(0.60–1.79)	1.09	(0.57–2.06)	1.52	(0.70–3.31)
Female	1		1		1		1		1		1	
Smoking-status												
Current smoker	3.95	(2.13–7.32)	3.36	(1.71–6.60)	1.35	(0.47–3.87)	1.76	(0.98–3.14)	3.70	(1.95–7.01)	3.40	(1.61–7.17)
Ex-smoker	1.31	(0.70–2.47)	1.38	(0.70–2.75)	0.95	(0.36–2.54)	1.18	(0.69–2.00)	1.21	(0.64–2.28)	0.85	(0.37–1.96)
Never	1		1		1		1		1		1	
Age in years	1.00	(0.97–1.03)	1.00	(0.97–1.03)	1.00	(0.95–1.04)	0.98	(0.96–1.01)	1.00	(0.98–1.03)	0.98	(0.94–1.01)

29.0 and 31.1% (Lutsky et al. 1985; Reijula et al. 2003). The prevalence of asthma has been reported to be rather high being 12% in Californian veterinarians (Susitaival et al. 2003), whereas, consistent with our findings, the prevalence of asthma as found among Finnish veterinarians was lower (7%) (Reijula et al. 2003). Wheezing was reported to range between 2.4 and 8.9% in Dutch veterinarians (Tielen et al. 1996), which is lower than in our study. The prevalences of allergic symptoms vary widely between the available studies, and geographical or regional differences in veterinary practice may play a role for this. Given the fact that both the sample size and response rate were high in the present study, we consider our data to be conclusive for the studied regions in Bavaria. To our knowledge only the study among Californian veterinarians reached a higher sample size so far (Susitaival et al. 2003).

To compare our findings with data from the general population, we used the ECRHS questionnaire. In the ECRHS study prevalences ranged from 4.1 to 32.0% for wheeze, from 9.5 to 40.9% for allergic rhinitis, and from 2.0 to 11.9% for asthma (Janson et al. 2001). Our findings all range within this spectrum. Compared to the findings of the German centers of the ECRHS study (wheeze 21.0%, allergic rhinitis 21.9%, asthma 4.4%), the prevalence of wheeze among veterinarians was lower than in the general population, while the prevalences of asthma and allergic rhinitis were similar (Nowak et al. 1996). Therefore, the prevalence of allergic symptoms does not seem elevated among the veterinarians studied. This may be partially explained by a Healthy Worker Effect, as veterinarians who developed, e.g., asthma earlier in their career, may have left their occupation at the time of study. For future studies, it would be very interesting, to assess the development of the sensitization and allergy status from the student years and during the course of occupation. Thus, more longitudinal studies are needed.

Several limitations of this study need to be considered. First of all only veterinarians being in practice were included in the study, and those who changed into other veterinary specialties due to allergic symptoms are not represented. This group, however, can be considered small, since a former study comprising 27,500 veterinarians and their staff detected only 30 persons who had to give up their job due to work-related allergic asthma (Nienhaus et al. 2005). Although questionnaire-based surveys are an appropriate instrument to achieve high sample sizes, there are limits to this method. The questionnaire was a combination of standardized questions but the consistency between reported symptoms and the actual prevalence of allergic symptoms cannot be evaluated from these data. Irrespective of this, it should be noted that our results were similar in both surveys which may increase the confidence in the validity of our findings.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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Generalized linear mixed models

August 16, 2016

1 Table 3/Appendix

	OR	CI.lower	CI.upper	p-value
Intercept	0.04	0.01	0.16	< 0.0001
Year 2012	0.77	0.5	1.18	0.22
Male gender	0.79	0.45	1.4	0.42
Ex-smoker	1.36	0.78	2.36	0.27
Current smoker	4.86	2.61	9.07	< 0.0001
Age in years	1.01	0.98	1.03	0.65
Practice type: mixed	1.48	0.84	2.63	0.18
Practice type: small animal	1.8	0.91	3.55	0.09

Table 1: Wheezing

	OR	CI.lower	CI.upper	p-value
Intercept	0.01	0	0.07	< 0.0001
Year 2012	0.51	0.29	0.92	0.03
Male gender	0.83	0.36	1.92	0.67
Ex-smoker	1.26	0.56	2.81	0.57
Current smoker	5.68	2.24	14.44	0.00026
Age in years	1.01	0.98	1.05	0.55
Practice type: mixed	1.38	0.61	3.13	0.44
Practice type: small animal	1.43	0.53	3.84	0.48

Table 2: Wheezing without cold

	OR	CI.lower	CI.upper	p-value
Intercept	0	0	0.08	0.00082
Year 2012	1.17	0.55	2.51	0.68
Male gender	0.99	0.33	2.96	0.99
Ex-smoker	1.28	0.46	3.61	0.64
Current smoker	2.05	0.6	6.96	0.25
Age in years	0.99	0.94	1.03	0.57
Practice type: mixed	1.29	0.45	3.72	0.64
Practice type: small animal	0.86	0.22	3.28	0.82

Table 3: Asthma

	OR	CI.lower	CI.upper	p-value
Intercept	0.41	0.11	1.5	0.18
Year 2012	0.73	0.46	1.18	0.20
Male gender	1	0.49	2.01	0.99
Ex-smoker	1.24	0.64	2.41	0.52
Current smoker	1.78	0.79	4.02	0.16
Age in years	0.97	0.94	1	0.03
Practice type: mixed	0.87	0.44	1.72	0.69
Practice type: small animal	0.39	0.16	0.94	0.04

Table 4: Rhinitis