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Prevalence and risk factors for respiratory disease on Thoroughbred and Standardbred stud farms in New Zealand

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Abstract

Respiratory disease has been identified as an important and production-limiting health problem on equine stud farms. This study aimed to describe the prevalence and risk factors for respiratory disease on commercial Thoroughbred and Standardbred stud farms in New Zealand, using logistic regression analysis. In 2012, 33 stud managers were interviewed regarding the 2010/11 and 2011/12 breeding seasons, including stud manager reported respiratory disease and strangles vaccination practices. Twenty-two stud managers reported having respiratory disease on their stud farm in the 2010/11 breeding season, and twenty-six stud managers reported disease in the following season. On 90% of stud farms, nasal discharge was reported by stud managers as the main sign of disease and on 41% of stud farms no treatment was undertaken. When breeding season and the size of the stud farm were accounted for, vaccinating horses against strangles increased the odds of horses having experienced respiratory disease (OR 7.26, 95% CI 1.48-35.64), while the presence of a stallion decreased the odds (OR 0.05, 95% CI 0.004 - 0.48). This study has confirmed that respiratory disease is a common health issue on Thoroughbred and Standardbred stud farms in New Zealand.

Keywords: strangles vaccination; horse; logistic regression; face to face interview

Introduction

Previous studies have shown that the bacteria and viruses that cause respiratory disease are present in horses in the New Zealand equine industry, including *Streptococcus equi* subspecies *equi* (strangles) (Patty & Cursons 2014), *Strep. zooepidemicus* (Acke et al. 2010), *Rhodococcus equi* (Dunowska et al. 2011) and equine herpes viruses (EHV) (Dunowska et al. 2002, McBrearty et al. 2012). Respiratory disease has an impact on the breeding industry as there are high numbers of young, immunologically susceptible animals, high stocking densities (Rogers et al. 2007), limited biosecurity practices (Rogers & Cogger 2010) and the frequent movement of horses between properties (Rosanowski et al. 2013).

In order to optimise economic returns, a commercial breeder must produce well-grown yearlings, in what is a relatively short breeding season (August to January) (Dicken et al. 2011; Waldron et al. 2011). Thus, a respiratory disease outbreak could impede growth of youngstock and restrict breeding activities. Within New Zealand, respiratory disease has been reported to be the second most common cause of involuntary retirements for racehorses (Perkins et al. 2004), and responsible for 30% of training days lost in a study of 2-year-old racehorses in the United Kingdom (Dyson et al. 2008). A study in Ireland reported 42% of foals across four stud farms had respiratory disease, lasting for an average of 144 days (Galvin & Corley 2010). Similar results were reported from a study of Thoroughbred foals in the United Kingdom (Yates et al. 2009).

While it is known that respiratory disease is present on Thoroughbred and Standardbred stud farms in New Zealand, it is unknown how many properties are affected on a yearly basis. Additionally, how affected animals are managed and risk factors for disease on a property are unknown. Therefore, the aim of the current study was to describe the prevalence and risk factors for respiratory disease on Thoroughbred and Standardbred stud farms.

Materials and methods

Sample

The sampling frame consisted of all the commercial Thoroughbred and Standardbred stud farms located in the South Auckland, Waikato and Manawatu regions of the North Island of New Zealand (n=57). The sampling frame was restricted to these regions to allow the interviewer to conduct the surveys face-to-face with the stud managers within the time frame of the study.

Survey

The cross-sectional survey was conducted by one interviewer between December 2011 and January 2012, collecting information about the 2010/11 and 2011/12 breeding seasons and included open, semi open and closed questions. The questionnaire was divided into three sections. The first section collected information about the property, the number and type of horses on the property, and how these horses were managed in the two breeding seasons. The second section asked questions about the occurrence of respiratory disease on the property in the previous two

seasons as described and reported by the stud manager. Consequently, disease would be described in lay terms, rather than as a veterinary diagnosis. Additionally, if veterinary diagnosis or treatment was sought in relation to respiratory disease and the strangles-vaccination practices on the stud farm were recorded in this section. The final section collected information about the biosecurity practices used on the property, and if these had changed between the two breeding seasons. During the interview, the stud managers' responses were recorded on a *pro-forma* recording sheet created specifically for the questionnaire.

Statistics

Data were entered into a Microsoft Excel spreadsheet and checked for completeness. Data on the property, biosecurity practices and respiratory disease were compared between the two seasons. Binary and categorical data were summarised as counts and percentages, whilst non-normally distributed continuous data were presented as median and interquartile range (IQR).

The presence of respiratory disease on a stud farm

was defined by one or more horses having a cough and/or nasal discharge, plus swollen lymph nodes and/or elevated temperature and/or depression. Logistic regression was used to investigate the association of region, year, property size, horse numbers, whether horses were vaccinated and if stallions were kept, with the report of respiratory disease on a stud farm. Variables were selected for inclusion in the multivariable model based on p value of <0.20. Variables were retained in the model if significant at p=0.05. Analyses were conducted in Stata version 11 (Statacorp LP. 2009. *Stata Statistical Software: Release 11*. College Station, TX).

Results

Description of the stud farms and horses

Thirty-three stud farms were visited during the study period: 28 Thoroughbred; four Standardbred and one Thoroughbred and Standardbred stud farm (58% response rate). Stud farms were located in Auckland (6/33; 18%), Waikato (21/33; 64%) and Manawatu (6/33; 18%) regions. The median size of the properties

Table 1 Descriptive statistics of the number of horses on Thoroughbred and Standardbred stud farms in the 2010/11 and 2011/12 breeding seasons. Data collected during a face-to-face interview with 33 stud managers in 2012.

Breeding season	Variable	Number of properties	Median	Interquartile range
2010/11				
	Number of mares served ¹	29	90	19-125
	Number of resident mares	30	50	19-90
	Number of stallions	12	2.5	2-3.5
	Number of foals	31	54	13-85
	Number of weanlings	31	35	16-57
	Number of yearlings	33	24	15-50
	Number of racehorses ²	14	11.5	7-17
	Number of spellers ³	26	12	6-20
	Number of sports horses	9	4	3-5
2011/12				
	Number of mares served ¹	29	80	15-125
	Number of resident mares	30	33	19-87
	Number of stallions	12	3	2-5
	Number of foals	31	40	13-80
	Number of weanlings	5	70	55-120
	Number of yearlings	33	25	14-50
	Number of racehorses ²	17	10	5-17
	Number of spellers ³	28	10	5-20
	Number of sports horses	11	3	2-4

¹ Total number of mares served during the breeding season.

² Total number of racehorses in active training, with training based on the stud farm.

³ Total number of racehorses not in active training on the stud farm. These horses may have been trained at the stud farm or at another training facility.

was 97 ha (IQR 32-154). This did not change on any stud farm between the two breeding seasons. The descriptive statistics for the number of horses on the property is shown in Table 1.

Table 2 Groups of horses on stud farms vaccinated with a Strangles vaccine in 2010/11 and 2011/12 breeding seasons, as reported by stud managers. Data collected during a face to face interview with 33 stud managers in 2012.

Breeding season	Group of horses	Number of stud farms vaccinating (%)
2010/11 (n=25)	All horses	13 (52)
	Mares and youngstock*	7 (28)
	Mares and youngstock* that were moved	1 (4)
	Only mares	1 (4)
	Only youngstock*	3 (12)
2011/12 (n=24)	All horses	14 (58)
	Mares and youngstock*	6 (24)
	Mares and youngstock* that were moved	1 (4)
	Only youngstock*	3 (13)

*Foals, weanlings or yearlings

Description of farm practices

In the breeding season (August to January), most (52%; 17/33) stud farms had veterinarians visit the stud farm daily, whilst on 39% (13/33) of stud farms the veterinarian visited one to six times per week and on 9% (3/33) of stud farms veterinarians visited less than once a week. Outside of the breeding season, most (52%; 17/33) stud farms had veterinarians visit the farm 'as needed', and 27% (9/33) of stud farms had visits from veterinarians one to six times per week. Only three stud managers reported that veterinarians visiting the stud farm had to follow biosecurity protocols.

Horses on the stud farms were observed daily, twice daily or more than twice daily by either the stud manager or stud staff on 9% (3/33), 55% (18/33) and 9% (3/33) of stud farms, respectively. On some stud farms, horses were observed at least every other day (6%; 2/33) or at least daily (21%; 7/33) by staff.

New horses coming onto the stud farm were never, sometimes, or always isolated from resident horses on 27% (9/33), 18% (6/33) and 55% (18/33) of stud farms, respectively. On stud farms where horses were isolated, new horses were isolated for less than one week on 25% (6/34) of stud farms, one to two weeks on 50% (12/24) of stud farms, two to three weeks on 8% (2/24) of stud farms, and for longer than a month on 4% (1/24) of stud farms. Three stud managers did not report how long horses were isolated for.

In the 2010/11 breeding season, 25 stud managers reported that horses on the stud farm were vaccinated

with a strangles vaccine and in the following year 24 stud managers reported vaccinating horses (Table 2).

Prevalence of respiratory disease

For the 2010/11 breeding season, 22 stud managers reported horses on their stud farm with signs of respiratory disease. For the following season, 26 stud managers reported horses on their stud farm with signs of disease. Six stud managers reported not having observed signs of respiratory disease in horses in either of the two years, six reported having signs in only one year and 21 reported signs in both years. In total eight stud managers reported keeping written records regarding horses on their stud farm.

The most commonly reported reason for respiratory disease was cold or flu on 13 stud farms. The second most commonly reported reason for respiratory disease was an undiagnosed virus on 11 stud farms (5 in 2010/11 and 6 in 2011/12), followed by strangles on 5 stud farms (1 in 2010/11 and 4 in 2011/12). *Rhodococcus equi* was reported on two stud farms in both years and *Strep. zooepidemicus* was reported on one stud farm in each season. Equine herpes virus was reported on one stud farm in 2010/11 and one stud manager described the reason for respiratory disease as being associated with 'growth' in 2011/12.

Across both years, on 52% (25/48) of stud farms the stud manager was the first person to identify horses with respiratory disease. Primary reports of disease were made by stud staff 33% (16/48) of the time and diagnosed by veterinarians 15% (7/48) of the time. Six stud managers reported a secondary confirmation of disease, of which five of these were diagnosed by a veterinarian. Overall, nine stud managers reported seeking veterinary advice for the diagnosis or treatment of respiratory disease. Veterinarians were involved in the diagnosis or treatment of horses with strangles (n=5) or with *Strep. zooepidemicus* (n=2) and *R. equi* (n=2). All of the stud farms where strangles was reported by stud managers had also reported vaccinating horses.

The main sign of respiratory disease reported by stud managers was nasal discharge on 91% (20/22) and 88% (23/26) of stud farms in the 2010/11 and 2011/12 breeding seasons, respectively. In 2010/11, stud managers reported horses with a cough (41%;

Table 3 Treatment and control measures for respiratory disease in horses in 2010/11 and 2011/12 breeding seasons, as reported by stud managers. Data collected during a face to face interview with 33 stud managers in 2012*.

Variable	Level	Breeding season	
		2010/11	2011/12
Treatment	No treatment	10	9
	Antibiotics	8	11
	NSAID#	2	1
	Steroids	1	2
	Other treatments	4	6
	Unknown treatments	2	3
Control	No control measures	9	12
	Isolation of horses	8	11
	Disinfect gear or stables	2	2
	Vaccinate horses	2	1
Total number of stud farms affected		22	26

*Number of treatments greater than the number of stud farms as some stud managers reported multiple treatments.

#NSAID nonsteroidal anti-inflammatory drug.

9/22), swollen lymph nodes (32%; 7/22), elevated rectal temperature (23%; 5/22), depression (23%; 5/22) and inappetence (18%; 4/22). In 2011/12, the stud managers reported horses with a cough (39%; 10/26), swollen lymph nodes (35%; 9/26), elevated rectal

Table 4: Univariable logistic regression results for the presence of respiratory disease on a stud farm. Data collected during a face to face interview with 33 stud managers in 2012.

Variable	Level	OR#	95% CI	P value*
Region	Auckland	1		
	Waikato	2.13	0.51 - 8.85	0.3
	Central Districts	0.5	0.1 - 2.6	0.41
Property size	<31	1		
	32 - 96	0.8	0.18 - 3.46	0.77
	97 - 153	2.1	0.47 - 9.44	0.33
	>153	4.8	0.81 - 28.6	0.09
Vaccinated	No	1		
	Yes	5	1.51 - 16.53	0.008
Stallion	No	1		
	Yes	0.27	0.08 - 0.89	0.032
Breeding season	2010/11	1		
	2011/12	1.86	0.62 - 5.61	0.27

Odds ratio. *Wald p value.

temperature (35%; 9/26), depression (39%; 10/22) and inappetence (23%; 6/26).

On 36% (8/22) and 42% (11/26) of stud farms in the 2010/11 and 2011/12 breeding seasons, respectively, signs of respiratory disease were treated with antibiotics for at least some of the horses affected (Table 3). On stud farms where respiratory disease was reported, 46% (10/22) and 35% (9/26) in 2010/11 and 2011/12, respectively, did not undertake any treatment. The group of horses reported by stud managers to be most affected by respiratory disease in both years was youngstock: yearlings, weanlings and foals. Over both years, on an average of 44% of stud farms that were affected by respiratory disease no extra action was taken by stud managers to control disease.

Risk factors for respiratory disease

Property size was identified to be correlated with the number of horses in any stock class and was used in the logistic regression modelling rather than horse numbers. The univariable logistic regression analysis is presented in Table 4.

The year, the size of the stud farm, the presence of stallions on the stud farm and whether horses on the stud farm were vaccinated were all retained in the final multivariable model (Table 5). The 2011/12 breeding season, larger stud farms and having vaccinated horses

on the stud farm increased the odds of respiratory disease on the stud farm, whilst the presence of a stallion on the stud farm reduced the odds of respiratory disease on a stud farm.

Discussion

The current study has identified that annually there is a high prevalence of stud manager reported respiratory disease on stud farms. While stud managers reported that horses were observed regularly and veterinarians visited stud farms regularly, few episodes of respiratory disease were diagnosed or treated by a veterinarian. Additionally, few stud farms isolated horses that arrived onto the stud farm long enough to prevent disease spread to resident horses, asked veterinarians to follow biosecurity procedures to protect resident horses, or vaccinated enough horses on the property to provide protection or reduce the impact of disease, if an

Table 5 Multivariable logistic regression model for the presence of respiratory disease on a stud farm. Data collected during a face to face interview with 33 stud managers in 2012.

Variable	Level	OR#	95% CI	P value*
Breeding season	2010/11	1		0.24
	2011/12	2.25	0.58 - 8.71	
Strangles vaccination	No	1		0.02
	Yes	7.26	1.48 - 35.64	
Stallion present	No	1		0.01
	Yes	0.05	0.004 - 0.48	
Property size (Ha)	<31	1		
	32 - 96	6.36	0.49 - 82.1	0.16
	97 - 153	11.21	0.86 - 146.25	0.07
	>153	16.53	1.29 - 212.15	0.03

Odds ratio. *Wald p value

outbreak was to occur. These findings are similar to previous studies investigating biosecurity practices on stud farms (Rosanowski et al. 2013; Rogers & Cogger 2010). As youngstock destined for domestic or international racing need to be well developed for yearling or ready-to-race sales and 2-year-old racing (Fennessy 2010), any setbacks in this process due to respiratory disease will have a financial impact for stud managers.

In the current study using a strangles vaccine was a risk factor for respiratory disease when the breeding season, presence of stallions and size of the property were accounted for. Additionally, on all stud farms where strangles was diagnosed, horses were vaccinated. These findings are similar to those reported by Jorm (1990), who found that properties where horses were vaccinated against strangles were at a higher risk of having a strangles outbreak. However, in the study by Jorm (1990), the timing of vaccination compared to when a strangles outbreak occurred was not accounted for, with participants reporting vaccinating horses after an outbreak to protect horses against future outbreaks, rather than the increased risk being due to vaccine failure. In the current study the increased risk of respiratory disease associated with vaccination could be due several factors. As most stud managers did not report strangles as the respiratory disease affecting their horses, vaccinating against strangles would be ineffective. Additionally, vaccinating animals may be providing a sense of protection for stud managers, meaning that other biosecurity practices are being less rigorously adhered to.

The current study has identified a high prevalence of respiratory disease on stud farms in New Zealand in the 2010/11 and 2011/12 breeding seasons. The size of the property and vaccinating horses on the stud farm against strangles were both identified as risk factors for respiratory disease, while having a stallion on the

stud farm was identified as protective. Addressing these risk factors and implementing control measures to reduce the prevalence of respiratory disease requires further investigation.

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