COMMON EQUINE PARASITES DIAGNOSED IN PENINSULAR MALAYSIA FROM THE YEAR 2014 TO 2018

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ABSTRACT. Information on common diseases is important for effective disease control and management programme. This paper aims to identify the common equine parasites infection diagnosed in Peninsular Malaysia using existing laboratory data system records from government veterinary laboratories. Equine data were analysed on the basis of disease diagnoses, states, types of programme, and breed from January 2014 to December 2018. For this purpose, laboratory data from parasitology unit in six (06) Department of Veterinary Services (DVS) laboratories across Peninsular Malaysia were compiled and a total of 7,123 samples sent to the laboratories during the time period were analysed. A total of 623 samples (8.75 %) were positive of 7 different endoparasites, with helminthiasis recording 4.45 % and protozoan infections recording 4.28 %. Monitoring programme recorded second highest number of samples received (33.58 %) but with highest positive samples (6.96 %), while import programmes had the highest number of samples received but with only 0.62 % of the samples were recorded positive. State of Johore (7.97 %) had the highest number of horse positive sample followed by Perlis (0.24 %) and Pahang (0.21 %). Thoroughbred were breed with the highest number of samples received (66.31 %) with 7.28 % were positive. In conclusion, this study provides an idea of prevailing equine common parasite status in Malaysia as per handled in the DVS laboratories, as DVS continues to emphasize horse health by conducting disease screening primarily associated with import and export programmes as well as conducting disease monitoring to ensure sustainability of the industry

Keywords: Equine, endoparasite, helminths, protozoa, Malaysia

INTRODUCTION

Horses are often exposed to many diseases which affect their performance. Among these, parasitic diseases stand out as the most important contributor in successful horse rearing all over the world.

Nonetheless, many species of parasites are found to infect horses. Parasites are classified as ectoparasites, which consist of parasites that live on the host's body surfaces, or endoparasites, which live within the host, and can be further grouped as protozoa or helminths (Khamesipour

et al., 2021). The most common parasitic helminths found in horses include stomach worms (*Habronema* species and *Draschia megastoma*), horse bots (*Gasterophilus* species), large strongyles (*Strongylus vulgaris, S. edentatus, S. equinus*), ascarids (*Parascaris equorum*), pinworms (*Oxyuris equi*), small stomach worms (hairworm, *Trichostrongylus axei*), small strongyles (cyathostomins, multiple species), *Strongyloides westeri*, and tapeworms (*Anoplocephala magna, A perfoliata, Paranoplocephala mamillana*) (Klei, 2019; Proudman *et al.,* 2000; Khamesipour *et al.,* 2021). They are generally transmitted when an animal consumes contaminated soil, water, faeces, or food containing parasite eggs or spores. They can cause serious illness and even death in horses. (ESCCAP, 2019). Protozoa that commonly infects horses include *Eimeria sp., Neospora sp., Theileria* (Babesia) *equi, Babesia caballi, Cryptosporidium sp.,* and *Toxoplasma gondii* (Foster, 1942). Surra, the disease that is caused by infection with the protozoan parasite *Trypanosoma evansi* has also been diagnosed frequently in horses, with biting flies as vectors aiding transmission (Desquesnes *et al.,* 2013; Erwanas *et al.,* 2015; Wisnu *et al.,* 2019). Equine Piroplasmosis caused by protozoan parasites, *Theileria* (Babesia) *equi, Babesia caballi* are often spread by vectors such as ticks, which transfer the parasites from one horse to another (Onyiche *et al.,* 2019).

Horse industry contributes not only to the economy, but also to the social well-being of the country through sporting achievements. The Department of Veterinary Services (DVS) has been organizing several international horse competitions in Malaysia over the past few years, such as horseracing, endurance, polo, and show jumping involving the industry's stakeholders with DVS playing an important role to ensure that no diseases are transmitted through the participation of these imported horses. The DVS is also involved in monitoring and maintaining the biosecurity part of the event, which covers quarantine measures before, during, and after each event. These competitions not only advance the country's equine industry, but also establish Malaysia as an equine event organizer (APTVM, 2010). Due to lack of data in equine diseases especially parasitic infections, this data analyses attempt to provide an overview of the incidence of parasite infections among horses in Peninsular Malaysia over a 5-years study period based on samples received by DVS Veterinary Laboratories.

METHODOLOGY

Study Area And Data Collection

The data were collected from the five (05) Veterinary Laboratories (VLs) throughout Peninsular Malaysia and the Veterinary Research institute (VRI). The location of these five (05) VLs and VRI, namely in Central Zone Veterinary Laboratory (Selangor), Southern Zone Veterinary Laboratory (Johore), Northern Zone Veterinary Laboratory (Penang), Eastern Zone Veterinary Laboratory (Kuantan, Pahang), Eastern Zone Veterinary Laboratory (Kota Bharu, Kelantan) and VRI (Perak) ensure that data obtained are sufficient to represent the equine population in Peninsular Malaysia. The data specific for equine were acquired from *Sistem Maklumat Makmal* (SIMMAK) for VLs and Laboratory information systems (LIMS) for VRI which consists of the information on total number of samples received, types of samples received, types of work conducted, species, breeds, states of which the samples were collected, and final diagnoses for five consecutive years, from January 2014 up to December 2018.

Diagnostic Test Method

Samples were submitted to the respective VLs by equine industry players as well as the DVS, based on the type of work conducted on field, namely based on clinical signs, for screening, for movement and/or permit purposes, or others. Faecal samples received were subjected to McMaster's and floatation methods while blood and organ samples were subjected to examination using thin blood smear and impression organ smear methods, respectively. The presence of helminths ova and oocysts in faeces, intracellular protozoans (*Anaplasma* spp., *Babesia* spp. and *Theileria* spp.) or extracellular protozoans (*Trypanosoma evansi*) in blood smears were considered to be positive results. Helminths found during post-mortem were also recorded as positive results. All of these methods are conducted according to Christopher *et al*. (1992).

Data Analysis

Descriptive statistics from the data generated from the laboratory data management system was done using Microsoft Excel 2013.

RESULTS

A total of 7,123 horse samples for diagnosis of parasitic infection were sent to government veterinary laboratories between 2014 and 2018, and 623 samples were positive, which bring to the overall prevalence of equine parasites in Peninsular Malaysia at 8.75 % from the year 2014 to 2018. Prevalence means the total number of cases or outbreaks of a disease that are present in a population at risk, in a particular geographical area, at one specified time or during a given period (OIE, 2021). The number of samples received varied by year as shown in Table 1. Thus, when calculated for 2014 to 2018 singly, the highest prevalence recorded was 18.39 % (275 / 1495) in 2015 followed by 9.37 % (107 / 1142) in 2016, with the lowest recorded was 3.36 % (42 / 1249) in 2018 as indicated in Table 1. The distribution of the parasitic infection in horses by states in Malaysia is shown in Table 2, with the state of Johore recorded highest prevalence over the 5-year study period with 7.92 % (568 / 7123) followed by Perlis with 0.24 % (17 / 7123), and Pahang with 0.21 % (15 /7123). The distribution of the parasitic infection according to type of work involved is shown in Table 3, with monitoring recorded the second highest number of samples received (33.58 %) but with the highest prevalence (6.98 %) followed by diagnostic with 0.76 % positive cases. Import, however, recorded the highest number of samples received at 36.98 % but with only 0.62 % of the samples were recorded positive. No positive samples were recorded for research and reference activities, even though they account to 4.11 % of the total samples received. The most common endoparasite identified was helminths, 4.45 %, followed by theileriosis (3.57 %), coccidiosis (0.25 %) and trypanosomiasis (0.25 %). Only one case of ectoparasite was diagnosed over the five years' period of study. Out of the 14 breeds listed in SIMMAK and LIMS, the thoroughbred was the highest number of samples received with 4757 (66.31 %) and has the highest (7.28 %) percentage of parasitic infection. However, due to human error, there were also samples received that were recorded as unknown breeds. These category accounts for 11.51 % of the total samples received and recorded 1.32 % positive cases.

Table 1. Prevalence of Positive Samples Based on Year of Study.

Year	Total No. of Samples	Parasites Diagnosed	Positive Samples		Total Prevalence (%)
			N	Prevalence (%)	
2014	1787	*Anaplasma* spp	10	0.56 %	6.38 %
		Eimeria sp.	6	0.34 %	
		Ectoparasite	1	0.06 %	
		Helminths	75	4.20 %	
		Theileria sp.	15	0.84 %	
		Trypanosoma sp.	7	0.39 %	
			114		
2015	1495	Helminths	156	10.43 %	18.39 %
		Theileria sp.	118	7.89 %	
		Trypanosoma sp.	1	0.07 %	
			275		
2016	1142	*Eimeria* sp.	12	1.05 %	9.37 %
		Helminths	69	6.04 %	
		Theileria sp.	26	2.28 %	
			107		
2017	1450	*Babesia* sp.	2	0.14 %	5.86 %
		Helminths	16	1.10 %	
		Theileria sp.	67	4.62 %	
			85		
2018	1249	*Anaplasma* spp	3	0.24 %	3.36 %
		Helminths	1	0.08 %	
		Theileria sp.	28	2.24 %	
		Trypanosoma sp.	10	0.80 %	
			42		
Grand Total	**7123**		**623**	**43.37 %**	**37.51 %**

Table 2. Distribution of Parasitic Infection Based on State.

State	Total Samples Received	Parasites Diagnosed	Positive Samples		Total Prevalence (%)
			N	Prevalence (%)	
Johor	1181	*Anaplasma* spp	3	0.04 %	7.97 %
		Babesia sp.	2	0.03 %	
		Eimeria sp.	18	0.25 %	
		Helminths	298	4.18 %	
		Theileria sp.	237	3.33 %	
		Trypanosoma sp.	10	0.14 %	
Perlis	24	*Anaplasma* spp	10	0.14 %	0.24 %
		Trypanosoma sp.	7	0.10 %	
Pahang	1029	Helminths	8	0.11 %	0.21 %
		Theileria sp.	7	0.10 %	
Pulau Pinang	38	Helminths	8	0.11 %	0.11 %
Selangor	3001	*Theileria* sp.	5	0.07 %	0.07 %
Perak	1055	Ectoparasite	1	0.01 %	0.06 %
		Helminths	3	0.04 %	
W.P. Kuala Lumpur	474	*Theileria* sp.	5	0.07 %	0.07 %
Kelantan	121	*Trypanosoma* sp.	1	0.01 %	0.01 %
Kedah	1	-	0		0.00 %
Melaka	20	-	0		0.00 %
Negeri Sembilan	24	-	0		0.00 %
Sabah	4	-	0		0.00 %
Terengganu	151	-	0		0.00 %
Grand Total	**7123**		**623**	**8.75 %**	**8.75 %**

Table 3. Distribution of Parasitic Infection Associated with Types of Programme.

Types of Work	Total No. of Samples	Parasites Diagnosed	Positive Samples		Total Prevalence (%)
			N	Prevalence (%)	
Monitoring	2392	*Anaplasma* spp	6	0.08 %	6.98 %
		Eimeria sp.	18	0.25 %	
		Helminths	272	3.82 %	
		Theileria sp.	191	2.68 %	
		Trypanosoma sp.	10	0.14 %	
Diagnostic	156	*Babesia* sp.	2	0.03 %	0.76 %
		Ectoparasite	1	0.01 %	
		Helminths	25	0.35 %	
		Theileria sp.	26	0.37%	
Import	2634	Helminths	20	0.28 %	0.62 %
		Theileria sp.	24	0.34 %	
Surveillance	159	*Anaplasma* spp	7	0.10 %	0.20 %
		Trypanosoma sp.	7	0.10 %	
Export	1241	*Theileria* sp.	8	0.11 %	0.11%
Animal Movement	248	*Theileria* sp.	5	0.07 %	0.08 %
		Trypanosoma sp.	1	0.01 %	
Research	29	--	0		0 %
Reference	264	--	0		0 %
Grand Total	**7123**	**-**	**623**	**8.75 %**	**8.75 %**

Table 4. Distribution of Parasitic Infection Based on Breed of Horse.

Breed	Total No. of Samples	Parasites Diagnosed	Positive Samples		Total Prevalence (%)
			N	Prevalence (%)	
Throroughbred	4757 (66.78)	Helminths	304	4.27 %	7.31 %
		Theileria sp.	181	2.54 %	
		Eimeria sp.	18	0.25 %	
		A*naplasma* spp	10	0.14 %	
		Trypanosoma sp.	8	0.11 %	
Unknown	820 (11.51)	*Theileria* sp.	66	0.93 %	1.32 %
		Helminths	13	0.18 %	
		Trypanosoma sp.	10	0.14 %	
		*Anaplasm*a spp	3	0.04 %	
		Babesia sp.	2	0.03 %	
Mestizo	696 (9.77)	*Theileria* sp.	7	0.10 %	0.10 %
Fallabella Horse	3 (0.04)	Ectoparasite	1	0.01 %	0.01 %
Polo	377 (5.29)	--	0		0
Mixed	273(3.83)	--	0		0
Pony	83 (1.17)	--	0		0
Arabian	68 (0.95)	--	0		0
Padi	18 (0.25)	--	0		0
Criolo	10 (0.14)	--	0		0
Bonsai	9 (0.13)	--	0		0
Burchell's Zebra	3 (0.04)	--	0		0
Warmblood	3 (0.04)	--	0		0
Equus Ferus	2 (0.03)	--	0		0
Holstein	1 (0.01)	--	0		0
Grand Total	**7123 (100)**		**623**	**8.75 %**	**8.75 %**

DISCUSSION

In Malaysia, very few studies have been carried out on the prevalence of parasitic infections in horses. One study reported the prevalence and identification of gastrointestinal parasites in 100 horses from various establishments in Malaysia showed that 38.0 % of the horses are infected (Periyasamy *et al.,* 2017). In the present study, gastrointestinal parasites namely helminths (4.45 %) accounts for the positive samples sent to the government veterinary laboratory from the year 2014 up to 2018. Differences in management and parasitic control systems may have attributed to the difference in prevalence between these studies. In this study, the prevalence of equine parasites is at 8.75 % over the 5-year study period. In Malaysia, the thoroughbred equine population is found in Selangor, Perak and Kuala Lumpur where the samples showed a markedly lower percentage (0.07 % in Selangor, 0.06 % in Perak and 0.07 % in W.P Kuala Lumpur) of positive samples for parasites as they are well taken care with highest level of biosecurity. Thoroughbred is the highest number of breeds in Malaysia. The high prevalence recorded in thoroughbred compared to other breed may be associated with the main purpose for racing, equestrian sports and hobby. For this reason, they are better managed with up-to-date management systems and equipment (Bashir *et al.,* 1998). In the present study, the good management system adopted by horse owner was probably responsible for the low frequency of other parasites among horses. As the equine industry is a commercial enterprise, it is important that common infections transmitted by ticks are kept under control. Constant routine endoparasite management such as faecal egg counts, faecal egg count reduction tests, pasture rotation and manure management are all essential elements of an efficient deworming program. The risk of parasite exposure can be minimized with adequate planning and improvement of horse health (Love *et al.,* 2012; Ivey *et al.,* 2018).

Equine piroplasmosis (EP) is global disease of equids that affect the international movement of horses and their industry. Babesia *caballi* and *Theileria* equi are responsible for causing EP (Wise *et al.,* 2013). It is notifiable disease by Department of Veterinary Services (APTVM, 2010), Malaysia and also reportable diseases to World Animal Health Organization (WAHIS, 2021). In Malaysia, EP is widespread in Kelantan with the infection rate of 50.67 % Theileria *equi* and 62.16 % Babesia caballi (Al-Obaidi *et al.,* 2016). In previous survey on prevalence of EP in selected states in which horse are mostly found in peninsular Malaysia, the results indicated 1.2 % from 242 horses tested were found positive (Chandrawathani *et al.,* 1998). Many countries have decided stricter importation regulations in order to restrict the movement of piroplasm seropositive horses from crossing their border. In the present study, most samples were sent to the laboratory for import (37.0 %), export (17.4 %) and animal movement (3.50 %) for permit requirement purposes to assure all horses are healthy and free from diseases prior to reaching their intended destination. In this study, 3.59 % of samples diagnosed were positive EP where *Theileria* sp. was detected in 3.54 % of the samples received and only 0.03 % were recorded as Babesia sp. The current study is in agreement with the study conducted by Zawida et al. (2010) on prevalence of protozoan in local horses in Peninsular Malaysia which piroplasmosis Theileria equi (20.0 %) were more prevalent compared to Babesia caballi (1.0 %).

Trypanosoma evansi or Surra most commonly affects horses compared to other animal species and may cause rapid fatality in cases of acute and severe infection (OIE, 2021). Surra is endemic in Malaysia and trypanosomiasis caused

by *Trypanosoma evansi* remains a potential disease outbreak concern. An outbreak of trypanosomiasis was diagnosed by VRI in early 2012. Many studies had been carried out after the outbreak monitoring various animal hosts to further gain knowledge on the epidemiology of this disease which affects many animal species (Nurulaini *et al.,* 2013). Outbreak was reported in deer, cattle, buffaloes and pigs in Perak in 2013 (Nurulaini *et al.,* 2013). Previously, study on local horse in Peninsular Malaysia reported prevalence of *Trypanosoma evansi* at 12.0 % (Zawida *et al.,* 2010) and the most recent study by Elshafie et al. (2013) reported an overall seroprevalence of *Trypanosoma evansi* in horse at 13.90 %. In the present study, Trypanosoma sp. were recorded in Johore (0.14 %), Perlis (0.10 %) and Kelantan (0.01 %) in 2018, 2014 and 2015 respectively. The presence of trypanosomiasis in the north of Peninsular Malaysia may be due to it being geographically adjacent to Thailand. Several outbreaks were recorded every year and frequently fatal for horses in Thailand (Desquesnes *et al.,* 2013). As horse industry is expanding in Malaysia, horses are imported or illegally smuggled from non-free Trypanosoma evansi country which may cause horse entering the country serving as carriers and introduce these protozoa to susceptible pool of naïve animals (Desquesnes *et al.,* 2013). The reason for prevalence of Surra in state of Johore which is located in southern of Peninsular Malaysia were probably due to movement of infected animals, environmental condition such as farm adjacent to the jungle where its environment may serve as a natural habitat for the fly vectors of Typanosoma evansi and also the grazing system practiced by the stable. Previously in 2013, Elshafie et al. reported that the highest prevalence of *Typanosoma evansi* in horse was recorded in Negeri Sembilan at 13 % (3/23) by HCT, GSS and PCR, while low prevalence was detected in Terengganu by PCR only at 2.67 % (3/112). No parasite was detected in horses from other states. That study predicted that the high prevalence in Negeri Sembilan was due to the location of the stable adjacent to the jungle and horse grazed with cattle and buffaloes. It was suggested that the management has to ensure that horses do not graze with cattle and buffaloes as they are known to have subclinical infections with *Typanosoma evansi* thus serving as reservoir hosts (Luckins, 1988).

Further study and investigation on the epidemiology of the infection are recommended by looking all factors in the horse farm location as data collected in this present study from each laboratory are limited. Constant monitoring and mandatory test of *Trypanosoma evansi* for imported horses are recommended to avoid serious outbreaks and mortality. The current test method used for detection of *Trypanosoma* was blood smear examination, which has low sensitivity rate (Ramírez-Iglesias *et al.,* 2011). It is recommended to investigate further any similar clinical sign and to complete the identification of Trypanosoma species by determination of its strains as it is crucial for treatment and preventive measures for future cases to reduce economic and resource losses due to this disease (Mohd Rajdi *et al.,* 2021).

CONCLUSION

The present study demonstrated that endoparasites caused by helminths and protozoans were found to be common in horses every year during 2014 to 2018 with an overall prevalence of 8.75 %. A continuous monitoring of horse by the DVS will provide important information for assisting the industry player to manage the spread of parasitic infection and maximize horse's health. The general public and the government agencies need to engage

with stakeholders of this industry in order to find out the limitation and constraints namely with parasitic diseases to enhance DVS's ability in disease diagnoses and prevention.

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