



**UNIVERSITI PUTRA MALAYSIA**

**PREVALENCE OF PARASITIC GASTROENTERITIS IN GOATS FROM  
SELECTED FOSTER FARMS OF FACULTY OF VETERINARY  
MEDICINE, UNIVERSITI PUTRA MALAYSIA**

**SITI NOR AIN FATIHAH HAMZAH**

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FPV 2020 31**

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GOATS FROM SELECTED FOSTER FARMS OF FACULTY OF  
VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA**

**SITI NOR AIN FATIHAH HAMZAH**

A project paper submitted to the  
Faculty of Veterinary Medicine, Universiti Putra Malaysia

In partial fulfilment of the requirement for the  
**DEGREE OF DOCTOR OF VETERINARY MEDICINE**

Universiti Putra Malaysia

Serdang, Selangor Darul Ehsan

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## CERTIFICATION

It is hereby certified that we have read the project paper entitled “Prevalence of Parasitic Gastroenteritis in goats from selected foster farms of Faculty of Veterinary Medicine, Universiti Putra Malaysia”, by Siti Nor Ain Fatimah Hamzah and in our opinion, it is satisfactory in terms of scope, quality and presentation, as partial fulfilment of the requirement for the course VPD 4999- Final Year Project.

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## DEDICATION

I would like to dedicate this thesis to:

### **My late father and my mother**

Hamzah Embong and Siti Zainab Hassan

Whose affection, love, encouragement and prays of day and night make me able to reach at this stage

### **My siblings**

Hazarul Hamzah, Hazimahtul Hamzah, Miza Hamzah and Amin Hamzah

### **DVM 2021 Batchmates**

For being extraordinary batch ever

### **Farmers, UVH and FPV staffs**

For giving me chances to conduct my project without any problems

### **My best friends**

For your understanding and overwhelming support that never end

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## LISTS OF ABBREVIATIONS

PGE	Parasitic gastroenteritis
GI	Gastrointestinal
EPG	Egg per gram
FEC	Faecal egg count
L3	Larvae stage 3
L4	Larvae stage 4
ANOVA	Analysis of variances
%	Percentage
Spp.	Species
FPV	Faculty of Veterinary Medicine
UPM	Universiti Putra Malaysia
°C	Degree Celcius
h	Hour
ml	milliliter
mm	millimeter
NaCl	Sodium chloride
10x	10 times magnification
40x	40 times magnification
PKC	Palm kernel cake
-	To
/	or

## **ABSTRAK**

Abstrak daripada kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4999- Projek Tahun Akhir.

### **PREVALENS PARASIT GASTROUSUS DALAM KAMBING DARIPADA LADANG ANGKAT TERPILIH, FAKULTI PERUBATAN VETERINAR, UNIVERSITI PUTRA MALAYSIA**

**Oleh**

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Parasit gastroenteritis (PGE) adalah keadaan penyakit yang disebabkan oleh jangkitan nematoda gastrointestinal (biasanya strongyle) di perut (abomasum dan usus) ruminan. Jangkitan yang lebih tinggi akan menyebabkan haiwan menjadi sakit secara progresif dan menghasilkan tanda-tanda seperti cirit-birit, penurunan berat badan atau penurunan berat badan berlebihan, edema pada kes-kes kronik dan kematian mendadak dalam kes-kes kritikal yang membawa kepada implikasi ekonomi dan kesejahteraan yang serius. Kajian ini bertujuan untuk menentukan prevalens parasit gastrointestinal (PGE) di lima ladang angkat terpilih Fakulti Perubatan Veterinar, Universiti Putra Malaysia (UPM). Sampel najis diambil daripada rektum dan soal

selidik mengenai amalan pengurusan ladang terpilih direkodkan. Sebanyak 60 sampel najis kambing dikumpulkan dan kiraan telur nematode Strongyle dikira sebagai telur per gram (EPG) ditentukan menggunakan teknik modifikasi McMaster. Kultur najis yang dikumpulkan dilakukan untuk setiap peternakan dan larva tahap infektif (L3) diambil dan dikenal pasti tahap genus. Analisis data dilakukan melalui pendekatan sistematik menggunakan ujian-t, dan ANOVA. Kajian ini menunjukkan bahawa kadar prevalens PGE yang disebabkan oleh strongyle untuk peternakan angkat terpilih Fakulti Perubatan Veterinar adalah 87% dimana ianya lebih tinggi daripada kadar prevalens 58% yang dilaporkan sebelumnya di Semenanjung Malaysia. Perkaitan antara setiap amalan dan jumlah telur faecal (FEC) menunjukkan bahawa dengan memberi suplemen garam jilat untuk meningkatkan pengambilan tenaga dan protein nampaknya berkesan dalam mengurangkan FEC. Namun, purata FEC juga berkurang dengan penerapan suplemen, penyahcacingan dan pembersihan najis pada kambing. Sebagai kesimpulan, prevalens gastroenteritis parasit di peternakan ladang angkat adalah tinggi dan amalan pengurusan mempengaruhi prevalens PGE di ladang.

Kata kunci: Nematoda, Strongyle, EPG, FEC, L3, ujian-t, ANOVA

## **ABSTRACT**

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfillment of the course VPD 4999- Final Year Project

**PREVALENCE OF PARASITIC GASTROENTERITIS IN GOATS FROM  
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Parasitic gastroenteritis (PGE) is the disease condition caused by infestation of gastrointestinal nematodes (usually strongyle) in the stomach (abomasum and intestine) of the ruminant. Higher infection will cause animals to become progressively ill-thriven and produce signs such as diarrhoea, weight loss or reduced weight gain plus, oedema in chronic cases and sudden death in acute cases which lead to serious economic and welfare implications. This study aims to determine the prevalence of gastrointestinal parasite (PGE) in five selected foster farms of Faculty of Veterinary Medicine, Universiti Putra Malaysia (UPM). Faecal samples were collected per-rectum and a questionnaire regarding selected management practices of the farms were recorded. A total of 60 goat's faecal sample were collected and Strongyle nematode egg count counts as egg per gram (EPG) were determined using

Modified McMaster technique. Pooled faecal culture was conducted for each farms and infective stage larvae (L3) were retrieved and identified genus level. The data analysis was performed through systematic approaches using t-test, and ANOVA. The study revealed that the prevalence rate of PGE that caused by strongyle for selected foster farms of Faculty of Veterinary Medicine was 87% which is higher than 58% prevalence rate reported previously in Peninsular Malaysia. The relationship between each practices and faecal egg count (FEC) revealed that by giving mineral block supplementation to improve energy and protein intake appeared to be effective in reducing FEC. However, mean FEC also reduce with the application of supplement, deworming and manure removal practices in goats. As a conclusion, the parasitic gastroenteritis prevalence in foster farms were high and management practices does affect the prevalence of PGE in farms.

**Keywords:** Nematodes, Strongyle, EPG, FEC, L3, t-test, ANOVA

## 1.0 INTRODUCTION

Small animal production system has changed from small farmer with different types of management towards commercial production practised by many government and private farms (Rajion *et al.*,1993). In rural area, small ruminant production especially goat farming has become as one of the alternatives to raise additional source of income (Azlan *et al.*, 2019). Generally, there is an issue of low goat production, decrease growth rate and incidence of death in goats which mostly due to pathogenic characteristic of gastrointestinal parasite correspond to its high prevalence in goats (Nuraddis *et al.*, 2014). These conditions are usually caused by strongyles which include *Haemonchus*, *Trichostrongylus*, *Oesophagostomum*, and *Cooperia* (Wahab & Adnan, 1992; Khadijah *et al.*, 2014). Bloodsucking nematode which is *Haemonchus contortus* is the major factor causing reduction in goats farming industry (Chandrawathani *et al.*,2009). This is also supported by Nor-Azlina *et al.*, (2011) which stated that the most common and detrimental parasite in both sheep and goats is the *Haemonchus contortus* or the abomasal worm. Percentage of gastrointestinal parasitic infestations in goats were associated with the season, region and age (Gebeyehu *et al.*, 2013). Despite of these factors, different management practices will affect the worm burden (Nor-Azlina *et al.*, 2011). In Malaysia, most study of the prevalence of gastrointestinal parasite were carried out at the East Coast of Peninsular Malaysia and less common in West Coast of Peninsular Malaysia. In recent study, there is no research conducted about the prevalence of gastrointestinal parasite in goats of foster farm, Faculty of Veterinary Medicine, Universiti Putra Malaysia and its association with the effect of selected management practices namely grazing time, mineral block supplementation, type of drug used, breed, source of animal, grass type,

additional feed and drenching personnel. Thus, this study aimed to determine the prevalence of parasitic gastroenteritis and provide the association of different management practices and the prevalence of parasitic gastroenteritis (PGE) in Foster Farm. The results obtained should provide an information to the farmers and veterinary practitioner on how to control and prevent the parasitic gastroenteritis infestation in order to improve goat productions.



## 2.0 LITERATURE REVIEW

### 2.1 NEMATODE INFECTION IN SMALL RUMINANTS

An important helminth group that causes direct damages to the livestock is the gastrointestinal nematode (Yusof *et al.*, 2016). According to Azlan *et al.* (2019), stated that one of the economic and welfare burdens to the global ruminant livestock industry is infections of parasitic intestinal helminths. *Haemonchus contortus*, *Trichostrongylus* spp., *Oesophagostomum* spp., *Ostertagia* spp., and *Trichuris ovis* are the most common species of gastrointestinal helminths found in goats in Peninsular Malaysia (Sani *et al.*, 2004). Nematode species is an important parasite in Malaysia that caused a parasitic disease called gastroenteritis (Jesse *et al.*, 2017). Infestation of gastrointestinal nematodes can result in detrimental effect on animal health and performance particularly in small ruminant production systems. According to Thomas (2008), strongyle is most commonly nematode either singly or in combination and greatest numbers of parasites infection will most likely to exhibit disease sign. However, the most prevalent and highly pathogenic parasite in livestock particularly small ruminants (sheep and goat) is *Haemonchus contortus* and *Trichostrongylus* spp. (Tan *et al.*, 2014). One of the important causes of mortality and morbidity in small ruminants in Malaysia is caused by gastrointestinal nematode referring mainly to haemonchosis (Nor-Azlina *et al.*, 2011).

Gastrointestinal nematodes can infect different ages of small ruminants (goat and sheep). Furthermore, this severe infection will cause low production, high cost of prophylaxis and treatment and death of infected animals that lead to economic losses. Haemonchosis causes anaemia, anorexia, depression, loss of condition, and eventual

death (Miller *et al.*, 2006). This also supported by Jesse *et al.*, (2013) stated the characteristics signs of haemonchosis are usually anaemia and weight loss with no change in fecal consistency.

The infection of parasitic gastroenteritis involved the agent (nematode especially strongyle), host (livestock) and the environment. The agent influenced by a few factors such as short development time which it takes only three to four days for ova to develop into L3, short generation interval where L3 to adult worm development takes only three to four weeks and female *Haemonchus* is a prolific egg producer which it can produce about 5000 to 15000 eggs per day. However, the host affected by a few characteristics such as the age which young grazing animals are susceptible due to immune status where immunity build-up in goats is more than 12 months of age or not at all, genetics (certain breeds are resistance to larval infection), nutritional status (improved nutrition will increase host immunity to build up resistance to infection), hypobiosis (condition where the larvae will stay dormant in host until the outside environment of the host are favors for the them to survive) and pregnancy (condition where animals has low immune system and weak stages to fight the infection). The environment that involves in the development and survival of infective larvae are hot and humid tropics, pasture composition, grazing management, housing system and personnel drenching (Waller & Thamsborg, 2004; Roeber *et al.*, 2013)

Nematode lifecycle consists of direct life cycle. In direct life cycle, the infection acquired by ingestion of free L3. The general life cycle of nematodes, eggs are passed in the manure after produced by adult female parasites in the abomasum or intestines. Before hatching process occurs, L3 develops inside the eggs (Hansen & Perry, 1994).

With conditions of optimum temperature and moisture, infective stages (L3) developed within 7-10 days and moves on top of grasses. Without host, L3 can survive from weeks to months on pasture. Strongyle parasite typically for *Haemonchus contortus* and *Teladorsagia* spp. larvae has the ability to increase the survival and egg production in adverse climatic condition called hypobiosis which contributes to pasture contamination (Roeder *et al.*, 2013). L4 developed in the host within 1-2 days after L3 are ingested and burrow into the intestine. Before L4 return to the surface and molt into adult stage, L4 remain in the tissue for up to 10 days. The whole cycle takes 3 to 4 weeks to be completed (Smith, 2004).

In the host, the parasite will develop in different part of the stomach. For example, in the abomasum, the *Haemonchus* and *Ostertagia* will cause highly proteolytic gastric juice production due to reduction in the functional gastric gland mass. Parietal cells, which produce hydrochloric acid, are replaced by rapidly dividing, undifferentiated non-acid secreting cells. As a result, there will be no hydrochloric production lead to pH changes in the abomasum from pH 2 to pH 7. Activation of pepsinogen to pepsin also cannot be happened. There is also loss of bacteriostatic affect in the abomasum where bacterial flora in gut affected by abnormal conditions. Malabsorption and maldigestion occurs as a result of damage parietal cells or gastric glands. Pepsinogen and plasma proteins (macromolecules) permeability through the abomasal epithelium enhanced when the cell junction in the replacement cells increase lead to loss of intercellular integrity and increase permeability resulting in smooth pass of macromolecules into and out of the epithelial sheet. This condition will cause hypoalbuminemia. However, in the abomasum also there will be blood sucking

activities of *Haemonchus* which can cause acute haemorrhagic anaemia. There will be progressive and dramatic fall in the packed red cell volume after two weeks of infection in acute haemonchosis. In the other parts of stomach such as at crypts, *Trichostrongylus* and *Cooperia* will cause chronic mucosal inflammation leading to protein-losing gastroenteropathy. There will be atrophied villous, gastric gland hyperplasia and mucous cell metaplasia and lead to malabsorption of nutrients, electrolytes and water as well as diarrhoea (Urquhuat *et al.*, 1985).

Studies have been done on the prevalence of gastrointestinal parasite in livestock animals in many countries. Gebeyuhu *et al.*, (2013) reported the prevalence of gastrointestinal parasite in Korean native goats comprised of 67.6% were infected with coccidia, 22.4% by nematodes and 2.1 % by cestodes. *Strongyloides* has heaviest parasitic load which about 23.5% although its prevalence is lower compared to another gastrointestinal parasite. In this study, strongyle group (20.7%) was observed to be most gastrointestinal nematode compared to *Strongyloides* (7.1%) and *Trichuris* spp. (1.7%).

Nuraddis *et al.*, (2014) stated that prevalence rate of gastrointestinal parasite is 89.3% for sheep and 87.1% for goats in and around Jimma Town, western Ethiopia. Among the samples from sheep and goat, *Haemonchus*, *Trichostrongyloid*, *Strongyloid*, *Ostertagia*, and *Paramphistomum* were found with prevalence rate of 39.8%, 25%, 22.7%, 20.1% and 18.8% respectively.

## 2.2 MAJOR NEMATODE SPECIES IN GOAT

According to Tan *et al.*, (2017), goats harboured the highest diversity of gastrointestinal parasite (ten types) which are comprised of Helminth: Strongyle (57.7%), *Moniezia* spp. (5.4%), *Paramphistomum* spp. (4.5%), *Strongyloides* spp. (4.2%) *Dicrocoelium* spp. (2.3%), *Trichuris* spp. (2.3%); Protozoa: *Eimeria* spp. (23.7%), *Entamoeba* spp. (18.8%), *Giardia* spp. (1.9%), *Cryptosporidium* spp. (0.2%), followed by sheep (six types) and deer (two types). Taylor (2007) reported worms species infect sheep identical to those infecting goats with some minor exceptions. The example of the worms are *Haemonchus* spp., *Trichostrongylus* spp., *Oesophagostomum* spp., and *Cooperia* spp. .

A study was done on identification of gastrointestinal helminths infection from goats isolated in a farm in Kuantan, Pahang, Malaysia and showed that the species found were *Haemonchus contortus*, *Trichostrongylus* spp., *Trichuris ovis*, *Oesophagostomum* spp., *Ostertagia* spp., and *Strongyloides papillosus*. An impaired immune system, poor farm management, and uncontrolled anthelmintic treatment suggested to cause high infection of gastrointestinal helminths in this study (Azlan *et al.*, 2019). The most species that cause PGE in goats Malaysia are *Haemonchus contortus*, *Trichostrongylus axei*, *T. colubriformis*, *Oesophagostomum columbianum* and *Cooperia curticei* (Wahab & Adnan, 1993; Khadijah *et al.*, 2014).

*Haemonchosis* is the significant threat of small ruminants (sheep and goat) in tropical and warm temperate zones in terms of health and production according to Besier *et al.*, (2016) and *Haemonchus contortus* is the main parasite. Urquhuat *et al.*, (1985) stated because of their specific location and their large size (2.0 -3.0 cm), the adults

are easily identified grossly. “Barbers pole” appearance produced by the white ovaries winding spirally around the blood-filled intestine are easily recognized in fresh specimens. Male worms have an asymmetrical dorsal lobe and barber spicules while female usually has a vulval flap. Moreover, there are cervical papillae and tiny lancet inside the buccal capsule in both sexes.

The larvae developed piercing lancet before the final moult and blood can be obtained from the mucosal vessels the mucosa due to their blood sucking activities., 0.05 ml of blood per day able to removes by each worm by ingestion and seepage from the lesions so that with 5000 *H. contortus* may cause 250 ml blood loss daily in goat.

*Trichostrongylus colubformis* , *T. vitrinus* and *T. capricola* live in small intestines occurring commonly in goats and sheep. *Trichostrongylus axei* live in the abomasum of ruminants. *Trichostrongylus* is one of the most important causes of parasitic gastroenteritis in subtropics but rarely a primary pathogen in temperate areas. The adult is usually less than 7.0 mm long, small and hair like which difficult to see by naked eye grossly. There is distinct excretory notch in the oesophageal region which the most useful generic character and the worms has no obvious buccal capsule. The spicules of *T. axei* are unequal in length and *T. vitrinus* is leaf-like spicules. Tail of female is bluntly tapered and there is no vulval flap. Heavy infections can cause rapid weight loss and diarrhoea. Low infection levels produce clinical signs such as inappetence and poor growth rates, occasionally accompanied soft faeces. The effects of low infections are often difficult to distinguish from malnutrition.

*Oesophagostomum columbianum* (nodular worm) and *O. venulosum* (large bowel worm) are pathogenic species in goat and sheep and associated with intestine nodule

formation. In many species, there is small buccal and it is surrounded by leaf crowns. If the external crown is present, there is only a narrow opening into buccal capsule due to compression. There is an inflated cuticular cephalic vesicle around the anterior oesophagus terminates in a cervical groove is followed in some species by broad cervical alae. To identified species, the position of cervical papillae and the leaf crown arrangements are used. Clinical signs in chronic infection include inappetence and emaciation with intermittent diarrhoea as well as anaemia as the main signs in oesophagostomiasis. These signs occur primarily in sheep. The main clinical signs of acute infections are severe dark green diarrhoea and there is also a rapid weight loss and submandibular oedema.

According to Taylor (2006), goat worm control is limited to either a programme of strategic anthelmintic treatments or reduce infective larvae exposure by in another way such as zero grazing, delayed turnout, reduction in stocking rates or roughage supplementation because limited availability of clean pasture. There are various options to control worms in small ruminants such as grazing management, anthelmintics, and breeding. Worm burden in goats with good management practices revealed beneficial effects (Nor-Azlina *et al.*, 2011). Rotational grazing management is a success if the farmers consistent in their practice but it has not been well adopted in ruminants farming because of the benefits are not established (Sani *et al.*, 2004). Anthelmintic resistance is one the challenge in livestock animals. However, the most common form of control is chemical deworms which recommended that two drugs rotated per year and strict precautions such as fasting animals before treatment and calculating dosage based on the weight of animals should be applied (Sani *et al.*,

2004). According to Waller *et al.*, (2005), *Haemonchus contortus* reported as the most prominent parasites that causing anthelmintic resistance in all countries of the world that produce small ruminant. Other than that, breeding control is one of the ways to solve the PGE problems. According to Sani *et al.*, (2000), a resistance offspring produced by mating the resistant individuals will cause low infection of PGE of the animals.



### **3.0 MATERIALS AND METHOD**

#### **3.1 SAMPLES COLLECTION AND STORAGE**

Faecal samples were collected per rectum from total of 60 goats that are randomly selected from five selected foster farms of Faculty of Veterinary Medicine, Universiti Putra Malaysia. The faecal samples was placed in a in small and clean plastic and labelled accordingly. The samples then kept in an airtight box cooler with dry ice packs and transported on the same day to Laboratory of Parasitology, Faculty of Veterinary Medicine, Universiti Putra Malaysia and then kept at 4°C for a maximum of 48 h before analysis.

#### **3.2 MCMASTER TECHNIQUE**

Two grams of the faecal sample were mixed thoroughly with 60 ml of sodium chloride (NaCl). Then, the solution will be stirred and emulsified thoroughly using a spatula. The faecal suspension will be filtered by using a sieve or double layer of cheesecloth into the second container. Next, the filtrate will be stirred in the second container with a Pasteur pipette. A sample of the mixture will be withdrawn and transferred to one of the chambers of the McMaster slide by using a pipette. The counting chamber will be stand for 5 minutes for the egg to float while debris to fall to the bottom of the chamber. The counting chamber will be examined within gridded of both sides of the chamber and observed under a light microscope at 10x and 40x magnification. The faecal egg count will be calculated as egg counted divided by the weight of faeces multiply by the volume of saturated sodium chloride (NaCl) used divided by 2(0.15ml).

### 3.3 FAECAL CULTURE

The faeces will be wrapped in gauze and be suspended in lukewarm water. Most of the third stage infective larvae will be appear after seven days of incubation of the faecal culture at room temperature. Each type of the larvae identified will be expressed in percentage. At least 10 larvae will be identified and times by 10 result in percentage. The procedure conducted by ten grams of goat's faeces weighed and break up in a bottle. Two millilitre (mm) of distilled water will be added if the faeces is too dry. Besides, vermiculite or sterile faeces will be added if it is too moist or diarrhoeic until it is of normal consistency. The surface of the culture will be tapped lightly and the inside of the bottle will be wiped clean. Then, a piece of cotton gauze will be tied over around the mouth of the bottle with a rubber band. The gauze will be moistened with distilled water. In order to keep the gauze and the culture moist, the culture will be kept in room temperature and checked daily. The gauze will be removed after seven days and the bottle will be filled with lukewarm water until meniscus is formed. A petri dish will be placed carefully on the meniscus over the mouth of the bottle. The petri dish and bottle will be inverted. Petri dish will be filled with more lukewarm water. To allow the active larvae to migrate out into petri dish, the inverted bottle will be left for five minutes. Some larvae will be transferred onto glass slides with pipette. A drop of the diluted Lugol's iodine will be added onto the glass slides. A coverslip will be placed and the larvae found will be differentiated under 40x objective of the compound microscope.

### 3.4 STATISTICAL ANALYSIS

The prevalence of parasitic gastroenteritis in goats from selected foster farms of Faculty of Veterinary Medicine, Universiti Putra Malaysia, Selangor was determined using Microsoft Excel 2016. The relationship of faecal egg count (FEC) of strongyle and the selected management practices were analyzed using student t-test and ANOVA (IBM SPSS statistic version 25.).



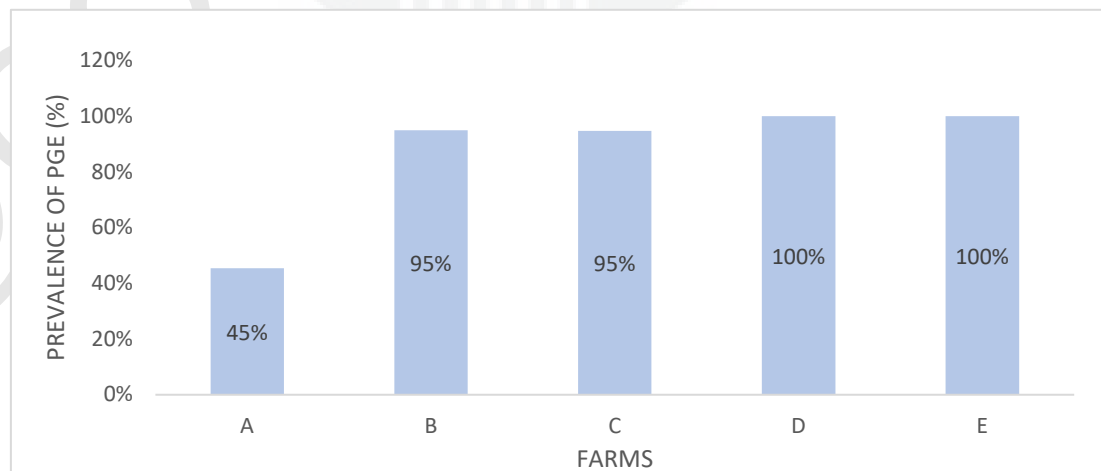
#### 4.0 RESULT

All five Foster Farms of FPV, UPM were positive with PGE. The overall prevalence of PGE in Foster Farms, FPV, UPM was 87%. From 60 goats examined, 52 were positive for strongyle. Higher prevalence rate affected by the higher number of animals positive with strongyle eggs per total number of animals sampled in each farm. The highest prevalence of PGE is 100% which noticed in Farm D and Farm E. The lowest prevalence rate of PGE is 45% showed in Farm A (Refer to Table 1 and Figure 1).

Farms	Total no of goats	Positive Strongyle	Negative Strongyle	Total sample	Prevalence of Strongyle
A	20	5	6	11	45%
B	48	19	1	20	95%
C	40	18	1	19	95%
D	25	4	0	4	100%
E	11	6	0	6	100%
A+B+C+D+E	144	52	8	60	87%

Table 1: Prevalence rate of PGE eggs measured as EPG in five goat's farms

Figure 1: Prevalence rate of PGE based on strongyle infection in goats of each farms



From the PGE infection analysis, graph bar chart has been created. The chart showed comparison between each Foster Farms, FPV, UPM regarding the infections of strongyles lead to occurrence of PGE (Figure 1).

TABLE 2: Management practices adopted by farms and their mean FEC

Farm no./Management practices	A	B	C	D	E
Farming system	Semi-intensive	Intensive	Intensive	Intensive	Intensive
Source of goats	Local	Local	Local	Local & Australia	Local
Diet	Pasture (cut & carry)	Pasture (fresh and cut & carry)	Pasture (fresh)	Pasture (cut & carry)	PKC
Mineral block supplementation	Not given	Not given	Given	Given	Given
Additional feed	Not given	Given	Not given	Not given	Not given
Drenching personnel	Veterinarian	Veterinarian	Veterinarian	Farmer	Veterinarian
Manure removal	2 times a day	Once in 2 days	2 times a day	Once a week	Once a day
Type of flooring	Slatted, wood	Slatted, wood	Slatted, wood	Slatted, wood	Slatted, wood & concrete
Breed	Mix breed	Mix breed	Mix breed	Boer cross	Boer cross
Deworming	No	No	No	Yes	Yes
Supplement	Not given	Not given	Not given	Given	Given
Pen cleaning	2 times a day	Once in 2 days	Once in 2 days	Once a day	Once a day
Vaccination	No	No	No	No	Yes
Mean FEC (SE)	222.73 (107.738)	822.50 (150.634)	305.26 (100.793)	265.00 (137.204)	243.17 (80.354)

Data on management practices adopted by the owners on the five farms were obtained from a survey based on questionnaire. Questionnaire is an inexpensive, efficient and quick way to gather data from the farmers by asking them a question. The management

practices chosen in this study were farming system, source of animals, type of diet, mineral block supplementation, additional feed given, drenching personnel, manure removal, type of flooring, breed, deworming, supplement, pen cleaning and vaccination status. For farming system, two categories were involved: namely semi-intensive and intensive. The goats were sourced locally within Malaysia and also outside Malaysia, mainly Australia. Type of diet given divided into four categories which are using pasture (fresh only, cut and carry only, fresh and cut and carry) as well as PKC only. Mineral block supplementation additional feed and supplement were categorized into given and not given. The mineral blocks were available ad libitum to all the animals in three farms. Additional feed given contained of chopped and unchopped oil palm fruit and cut “daun balik angin”. The types of drugs supplements were multivitamin, Vitavet and Cartosan. The manure removal practices were applied in all farms. Most flooring types used by the five Foster Farms were slatted and wood floor. The breed of goats raised in five farms were mainly mix breed and Boer cross. Deworming and vaccination were divided into yes and no categories. The Department of Veterinary Services (DVS) staff or farmers drenched the goats (Table 2). Farm A has a lowest mean FEC which was 222.73 (SE= 107.738) epg while Farm B has the highest mean FEC that was 822.50 (SE=150.634) epg.

Table 3: The relationship between management practices and FEC

Management practices		n (goats)	Mean FEC (epg)	Standard error	Sig.
Farm system	Semi-intensive	11	222.73	107.738	0.184
	Intensive	49	505.49	82.304	
Mineral block	Given	29	286.86	69.427	0.001*
	Not given	31	609.68	115.712	
Goat source	Local	56	467.13	75.483	0.328
	Local, Australia	4	265.00	137.204	
Breed	Mix breed	50	494.00	83.344	0.028*
	Boer cross	10	251.90	68.374	
Drenching personnel	Farmer	13	281.54	92.034	0.105
	Veterinarian	47	501.26	86.333	
Deworming	Yes	29	286.86	69.427	0.001*
	No	31	609.68	115.712	
Age	<1 year	33	467.24	80.810	0.142
	>1 year	27	437.04	125.280	
Supplement	Given	10	251.90	68.374	0.028*
	Not given	50	494.00	83.344	

Table 4: Analysis of variance (ANOVA) of the selected management practices

Source of variation	Df	Mean square	Sig.
Manure removal	3	1362218.606	0.002*
Mineral block supplementation	1	1561409.428	0.022*
Deworming	1	1561409.428	0.022*

The systematic approaches were used for data analysis using IBM SPSS Version 25 because most of the practices were measured at the farm level. Statistical test such as t-test used to compare mean of two groups in order to know whether two groups are different from one another. Moreover, analysis of variance used to compare mean between two or more unrelated groups and if there is any statistically significant between the groups. Therefore, it was presumed that there might be a high relationship between management practices. To determine the effect of these practices on the FEC of strongyle, a systematic approach was developed. Therefore, FEC associated with management practices was evaluated using t-test (Table 3). Other than that, the analysis of variance was performed to assess the significance of each of the practices, which association significance was considered at alpha equivalent to 0.05 (Table 4).

The first analysis using t-test revealed that mineral block supplementation, breed, additional feed, deworming and supplement were associated with FEC. By giving mineral block, deworming and supplement affect the low number of mean FEC with significant of less than 0.05 (Table 3). However, in ANOVA which was used to assess the relationship between each practice while controlling for the other practices showed that manure removal, mineral block supplementation, additional feed and deworming were significantly associated with FEC (Table 4).

Table 5: Percentage of larval population in selected Foster Farms of FPV, UPM

Farm	L3 strongyle type	Percentage (%)
A	<i>Haemonchus</i> spp.	50
	<i>Cooperia</i> spp.	40
	<i>Oesophagostomum</i> spp.	10
B	-	-
C	-	-
D	<i>Hemonchus</i> spp.	80
	<i>Cooperia</i> spp.	20
E	-	-

Three species of strongyle were recorded in Farm A and two species found in Farm D, although in other 3 farms no species was discovered. The species identified from the cultures were *Haemonchus* spp., *Cooperia* spp., and *Oesophagostomum* spp.. The most dominant species in Farm A and farm D was *Haemonchus* spp., which comprised about 50% and 80% respectively followed by *Cooperia* spp. which comprised only 40% and 20%. *Oesophagostomum* spp. was the least common strongyle which comprised only 10% respectively of worm cultures (Table 5).

## 5.0 DISCUSSION

The present study presented prevalence of PGE in five Foster Farms in FPV, UPM and the management practices associated with the prevalence. The faecal egg count (FEC) in the present study are lower than previous reports of studies conducted in Malaysia. For example, Khadijah *et al.*, (2014) reported mean FEC was high in goats from two farms in Terengganu and it is in line with Nor-Azlina *et al.*, (2011) showed that mean FEC was also high for goats in Terengganu followed by Chandrawathani *et al.*, (2011) stated that mean FEC was also high for goats in Perak. However, 500 epg of faecal egg count is generally considered high where treatments are required to reduce pasture contamination and subclinical diseases. Thus, despite having lower FEC as compared to other studies, anthelmintics. The overall prevalence of PGE in five Foster Farms, FPV, UPM was 87%. This study shows higher prevalence rate of PGE. This is because strongyles were most prevalent gastrointestinal parasites among goats (66.5%) and sheep (80.0%) reported by Tan *et al.*, (2017).

Farm A shows the lowest prevalence of PGE which about 45% as well as lowest mean FEC which was 222.73 epg. However, Farm D shows 100% prevalence of PGE with the highest mean FEC of 822.50 epg. These two farms applied different management practices which lead to different results. Type of diet, manure removal and pen cleaning were the major causes that affect the low and high number of mean FEC based on Table 2. Farm A applied practices by giving cut and carry pasture to the goats while Farm D giving mix of fresh as well as cut and carry pasture. In the life cycle of the *Haemonchus contortus*, after the eggs of *Haemonchus* passed in faeces, it will hatch into a few stages and then develop into infective stage (L3). L3 able to travel in

a few distances and move on the top of the grass and reside in dew or water film until it will be ingested by the host (Ehsan *et al.*, 2020). Therefore, fresh pasture is not advisable to be given to the animals because it contains moisture where the parasite can survive at the pasture for three to four weeks. This is supported by David (2010) where pasture safer for sheep and goats if it is exposed the pasture to sunlight for three to four weeks because it will kill many of the remaining parasite larvae. Hygiene practices such as manure removal and pen cleaning are very important factors that will be one of major cause of PGE infections. These parasites introduced into the host by feed contamination with faecal matter where parasite reside in it. Other than that, larvae also can be spread by animals if the animals contaminated the grass or feed by walking or stepping onto nearby grass or feed with their feet that already been contaminated with faeces. Therefore, increase the frequency of manure removal and pen cleaning will reduce the number of mean FEC. Other than that, David (2010) also stated transmission of parasite can be limited by regularly clean the water container or bowls and discard the spilled feed, compost or fed to other animals such as horses, pigs, or poultry.

According Mitchel (2005), host ability to cope with parasitism effects and to overcome parasitism depends on adequate nutrition provided. This is supported by David (2010) where he stated that poor nutrition will lead to weak host and it is important to feed the host with adequate amount of proteins. According to Nor-Azlina *et al.*, (2011) energy and protein intake appeared to be effective in reducing FEC by giving mineral block supplementation. This is in line with this present study where by giving mineral block and supplement will reduce the mean FEC significantly. Knox and Steel (1996)

stated urea-molasses blocks supply nitrogen and essential minerals which aid the host to resist infection and it is also confirmed by other studies (Waruiru *et al.*, 2003; Waruiru *et al.*, 2005). Supplement the animal with vitamin and mineral such as vitamin, selenium, copper and zinc properly will enhance the immunity by increasing resistance to infections and by decreasing severity of infection (Smith *et al.*, 1984). Since goats are more susceptible to helminthiasis in compared to sheep (Sani *et al.*, 2004), thus anthelmintics need to be applied in order to control the worm burden. However, there were many reports stated of anthelmintics resistance from other previous studies. The factors that lead to emergence widespread of anthelmintics resistance are wide availability of major group of anthelmintics combined with subsidies from government for supporting animal health. Thomas (2008) reported that by giving the correct dose, correct time and correct drugs will lead prevent the resistance. Present study shows management practices such as mineral block, deworming and supplement will affect the number of FEC and this is supported by Sani *et al.*, (1995) which noted the establishment of new infections will be reduced effectively with improved nutrition by blocks, anthelmintic and supplement application.

According to Azlan *et al.*, (2019), larvae identification is very important in order to know the severity and to suggest for prevention measure. This is because *Haemonchus* is a blood sucking parasite which one worm can feed on 0.05 ml blood per day causing severe loss of blood. According to previous study, Wahab & Adanan, (1992) stated *Haemonchus contortus* was the most dominant species which comprised of 46% of the total whole nematode population of goats and this is in line with present study

which the percentage of *Haemonchus* is the highest in two farms which are Farm A and Farm D. The least common in the previous study were *Trichostrongylus* and *Cooperia* spp. which about 10.4% and 7.0% respectively but in this study the second highest dominant species is *Cooperia* spp. the result should show low number of *Cooperia* spp. because according to Kates (1947), *Cooperia* has always been considered poor egg producer. Error of the results might be because of human errors where it is hard to differentiate each genus of the larvae under the microscope. There were few farms which Farm B, C and E that the percentage of larvae population unable to be obtained. Conditions such as inadequate moisture provided, unfavorable temperature and low number of faecal egg count leads to unsuccessful culture. Thus, unsuccessful culture will result in absence of L3 larvae or presence but with low number of L3 larvae.

## 6.0 CONCLUSION

The five selected Foster Farms, Faculty of Veterinary Medicine, Universiti Putra Malaysia high prevalence rate of parasitic gastroenteritis that caused by strongyle in goats with all of the five Foster Farms were positive for PGE and the most dominant strongyle is *Haemonchus contortus*. This is because the female *Haemonchus* is a prolific egg producer which it can contribute to 5000-15000 eggs per day. Management practices applications such as mineral block supplementation, deworming, supplement and manure removal affect the mean FEC. Mineral block supplementation and supplement provides nutrient to the goats and help in to improve the immunity in order to fight against the PGE infection. Furthermore, deworming and hygiene of farm aid in to avoid or control the infections of PGE. Thus, management practices do affect the prevalence of PGE caused by strongyle in Foster Farms, FPV, UPM.

## **7.0 RECOMMENDATION**

Future studies should increase sample size with good representative sample for each farms and balance number of farms in different management system which are intensive, semi-intensive and extensive system in other to prevent bias result. Other than that, animal health assessment is required for parasitic infections relation so that the relationship between the clinical signs and mean FEC can be obtained.

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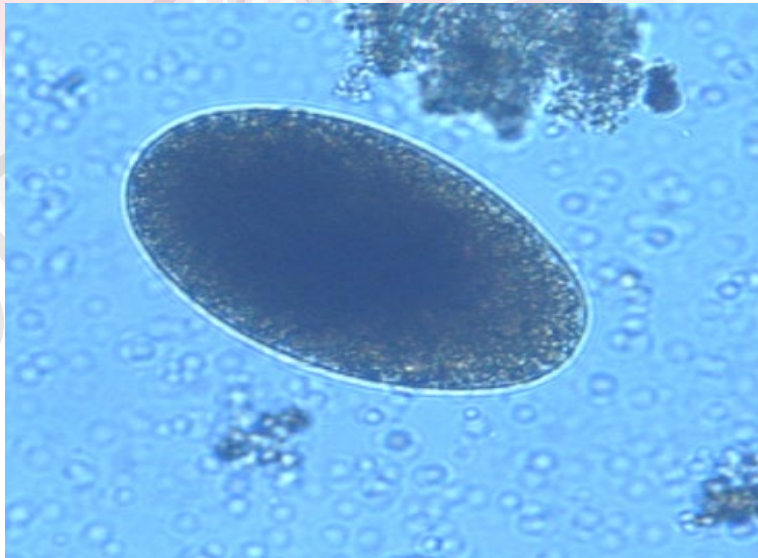
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## APPENDICES



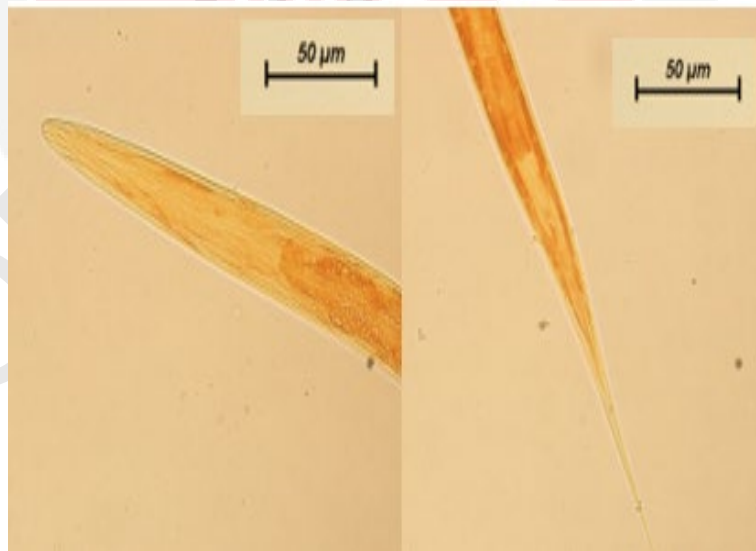
One of Foster Farms, FPV, UPM for sampling



Strongyle egg



L3 larvae of *Haemonchus contortus* under 10x magnification



The head and tail characteristics of *Haemonchus contortus* larvae under 40x magnification