A Report on

Prevalence of Helminths Parasites in Mules of Brick Kiln of Lalitpur District

Submitted By:

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Abstract

Internal and external parasitic diseases are a common health problem in both domestic and wild animals. Parasitic infection decreases the performance, production and productivity in the animals mainly in the reduction of body weight or failure to gain weight or even increases the mortality in acute cases. A study was conducted in April to July 2009 to determine the prevalence of endoparasites in the mules of six different brick kilns of Lalitpur district. A total of 60 samples including 10 samples from each area were taken for the study. The samples were examined qualitatively by sedimentation and floatation method. The laboratory work was executed at department of parasitology in Himalayan College of Agriculture Sciences and Technology (HICAST), Bhaktapur. The findings revealed the parasitic prevalence of 45 % and the highest prevalence seen in the animals of age group 11 years and above. The findings provided the baseline idea on parasitic burden in mules and open avenues to formulate appropriate strategies to mitigate the endoparasitic problem in mules. It is recommended to deworm all mules/donkeys of ***Animal Nepal*** *supported area every three months, full dose with broad spectrum antehelminthics as the continuous heavy work makes them feeble and immuno compromised.*

Key words: Endoparasites, helminthes, fecal examination, mules, brick kilns

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ACRONYMS

AGDP	Agricultural Gross Domestic Production
APP	Agricultural Prospective Plan
B.V.Sc & A.H.	Bachelor of Veterinary Science and Animal Husbandry
CBS	Central Bureau of Statistics
CVL	Central Veterinary Laboratory
DLS	Department of Livestock Services
GDP	Gross Domestic product
Ha	Hacter
HICAST	Himalayan College of Agricultural Sciences and Technology
INGO	International Non Government Organization
LGDP	Livestock Gross Domestic Products
Masl	meter above sea level
MOAC	Ministry of Agriculture & Co-operative
NGO	Non Government Organization
VDC	Village Development Committee
VEC	Veterinary Epidemiology Centre

CHAPTER ONE

INTRODUCTION

1.1 Background

Equines as a means of transport for men and material provide livelihood to a number of rural and semi-urban populace of Nepal. They have a prominent position in the agricultural systems of many developing countries. It is suggested that donkeys can play a great role in the frame works of food security and social equity of high food insecure countries. In areas away from roads, many Nepalese use mules or yaks to transport food and other supplies to villages. Groups of 20 or so mules form a mule train, which is driven by one or two people. These mules are primarily used for domestic good transport in the track of high and mid mountain of Nepal where surface road transportation and air transport is not easily assessable. Inside the valley of the capital, mules are being recently used to carry raw bricks from filed to the oven. These animals not only provide the alternative entrepreneurship in these regions but also provide alternate employment opportunity in this area. Most of the mules being used in Nepal they are being brought from neighboring part of India. Very few of them are natively breeded (Karki & Manandhar 2006). Even though mules/donkeys have often been described as sturdy animals, they succumb to a variety of diseases and a number of other conditions. They do suffer from a number of diseases. Parasitic infestation is a major cause of illness. Documentation of parasitic infestation of equines in our country is lacking.

Horses have 64 chromosomes, while donkeys have 62. When horses and donkeys are mated, the mule offspring have 63 chromosomes. The gestation period in donkeys is 12 months on average, but it may vary from 11 to 14 months. Despite being considered sterile, mare mules and mare hinnies will have estrus cycles. These cycles can be regular, or erratic and variable. Female hinnies and mules can be used as embryo transfer recipients but care must be given to compatibility of donor and recipient. There have been documented cases of fertility in the female mule but not the female hinny. Donkeys and mules can survive on coarser pastures than a horse. Lush pastures suitable for horses may be too rich in protein and energy and, therefore, unsuitable for donkeys. Dry matter intake of feed as a percentage of body weight should be 1.75%-2.25% to meet the metabolic demands for maintenance for most donkeys and mules. Animals that are pregnant, nursing, growing, or used for heavy work, will have additional feed requirements (rolled oats, grain, hay or pasture) above their maintenance requirements.

There are estimated to be 50 million donkeys (*Equus asinus*) and as many mules worldwide. They can be used for such applications as riding, driving, flock protection, companion, breeding, and training calves. Donkeys and mules are not small horses. They have anatomical and physiological differences compared to horses and their care requires special consideration. Structural differences compared to horses mean that they require specialized tack and harness for riding and driving.

There were about 20,000 horses and 6,000 mules and asses in Nepal in 2004 (Central Bureau of Statistics, 2004). There has been a gradual decline in equine population in Nepal since 1980’s due to road construction, decline in grassland and forest area and to

some extent due to availability of air transport. Most of these horses and mules are used for transport in various remote districts of mountain region of Nepal such as Jumla, Humla, Kalikot, Dolpa, Mugu, Mustang, Manang, Bajang, Bajura, Rasuwa, Taplejung etc and in Kathmandu mules are used in brick kilns for draft purpose (Sharma, 2005). Mules get a preference over hill ponies because of their greater strength, sure-footedness and sturdiness. The donkeys are also used for breeding to produce mules. The mules are produced by crossing donkeys (Jack) with mares.

Lalitpur district, a part of Bagmati zone, spreads from valley to hills. The district, with Patan as its district headquarters, covers an area of 385 sq km and has a population of 337,785 people (CBS, 2001). The elevation ranges from 1262 -2731 masl. The temperature averages 1.1˚C in winter and 31.5˚C in summer and the annual rainfall is 176.4mm.

Equine endoparasites may be divided into three categories: nematodes, or roundworms; cestodes, or tapeworms; trematodes, or flukes. Parasites are assigned to these categories according to their morphology, or structure. Growth and life cycles of parasites within each group are generally distinct from those of the other groups. The roundworms are by far the most economically important internal parasites of equines.

Nematodes, or roundworms, are elongated, cylindrical, and tapered at both ends. Adults of this class range from 5 millimeters to more than 50 centimeters in length. They have a complete digestive tract and a tough, elastic, skin-like cuticle. The mouth area may be specialised for attaching to or feeding on the host. For example, the large strongyles (*Strongylus* species) have mouth capsules with teeth to perform such functions. Males of certain species of nematodes attach to females for mating by using a structure called a bursa. This is a posterior expansion of the cuticle or skin, which is bell-shaped or funnel-shaped and supported by finger-like projections called rays. Mating is also assisted by structures called spicules, used by the male to hold open the genital orifice of the female. The shape and arrangement of the male bursa and spicules vary from species to species and are frequently used to identify different nematodes.

Tapeworms, or cestodes, are flat, ribbon-like organisms that live most often in the small intestine of their host. The head, or scolex, of the tapeworm has suckers, hooks, or a combination of suckers and hooks used to attach the worm to the wall of the intestine. Proglottids (tapeworm segments) are generated from the scolex. In some species, the strobila or body of the worm may become several meters long. Each mature proglottid is a complete functional unit, incorporating a digestive system, organs of both sexes, and other organs. This phenomenon of both sexes in one body is known as hermaphroditism. Cestodes absorb nourishment directly through their tegument from the gut contents of the host animal.

Flukes, or trematodes, are characteristically flat, unsegmented worms. The equine intestinal fluke, found in Africa and India, is saucer-shaped. Suckers are located at the

front and back of the fluke and are used as organs of attachment to the host. Horses are sometimes infected by the common liver fluke, *Fasciola hepatica*.

In Nepal working donkeys and mules provide an important alternative to mechanisation in resource-poor communities but very little is known about their helminth status, or about the impact of helminths on their work output. The aim of this study was to investigate the helminth status of working donkeys/mules in brick kiln of Lalitpur district

1.2 Rationale/justification of the study

Parasites and diseases can take a toll on both individual animal and on herd populations in general. An understanding of both the biology of the organisms involved and the methods of transmission helps to determine the significance of these types of infections in animals. Monitoring equines numbers and habitat condition as well as ascertaining parasite and diseases surveillance becomes extremely important in maintaining adequate numbers of healthy equines. In Nepal there had been very less studies on endoparasites in horses which may be one of the factor in declining population of the equines. Parasitic infection decreases the production and productivity in the animals mainly in the reduction of body weight or failure to gain weight or even mortality in acute cases. Very few studies had been conducted in Nepal to determine the potential losses in equines population. Thus, a need is felt to conduct a study regarding parasitic prevalence and its control which gives the suggestive guideline for vet-practitioner .In addition, the role and importance of horses for parasitic transmission and their significance in the continuity of some zoonotic diseases can be investigated.

1.3 Limitations/ constraints of the study

The purposed study includes the limited sample animal population of the area. Though strong effort will be made to make the sample population representative of the study population with all known statistical principles, sampling error may exist. As this study will be conducted within the limited time period among sample animals, it provides fair idea on prevalence only. The fecal samples might be of the same animals and delineation of feces with species is also difficult. However all efforts will be made to fulfill the objective of study.

1.4 Literature review

The main endoparasites in equines are *Ascaris equirom, Parasacaris euirom, Strongylus spp , Trichonema spp., Triodontophorus tenicolluis, Anoplocephala spp., Gastrodiscus aegyptiacus, Strongloides westeri, Dictyocaulus arnfieldi, Oxyuris equi, Paranoplocephala mamillana* (Soulsby, 1978). Threadworm occurs mainly in foals especially when suckling. Infection comes from the dam causing debilitating diarrhoea. Roundworms especially in foals tend not to damage the gut but compete for food leading to poor development. Severe infestation can cause dangerous colic. Eggs are viable in soil for a very long time. *Dictyocaulus arnfieldi* is commonly known as equine lungworm (Slender worm, 25 to 70 mm. long). It has a direct life cycle. The larvae penetrate the wall of the horse’s intestine and are carried by the circulatory system to the lungs, where they break through the blood vessels into the lungs and develop to adults. The prepatent

period is 5 to 6 weeks. Its predilection site is bronchi and bronchioles. The parasite is worldwide in distribution, particularly in areas with heavy rainfall. Donkeys are a common host and may, in some areas of the world, be the reservoir of infection for horses. D*ictyocaulus* does no damage if only a few are present, but large numbers of lungworms can cause death. Lungworms are significant only in areas with heavy rainfall.

Strongyles (Encysted small redworm larvae & migrating large redworm) are found in large intestine wall cause damage leading to bleeding, poor condition and anaemia. Bots damages stomach. Eggs are visible during summer stuck to hair typically on lower legs. They appear as white/cream tiny grains. Wiping off with a wet sponge/cloth before they get licked off and ingested. Lungworm migrates through the body to the lungs doing damage and causing permanent respiratory problems. Tapeworms infest the Ileum and small Intestine.

Karki and Manandhar (2006) determine the prevalence rates and found associations between the acute sudden death of mules with colic symptom and parasites burden. A total of 33 faecal samples were collected randomly for qualitative and quantitative faecal analysis. The parasites encountered were *Strongyle* (100%), *Parascaris equorum* (50%), *Oxuris equi* (3%) and *Fasciola* (1.5 81.7% of mules sampled were severely infected, 8.3% heavily, 3.8% moderately and 6.2% mildly infected. Mixed infections were detected in 54.8% of the mules.

Paudel (2007) found the prevalence of gastrointestinal parasites as 80.48% (33/41) with *Strongylus* (48.78%), *Trichostrongylus* (31.70%), *Parascaris* (21.95%), *Trochonema* (17.07%), *Gastrodiscus* (7.31%), and *Habronema* (4.87%) in horses of Sainik stud farm Chitwan. The EPG count of Strongylus ranged between 200 and 800.

A study of parasitic infestations in equines under unorganized husbandry practices was carried out in Kashmir valley of Jammu & Kashmir state by faecal samples examination. The overall infestation was found as high as 93.26%. *Trichonema sp.* (96.78%) dominated other types of parasites, *Strongylus sp*. (81.19%), *Triodontophorus sp*. (41.39%), *Dictyocaulus sp*. (14.10%), *Oxyuris sp.* (9.40%), *Paranoplocephala sp*. (8.14%), *Strongyloides sp.* (6.19%), *Parascaris sp*. (4.01%), *Amphistome sp.* (0.91%) and *Eimeria sp.* (0.34%) were also recorded (Pandit, Shahardar & Jeyabal, 2008).

Uslu and Guclu(2007) found parasites in 100% of horses and donkeys in konya region in Turkey. Among the parasites determined in horses, the prevalence of *Strongylidae*, *Parascaris equorum*, *Strongyloides westeri*, *Fasciola sp*., *Anoplocephalidae*, *Oxyuris equi*, *Trichuris sp*., *Dicrocoelium dendriticum*, *Eimeria leucart*i, and *Eimeria sp*. was 100%, 10.81%, 7.2%, 3.6%, 2.7%, 1.8%, 0.9%, 0.9%, 4.5%, and 12.61%, respectively. In donkeys, the prevalence of *Strongylidae*, *S.westeri*, *P. equorum*, *Fasciola sp*., Anoplocephalidae, *Oxyuris equi*, *Dicrocoelium dendriticum*, *Eimeria leucarti*, and other *Eimeria sp*. was 100%, 12.34%, 9.8%, 6.17%, 6.17%, 1.23%, 1.23%, 3.7%, and 22.22%, respectively. According to faecal cultures, the prevalence of *Strongylus vulgaris*, *Strongylus edentatus*, *Trichonema sp*., *Triodontophorus sp*., and *Poteriostomum sp*. was 31.53%, 17.11%, 58.55%, 6.3%, and 5.40% in horses, respectively, and 23.45%, 14.81%, 74.07%, 4.93%, and 2.46% in donkeys, respectively.

Kuzmina & Kuzmin (2008) studied the species composition of the strongylid community of donkeys and explore the influence of anthelmintic treatments on the community structure. Seventeen species were found in donkeys studied: 16 species of Cyathostominae and 1 of Strongylinae. Between 2 and 7 species were found per donkey (average of 4.2 ± 2.8). Cyathostomum tetracanthum, C. catinatum, Cylicocyclus nassatus, Cylicostephanus goldi and C. longibursatus) dominated in the community; they were found in 80-100% animals studied and comprised 91.7% of the total number of strongylids collected. Two species C. tetracanthum and Cylicocyclus auriculatus were found to be specific for donkeys. The results obtained showed a reduction of the species richness of the strongylid community in donkeys caused by lack of grazing and by regular anthelmintic treatments.

Over a period of 1 year from 1999 to 2000, fecal and blood samples and external surfaces of 290 racehorses on 20 private horse farms were examined for parasitic infections in Iran. The alimentary canal was the only infected organ found. Fecal examination using a flotation method and saturated solution provided an indication of the *Parascaris equorum, Oxyuris equi*, and *Strongyle* eggs in 13.8%, 17%, and 28.3% of tested samples, respectively (Eslami, Bokai & Tabatabhai, 2000).

Mattioli (1993) studied the prevalence of gastrointestinal strongyles and level of strongyle egg outputs in relation to husbandry practices in the draught donkey population in The Gambia. Feeding regime, number of working hours per day and overnight penning practices of donkeys affected significantly ($P<0{\cdot}05$) the level of gastrointestinal strongyle egg output. Dual trypanosome and gastrointestinal strongyle infection significantly reduced the PCV ($P<0{\cdot}001$). Animals positive for gastrointestinal strongyles alone did not show a significantly ($P>0{\cdot}05$) lower PCV than those found negative.

Faecal samples collected from fifty-four stallions, in eleven randomly selected horse stables within Sokoto metropolis were analysed using the direct faecal smear, flotation method and modified McMaster techniques. The helminth ova identified were those of *Ascaris* sp, *Strongylus* sp, *Strongyloide* sp, *Panaplocephala* sp, *Dictyocaulus* sp, and *Gastrodiscus* sp. 84.4% of the samples examined were positive, out of which *Strongylus* sp. Ova had the highest (75.5%). Eggs of *Oxyuris* sp were not seen. This study of horses in Sokoto metropolis is aimed at having an insight into the most prevalent gastrointestinal helminthes and recommendations were made towards improving the health and management of horses (Alayande, Onakpa & Lawal, 2003).Yoseph et al (2001, cited by Karki 2006), Mulate (2005, cited by Karki, 2006) and Fikru et al (2005, cited by Karki, 2006) reported 100%, 100% and 98.2% helminthes prevalence in donkeys of Wonchi, high lands of Wollo province and western highlands of Oromia, respectively .

Annual Technical Report of Central Veterinary Laboratory (2005/2006) documented 7 positive cases of *Strongyles* during the months of December- January.

1.5Objectives

1.5.1General objective

To find out the prevalence of endoparasites in the mules of Lalitpur.

1.5.2Specific objectives

- To find the helminthes species in the mules/equines.
- To find age wise and sex wise prevalence of parasites.

CHAPTER TWO

METHODOLOGY

2.1 Site of study

The study area was the different brick kilns of Lalitpur.

2.2 Sampling of animals

Opportunistic fresh fecal samples were taken from 60 mules including 30 samples from each sex. The samples were kept in clean plastic bags. The plastic bags containing samples was kept in icebox and transported to parasitology laboratory of HICAST.

2.3 Qualitative fecal examination

The qualitative parasitic investigation was carried out through different methods as per Urquhart (1998).

2.3.1 Sedimentation method

About 3 gm of grinded fecal sample will be placed in 100 mL beaker and water will be added. The mixture will be poured through a tea strainer and the material left in the strainer will be discarded. After 25 minutes supernatant will be discarded and refilled with fresh water until the supernatant is cleared. Then sediment left in bottom will be examined under microscope.

2.3.2 Differential flotation method

About 3 gm of grinded fecal sample will be placed in 100 mL beaker and water will be added. The mixture will be poured into a beaker containing clean water through a tea strainer and the material left in the strainer will be discarded. After 25 minutes supernatant will be discarded and refilled with fresh water 2-3 times until the supernatant being cleared/fresh. Then, the sediment content will be mixed with 10-20 times (42mL) of its volume of saturated common salt solution (380 gm of NaCl/ L of water having specific gravity of 1.2) for nematode and cestode and that of the Zinc Sulphate (830gm/ L of water with sp. gr. 1.3) for trematodes. It will be allowed to stand in a specimen tube for 30 minute. The surface will be touched with cover slip and transferred to a grease free slide and examined under microscope.

CHAPTER THREE

RESULT AND DISCUSSION

3.1 Management Status

Management systems consisted of donkeys which were kept in a small yard at during night, grazing on holiday (once a week) and somewhere after and before work and work from 7 am to 5 pm all day. They were fed bran, maize and wheat flour, wheat stalk. The mules are housed in a loose housing system on ground floor with a raised manger.

The mules and donkeys are vaccinated with tetanus toxoid vaccine only.

Donkeys are affected by several different parasites or worms, and must be dewormed regularly. The interval between routine worming depends on the type of antihelminthics used and local epidemiology.

3.2Overall Prevalence

Out of 60 randomly selected samples 27 samples were positive for parasites of different species showing a prevalence of 45%. The findings is much lower than that made by Karki and Manandhar (2006) in mules of Udayapur and also lower than that observe by Poudel (2007), who found the parasitic burden much higher about 80.48%.

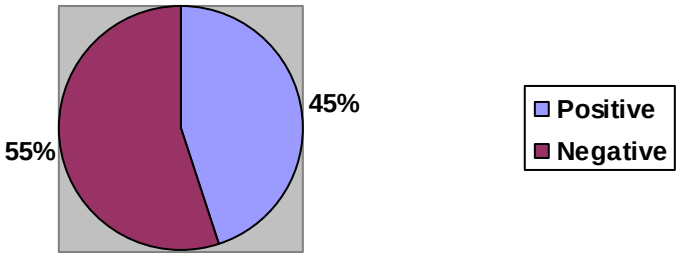

Fig . Pie chart showing prevalence of parasites

3.3 Types of parasites found

Out of 27 infected samples the species of parasite found are *Gastrodiscus* (30%), *Strongylus* (22%), *Oxyuris* (30%), *Dictyocalus* (7%) and *Triodontoforus* (11%). Karki and Manandhar (2006) founds *Strongyle* (100%), *Parascaris equorum* (50%), *Oxuris equi* (3%) and *Fasciola* (1.5 81.7% of mules sampled were severely infected, 8.3% heavily, 3.8% moderately and 6.2% mildly infected. Mixed infections were detected in 54.8% of the mules. Paudel (2007) found the prevalence of gastrointestinal parasites as 80.48% (33/41) with *Strongylus* (48.78%), *Trichostrongylus* (31.70%), *Parascaris* (21.95%), *Trochonema* (17.07%), *Gastrodiscus* (7.31%), and *Habronema* (4.87%) in horses of Sainik stud farm Chitwan. The EPG count of Strongylus ranged between 200 and 800.

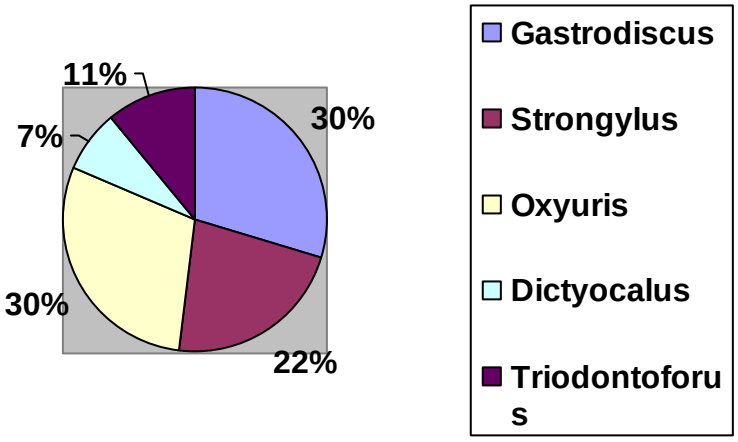

Fig. Pie chart showing types of parasites in mules

3.4 Sex wise prevalence

Out of 30 samples from male 11 samples are positive for endoparasites showing prevalence of 36.66% and for female it is 53.33% with 16 animal being infected with at least a parasites species. Female are found to have higher infection as they might have lower immunity due to gestation, lactation etc.

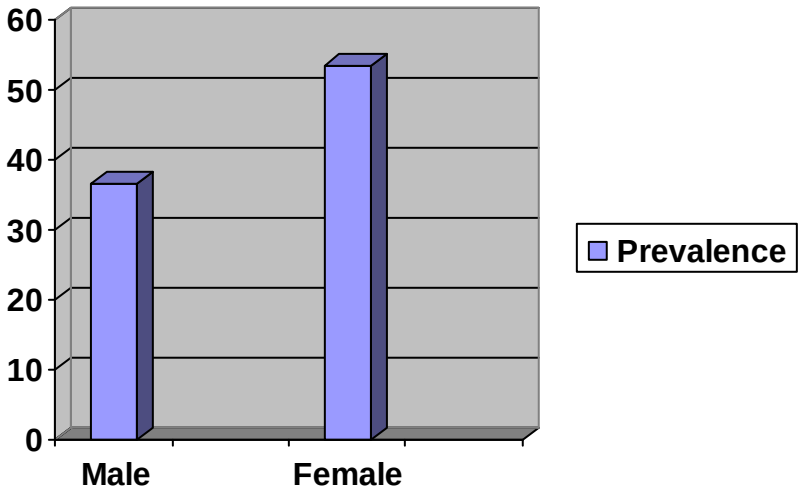

Fig. Bar diagram showing sex wise prevalence of helmiths parasites

3.5 Age wise prevalence

The study shows the prevalence of parasites to be 25.92 %, 14.81 %, 14.81 % and 37.03 % respectively in the age group of below 5 years, 5-8 yrs, 8-11 yrs and above 11 yrs. The highest prevalence is seen in animals of old age due to waning body condition and immunity.

Table. Showing age wise prevalence of parasites

S. No	**Age**	**Positive**	**Positive percentage**
1	Below 5	7	25.92% (7/27)
2	5-8 yrs	4	14.81%(4/27)
3	8-11 yrs	4	14.81%(4/27)
4	Above 11 yrs	10	37.03%(10/27)
	Total	**27**	

CHAPTER FOUR

CONCLUSION

The results show the parasitic prevalence of 45 % in the mules of the study area which were dewormed with antehelmithics two- three months ago. This shows the reinfection and repetition of cycle. Thus the animal needed periodic deworming. A comprehensive parasite control program should include pasture management and environmental sanitation, and regular anthelmintic administration. Performing routine fecal egg counts will help to determine the efficacy of treatment and control programs. Anthelmintics should be chosen conscientiously and their use should be rotated slowly to decrease the occurrence of resistance. A slow rotation of wormers is recommended (the same wormer over the course of a year or more).

CHAPTER FIVE

SUGGESTIONS & RECOMMENDATIONS

1. Resistance to parasitic infection increase with senility. Older, resistant animals may harbor mild infections but show no sign that is why young animals should be maintained separately.
2. Larval lungworms are sensitive to drying, so pasture drainage is an effective management technique.
3. A further essential part of parasite control is based on stable and pasture management. Worming alone is not satisfactory. Droppings should be picked up from all donkey areas regularly.
4. To check the efficiency of deworming and with a view to minimizing the amount of wormer administer to donkeys, it is advisable to submit fresh dung samples to vet for worm egg counts to be done, (every couple of years), which will give a good indication of worm infestation levels. Guesswork plays no part in parasite control.
5. Always deworm all donkeys at the same time. Worm all newcomers on arrival and isolate for 72 hours.
6. Pasture and stable hygiene is vital. Pick up droppings. Not all parasites are controlled by all wormers.
7. Always check with veterinarian about which wormer to use and when. Follow his/her advice. One needs to know the weight of his/her donkey, as this will affect the amount of wormer administered.
8. It is recommended to deworm all mules/donkeys of **Animal Nepal** supported area every three months, full dose with broad spectrum antehelminthics as the continuous heavy work makes them feeble and immuno compromised.

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ANNEX I

Table 1. Overall parasitic prevalence

S.N	Parasites	Positive	Positive %
1	*Gastrodiscus sp.*	8	29.62%
2	*Strongylus sp.*	6	22.22%
3	*Oxyuris sp.*	8	29.62%
4	*Dictyocalus sp.*	2	7.40%
5.	*Triodontoforus*	3	11.11%
	Total	27	45%

ANNEX -II

LIST OF HELMINTHS PARASITE OF HORSE, MULE AND DONKEY

Parasite	**Group**	**Predilection site**
Gastrodiscus aegypticus	Trematodes	
Gastrodiscus secundus	Trematodes	
Pseudodiscus collinsi	Trematodes	
Dicrocoelium dendriticum	Trematodes	Liver
Fasciola gigantica	Trematodes	Liver
Fasciola hepatica	Trematodes	Liver
Fascioloides magna	Trematodes	Liver
Anoplocephala magna	Cestodes	
Anoplocephala perfoliata	Cestodes	
Paranoplocephala mamillana	Cestodes	
Cysticercus tenuicollis	Cestodes	Liver
Hydatid cyst	Cestodes	Liver
Paraascaris equorum	Nematodes	
Habronema muscae	Nematodes	
Habronema microstoma	Nematodes	
Habronema megastoma	Nematodes	

Gongylonema pulchrum	Nematodes	
Strongyloides westeri	Nematodes	
Strongylus equinus	Nematodes	
Strongylus edentatus	Nematodes	
Strongylus vulgaris	Nematodes	
Triodontophorus spp.	Nematodes	
Oesophagodontus robustus	Nematodes	
Craterostomum spp.	Nematodes	
Gyalocephalus capitatus	Nematodes	
Potriostomum spp.	Nematodes	
Trichonema spp	Nematodes	
Trichostrongylus axei	Nematodes	
Probstmayria viviparia	Nematodes	
Oxyuris equi	Nematodes	

Source: Soulsby, 1978

APPENDICES III

Animal Nepal assisted brick kiln mule population in Lalitpur

S.No	Brick kiln	Location	Number	Remarks
1	Sri Shakti	Harisiddhi	7	
2	Mankamana	Godavari	30	21 M, 9F
3	Bal Bum	Sanuwarasi	50	
4	Santaneshwor	Sanuwarasi	22	
5	Kantipur	Taukhel	70	
6	RM	Taukhel	75	
7	Bajra	Santawarasi	-	
8	Sri AB	Powerhouse	23	
9	Bungamati /UK	Bungmati	90	
10	Sri Dakchhinkali/Om Shree	Chanakhel	48	
11	A plus	Farsitol	20	
	Total			

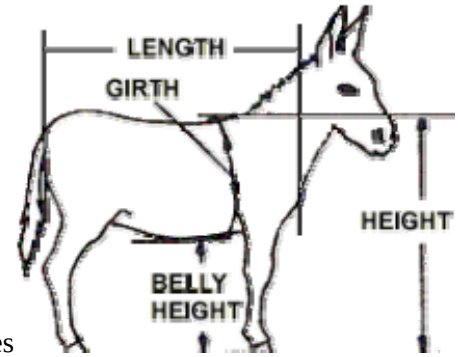
Source : Animal Nepal

ANNEX -IV

ESTIMATING THE WEIGHT OF DONKEY

When you need to worm your miniature donkey it is most crucial to know their weight. You will need to know this also for many drugs and anaesthetics as all doses are proportional to body weight. If you don't have access to a weighbridge or method of weighing your donkey, then a means of estimating must be used. Many weigh-bands and formulae were designed for horses and do not suit all donkeys. Similarly some donkey formulae tend to become inaccurate when applied to miniature donkeys. One formula we recommend is a little more involved but much more accurate. Keep a record of weights as this may also assist your veterinarian in the future.

Measured in



centimetres

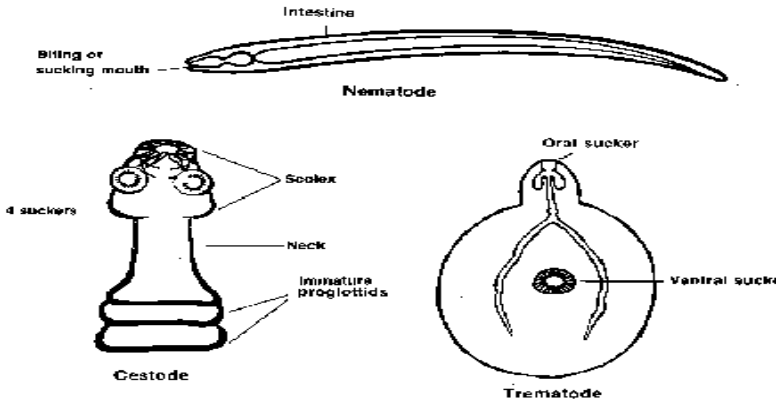
WEIGHT (Kgs) =

$$\frac{\text{(Height - Belly height) x Girth x Length}}{3{,}500}$$

As a check most adult miniature donkeys will be in the range 80-120 kgs.

Courtesy: http://www.miniature-donkey-assoc.com/Worming.htm

PHOTOGRAPHS



Anterior end of typical nematode

Posterior end of male T.axei showing bursa, rays and spicules, (polarised light)

Dicytocaulus larva

Dicytocaulus– adult anterior

Two day old foal from the mule of study area

Sample collection

Mules in barn

Processing of samples

Sedimentation of sample

Examination of sample