Discussion

The prevalence rate cannot be reduced in animals already having slit nostrils. However, the incidence of fresh cases can be minimized with a series of focused awareness-raising interventions. Thus, the issue can be tackled in the long run by creating awareness in equine- owning communities of the cruelty of the practice. For this purpose, equine owners/users in communities, work places, and animal fairs were taken into account in order to design interventions to change their perceptions about the issue. Through pictorial banners, leaflets, demonstrations, and owners/users meetings, awareness on issue was aroused. The issue was treated with other welfare issues during walks and events arranged from time to time, for example World Animal Day – celebrated during the last 2 years in all 3 districts. Equine owners were educated on the importance of regularly giving fresh water, including normal saline, to their animals especially in summer. Owners/users awareness was raised on the prevention and management of heat stress in their animals. Thirteen water troughs and 14 shed/shelters were constructed in communities of the region through participatory action. More than 400 canvas water buckets were distributed amongst the communities at subsidized rates.

For short-term and immediate results, the source of the nostril-slitting practice was thought to be eliminated. The quacks of the area were educated about the facts of the issue and were motivated to stop this traditional practice and to join Brooke efforts of animal welfare through participation in CBAHW training arranged by Brooke South. Four practising quacks joined the training and became trained animal health workers. Initially they were given first aid kits and basic medicines used in veterinary practice. They were linked with equine owners/users and relevant stakeholders. Furthermore, 7 seven other slit nostril experts from the communities were identified and motivated enough to quit practising nostril slitting. They also actively supported Brooke teams in delivering and arranging awareness-raising camps and campaigns.

Welfare assessment data are being used for internal monitoring of the interventions. The results showed a reduction in the prevalence of the practice pointing to the right direction towards the goal. In future the same activities will be continued to cope with the issue in and around Brooke operational areas.

Acknowledgments

The author would like to express his gratitude to Brooke field staff and equine owners for their cooperation and support in execution of the study. The decision of slit nostril experts to leave traditional practice and to join the Brooke programme as CBAHWs is highly appreciated. Sincere thanks are registered for the valuable comments of my friends Dr Imtiaz Ahmed Salik and Dr Abid Pervez Shah.

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DISASTER RISK REDUCTION: THE BANGLADESH STORY

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Background

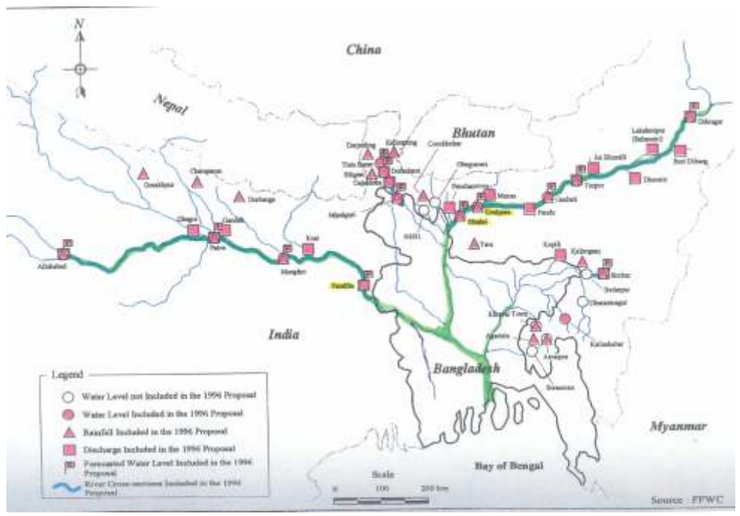
A country born out of a bloody freedom struggle in 1971 and currently home to 16.2 million people within a 145,570 sq km land area, Bangladesh is identified as a developing country. It is an agrarian economy; 41% of the population are literate, of which 31% are female. With a per capita income of $520 (2008), the country has managed to continue an annual average growth of 5% since 1990 despite political unrest and repeated devastating disasters.

Bangladesh is distinctly identified as a high-risk country on the world map. Its vulnerability to natural disasters is rooted in its geographic location in the world's largest delta compounded with a series of hydro-meteorological and geo-physical factors, including huge inflow of monsoon water from upper riparian countries, a low floodplain, and storm surges across the long funnel-shaped coastline with tropical climate.

Topography

Bangladesh, in the low-lying Ganges–Brahmaputra River Delta or Ganges Delta, practically provides the drainage for the mighty rivers of the South Asian region (see Figure 1). This delta is formed by the confluence of the Ganges (local name Padma or Pôdda), Brahmaputra (Jamuna or Jomuna), and Meghna rivers and their respective tributaries. The Ganges unites with the Jamuna (main channel of the Brahmaputra) and later joins the Meghna to eventually gush into the Bay of Bengal. There are 232 rivers and rivulets. The alluvial soil deposited by these rivers has created some of the most fertile plains in the world. Bangladesh has 58 trans-boundary rivers, making water issues politically complicated to resolve. The country has 700 km of coastline. Most parts of Bangladesh are less than 12 m above sea level.

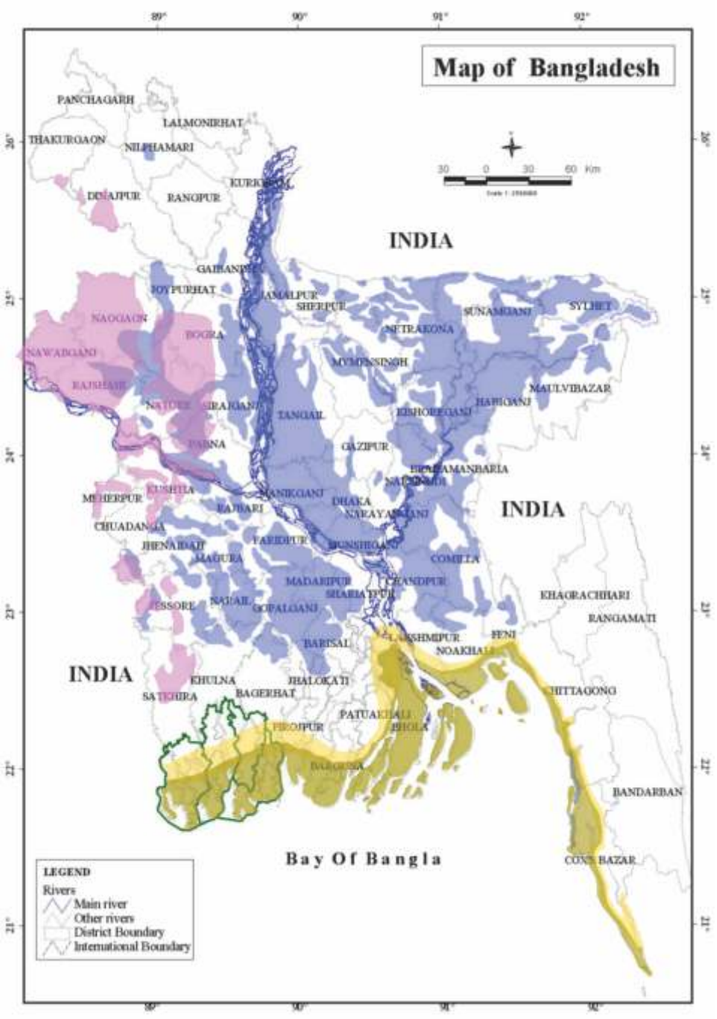
Figure 1. Regional view: Bangladesh, the drainage system of the mighty rivers



Disasters

Flood, tropical cyclone, tornado, tidal surge, drought, and large-scale riverbank erosion are regular phenomena in Bangladesh, creating repeated havoc and disrupting the lives and livelihoods of the disaster vulnerable people in most parts of the country (see Figure 2). Since independence in 1971, the country has endured approximately 200 disaster events causing the loss of more than 600,000 human lives and destroying years of development gains.

Figure 2. Disaster areas of Bangladesh



Flood and river erosion areas
Cyclone and surge areas
Drought areas

The cyclone that hit the country in 1970 and killed about half a million people was the worst in the recorded history of the world. The severe blow to the economy wrecked by the floods of 1987, 1988, and 1998 took a long time to recover from. The floods of 2004 affected over 34 million people and caused a loss of over US$3.2 billion in infrastructure, crops, and properties. Riverbank erosion, on the other hand, is a slow onset and silent disaster in this land of mighty rivers, leaving over 10,000 people (on average) homeless and destitute every year. Category 4 cyclone Sidr in 2007 claimed 3,447 lives, injured 55,282 people, and affected 9 million people in 30 districts. A total of 2 million people had to take refuge in the emergency shelters. About a quarter of the world heritage site Sundarbans (a tropical mangrove forest) was damaged and it will take 40 years to recover from the catastrophe. The loss was estimated to be around $1.7 billion. Before the country could recover from the onslaught of Sidr, it was hit by cyclone Aila in May 2009. The death toll from the cyclone rose to 121; at least 58,450 domestic animals were killed [1].

Records of the last 200 years show that at least 70 major cyclones have hit the coastal belt region of our country. Examples of severe tropical cyclones are the Barisal cyclone of 1584, the Bakerganj cyclone of 1876, the Urir Char cyclone of May 1985, the November 1970 cyclone, the great cyclone of 1991, and of course Sidr of 2007.

When disasters strike, the poor suffer disproportionately. Disasters destroy the meagre physical assets that they have, and severely affect their livelihoods including their precious asset: livestock. Disasters thus further entrench poverty and inequalities. Hazards such as floods, cyclones, and droughts are noted for aggravating poverty in 2 ways: through destruction of food stocks and the scanty assets, including livestock, crops, and houses, of the poorer households; and through making employment opportunities scarce, leading to food insecurity, malnutrition, disintegration of families, and social unrest.

To make conditions worse, Bangladesh is identified as one of the countries most vulnerable to climate change impact: 70 million people are estimated to be affected annually by floods, and 8 million by drought; up to 8% of the low-lying lands may become permanently inundated due to sea level rise; salinity ingress is threatening food security – all by 2050.

The total population in the 19 districts of the coastal zone amounts to 35.08 million, the male population being 17.9 million and female 17.1 million [2]. Agricultural labourers, small farmers, fishermen, and the urban poor make up 70% of the 6.85 million households on the coast and the coastal population is projected to grow to about 41.8 million in 2015, and 57.9 million in 2050. The extent of poverty is relatively high compared with the remaining part of Bangladesh: 52% are poor and 24% are extremely poor. Climate change is threatening huge problems for this large and growing population.

Disaster management capacity

Over the years the government and NGOs in Bangladesh have developed expertise in post-disaster relief and rehabilitation operations as a result of managing big disasters repeatedly and by disaster management capacity-building initiatives undertaken since 1992.

Bangladesh is considered a world leader in disaster management. The death toll of category 4 cyclone of 1970 was 500,000 while in the same category cyclone in 2007 the figure was 3,447. This is indicative of a marked improvement in the disaster management capacity of the country. Bangladesh has an elaborate system, from national to local level, for disaster management. There are Disaster Management Committees (DMCs) at all levels. However, the area where the country is still limping is saving the livelihoods of the people, i.e. saving their assets of crops, fish stock, livestock, and houses. The damage estimates of each disaster reach billions due to this loss of livelihoods and infrastructure.

Since independence, huge funds have been spent in Bangladesh on disaster management: relief, rehabilitation,

and disaster preparedness. After the cyclone in 1991, over US$1 billion was spent. The government and donors spent over $290 million on the emergency relief operation after the floods in 2004. In addition, the government allocated more than 700,000 tonnes of food grain in 2004 under its normal relief programme in the form of Vulnerable Group Feeding (VGF), Food for Work, Test Relief, etc. After Sidr in 2007, more than $500 million were allocated for response and recovery, including loans from the World Bank. On the other hand, the biggest programme to date in Bangladesh has been the CDMP (Comprehensive Disaster Management Programme), with a completed 1st phase of $26 million and ongoing 2nd phase of $50 million.

However, since the 1990s, it has been recognised that relief/rehabilitation support cannot ensure sustainable recovery, especially of the livelihoods of the poor and low-income groups; nor can it save them from the onslaughts of nature's fury. Instead the need of the hour is to invest in disaster risk reduction by capacity building and vulnerability reduction of the communities to shield them from the risks of these natural hazards.

Loss of livestock in disasters

The Bangladesh economy is still largely agrarian. Agriculture in this country has not yet been able to reap the benefit of technological advancements in this sector, and therefore livestock is still very crucial in agriculture in addition to being an important asset on its own. To a farmer his bull or cow is as precious as his own life! Studies show that people are often reluctant to leave their homes to take refuge in the cyclone shelters until the very last moment, at 'danger signal number 9' or '10', because they do not want to leave behind their livestock; and they cannot take the animals with them due to lack of provision for livestock in the shelters (see Table 1). This results in more casualties. Women are the main care takers of livestock. So, they are often the victims of such delays in evacuation to safety.

Table 1. Loss of livestock in some major disasters

Disaster	Cattle lost	Poultry lost
Sidr 2007	21,100	611,347
Tornado 2005 – 1 district only	35	
Flood 2004	1,451	2,54,488
Cyclone 1970	280,000	

Sources: [3] [4]

Bangladesh Disaster Preparedness Centre (BDPC)

Bangladesh Disaster Preparedness Centre (BDPC) has been working since 1992 to promote capacity building of all stakeholders in disaster risk management and to promote mainstreaming of disaster risk reduction (DRR) into development policies and planning and community empowerment for sustainable DRR and climate change adaptation.

BDPC believes that disaster risk is rooted in conditions of physical, social, economic, and environmental vulnerabilities that need to be assessed and managed on a continuing basis. People's livelihoods and their empowerment are critical elements for DRR. Although we do not directly get involved in relief operations, we facilitate coordination and advocate promoting the rights of the affected communities so that minimum

humanitarian standards are met during the relief and recovery process.

The field of disaster management has evolved considerably over time, particularly over the last 2 decades, to the point that today it can be considered a professional discipline, with its own fundamental principles, body of knowledge, and methods of practice.

Shelter-based community risk reduction project of BDPC

Figure 2. Frontal elevation of shelter at Morrelganj

BDPC is implementing a **s**helter-based community risk reduction project at the Sidr affected area in the southern part of the country: Morrelganj Upazila of Bagerhat District. The Swiss Agency for Development and Cooperation (SDC) is building 4 cyclone shelters at Morrelganj (see Figure 2). BDPC is working on social mobilisation among the target beneficiaries, namely all the people within a 1 km radius area around each shelter. The objective is to inculcate ownership within the community, so that they manage and utilise the shelter building before, during, and after the cyclone. As part of that process, we carried out extensive consultation with the community to assess their needs and views about the usage of the building. One of the points to come across strongly, quite understandably, is the need to shelter their livestock. BDPC carried out a livestock survey (see Table 2).

Table 2. Livestock count in Morrelganj

SL No.	Shelter site	Cattle	Goats	Hens and ducks
01	Khawlia – 01	104	108	999
02	Khawlia – 02	173	128	1,758
03	Hogolpati - 01	174	265	1,333
	Hogolpati - 02	201	190	1,857
	Total	652	691	5,947

Morrelganj, being in the coastal belt, bears the brunt of climate change, salinity ingress. On top of this, indiscriminate shrimp cultivation over the last 15 years has almost destroyed the biodiversity of the area and there is very little green left in the area. Thus survival of livestock becomes a challenge in the absence of pasture.

There are some 1,334 households comprising 5,045 people in the target area. They still have some livestock, as revealed in the survey, for which they need shelters to protect them against tidal surge. Therefore, as per the demands of the community, all 4 shelters have the ground floor as open space, for sheltering the livestock. Guidelines for shelter management have been developed under this project, and they contain suggestions regarding the care of livestock in the shelter during the disaster period.

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SYNOVIAL SEPSIS IN WORKING EQUIDS: RESPONSE TO TREATMENT IN 57 CASES

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Abstract
Relationships between historical and clinical factors and outcome were investigated in 57 cases of synovial sepsis presented to a charitable clinic. Cases were treated with synovial lavage combined with systemic, regional, and intra-articular antimicrobial administration. Cause of injury, time from injury to treatment, site of injury, and number of flushes required did not appear to affect outcome. A significant association was identified between degree of lameness at admission and degree of lameness at discharge (p=0.01). Equids presenting with a lameness of 9–10/10 were 11.3 times more likely to be lame at discharge than equids presenting with a lameness of 3–4/10.

Introduction

Synovial penetrations are common in working equids and result in severe lameness. The condition not only represents a major cause of morbidity but has significant economic implications for the human population.

Current evidence would indicate that the most effective treatment is lavage of the synovial structure with systemic and sometimes additional regional administration of broad-spectrum antimicrobial drugs [1, 2, 3, 4]. Arthroscopic examination in association with lavage of the affected synovial structure is considered by many to be the gold standard especially when treating chronic cases [1, 2, 3, 4]. Arthroscopic examination is expensive, labour intensive, and is not available in charitable clinics. Through-and-through lavage of the synovial cavity using large-gauge needles provides an effective substitute [5]. To the authors' knowledge there are no reports of the treatment of synovial sepsis in working equids. The following study aimed to investigate factors that might influence the success of treatment for synovial sepsis in a charitable clinic; specifically whether outcome could be predicted from the cause of injury, time from injury to treatment, the degree of lameness at admission, the synovial structure affected, and the number of times lavage was required.

Materials and methods

Study design

Case records for working equids presented to Animal Care in Egypt between July 2008 and December 2009 were reviewed. All animals in which synovial sepsis was diagnosed were considered for inclusion. If soft tissue or skeletal injuries that could potentially limit return to soundness were present concurrently the cases was excluded. Data were collated using Microsoft Excel [6] prior to analysis using Stata software [7]. Relationships between clinical and historical case data and degree of lameness at discharge were investigated using Fisher's exact test. Relationships between clinical and historical case data and duration of hospitalisation were investigated using a one-way ANOVA. Significant results were further investigated using univariable logistic regression. The significance level was set at $p \leq 0.05$ for all tests.

Diagnosis

In the majority of cases diagnosis was made by observation of saline exiting a wound following distension of the synovial cavity. Failing this synovial fluid was analysed visually, microscopically, and using a refractometer. Synovial sepsis was diagnosed if total protein concentration exceeded 40g/l and greater than 80% of the leucocytes within the sample were identified as polymorphonuclear cells [4]. In selected cases radiographic examination also facilitated diagnosis.

Treatment

Following diagnosis the affected structure was lavaged immediately via standard approaches [8] using 14–21

gauge needles and 2–4 litres of sterile saline per structure. Restraint was achieved by chemical sedation using detomidine and butorphanol. Horses were treated standing; donkeys were cast and physically restrained in lateral recumbency. Regional analgesia was performed for cases involving the distal limb. A minority of cases were treated under general anaesthesia induced and maintained with ketamine hydrochloride. Following lavage each synovial cavity was infused with 150–300mg gentamicin; the dose being determined by the size of the synovial cavity. In all cases the limbs were dressed following surgery and remained covered until all associated wounds had epithelialised. Short periods of daily exercise were enforced from the day following surgery in an attempt to limit intrasynovial adhesion formation. Where possible, the day after surgery and every other day thereafter intravenous regional perfusion (IVRP) was performed. Following placement of a tourniquet, 250–600mg gentamicin diluted in 20–40ml 0.9% sodium chloride was infused intravenously proximal to the lesion and distal to the tourniquet. The tourniquet was released 30 minutes after infusion of gentamicin [9]. Synovial lavage was repeated if the degree of lameness failed to improve and synoviocentesis indicated persistent inflammation (total protein in excess of 20g/l and neutrophil percentage in excess of 80%). Repeat flushing was not performed more frequently than every 48 hours. On the alternate days IVRP was performed.

In the absence of bacterial culture and sensitivity techniques antimicrobial selection was empiric and influenced by availability and cost. A combination of procaine penicillin (22,000IU/kg BID) and gentamicin (6.6mg/kg SID) administered for 5 days was the first choice in all cases. Thereafter oral enrofloxacin (7.5mg/kg SID PO) was administered if there was a suspicion of persistent infection; otherwise oral trimethoprim sulphadoxine (20mg/kg BID PO) was administered. Oral antimicrobials were administered until there was no clinical evidence of intrasynovial or wound infection. Flunixin meglumine 1.1mg/kg IV BID was administered as necessary to provide analgesia. Body weights were estimated using a weight tape.

Results

Forty seven donkeys and 10 horses met the inclusion criteria. Results are presented in Table 1. Results of statistical analysis are presented in Table 2. The results of univariable logistic regression indicated that animals presenting with a 9–10/10 lameness at admission were 11.3 times more likely to be lame at discharge than those presenting with a 3–4/10 lameness (OR 11.3, Standard Error 9.42, p=0.04).

Table 1. Outcome following treatment for synovial sepsis in 57 working equids. Cases are presented according to the cause of injury, the duration of injury, the synovial structure infected, the number of flushes performed, and the degree of lameness at presentation. The percentages of animals working sound (<3/10 lame), sound (0/10 lame), and the duration of hospitalisation are presented for each category.

	Cases (%)		Number of cases working sound at discharge (%)	Number of cases sound at discharge (%)	Duration of hospitalisation (days)
Cause					
Bites	24	42	92	63	16
RTA	12	21	92	50	21
Palm spikes	12	21	92	67	15
Others	9	16	67	44	14

Duration					
0–24h	9	16	89	56	23
24–72h	27	47	96	67	15
>72h	21	37	71	52	
Structure					
Carpus	12	21	92	50	15
DFTS	15	26	73	47	17
Fetlock	9	16	100	89	17
Tarsocrural joint	10	18	100	70	15
Other	11	19	73	45	20
Number of flushes					
0	13	23	77	54	13
1	24	42	96	71	14
2–3	13	23	77	46	22
>3	7	12	86	43	22
Lameness at presentation					
3–4	22	39	100	78	12
5–6	12	21	92	67	17
7–9	10	18	70	50	22
9–10	13	23	69	23	21

Table 2. The significance of clinical and historical data on outcome in 57 working equids with synovial sepsis. Numbers shown are p values generated by Fisher's exact test (working soundness at discharge and soundness at discharge) and one-way ANOVA (duration of hospitalisation). Significance is assumed at p<0.05

	Working sound at discharge	Sound at discharge	Duration of hospitalisation
Cause	0.365	0.702	0.261
Duration	0.80	0.393	0.855
Structure	0.222	0.246	0.927
Number of flushes	0.229	0.369	0.067
Lameness at presentation	**0.01**0	0.014	0.067

Discussion

The results presented indicate that degree of lameness at admission is the only factor of those investigated that had a significant affect on outcome. As sample sizes were relatively small it is possible that with greater case numbers further significant associations might have been identified. There were non-significant trends towards both number of flushes and degree of lameness at presentation being associated with duration of hospitalisation.

The cause of injury did not significantly influence outcome. The nature and distribution of injuries in this study is very different from previous reports of pleasure and sports horses yet the outcomes appear similar and this is likely due to the fact that synovial cavities react in a similar manner to contamination regardless of type and source. We had suspected that bite injuries might be associated with a less favourable prognosis as a result of the crushing and tearing associated with such an injury and the contamination with oropharyngeal bacteria. This did not prove to be the case. One major difference between this and many previous studies of synovial sepsis is the discharge of relatively lame animals due to their economic importance. Unfortunately long-term follow-up was not possible.

An unexpected finding was the absence of any significant relationship between duration of injury and outcome. Most clinicians would consider that prognosis reduces as the time between synovial penetration and treatment increases [10]. However, one previous study reported similar findings following arthroscopic lavage despite delays in treatment [11]. Potentially confounding factors in this study might be the relaxed attitude of owners towards veterinary care of working equids. Injuries that owners perceive to be less severe might be left a number of days prior to presentation even if a synovial cavity is penetrated. Severe soft tissue contusions are more likely to be presented soon after injury. It was impossible to account for the variation in nature and severity of the injuries that accompanied synovial sepsis.

Injuries to the fetlock and tarsocrural joints appeared to be associated with a better prognosis; however these results were not statistically significant. A possible explanation would be the greater ease with which a thorough flush of these joints can be achieved in comparison with other synovial structures.

In cases where more flushes were required a less favourable prognosis would be expected as repeated flushes were performed as a reaction to a poor response to treatment. Cases that received a single flush appeared to do better (although this result was not statistically significant). Results were similar for cases that were flushed twice or more times. Thirteen cases did not receive any effective synovial lavage. Many were chronic cases in which it was assumed there were fibrinous adhesions and pannus deposition that prevented lavage. Some, however, were less than 48 hours old and in these cases it was presumed that there was extensive synovial hyperplasia, pannus formation, or peri-articular swelling that had led to collapse of the synovial cavity. Whilst these cases might indicate

the limitations of lavage in comparison to lavage with associated arthroscopic examination and debridement [3] their outcomes would seem to indicate that prognosis is by no means hopeless if effective lavage cannot be achieved. Seven of the 13 cases returned to complete soundness.

A limitation of the current study was the difficulty in definitively diagnosing sepsis. Differentiation between sepsis and inflammation can be difficult even when all diagnostic modalities are available and it was possible that some cases which were severely inflamed were treated as septic. A further difficulty was the objective grading of lameness in donkeys at walk. Further investigation with greater case numbers ought to be performed to substantiate these preliminary findings.

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CONTROLLED FIELD TRIAL OF A BEHAVIOURAL PAIN ASSESSMENT TOOL IN DONKEYS

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Abstract
Behavioural indices for pain in donkeys are believed to be more subtle than in horses. Therefore, more sensitive behavioural indices for pain recognition and quantification are needed. An ethogram of behaviours involving postures and events with predefined criteria was used in this tool to identify and quantify pain-related behaviours in donkeys. The posture behaviours recorded were position of ears, eyes, head, muzzle, tail, and head. The event behaviours recorded were body movements, feet movements, oral movements, vocalization, and self-focus behaviours. Posture behaviours were recorded using instantaneous scanning, 1 scan per minute for 10 minutes; event behaviours were recorded continuously for the same 10 minutes. Forty donkeys from 20 brick kilns were used as paired samples. The analgesic used was meloxicam (Metacam®). The observer was blinded to the treatment. Behaviours were recorded before administration of the drug or placebo and then again after 2 hours of giving the drug or placebo. After the meloxicam administration there was a significant increase in walking, sniffing, and chew/bite behaviour. This indicates that a reduction in walk, sniff, and chew/bite behaviours are predictable indicators for pain in donkeys. This study shows that recording specific posture and event behaviours for a short duration could be used as a tool to recognize pain in donkeys in the field as well as in a clinical setting.

Introduction
There are an estimated 44 million donkeys in the world [2] of which the majority are found in developing countries. India has an estimated 1.6 million donkeys [6]. Donkeys in developing countries are vital in providing draught power to transport goods for the poor. In doing so, donkeys can suffer several welfare problems.

Most literature suggests that donkeys are more stoic than horses in expressing pain-related behaviour [7]. Therefore, it is important to study and understand pain-related behaviour in donkeys to be able to pick up more subtle behaviour changes than those shown in horses. Further, there is lack of reliable literature and research work on this species to enable recognition and measurement of pain and its mitigation.

A welfare assessment carried out by Brooke Hospital for Animals UK in developing countries including India showed that 70% of the donkeys were thin, 94.7% had limb-associated abnormalities, and 12% had hind quarter lesions [5].

This study uses a behavioural pain assessment tool developed by researchers of the University of Bristol. The tool has been successfully used to assess pain in donkeys in a clinical setting (unpublished data collected by F.H. Ashley). The aim of the present study was to investigate whether this behaviour-based assessment tool will be able to recognize pain in working donkeys under field conditions.

Materials and methods
Animal selection
Donkeys working in the brick kilns of Ghaziabad district, Uttar Pradesh, were used for this study. In these brick kilns, pack donkeys are extensively used for transporting bricks to and from the furnace. Each donkey carries around 40–50 bricks weighing 120–150kg for an average 5–6 hours per day.

Forty male donkeys that had been working regularly for at least 1 month (as ascertained by owner history) were used. Two donkeys were selected from each of the identified brick kilns, thereby making a total of 20 brick kilns, to achieve the sample population. This methodology allowed paired sampling from each brick kiln. One donkey from each brick kiln was randomly assigned to either the 'drug' group or the 'placebo' group. Male donkeys were selected because only male donkeys work in Ghaziabad brick kilns, thus reducing the sex confound. All selected animals were offered unlimited water before the experiment started.

The selection of each donkey from the identified brick kiln depended on the owner's consent and the ability of the animal to fulfill specified criteria. Criteria to select donkeys included age and body score. Only donkeys aged 5–15 years and with a body-condition score of 2–3 (on the scale of 1–5) were included. The body condition scoring system of 1=very thin to 5=very fat used by Pritchard [5] in the the welfare assessment of donkeys in India was used for this study. Animals with any visible injury to either or both of their eyes and ears were excluded from the study as observing the posture of these body parts was used extensively in the behaviour protocol. Animals which were suffering from non-weight-bearing lameness (animals which cannot walk) and/or suffering from other medical problems such as colic and respiratory problems were also not included in the study. It was presumed that all donkeys working in the brick kilns were experiencing some chronic and acute painful condition because of the nature of the work.

Non Steroidal Anti-Inflammatory Drug (NSAID) and placebo used
The NSAID used in this study was oral Meloxicam syrup (Metacam®) and the dosage rate followed was 1.2 mg/kg body weight. Both the NSAID and placebo were administered orally with a 100ml syringe. The placebo was made using starch powder and (food grade) vanilla to bring it to a consistency and colour similar to the drug being used. Experiments in equine species have shown that meloxicam absorption is 100% in 2–3 hours after oral administration [8]. The body weight of the donkeys was calculated by using the nomogram developed by Pearson [3] for estimation of body weight. The 2 variables used in this nomogram to calculate the body weight of donkeys were heart girth and length of the animals [3].

Experimental method
On each day of data collection, 2 donkeys were selected from a brick kiln, according to the criteria described above. The experimenter remained blind to the treatment group to which the donkeys were selected. The experiment was started 1 hour after the animals had finished work for the day. Hobbles and other pieces of equipment were removed before the observation started. Both donkeys were subjected to pre-drug/placebo observation of postural (10 instantaneous scans) and event (continuous focal scanning) behaviour for 10 minutes (Table 1). Observations were carried out in an 'experimental area' which was 2mx2m, quiet, and separate from other animals. Prior to behavioural observation animals were habituated to the area for 5 minutes.

After the pre-drug behavioural observation had been completed each donkey was given either the drug or placebo and returned to the normal resting environment. Two hours after the administration of the drug/placebo, the animals were unhobbled, returned again to the quiet 'experimental area', and the same postural and event behaviours were recorded again for 10 minutes (Table 1).

Pain-related behaviour assessment tool
The postures and event behaviours observed during the pre- and post-placebo/drug administration are listed in Table 1.

Table 1. Posture and event behaviours measured in the behaviour assessment tool

Posture behaviours (10 instantaneous scans in 10 minutes)	
Position of ears	Forwards, sideways, backwards, combinations
Position of eyes	Open and alert, closed or semi-closed, rolling eye
Position of the head	High, level, low, very low
Position of the muzzle	Normal, relaxed and droopy, fixed or clenched
Head orientation	No turn, look turn, body turn (lying down or standing up), limb turn
Position of tail	Relaxed, lifted, swishing, tucked
Event behaviour (continuous observation for 10 minutes)	
Body movements	Standing up or down, rolling
Feet movements	Walking, pawing, limb lifting, weight shifting
Oral movements	Sniffing, flehmen response, licking and chewing, yawning, chewing and biting
Vocalization	Snort, bray
Self-focus behaviour	Body rub, eye rub, stretch

Statistical analysis

Analyses were carried out using Minitab® 15. As most of the data were not normally distributed, a nonparametric alternative of 2-way ANOVA, Friedman test was used for analysis, blocked by donkey to minimize individual variation. The level of significance was set at p=<0.05.

Results

Walking (S=9,df=1,p=0.003), sniffing (S=9.94,df=1,p=0.002), and chew/bite (S=9,df=1,p=0.003) behaviours significantly increased after administration of Meloxicam when compared with pre- Meloxicam administration. This change was not seen when comparing pre- and post-placebo behaviour.

Figures 1 to 3 compare the distribution of data and the medians of the 4 groups: pre-drug, pre-placebo, post-placebo, and post- drug for all the significant behaviours.

Figure 1. Box plot showing the frequency of 'walking' behaviour (bouts per 10 minutes) before and after placebo and Meloxicam. The post-Meloxicam group showed significantly higher walking behaviour. The boxes indicate the upper and lower quartiles of the number of walking bouts with the median as the line in-between. The whiskers indicate the maximum and minimum values of the sample. * indicates an outlier, defined as those values which are above 1.5 times the interquartile range from the upper quartile.

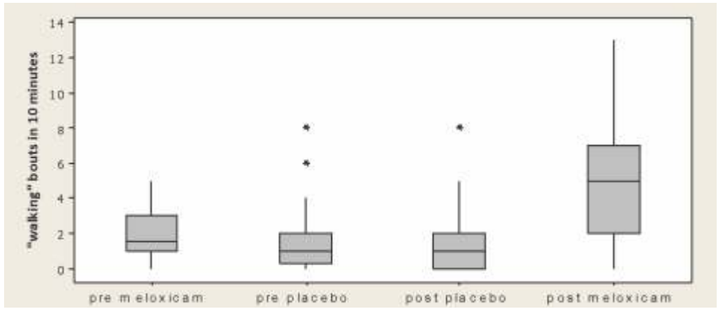


Figure 2. Box plot showing the frequency of 'sniff' behaviour in 10 minutes before and after placebo and Meloxicam. The post-Meloxicam group showed significantly higher sniff behaviour. The boxes indicate the upper and lower quartiles of the number of sniff behaviour with the median as the line in-between. The whiskers indicate the maximum and minimum values of the sample. * indicates an outlier, defined as those values which are above 1.5 times the interquartile range from the upper quartile.

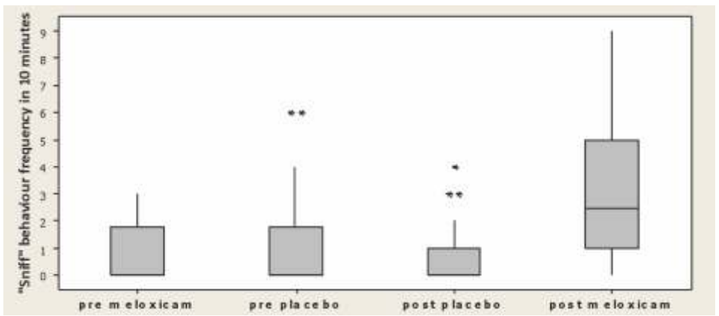
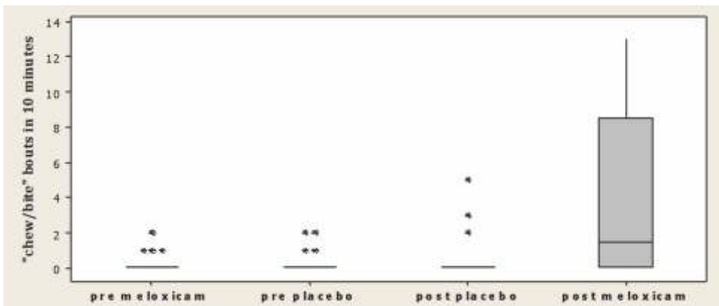


Figure 3. Box plot showing increased 'chew/bite' behaviour (bouts in 10 minutes) before and after placebo and Meloxicam. The post-Meloxicam group showed significantly higher chew/bite behaviour than others. The box indicates the upper and lower quartiles of the number of chew/bite bouts with the median as the line in-between. The whisker indicates the maximum value. As chew/bite behaviour is rarely shown by groups other than the post-Meloxicam group, the median line alone is indicated at 0. * indicates an outlier, defined as those values which are above 1.5 times the interquartile range from the upper quartile.



Discussion
The present study aimed to test the efficacy of a behavioural pain assessment tool that had been developed in a clinical setting under field conditions in the brick kilns of India. Observation and recording of all the equine behaviours set out in the tool were possible without difficulty under field conditions. The scanning of the posture behaviour and observing the frequency of event behaviours for 10 minutes was practical, making the tool applicable under field conditions.

Three behaviours – walk, sniff, and chew/bite – changed significantly after the administration of the drug (Meloxicam). This result indicates that exploratory behaviours like walk, sniff, and chew/bite increase after pain reduction with analgesics in donkeys. This suggests that these particular behaviours are potential indicators of a pain-free state. This result also suggests that pain behaviour in donkeys is similar to the horse pain behaviour in terms of the animals going to a 'switched off mode' as established by Price et al. [4].

Conclusion
The behaviour assessment tool used in this study is valuable in identification of pain-related behaviour in working donkeys under field conditions. Exploratory behaviour (walking, sniffing, and chewing/biting) could be used as predictable indicators of (an absence of) pain in working donkeys. Using behavirourals tools for pain identification could lead to better recognition of pain by veterinary health providers, animal owners, and other stakeholders, which in turn will help better management of pain.

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PARTICIPATORY ASSESSMENT OF THE IMPACT OF EPIZOOTIC LYMPHANGITIS IN ETHIOPIA

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Abstract
A participatory study to assess the impact of Epizootic Lymphangitis (EZL) was conducted in consultation with carthorse owners and drivers in 9 different regions of Ethiopia. Focus groups were used to explore owners' understanding and experience of this disease. Additionally, the effects of EZL on the infected animals and the subsequent socio-economic consequences for the owners/drivers were investigated.

Introduction and rationale
Epizootic Lymphangitis (EZL) is currently endemic in Ethiopia where it affects horses, mules, and occasionally donkeys. Despite eradication from Europe in the early 1900s, EZL currently infects horses in parts of Northern, Western, and Eastern Africa and Asia where eradication policies involving mass slaughter may be impractical.

Classically, this is a chronic, progressive, suppurative, pyogranulomatous fungal disease of the skin, although it may present in ocular, pulmonary, or mixed forms. In advanced cases there is extensive distribution of pathology throughout the body, which often results in debilitation and severe lameness. The yeast phase of the causative fungus *Histoplasma capsulatum var farciminosum* is found in the host whereas the mycelial phase persists in the environment.

There are limited studies reporting potential risk factors for EZL. Two cross-sectional studies found a negative correlation with altitude [1, 2]. In Ethiopia, regions between 1500 and 2300 metres above sea level have the highest prevalence, probably due to favourable environmental conditions for survival of the organism. Transmission is considered to be associated with season, fly vectors, wounds, or contact with discharge from ruptured lesions although further epidemiological studies are required to quantify these.

Essentially, the importance of this pathogen within the equine population in Ethiopia is due to the high prevalence of disease (~19%; range 0–39% in horses [1]) and the economic impact due to loss of equine productivity and mortality.

Ethiopia hosts the second largest equine population in the world with an estimated 7 million equids – half of Africa's equid population [3]. Equines are used mainly as draught animals in Ethiopia, and play an essential role in day-to-day life in both rural and urban centres [4]. They are used to transport goods including crops, firewood, household consumables, and water. In addition, horse-drawn taxis and carts are used to generate revenue as a source of sustainable income for a significant number of Ethiopian families [5].They often provide the only affordable transportation service in many towns [1]. Jones [6] stated that the impact of EZL on poor families as well as in terms of animal welfare is devastating. In a study investigating the economics of the cart-horse industry in Ethiopia, Abebaw [7] reported that losses to the owner due to morbidity of a horse with EZL resulted in more than 50% reduction in daily earnings.

The SPANA team in Ethiopia regularly see EZL cases with a variety of presentations at their mobile clinics. This

experience, along with previous cross-sectional studies implicating EZL as a problem in Ethiopia, prompted this study to be designed and conducted in collaboration with SPANA, Addis Ababa University Veterinary Faculty, and the University of Liverpool Veterinary School.

Methods

This participatory study was designed to address 4 main research questions:

- Is EZL recognised by carthorse owners/drivers and is it considered an important disease locally?
- What factors do carthorse owners/drivers associate with the development of disease?
- What happens to a horse with clinical disease and does this affect the economic value and use to the owner?
- Are measures taken to reduce disease occurrence and what makes an intervention sustainable for adoption by the owner?

Focus group discussions were held with carthorse owners and/or drivers attending 7 SPANA clinic sites and with owners/drivers in 2 towns not previously attended by SPANA. A semi-structured discussion format was used that incorporated pre-designed key questions. Photographs depicting different stages of EZL were used along with participatory methods such as disease ranking and matrices. Two animal health assistants trained in these methods facilitated translation during the discussions from Amharic/Oromic to English and vice versa. All focus groups were recorded using handwritten notes and audio-recording.

Data were compared between towns at varying topographical areas and also towns with and without access to SPANA clinics in an attempt to explore the influence of the educational programme provided by SPANA.

Disease ranking data were collated and compared between highland, midland, and lowland regions. Narrative data were analysed using thematic analysis (a qualitative analytical method used to summarise key topics arising during discussions).

Results

A total of 72 focus groups (involving 358 participants) were conducted over a 5-week period. Group size varied from 2 to 10 people. EZL, known as 'Nidift' (Amharic) or 'Bitchee' (Oromic), was identified as the most common disease in 17 of 22 groups from the midland and lowland regions. The combined rank scores of 19 groups showed EZL was considered the most important disease affecting horses (3 groups could not agree on ranking).

In summary, carthorse owners/drivers considered that EZL was transmitted via contact with infected horses, flies and insects, wounds, and if the owners' attention to the hygiene of the horse was poor.

The effect of the disease on the horse was described as varying in accordance with the progression of the disease and included stiffness and lameness, inappetance, loss of condition, and weakness and was characterised by skin wounds that were described as swellings that rupture releasing discharge and having a pungent smell.

EZL was described as reducing the working efficiency of the horse due to a gradual inability to pull a cart and a reduction in the number of people or loads they were able to carry. Additionally, people were unwilling to hire these taxis due to the appearance and pungent smell of the horse. This had a direct impact on the achievable daily income. Owners tried to use the horse for as long as possible by reducing the distance, working hours, and loads carried. If the horse could no longer work, owners reported no option other than to abandon the animal due to socio-economic pressures. This resulted in death of the horse.

Specific measures to prevent EZL were not always considered or put into practice, often due to lack of resources and knowledge. Specific measures that were used included washing the horse regularly, replacing materials in areas of the harness that had been in contact with an infected animal, keeping the stable clean, providing good feed for the animal, using kerosene to repel flies, and keeping the animal inside after work to protect it from flies.

However, the use of each of these measures varied according to their practicality, perceived efficacy, and also by region.

Conclusions

Findings from this study provide an insight into the wealth of local knowledge regarding EZL and the sociological impact of this disease within the working equine owners' community. This is a disease with far-reaching welfare implications, not only due to difficulties in treating cases but also due to the effect of abandonment of horses.

A wider variety of themes was described among midland and lowland groups compared with highland groups. This may reflect the low prevalence of disease in highland regions where owner/drivers are likely to have less experience of EZL. There was limited dialogue regarding treatment options and disease prevention in general, but particularly regarding disease prevention in areas not accessed by SPANA clinic. This may demonstrate areas to focus education initiatives.

Themes arising within the analyses provide hypotheses which can be explored further with traditional quantitative studies. With further epidemiological investigation, it is hoped that interventions that are practical, affordable, and sustainable can be developed to prevent this disease.

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PARASITES AND THEIR CONTROL IN WORKING DONKEYS: THE NEED TO DEWORM AND FREQUENCY OF ANTHELMINTIC TREATMENT

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Abstract
In many developing countries donkeys are extensively used for work and may be maintained on a low-quality diet. They are often highly stressed from overworking, poor management practices, and other disease conditions. In such populations of working donkeys, parasites are one of the major health problems, often leading to poor work performance and early demise. Most of the parasite control strategies used in the developed world are not applicable in most developing countries. Because of this anthelmintic treatment is the main alternative method currently in practice. However, drugs are expensive for poor donkey owners, and treating animals only when a threat occurs means money is not wasted and the rise of anthelmintic resistance is reduced. The DS projects in Ethiopia practise a biannual deworming programme. Recent studies, however, have shown that donkeys dewormed at the end of rainy season were diagnosed with a significantly lower mean epg at the end of the dry season compared with the pre-treatment mean epg for 2 consecutive years ($p<0.0001$). There was no statistically significant difference in mean epg between donkeys treated annually and biannually ($p<0.0001$). This clearly indicates that working donkeys may not need deworming at the end of the dry season.

Parasite infection in working equids
Although similar parasitic infections exist in equids raised under the temperate and tropical climatic conditions, working donkeys have been shown to have differing profiles of parasitic disease and treatment needs when compared with their non-working counterparts [11, 8, 4, 6]. Hence most of the parasite control strategies used in the developed world are not applicable in most developing countries where working equids are kept under extensive management systems by resource-limited communities. Because of this anthelmintic treatment is the main alternative method currently in practice by most animal charity organisations working with working equids.

In the past, helminth control in donkeys was deemed unnecessary, and the traditional perception among most people, that donkeys never get sick, can be attributed to a general lack of knowledge of the effects of helminths on donkeys. The following questions are often raised when it comes to anthelmintic treatment in working donkeys:

- Do working donkeys really need anthelmintic treatment?
- Do they benefit from it?
- Do all donkeys need anthelmintic treatment?
- How frequently do they have to be dewormed?

To answer these questions, the effect of parasites, the general epidemiology of parasitic infection in working donkeys, management practices, animal factors, environmental factors, and the different parasitic control strategies should be considered.

Effect of parasites on working donkeys
In addition to zebras and other wild animals, donkeys may be more resistant to parasitic infection than other equids, and infection may appear to cause less severe clinical disease [7]. However, in many developing countries, donkeys are often stressed from overworking, poor management, malnutrition, and other diseases conditions. In such a highly stressed population of working donkeys, parasitic strongyles are one of the major health problems often seen causing severe gut pathology [9, 10, 3, 8, 5]. They have a direct effect on health and production, which in turn, results in the early demise of an animal, or reduction in their work output and ultimately in

the income of the owner and community. Although data are not available, our long-term experience/observations and information obtained from the owners in areas where the DS projects operate in Ethiopia showed improved body condition and work performance and increased longevity of working donkeys. Therefore, there is no question that working donkeys need anthelmintic treatment. However, anthelmintic treatment should be coupled with improved diet and good management to get the maximum improvements.

Do all donkeys need anthelmintic treatment?
Donkeys in the wild often have a very good body condition without any anthelmintic treatment despite being diagnosed with a high faecal egg count. Similarly, domestic donkeys which are rarely used for work (e.g. Masai donkeys in Kenya), or working donkeys which are better looked after (e.g. coastal donkeys in Kenya and lowland donkeys in Ethiopia) are often seen with impressive body condition throughout the year without any anthelmintic treatment. This indicates that these animals can tolerate parasitic infection, provided they are not under stressful conditions and their immunity is not compromised. This makes sense when we think that donkeys did not need anthelmintics to survive throughout their evolution, and many may not need them today. Dosing these less susceptible animals yields very little benefit but it does reduce the level of acquired immunity in youngsters and may introduce drug resistant parasites. Selective treatment based on faecal egg count is not applicable both from its economic and practical point of view. Therefore, targeting those working donkeys with poor body condition thought to suffer more from parasitic infection is highly recommended although poor body condition may not be directly related to worm burden. Such an approach also helps to reduce the development of anthelmintic resistance by increasing parasitic refugia.

How frequently do we have to deworm working donkeys that need anthelmintics?
The frequency of anthelmintic treatment (FAT) in equids in the developed world is based on a number of factors most of which are not applicable in most developing countries. As drugs are expensive for poor donkey owners, treating animals only when a threat occurs means money is not wasted. The development of anthelmintic resistance from over-use of drugs should also be taken into account. Therefore, understanding factors that increase risk for parasitism in working donkeys will help in designing a more rational strategic anthelmintic treatment programme (SATP) so that anthelmintics are utilised reasonably and effectively in a sustainable way.

The Ethiopian experience
Previous epidemiological study to determine the seasonal patterns of strongyle faecal egg output in working donkeys showed high prevalence of strongyle infection with significantly higher faecal egg output during the rainy season compared to the long dry season [6]. A mathematical model based on the biology of strongyles and environmental factors to simulate the effect of timing and frequency of anthelmintic treatment (FAT) has shown that parasite levels fall rapidly and remain below the pre-treatment level for many years if donkeys are dosed only once a year [4]. These studies have shown that the exposure level the animals are experiencing to parasitic infection at different times of the year is the key factor that determines parasitic infection level in working donkeys. The DS project is practising the biannual anthelmintic treatment regimen; treating donkeys at the end of the rainy season (October) and at the end of the dry season (May).

A further unpublished field study to determine the FAT and the best time of deworming working donkeys in the mid-lowland region of Ethiopia has shown that donkeys dewormed in October were diagnosed with a significantly lower mean epg in May compared to the pre-treatment mean epg in October for 2 consecutive years (Table 1).

Table 1. The mean faecal strongyle egg count (epg) before and after treatment at the end of the rainy season and dry season in a donkey population, Akaki, Ethiopia

Number of donkeys		
Sample date	**examined**	**Mean epg + se***
October 2006	101	2050 + 427.31
May 2007	99	356 + 74.54
October 2007	99	654 + 136.34
May 2008	98	258 + 87.25

* Fitted mean value for the negative binomial distribution linked with identity function

There was no statistically significant difference in mean epg between donkeys treated annually and biannually ($p<0.0001$). After 2 years' annual deworming the faecal strongyle egg count was significantly reduced and the number of donkeys diagnosed with more than 300 epg was less than 25% (Figure 1). This figure shows that individual donkeys differ markedly in their susceptibility to strongyle infection and a small proportion of the herd is responsible for the majority of pasture contamination.

Figure 1. Scatter diagram showing the distribution of faecal strongyle egg counts among the donkey population before and after annual anthelmintic treatment

This study has shown that donkeys acquire high parasitic infections during the wet rainy season and the level of parasitic infection acquired during the subsequent long dry season is minimal. The mid-lowland region of Ethiopia is characterised by a rainy season of June to September and a long dry season of October to May. The long dry season is characterised by absence of rainfall, warm to hot temperature, and scarce herbage coverage, which is an unfavourable environmental condition for the development and survival of the parasites. This indicates that deworming donkeys at the end of the dry season may not be necessary.

Our experiences in Ethiopia [1] have shown that working donkeys can easily gain body weight/condition during the rainy season when pasture/grass is available and work load is reduced. On the other hand, the long dry season is the time of the year when donkeys are under stressful conditions and become immuno-compromised, and hence parasites have a detrimental effect. Moreover, studies have shown that cyathostomins in working donkeys may not

undergo arrested development during such unfavourable environmental conditions [2, 8]; rather they survive primarily as long-living adult worms [2].Therefore, targeting high parasite load acquired during the wet season is highly recommended. The chance that larvae produced from the survived adult parasites develop and infect donkeys is quite minimal in the dry season. Moreover, there will be no over-wintering of larvae unlike in most temperate regions. Therefore, the chance that the larvae will contribute to the resistance parasitic population is also low. On the other hand, deworming donkeys at the onset of the rainy season increases the proportion of resistance parasites; because the parasites survived the treatment they will have a greater chance to reproduce, contaminate pasture thus infecting donkeys, and assume the greater proportion of the resistance population.

Conclusions

It is much more logical to approach worm control from a preventive rather than therapeutic point of view. The goal in parasite control is not to eradicate but to reduce parasite reproduction and contamination of the environment so that there are fewer worm larvae in the next generation to infect the animals. From the findings of this study, the poor local economic climate and the possibility of anthelmintic drug resistance developing due to anthelmintic over-use mean that the annual anthelmintic treatment regimen at the end of the rainy season seems to be ideal for the control of gastrointestinal parasite of working donkeys in the mid-lowland tropical conditions of Ethiopia.

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FIRING (A MUTILATION) OF WORKING EQUINES IN INDIA: A COMPARATIVE ETHNIC PRACTICE IN DELHI, LUCKNOW AND HYDERABAD CITIES

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Abstract

Working equine species are reared by communities for their livelihoods, carrying out draught, pack, ridden work and other purposes such as for ceremonial or breeding use. Due to a lack of veterinary services or following traditional practices, equine-owning communities often carry out mutilation practices such as hot iron firing, which cause multiple welfare problems to equine animals. Firing is considered as an offence in Indian law and referred in the Prevention of Cruelty to Animals Act 1960 as a non-cognizable offence.

This paper aims to study the practice of firing of working equines; in terms of species and work type. It also covers the inter-city prevalence of firing and the general attitude (demeanour) of fired animals. The study analyzed the existence of these practices in Delhi, Lucknow and Hyderabad cities in India. Using a welfare assessment tool, a total of 867 animals were assessed during 2008 to 2009, comprising of 67.5% horses, 18.0% donkeys and 14.5% mules. The practice of firing was found in 2.9% of the study population: 3.9% of horses, 0.8% of mules and 0.6% of donkeys were mutilated by firing. The prevalence of firing was found to be highest in Hyderabad (12 out of 133 animals). It was most prevalent in horses compared to other species and in animals transporting people by cart (TPC) compared to other work types.

The study identified vulnerable animals of concern according to their species and work type in three cities. Such welfare issues quantified across the country would enable service providers such as Animal Husbandry department and municipal bodies to focus their activities on prevention.

Introduction

The Brooke is an international equine charity working in India and several other developing countries since 1934. The Brooke India is working along with its partner organizations for working equine animals belonging to the poorest of the community, with the vision of sustainable improvement of equine welfare [1].

The description of animal welfare as adopted by OIE (Office International des Epizooties) in May 2008 is “animal welfare means how an animal is coping with the conditions in which it lives". Welfare has also been defined by way of two questions “are the animals healthy; do they have what they want?” [1]. The Brooke aims to achieve welfare of working equines by using the framework of the “Five Freedoms”. They include 1. Freedom from Hunger and Thirst; 2. Freedom from Discomfort; 3. Freedom from Pain, Injury or Disease; 4. Freedom to Express Normal Behaviour; 5. Freedom from Fear and Distress [2]. The Brooke along with University of Bristol, U.K. developed a welfare assessment tool in 2003 covering both the physical and mental status of animals [3].

Firing is usually practiced by equine owners and local health providers and has been carried out for thousands of years, traditionally as a treatment for chronic lameness, especially for joints. Firing may also be used for decoration or as identification mark on any part of the body. Firing is the application of a heated metal instrument (usually referred to as an iron) to the skin and in some instances to the deeper tissues of the affected area. The practice is performed without proper restraint and application of sedatives and analgesics. During the process of firing, the animal experiences severe pain and discomfort and as a result its welfare status is compromised. Finally an open wound forms in the area of firing which quite often leads to other complications. Even though the prevalence of firing is relatively low, from an animal welfare point of view it is important because of the intensity of pain and suffering it causes.

In the Prevention of Cruelty to Animals Act 1960, mutilation is an offence. Section 11 (1)(k) considers firing as a

mutilation, a cruelty and a non-cognizable offence.

In this paper, data on firing from three cities has been compared with four other variables to find the most vulnerable group of animals and their mental demeanor.

Methods

A protocol of “Guidance notes to accompany working equine welfare assessment” [1] was applied to assess the prevalence and intensity of firing lesions among working equine animals in Delhi, Lucknow and Hyderabad during the period 2008 - 2009. Four intensities of firing lesions were differentiated: score 0 = no firing lesion; score1 = healed lesion; score 2 = firing lesion with broken skin or redness; score 3 = firing lesion with visible muscle and bone. Scars are usually hairless. Any sign of a firing lesion or firing scar on any part of the body was recorded, using the score appropriate for the most severe part of the lesion. Six trained welfare assessors assessed the animals.

A Brooke para-veterinarian guided the team to find animals at their grazing or working sites. The animals were sampled according to census sampling from Brooke operational sites and were assessed at their working spot or at their stable. At each site, data were recorded by hand and entered into a dedicated web-base database. The database was transferred to Microsoft Access and analyzed for the prevalence of each welfare parameter.

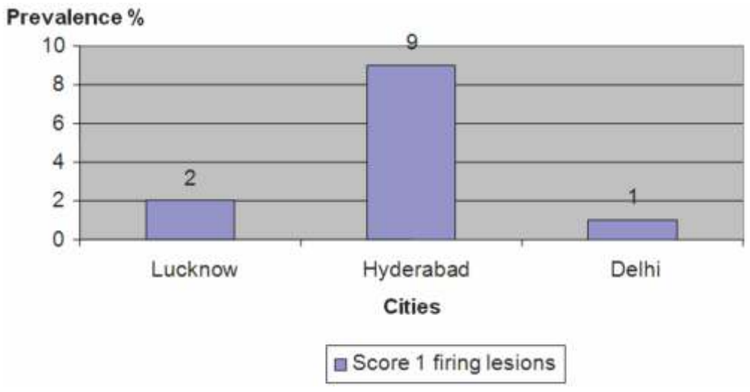
Results and Discussion

A total of 867 equine were assessed: 337 from Delhi, 133 from Hyderabad and 399 from Lucknow. Of these, 585 were horses, 126 were mules and 156 were donkeys.

1. Prevalence of firing in three cities: Delhi, Hyderabad and Lucknow

The prevalence of firing was 2% in Lucknow, 9% in Hyderabad and 1% in Delhi (Figure 1). The comparative severity of firing lesions in Delhi, Hyderabad and Lucknow shows that almost all firing lesions were superficial or healed or a scar (score 1). A score 2 firing lesion was reported in a donkey from Lucknow, representing less than one percent of the sample population.

Figure 1. Prevalence (%) of firing lesions in Lucknow, Hyderabad and Delhi



2. Distribution of firing according to species

Table 1 shows that most fired animals were horses (23), followed by mules (1) and donkeys (1). The prevalence of firing in horses across all cities was 5.0%. Among horses the highest number of fired animals were reported from Hyderabad (52.2%) followed by Lucknow (34.8%) and Delhi (13%) respectively.

Table 1. Firing lesions by species in Lucknow, Hyderabad and Delhi

Species/ Sites	Lucknow	Hyderabad	Delhi
Donkey	1	0	0
Horse	8	12	3
Mule	0	0	1

3. Distribution of firing according to work type

In all three cities, animals from six work types were found with firing lesions (Table 2). These work types were Transportation of Goods by Cart (TGC), Transportation of People by Cart (TPC), Transportation of Goods by Pack (TGP), Ceremonial (Cer), Bricks transported by cart (BKC), and Bricks transported by pack (BKP). Two hundred and seven animals worked as TGC and 111 animals worked as TPC; out of these animals 9 TGC (4.4 %) and 11 TPC (10 %) animals had firing lesions.

Table 2. Firing lesions among different work types

Cities/Work type	TGC	TPC	TGP	Cer	BKP	BKC
Lucknow	4	1	1	0	2	1
Hyderabad	3	8	0	1	0	0
Delhi	2	2	0	0	0	0
Total	9	11	1	1	2	1

4. General demeanor among fired animals

The general demeanor (assessment of animals interest in surroundings, curiosity and spontaneous movement of its body parts to correspond with its surroundings) of animals was also assessed to monitor their mental health. A three score system was adopted for assessing general attitude (Table 3).

Table 3. General demeanor among fired animals

	Attitude Score 0 (Alert)	Attitude Score 1 (Apathetic)	Attitude Score 2 (Severely depressed)
Lucknow	8	1	0
Hyderabad	11	1	0
Delhi	3	1	0

dealing with animal cruelty issues to focus their activity on creating awareness among equine owners and stakeholders to stop this brutal activity. It enables them to cater their services to the neediest animals and contribute to animal welfare in a more effective way. This study could also be used to Here 22 fired animals showed alert demeanor (attitude score 0), 3 fired animals showed apathetic demeanor (attitude score 1) and no animals fell into the category of severally depressed (attitude score 2) category.

Discussion

The findings from Lucknow, Hyderabad and Delhi city gave a comparative picture of fired animals. The study tried to cover all the working equine species and work types found in each of the selected cities in order to identify the work types and species most vulnerable to the practice of firing. The study demonstrates a higher percentage of firing lesions among horses compared to donkeys and mules. Swelling of tendon and accumulation of fluid on limbs is found in most working horses; this may lead owners to mistreat with hot iron rods. It is evident that animals transporting people and goods by cart bear more firing lesions compared to other work types; this may be attributed to their heavier loads and longer working hours.

The study will enable service providers such as the Animal Husbandry department, local municipal bodies and other organizations monitor the neediest animals for an effective animal welfare programme.

Acknowledgment:

This study was supported by the Brooke India and the Welfare Assessment unit of Brooke UK. The author would like to thank the Welfare Assessment unit and Dr. Syed Fareh uz Zaman, Team Leader, Causal Research from Brooke India for their assistance with data collection and allied technical support. We would like to thanks all the owners who kindly permitted assessment of their animals.

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IMPORTANT FACTORS IN DECISION MAKING IN TETANUS CASES IN DONKEYS: EXPERIENCE OF DONKEY HEALTH AND WELFARE PROJECT, ETHIOPIA

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Abstract
There is not enough information on tetanus in working donkeys and factors that affect the outcome of the disease. Medical records of 45 working donkeys with a history of tetanus presented to the Donkey Health and Welfare Project, Debre Zeit, Ethiopia between 2008 and 2009 were reviewed. The animals were admitted to the clinic for intensive treatment. The cases were divided into survivors and non-survivors groups. The clinical data of survivors and non-survivors were compared using a 2-sample t-test and chi-square test. The average time interval between the first clinical signs and recovery was 19.00±3.50 days for survivors. The survival rate was 66.3%. The first week appears to be the critical period for survival. Further data analysis showed no association between Tetanus Anti-Toxin (TAT) treatment and outcome. The occurrence of tetanus in working donkeys showed seasonality. The majority of tetanus cases were observed during the wet rainy season. Time elapsed between first clinical signs and hospitalization, complete lock jaw, dyspnoea, drenching pneumonia, and recumbency were the major indicators of poor prognosis for working donkeys suffering from tetanus.

Introduction
Tetanus is caused by a gram-positive, spore-forming anaerobic bacterium, *Clostridium tetani* [1, 2]. The disease is characterized by generalized muscular rigidity and spasms, hyperesthesia, convulsions, respiratory arrest, and death [1, 3]. Tetanus affects mammals worldwide, but the horse seems the most susceptible of domestic animals [3, 11]. Early diagnosis and therapeutic intervention is imperative for any chance of survival. Despite advances in understanding of the pathophysiology, there is no readily available diagnostic test that detects the presence of the toxin. The diagnosis is based on wound history and characteristic clinical signs [11].

Since routine vaccination of horses against tetanus was started, the occurrence of the highly fatal disease has decreased dramatically in the northern hemisphere [11]. In contrast, equids living in third-world countries where vaccination is often not performed are still frequently affected by tetanus [5].
The objective of this retrospective study was to describe the clinical course of tetanus in donkeys and to identify factors that could be useful for reasonably accurate prognosis and therapeutic decision making.

Materials and methods
Animals and study design
The medical records of 45 working donkeys treated for tetanus upon presentation to the Addis Ababa University, Faculty of Veterinary Medicine, Donkey Health and Welfare Project clinic in 2008–9 were reviewed. This includes 25 males and 20 females ranging in age from 2 to 20 years. The diagnosis was based on the presentation of typical clinical signs of tetanus. For each case, data on full anamnesis, clinical examination, wounds, and outcome were recorded. Based on the outcome cases were divided into survivors (S) and non-survivors (NS). (See Table 1.)

Treatment and supportive care
All donkeys were treated with Procaine penicilline (20000IU/kg) q12h. In addition Tetanus Anti-Toxin (TAT) was administered to 38 donkeys. Any wound or foot abscess was cleaned, debrided, and flushed with saline, iodine, and hydrogen peroxide (3%) as appropriate. Supportive treatments such as handling the animals quietly, gentle

plugging of ears using cotton-plug, a dark, quiet, and well-bedded box were provided to limit external stimuli that might disturb the animal and exacerbate hyperesthesia. Relaxation of the muscle tetany was attempted using acepromazine (ACP). Intravenous or stomach tube-feeding were provided during the critical stage when the animals could not eat and drink. Soft feeds and water were made easily available and accessible for those donkeys which could eat and drink. Gentle manual evacuation of the rectum and catheterization were performed in some donkeys to relieve their discomfort.

Statistical analysis
Descriptive statistics, 2-sample t-test, and chi-square test were performed using SPSS 15.0 for Windows. For all tests the level of significance was set at $p<0.05$.

Results
Hyperesthesia, elevated tail, flicking of the nictating membrane on touch, extended head, stiff gait, dilated nostrils, and erected ears were the common clinical signs observed. Locked jaw, dyspnoea, and recumbency were also seen in some donkeys. Drenching animals with herbal medicine in an attempt to treat tetanus by owners was a very common feature observed.

Analysis of the data showed 66.3% and 33.3% survival rate and case fatality rate, respectively. Age ($p=0.213$) and sex ($p=0.352$) had no significant effect on the outcome of the disease.

The frequency of complete locked jaw, dyspnoea, and recumbency was significantly higher in non-survivors**.** Drenching with herbs or plants was significantly associated with the survival rate where only 14.3% (1/7) of the drenched survived. The mean time elapsed before presenting to clinic had a significant effect on the outcome of tetanus (Table 2).

TAT administration was not statistically associated with outcome ($p=0.67$). The overall mean time of recovery was 20.00±4.50 which ranges from 13 to 30 days. There was significant difference in the mean duration to recovery between TAT (19.50±4.40) administered donkeys and those without TAT (21.00±1.00) ($p=0.011$). The non-surviving donkeys were dead or euthanized within 3 days on average after the first sign of tetanus was observed.

Table1. Mean ±SD of age, pulse rate, respiratory rate, rectal temperature, and interval between the appearance of clinical signs and hospitalization and their effect on the outcome in 45 donkeys for tetanus, 2008–9, Ethiopia

	Range	Survivors(N=30)	Non-survivors (NS=15)	Total (N=45)	p-value
Age (year)	2–20	8.42±4.69	10.30±4.67	9.04±4.71	0.213
Pulse rate (bpm)	36–80	58.73±10.11	58.27±12.30	58.58±10.75	0.90
Respiratory rate (rpm)	14–80	42.47±17.01	38.53±14.71	41.16±16.22	0.429
Temperature	36–38.9	37.51±0.64	37.45±0.56	37.49±0.61	0.273
Time between first clinical sign and hospitalization (days)	1–9	2.80±1.97	4.57±2.22*	3.98±2.28	0.011

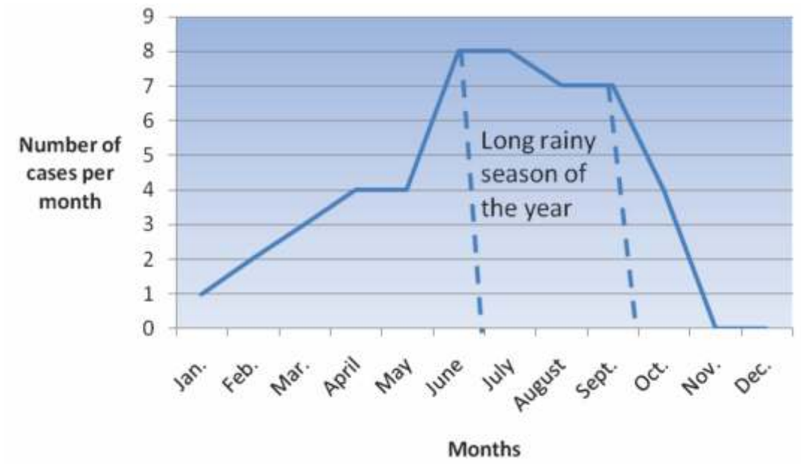
*Significantly different from mean value of the survivors group, $p<0.05$

Table 2. The association of some of the factors with the outcome in 45 working donkeys treated for tetanus, 2008–9, Ethiopia

	Survivors	Non-survivors	Total	p-value
Sex	Male: 15 (50%) Female: 15 (50%)	Male: 10 (66.7%) Female: 5 (33.3%)	Male: 25 (55.6%) Female: 20 (44.4%)	0.352
TAT status	TAT: 26 (86.7%) No TAT: 4 (13.3%)	TAT: 12(80.0%) No TAT: 3(20.0%)	TAT: 38(84.4%) No TAT: 7 (15.6%)	0.670
Wound	Wound: 17 (56.7%) No wound: 13(43.3%)	Wound: 10 (66.7%) No wound: 5 (33.3%)	Wound: 27 (60.0%) No wound: 18 (40.0%)	0.376
Recumb-ency	Recumbent: 7 (23.3%) Not recumbent: 23 (76.7%)	Recumbent: 15 (100%) Not recumbent: 0 (0%)	Recumbent: 22 (48.9%) Not recumbent: (51.1%)	0.000
Dyspnoea	Dyspnoea: 4 (13.3%) No dyspnoea: 26 (86.7%)	Dyspnoea: 10(66.7%) Normal: 5 (33.3)	Dyspnoea: 14 (31.1%) Normal: 31 (68.9%)	0.001
Complete locked jaw	Completely locked: 3 (10.3%) Not completely locked: 27 (90.0%)	Completely locked: 8 (53.3%) Not completely locked: 7 (46.7%)	Completely locked: 11 (24.4%) Not completely locked: 34 (75.6%)	0.003
Drenching pneumonia	Pneumonia: 1 (3.3%) No pneumonia: 29 (96.7%)	Pneumonia: 6 (40.0%) No pneumonia: 9 (60.0%)	Pneumonia: 7 (15.6%) No pneumonia: 15 (84.4%)	0.003

Most of the tetanus cases occurred during the long rainy season, from June to September. The highest number of cases was recorded in June and July (Figure 1).

Figure 1. Seasonal variation in the number of tetanus cases presented to Donkey Health and Welfare Project, 2008–9, Ethiopia



Discussion

The present retrospective study shows that tetanus is one of the major fatal and infectious diseases of working donkeys in Ethiopia. An overall survival rate of 46% (n=56) was reported in working donkeys of Morocco suffering from tetanus [5]. This survival rate is considered low compared with this retrospective study. This may be attributed to the difference in treatment protocol, grade of cases presented, and external environment in which donkeys were kept. The clinical course and prognosis for survival depends on the immune and vaccination status of the host, the dose of clostridial inoculation, and the duration and availability of aggressive treatment and supportive care [7].

Age was not a predisposing factor to tetanus in the present study. Similar findings were reported in a retrospective study of 56 horses and donkeys [7]. However, it was reported that young horses are particularly vulnerable to tetanus [6]. Age predisposition for developing tetanus should be studied using case-control methods.

A study undertaken in Morocco showed that there was no association between TAT treatment and outcome [10]. In the present work, although animals without TAT were fewer in number, a similar result was obtained. This suggests that tetanus antitoxin may not be beneficial or economically justifiable in the treatment of tetanus in working animals in the developing world [10]. However, a large sample size and a randomized, double-blind ended clinical trial is required to justify this.

The current study reveals that completely locked-jaw, dyspnoea, recumbency, drenching pneumonia, and a long time interval between the first clinical sign and hospitalization were indicators of poor prognosis. A similar study of equids revealed dyspnoea and recumbency as poor indicators of prognosis [6].

In the present study the surviving donkeys recovered within 3–4 weeks after the first sign of tetanus was observed, which is consistent with other findings [3, 6]. Neuronal binding of the tetanus toxin is irreversible. Recovery requires regrowth of axon terminals and toxin destruction, which explains the time taken to achieve full recovery [8, 9]. The first week appears to be a critical period for survival in working donkeys; non-survivor donkeys died or were euthanized 1–7 days after the first clinical sign was observed. Similar findings have been reported [1, 6].

The high numbers of tetanus cases observed during the long rainy season might indicate the association of the disease with the wet season. In the rainy season the feet of a donkey become soft and easily penetrated by sharp

objects. In addition, mud sticks to the feet facilitating anaerobic conditions for the organism to replicate and produce exotoxin. This time of the year is the time where land is ploughed, increasing the chance of donkeys to contract the *Clostridium tetani* organism.

This study indicates that time elapsed between first clinical sign and hospitalization, completely locked jaw, dyspnoea, drenching pneumonia, and recumbency can be used as indicators of poor prognosis of tetanus in working donkeys.

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THE DONKEY SANCTUARY INDIA'S MANAGEMENT OF EQUINE INFLUENZA IN NOIDA AND THE NEIGHBOURING OPERATIONAL AREAS: A SUMMARY

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Abstract
This paper gives details of how an outbreak of equine influenza in Noida and neighbouring operational areas was managed by the Donkey Sanctuary India. It was managed by establishing a probable diagnosis, confirming the existence of an outbreak, confirmatory diagnosis, and the implementation of treatment control and preventative measures.

Introduction

Equine influenza virus is extremely contagious. The short incubation period and persistent coughing, which releases large amounts of virus into the atmosphere, contribute to the rapid spread of the disease [1]. An outbreak of equine influenza (H3N8) was reported in India in June 2008 after a gap of 2 decades. The outbreak started from Jammu & Kashmir, a northern state of India, and spread to other parts of the country, affecting equines in 11 states [2, 3]. The outbreak was notified to OIE (World Organisation for Animal Health) on 28 November 2008. Noida is in the National Capital Region of India in the northern plains of the country. The Donkey Sanctuary India provides free emergency and routine treatment services, through a mobile clinic, to the donkeys and mules present in this area.

Chronological events and steps to manage the outbreak

Establishing a probable diagnosis

Two mares and a mule were reported on 11 October 2008, with a cough and serious discharge in Sector-135 Noida (Noida district of Uttar Pradesh State in India is divided into various geographical sectors). Standard treatment for respiratory infection was initiated.

Two days later, on 14 October, 31 donkeys with the characteristic dry harsh cough and nasal discharge were reported in Faridabad, Haryana State in India, near Sector-88. Their history revealed that their owners had returned from Beri, an equine fair located in Haryana approximately 65km north-west of Delhi, a couple of days previously (the fair had been held on 5–7 October). They had come across horses coughing and with nasal discharge at the fair, and had even purchased 2 mares with similar symptoms after getting treatment for them from somebody at the fair itself and being reassured that there was nothing to worry about. Now all their donkeys were coughing.

The 2 major features of equine influenza are its rapid spread and the dry deep cough [1].The nature of initiation, quick spread, and clinical signs indicated the acute respiratory infection to be equine influenza.

Confirmation of existence of outbreak

An outbreak is defined by the World Health Organisation (WHO) as the occurrence of more than the expected number of cases of a disease in a given area, among a specific group of people, and over a particular period of time. The sudden occurrence and the number of affected animals indicated an outbreak, so the Donkey Sanctuary India team immediately sought additional advice. An outbreak of equine influenza was confirmed by vets in the Indian Army who had an internal notification of an equine influenza outbreak, and had already begun restricting the movement of equines.

Confirmatory diagnosis

Whole blood and serum samples for analysis were collected and sent to the National Research Centre on Equines

(NRCE), Hissar, Haryana State. A total of 1,175 serum samples from equines in non-government organisations and private farms from various states of the country were examined by NRCE, and out of these 265 samples tested positive for antibodies against equine influenza infection in horses [4].

NRCE supported the presumptive diagnosis of equine influenza by confirming 3 out of 5 samples sent by the Donkey Sanctuary India team to be positive for equine influenza. The sample collection was carried out in sterile conditions and all precautions taken to ensure no transmission of the disease between the sites.

Implementation of treatment, control, and preventative measures

An outbreak is usually an unexpected event and necessitates quick action and rapid control.

- *Clinical management of the cases*. As for all viral diseases, treatment was largely supportive. Donkeys with temperatures above 40°C were given flunixin meglumin (1.1mg/kg body weight i/v). Those with purulent nasal discharge were given antibiotic (trimethoprim-sulfadiazine, 30mg/kg body weight p/o). They were also given oral multivitamins for 5 days for support. Owners were strictly advised to rest all patients, with/without fever. Owners of those with occasional coughing were advised to give them 250g of *jaggery* (unrefined sugar extracted from sugar cane) with a teaspoon of turmeric powder every day for 1 week.
- *Initiate panic control measures*. All equine owners who were contacting us were advised not to panic. They were informed that proper rest and care would lead to an uneventful recovery, and reassured that despite the high morbidity rate, the mortality rate was low. They were told to give their animals complete rest, good feed, clean water, and *jaggery* (unrefined sugar extracted from sugar cane) with turmeric.
- *Prevent further spread*. Responding quickly, the DSI team prepared leaflets in the local language and started reaching out to the community to inform them about the outbreak and various do's and don'ts. Community meetings were organised to inform people about the disease, how it spreads, and what needs to be done if animals show symptoms. Mass canvassing was carried out to advise equine owners to stay away from the equine fair at Garh in Garhmukteshwar, a city in the Ghaziabad district of Uttar Pradesh. The fair – one of the biggest of its kind – was due to be held on the banks of the river Ganges in the first half of November.

Figure1. Information leaflet in local language and its translation

In donkeys, mules and horses there is a risk of spreading equine influenza.
Please do the following to protect your animals from the disease:
1. Do not buy new animals.
2. If your animal is coughing or has discharge from its nose, then immediately keep it away from other animals and inform the vet.
3. Do not put sick animals to work – this could put their lives at risk.
4. Keep animals in the shade.
5. Put a blanket on them at night.
6. Give animals plenty of feed and jaggery.
7. After taking care of animals be sure to wash yourself thoroughly.
8. If your relatives have sick animals do not visit them.
Please co-operate with us to protect your animals from this disease.
For advice please call any of our helpline numbers.

Results

Figure 2. Equine population at risk and actual number of cases reported

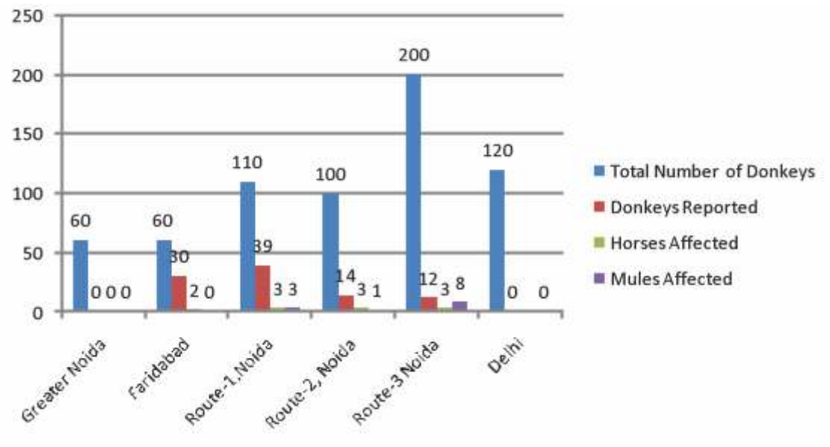
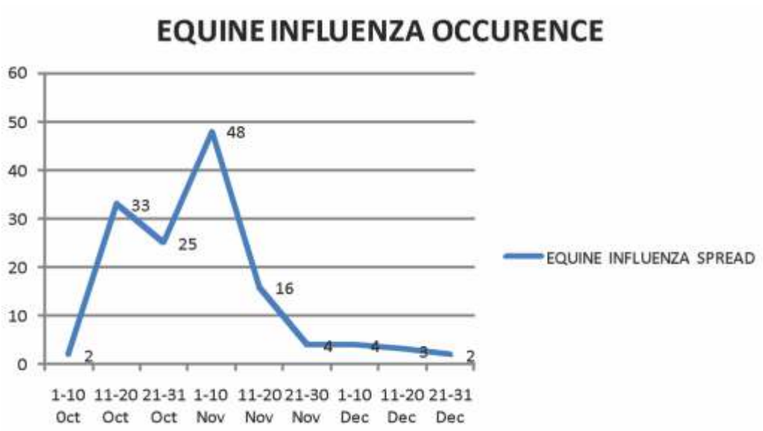


Figure 3. Time distribution and frequency of cases of equine influenza



All data were collected through direct observation by the Donkey Sanctuary India, Delhi Project vets (the authors) who operate a free mobile treatment clinic in the Noida area, supported by the Donkey Sanctuary UK. The data were collated and analysed from clinical records routinely collected.

Approximately 650 equines, mostly donkeys, were at risk in the DSI operational area in Noida. Approximately 150 cases were reported to DSI, which the vets attended. All cases had an uneventful recovery except 4. Of these, 2 were very young donkey foals of hardly a month's age and 2 were donkeys aged approximately 2.5–3.5 years. Post-mortem examinations could not be conducted; however, clinical findings indicated myocardial compromise.

Discussion
Clinical and lab findings confirmed the respiratory infection in Noida and the neighbouring operational areas of DSI to be equine influenza. The outbreak was recorded at the initial stages of the nationwide outbreak. The epidemiological pattern of the outbreak conformed to the earlier reported outbreaks with the characteristic incubation period of 3–4 days, rapid spread, and high morbidity with low mortality and mostly uneventful recovery in equines.

The donkeys showed more prominent coughing than horses or mules. The donkey is reported to have a different susceptibility to a number of diseases as compared with the horse, some of which are endemic throughout the world e.g. African horse sickness, equine viral arteritis, equine infectious anaemia, and glanders [5].

Conclusions
The quick and alert approach of the DSI team, who launched immediate awareness measures based on presumptive diagnosis, helped contain the spread of equine influenza. The containment of cases by this quick management helped the poor donkey owners' community avoid economic loss due to the outbreak and they could continue working and supporting their families.

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INVESTIGATION OF HEALTH AND WELFARE PROBLEMS OF DONKEYS AND MULES INVOLVED IN THE SALT BAR TRADE FROM AFAR TO DIFFERENT PARTS OF NORTHERN ETHIOPIA

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Abstract
Tigray branch Donkey Health and Welfare Project has been working to reduce the suffering of donkeys and mules in the region through integrated veterinary service, education, and community development activities. The objectives of investigating the health and welfare issues of donkeys and mules that are involved in the salt bar trade were to make a preliminary survey of basic health and welfare problems, identify possible areas for intervention, and point out matters which deserve further studies. Based on a semi-structured questionnaire interview with traders, observation of animals, and examination of harnesses together with visits of the production area the following major problems were identified: exhaustion, weight loss, lameness, wounds, parasitism, respiratory problems, colic, and sudden death. The project started to address the parasitism and wound problems. The causes of sudden death and colic in the subjects should be investigated further.

Introduction
Ethiopia has a large equine population mainly used for pack transport. Donkey Sanctuary/Donkey Health and Welfare Project has been working in the Tigray region since 2002 with the aim of improving the health and welfare of donkeys and mules through integrated veterinary service, education, and community development interventions.

One of the major tasks of donkeys, mules, and camels in northern Ethiopia (Tigray and part of Amhara regional states) is pack transport of salt bars from neighbouring Afar regional state to northern Ethiopia markets, mainly Mekelle. The salt trade dates back thousands of years and became the livelihood supplement of many subsistent farmers in the region. Some have been involved in the trade up to 45 years. For most of the Arho salt traders, it takes 2 weeks for a return journey and a trader usually drives on average 8 equids or a few camels with some donkeys or mules. Tax collectors have estimated that about 25,000 donkeys and about 100 mules are working with numerous camels in this trade. People prefer to use salt bars for home consumption and salt-lick for their livestock. The weight of a salt bar is 6–8 kg and an average 70 kg and 120 kg is carried by donkey and mule respectively. The salt production and trade extends from September to June but the number of donkeys participating in the trade decreases dramatically from March to June owing to absolute failure to thrive. July and August are non-trade months because it is the rainy season.

The salt production area, the Danakil, is a very arid, inhospitable part of the globe: 120 m below sea level with an average temperature of 48°C. It is believed that it was part of the Red Sea and an earth quake dramatically transformed the region's geography lifting the earth's crust to create an inland sea. This gradually evaporated to leave huge expanses of salt flats surrounding the salt lake of Aferar and Asale. The production area is about 150 km from Mekelle. The worst part of the journey is at the half- way point with a 3 km steep climb for the laden animals.

Due to the nature of the environment and heavy loads the salt trade may possibly be one of the worst human activities in the globe, hence the traders and pack animals are believed to have a very poor level of welfare.

Investigation of the problems was initiated because of the following rationale:
- The majority of the donkeys and mules are from the working districts of the Project and cases linked to the salt

trade appear commonly.
- Donkeys and mules are repeatedly observed with problems while transporting the salt bars.
- The Project team observed exhausted and abandoned donkeys on the route when a visit was made two and half years back for another epidemic problem in a district of Afar.
- As yet there has been no attempt to examine or alleviate the welfare problems of the animals.

Tigray Donkey Health and Welfare Project works to reduce the suffering of donkeys and mules, so investigation of health and welfare problems in the salt trade became a fitting subject matter.
Objectives of the investigation were to:
1. Explore the major health and welfare problems of donkeys and mules involved in the salt trade
2. Set up possible intervention areas for the Project and execute them accordingly
3. Identify issues which deserve further exploration

Materials and methods
- A semi-structured questionnaire was used to investigate the major health and welfare problems of donkeys and mules involved in the trade. Respondents were selected based on donkey and mule possession: 39 traders were interviewed in the production area, on the trade routes, and at resting sites. For this a visit of the production area was made twice in 2008.
- Animal observations were made to assess wounds, dehydration, lameness, skin disease, ophthalmic problems, and other problems.
- Harness examinations were undertaken to assess their condition and defects.

Results
Based on interviews, animal observations, and harness examinations health and welfare problems were identified.

Interview
The results of the semi-structured questionnaire interviews with 39 respondents are presented in Table 1. Rectal prolapse, skin diseases, ophthalmic problems, and hyena bites were also raised as health problems by significant numbers of respondents. Traders explained that they used traditional medication and interventions mainly for wounds, colic, and respiratory problems.

Table 1. Major health and welfare problems and their rates

S/N	Type of identified health and welfare problems	No. of respon d-ents	No. of respondents who mentioned each problem	%	Note
1	Exhausted, abandoned, dead animals	39	38	97	Encountered, observed frequently, and common to see
2	Weight loss	39	36	92	Observed visible weight loss after complete trip
3	Lameness	39	29	74	Encountered lameness once or more
4	Wound	39	28	71	Encountered wounds once or more

5	Parasitism	39	28	71	As indicator observed grossly visible once: parascaris on faeces, larval gastrophilus on rectum, and nasal bot during sneezing, lice and tick infestation
6	Respiratory problem /locally Asso/	39	25	67	Encountered once or more
7	Colic /locally Atsreshinti/	39	24	62	Encountered once or more
8	Sudden death/ locally Mendef/	39	16	41	Encountered sudden death of unknown cause

Harness examination
The aim of the harness examination was to identify visible defects, and the exercise revealed that some of the pack saddles were ragged, thin, with no proper straps, breechings or gutter to fit the conditions of the landscape, hard loads, and weather of the route. When the salt bars came into contact with the skin, the coat and skin were removed, becoming a source for different sores. The balance control and corrections is usually unachievable due to the dark tour and extremely exhausted drivers.

Animal observation
A number of donkeys and mules with different sores, lameness, weak and desperate were observed in the production area, route and resting centers (see Figure 1). Wheat straw taken from home barely lasted for the first few days of the trip; water was scarce for the greater part of the journey in Afar; and at times animals stayed up to 3 days in the production centre without feed and water due to an unpredicted dispute on taxation, price of salt bars with the local people, religious or public holidays, etc.

Research subjects: Investigation of causes of sudden death.
Investigation of causes of colic /abdominal pain/

Figure 1. An extremely exhausted donkey lagging behind the crowd

Discussion
Although it is known that donkeys and mules are hardy and can work incessantly in hot and semi-arid areas the climatic conditions and hostile terrain of this part of Afar mean they face severe challenges. From the investigation it is understood donkeys and mules involved in the salt trade suffer a number of welfare and health problems, including wounds, parasitism, lameness, sudden death, respiratory problems, colic, as well as a decrease in body weight after each trip. On top of the extreme temperatures of the trade routes lack of feed and water exacerbate the situation. As a result it is not uncommon to see weak, exhausted, abandoned, and dead animals. This indicates that intervention to address the problems is worthwhile.

Conclusion and recommendations
From the results it is perceived that there are a number of health and welfare issues that must be addressed. Traders are presently using traditional practices, but the results are not hopeful because they do not have access to adequate services for the many habitually occurring problems.

- Auxiliary focus group discussion with traders and other responsible bodies to substantiate the issues is desirable
- Local people and clan leaders around the production area should be persuaded to allow trucks to go right to the production centre to free the pack animals from this drudgery permanently.

Possible interventions for the project

- *Deworming.* In 2009 the team dewormed 1,500 donkeys and 151 mules involved in this task. Deworming was carried out at resting centres and in the districts as part of the regular biannual strategic deworming programme with ivermectin, and will continue to reach more animals.
- *Production and distribution of improved pack saddles*. Recently production and distribution of improved pack saddles with gutter, straps, and breechings has begun trials and follow-up is proceeding.

ZOONOTIC AND INFECTIOUS DISEASES: DEALING WITH DISEASE OUTBREAKS A REPORT ON SURRA (TRYPANOSOMIASIS) IN GUJRANWALA, PAKISTAN

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Abstract
A project was conducted to study the prevalence, clinical signs, treatment response and necropsy findings in equines suffering from surra in Gujranwala. For this purpose 73497 animals were tested over a period from April 1997 to January 2010. The data showed that out of 73497 animals tested, 2910 were positive. From April 1997 to March 1998, the prevalence was 10.46%. In the month of September 1999 the maximum Surra prevalence was 38.02%, which is now reduced to 3.96% in April 2009 to January 2010. Clinical and necropsy findings were characteristic for the disease. Out of 2910 infected animals, 2744 responded to Isometamedium chloride and Trypanil prosalt while 166 animals died.

Introduction
Surra is a frequently fatal parasitic disease caused by Trypanosoma evansi. Trypanosoma evansi affects a wide range of hosts including horses, mules, donkeys, camels, buffaloes, elephants, pigs and deer. This was the first trypanosome shown to be pathogenic for mammals and was identified by Griffith Evans, a British veterinarian. In majority of infections this parasite is monomorphic in character but polymorphism occurs sporadically.

The disease has a wide distribution in the area of Africa, Middle East, Central and South America, Pakistan, India, Burma, Sri Lanka, China, Philippines, Vietnam, Indonesia, Malaysia and Brunei. In some countries the disease incidence increases during rainy season when there are large biting fly populations. The case fatality is 100% in horses if untreated but it is much lower in cattle and buffaloes which may act as reservoir hosts.

Transmission and Pathogenesis
The disease is transmitted by biting flies such as Tabanus, Stomoxys and Lyperosia. No cyclical development occurs in these flies. Three factors are concerned in infection and spread of disease.

1. A reservoir of the protozoa.
2. An inoculator in the shape of a biting fly
3. A susceptible animal

Background
Before the Brooke's intervention in Gujranwala, this disease was causing a major threat to the working equines of the area: owners were not aware of this problem and were suffering huge losses due to surra outbreaks. In 1997 the Brooke operation was initiated against surra in Gujranwala. First of all a survey was carried out of the target area, which included brick kilns, the static clinic, wayside stations and different treatment points. Animals displaying poor body condition, conjunctival petechiae, ataxia or elevated temperature were suspected cases of surra and were selected for surra screening (blood sampling) and given treatment.
In October 1997 it was observed that approximately 21.32% of the equine population suffered from this disease, which rose to 38.02% by September 1999. Then Brooke Gujranwala addressed the problem and started creating awareness among the owners on this issue and its treatment, which was provided at mobile treatment points as well as at the Static Clinic. The number of cases began to reduce gradually.
In October 2005 once again an outbreak of surra was detected in the brick kilns in Gujranwala. A total of 1407 equines at 87 brick kilns were screened for surra and 423 positive cases were treated on the spot.

Methods

Data from a total of 32434 horses, 11297 mules and 29766 donkeys that presented to the Brooke Gujranwala from October 1997 to January 2010 were included in this study.

All the animals were thoroughly examined with particular reference to trypanosomiasis. The temperature was recorded and conjunctiva examined for petechiae, anemia, icterus and conjunctivitis. In some cases, oedema especially under the belly and on hind legs was observed. In advanced cases staggering and in-coordination of the hind legs was observed, particularly in horses, the superficial lymph nodes of which were swollen. Animals with poor body condition (and during an outbreak, all animals) were subjected to fresh blood examination under a field microscope to assess the density of protozoa.

Confirmation of diagnosis was determined by one or more positive results using the following criteria:

1. The periodic presence of live parasite in the peripheral blood, detected in a wet blood film, taken from a peripheral vein such as the facial plexus or marginal ear vein
2. Parasite detected in Giemsa-stained smears of peripheral blood. Some positive smears were seen in the laboratory after staining the slides.

Indirect tests for T. evansi include: Complement Fixation Test, Mercuric Chloride Test, Stilbamide Test, ELISA and animal inoculation. No serological tests were used in the Surra diagnosis, but it was broadly assessed that animals displaying poor body condition, conjunctival petechiae, ataxia or elevated temperature could be suspect cases of surra.

Figure 1. Blood smear preparation and examination

Figure 2. During clinical examination most of the animals were found in a poor body condition with a rise in temperature and some had a staggering gait.

Figure 3: Petechiae in the conjunctiva

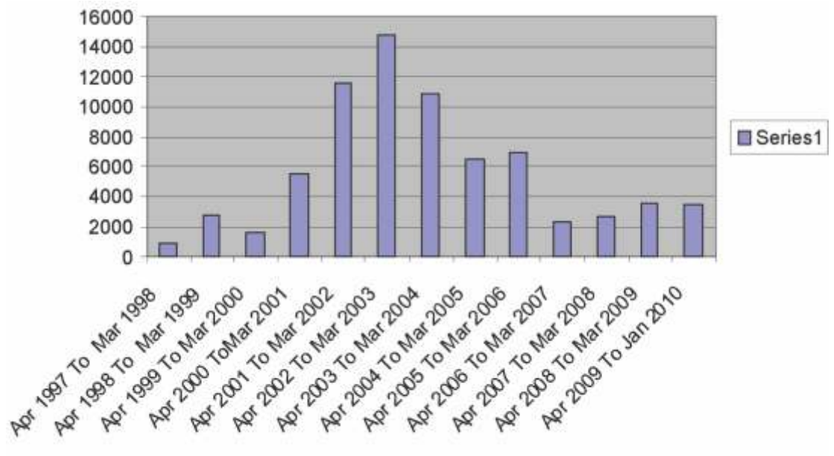
Results

As shown in Table 1, 73497 equines were tested out of which 2910 were positive for surra by wet blood film examination and/or stained blood smear and clinical examination.

Table 1. Animals tested for Surra from April 1997 to January 2010

Period	Animals Tested			Total	Positive Cases		Total	%
	Horses	Mules	Donkeys		Lab	Clinic		
Apr 1997 To Mar 1998	528	67	236	831	86	1	87	10.46%
Apr 1998 To Mar 1999	1717	240	798	2755	195	38	233	8.45%
Apr 1999 To Mar 2000	861	163	575	1599	88	172	260	16.26%
Apr 2000 To Mar 2001	2686	690	2200	5576	33	178	211	3.78%
Apr 2001 To Mar 2002	4895	2024	4681	11600	56	201	257	2.21%
Apr 2002 To Mar 2003	6043	2576	6165	14784	16	90	106	0.71%
Apr 2003 To Mar 2004	4790	1967	4061	10818	11	61	72	0.66%
Apr 2004 To Mar 2005	2933	935	2608	6476	56	121	177	2.73%
Apr 2005 To Mar 2006	2402	901	3733	7036	316	552	868	12.33%
Apr 2006 To Mar 2007	1115	363	842	2320	56	104	160	6.89%
Apr 2007 To Mar 2008	1202	408	1053	2663	75	93	168	6.30%
Apr 2008 To Mar 2009	1620	477	1466	3563	84	113	197	5.52%
Apr 2009 To Jan 2010	1642	486	1348	3476	34	80	114	3.27%
Total	32434	11297	29766	73497	1106	1804	2910	3.96%

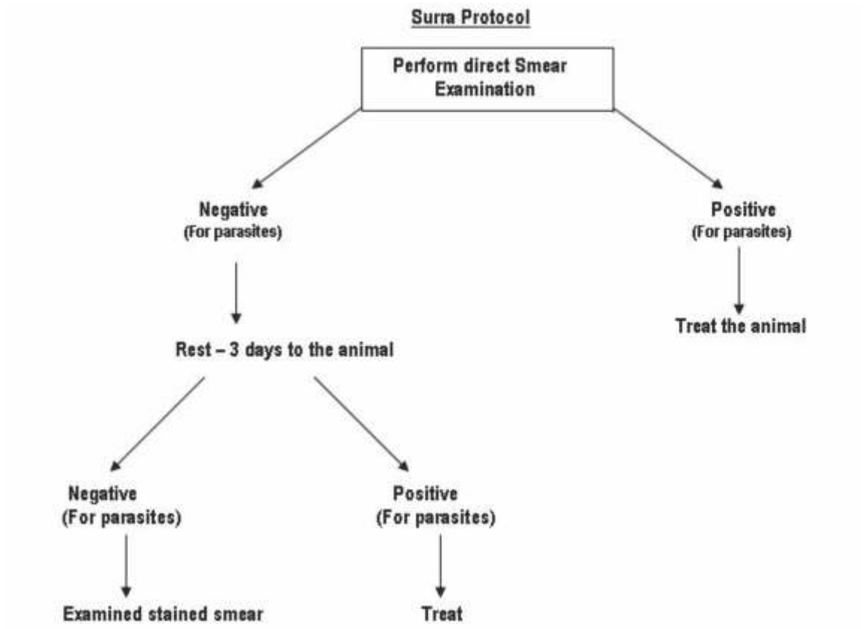
Figure 4. Number of animals tested for surra per annum



Necropsy Findings

After postmortem the necropsy findings were characteristic: body fat stores were found to be depleted, with marked anemia, enlargement of liver, spleen and lymph nodes. Necropsy of cases dying of acute Surra (positive for T. Evansi) revealed a general congestion in the visceral organs and extensive hemorrhages in all tissues.

Treatment



Animals found positive in the laboratory as well as by clinical examination were treated with Isometamidium chloride (Trypamidium): 125 mg in 500 ml of dextrose for horse and 62 mg for donkeys. This drug has a risk of causing shock if over-dosed or if the speed of I/V fluid administration is too high, which causes restlessness, salivation, sweating, shivering, frequent defecation and may lead to death if not checked in time.

Animals were also treated with Trypanil Prosalt (the two salts, Sulphate and Chloride, are for short term and long term effects): for horses 2.5 gm diluted in 15ml distilled water and for donkeys 1.25gm diluted in 10ml of distilled water, administered sub-cutaneously. Both drugs (Trypamidium and Trypanil Prosalt) were not administered at the same time. Good nursing and care are of utmost importance, including rest, a balanced diet, supportive treatment (tonics, vitamins and electrolytes) and follow-up treatment is most important for complete eradication of the disease.

Control of Trypanosomiasis

The control of Surra is dependent on the therapy and the elimination of blood sucking flies. The following measures are adopted:

a. Improve drainage systems to destroy breeding places for flies
b. Pour of kerosene oil onto stagnant water.
c. Sprays for the inside walls of animal houses include chlorinated hydrocarbon insecticides and organophosphates such as minalathion.
d. Regular sprays on the animal may be used every three weeks. The insecticides include 0.5% methoxychlor, 0.25% carbaryl or 1% giodrin
e. Wounds on animals should be covered properly.
f. Use disposable syringes.
g. Isolate cases and surround them with a smoke ring to prevent access to biting flies.
h. Euthanize animals when treatment is unlikely to succeed or not giving favourable results. Bury the carcass.

We also organized surra awareness camps in different areas and capacity building of equine owners in communities; this is a ongoing process.

Conclusions

1. We have reduced the prevalence of surra from 10.46 % to 3.96% in the project area.Surra exists in Gujranwala area in acute, sub acute and in chronic forms.
2. The disease is more prevalent and fatal in horses than donkeys.
3. Awareness about the disease by education of owners has been established and periodic meeting are being held by the Brooke vets on control of surra in equines.
4. Monitoring of the prevalence of the disease has been adopted as a regular and ongoing process by Brooke Gujranwala.
5. Prophylactic and curative treatment is being carried out as a regular treatment protocol.
6. The disease has been brought under control to some extent by adopting proper surra control protocols and administration of prophylactic treatment. The owners are regularly advised to keep the flies away from their animals by use of fly repellents and generation of smoke screens.

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IDENTIFICATION OF SPECIES AND SEX OF WORM PRESENT IN ANTERIOR CHAMBER IN EQUINE EYE

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Abstract
Ocular setariosis is a rare eye problem affecting equines. It causes uveitis and if not treated in time can lead to blindness. Working equines in developing countries may be more prone to infestation compared with equines maintained on stud farms, due to their close proximity with ruminants and vectors such as mosquitos. During the period October 2008–November 2009, 12 horses and 3 mules, aged 4 months to 15 years, with partial to complete corneal opacity were treated surgically for ocular filariasis at the mobile clinic of Brooke Hospital for Animals in western Uttar Pradesh. The worms were taken to the Indian Veterinary Research Institute, Bareilly, for species and sex identification. Of the 16 worms collected, 15 were Setaria digitata *(8 male, 6 female, and 1 immature); the morphological character of 1 worm was close to* Setaria marshalli.

Introduction
Eye problems are a significant welfare issue in working equines. In one study in Delhi they affected 66% of horses and 64% of mules [1]. Ocular setariosis is one of the eye problems encountered in working equines. Working horses and mules are more prone to infestation due to their close contact with ruminants and vectors (mosquito) in the poor hygienic conditions in which they live. Fifteen such cases presented at the Brooke's mobile clinics and were surgically treated.

Setaria digitata [2, 3] occurs mainly in the peritoneal cavity (although young worms have often been found in the eyes) of zebu, water buffalo, and cattle. In addition immature worms have been found in sheep, goats, and horses. *S. digitata* generally occurs only in Asia, but has been found in goats in Saudi Arabia [4]. *Culex quinquefasciatus* demonstrates its potential competence for serving as a transmission vector of *S. digitata.* This mosquito might therefore be responsible, at least in part, for the prevalence of cattle lumbar paralysis in Taiwan, as described in a 2004 report [5].

Setaria equina primarily presents in the peritoneal cavity but sometimes in the pleural cavity, lungs, scrotum, intestine, and eye of the horse, donkey, mule, and zebra and occasionally in cattle and humans throughout the world. One study in India found *Setaria equina* in 3% of 86 horses and 40% of 10 donkeys [6]. Another study examined several collections of Setaria from the aqueous humor of the eye of equids and found they were all *S. digitata,* not *S. equina* [7].

Setaria marshalli occurs in the peritoneal cavity of animals in Burma, India, and the Far East [8].

Materials and methods
Surgical approach
Surgery was performed under standing sedation using xylazine at 1.1mg/kg and butorphanol at 0.01mg/kg. Auriculopalpebral and retrobulbar nerve blocks were achieved with 2% lignocaine hydrochloride. Topical anaesthesia was also achieved using 4% lignocaine hydrochloride eye drops. A small incision was made on the limbus at the 1 o'clock position. The worm came out along with aqueous humor. Worms were preserved in 10% formalin for detailed morphological identification. A topical non-steroidal anti-inflammatory eye preparation (diclofenac sodium eye drops) and an antibiotic (gentamicin eye drops) were administered for 1 week, each at 3 drops 6 times a day. Recoveries were uneventful in all cases. Case details, proximity to other species and recovery days are summarised in Table 1.

Table 1. Surgical cases of ocular setariosis

S. No	Species	Sex	Age	Worm present	No. of days	Contact with other animal	Days to recovery
1	Horse	Mare	3 yrs	1	8	Water buffalo	21
2	Horse	Stallion	2 yrs	1	15	Water buffalo	24
3	Horse	Stallion	8 yrs	1	2	Water buffalo	22
4	Horse	Stallion	3 yrs	1	5	Caprine	18
5	Mule	Male	4 months	2	10	Water buffalo	24
6	Horse	Stallion	2 yrs	1	21	Water buffalo	24
7	Horse	Mare	5 yrs	1	20	Caprine	17
8	Horse	Mare	8 yrs	1	8	Caprine	22
9	Horse	Mare	6 yrs	1	12	Water buffalo	24
10	Horse	Mare	8 yrs	1	10	Water buffalo	28
11	Horse	Stallion	10 yrs	2	10	Water buffalo	19
12	Horse	Stallion	7 yrs	1	28	Water buffalo	24
13	Horse	Mare	6 yrs	1	18	Water buffalo	28
14	Mule	Gelding	6 yrs	1	14	Water buffalo	21
15	Horse	Stallion	8 yrs	1	24	Water buffalo	26

Worms were cleaned in lactophenol for 15 minutes for better examination of morphological features. They were examined under a microscope at 10x and 40x magnification. Photographs were taken of the anterior and posterior and the length of different organs was measured. The morphological features observed were four prominences in the peribuccal region: the lateral ones were projected outwards and almost triangular in shape, and the dorsal and ventral ones were an irregular shape.

Male *Setaria digitata* were identified based on the presence of spicules and attenuated and spirally-rolled posterior end; they were 36–44mm long and 300–500µ wide with a stout right spicule and a left spicule; the terminal knob over the tail was absent; the distance of the anus from the posterior end was 400–450µ.

Female *Setaria digitata* were identified on the basis of the opening of vulva near the anterior end in the oesophageal region and an attenuated posterior end, bent into a loose spiral, ending in a rounded terminal knob; they were 62–78mm long and 500–700µ wide; the vulva was 500–600µ from the mouth; well-developed lateral

caudal appendages were 60–70µ from the posterior end. In one worm the genital organs was not clearly distinct, this was considered to be an immature worm.

In one female worm the vulva was 575µ from the anterior end; it had a round tail, the terminal knob was absent and lateral appendages were 31.5–55µ from posterior end. The species characteristics were similar to *Setaria marshalli*.

Morphological features of different *Setaria* species are summarised in Table 2.

Table 2. Morphological features of Setaria according to the literature [9]

Morphology	S. digitata	S. marshalli	S. equina	S. cervi
Peribuccal ring	-	-	cuticular	cuticular
Lateral prominences	2 triangular shape	-	2 large	2 present
Dorsal and ventral prominences	indented	-	small	notched
Female: Length	62–78mm	90mm	70–130mm	60–120mm
Width (micron)	500–700µ	600µ	750–1200µ	600–900µ
Vulva distance from mouth	500–600µ	600µ	410–820µ	460–830µ
Tail	400–500µ	450µ	340 to 550µ	430–650µ
Caudal appendages distance	60–70µ	Very close to end	60–100µ	90–130µ
Terminal knob	Present	Absent, round tail end	Small, uneven - surfaced	Absent, spike at end of tail
Male: Length	36–46mm	50–60mm	50–80mm	40–60mm
Width	300–500µ	-	400–600µ	380–450µ
Terminal knob	Absent	-	Absent	Absent

Results and discussion

Of the 16 worms collected, 15 were *Setaria digitata* (8 male, 6 female, and 1 immature); the morphological character of one worm was close to *Setaria marshalli.*

In the *Setaria digitata* identified in this study, the distance of the anal opening from the posterior end was 367.5–388.5µ in females and males. Morphological features are summarised in Table 3.

Table 3. Morphological features of *Setaria* eye worms identified in this study

Morphology	S. digitata	S. marshalli
Lateral prominences	triangular	-
Dorsal and ventral prominences	small	-
Female: Length	60–85 mm	95 mm
Width (Micron)	500 µ–650 µ	598.5 µ
Vulva distance from mouth	590 µ–600 µ	577.5 µ
Tail	Terminal knob.	round
Caudal appendages distance	52.5- 84 µ	31.5- 52.5
Terminal knob	present	absent
Anus distance	367.5- 420 µ	262.5 µ
Male: Length	40–65 mm	-
Width	550–600 µ	-
Projection distance	75 µ	-
Terminal knob	absent	-
Anus distance	346.5 µ	-

Figure 1. Uveitis caused by ocular setariosis

S.digitata uveitis (Day1)

Recovery after surgery (Day 25)

Figure 2. Photomicrographs of S. digitata

S. digitata female (Anterior end*)*

S. digitata male (Posterior end)

The animals were in close proximity and/or contact with water buffalo and housed near to the village pond. This could be a predisposing factor for ocular setariosis in equine animals living in rural areas.

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BUCCO-DENTAL PATHOLOGIES OF WORKING EQUINES IN MOROCCO

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Introduction

The understanding of the nature and treatment of equine dental pathologies has advanced rapidly in the last decade demonstrating the common occurrence of numerous dental disorders in horses and highlighting the importance of good dental care in the welfare of the horse (Dixon 2005). In contrast, literature on working equine dental pathologies is limited to a few articles (Toit et al. 2009). In developing countries, the obvious welfare issues concerning dental problems in working equines can have a big economic effect on the poorer people who generally use these draft animals. The objective of this study was to evaluate the impact of the dental problems on the welfare of the working equine in Morocco and their body condition score.

Method

Dental examinations were performed on 165 unsedated animals (42 horses, 74 mules, and 49 donkeys) at 5 refuges of the Society for the Protection of Animals Abroad (SPANA, Morocco). Following oral lavage, animals were examined using a Haussmann speculum, and a standard dental chart concerning each animal was completed. Specific teeth and incisor problems were recorded, including: sharp enamel points, diastemata, worn teeth, overgrown teeth, displaced teeth, periodontal disease, caries, wave mouth, smooth mouth, shear mouth, and step mouth. Dental-related oral soft tissue injuries, such as oral calluses and ulcers, were also recorded.

Results

The 165 animals examined were aged after their incisors between 1 and 14 years. Eighty five per cent of all animals examined presented teeth problems and/or oral diseases. Findings included:

- Cheek teeth were the most affected with 75.8% followed by the incisor teeth with 20%, and the canines with 4.2 %.
- The most predominant pathology observed was overgrown teeth with 88 cases (62.8 %).
- Dental and oral pathology increased with age from 50% in animals less that 5 years old to 93% in those over 15 years.
- Teeth overgrowths and hooks problems become serious only beyond 15 years old.

We did not find a significant relationship between teeth anomalies and body condition scoring. However, in many cases examined the loss of cheek teeth and partial and/or mobile dental fractures was accompanied by oral soft tissue injuries (tongue, cheeks, and the gingiva) possibly preventing weight gain.

Conclusion

Dental disorders are a significant problem in the population of working equines in Morocco. Overgrown teeth represent in this study an overall prevalence of 63%. Bucco-dental pathologies were correlated to age. Overgrown teeth became a problem at the age of 9 years. Wave mouths and hooks became a problem at 15 years which highlights the importance of managing dental disorders from a young age to prevent progression to more serious disorders in older animals. There was no significant association between body condition score and bucco-dental diseases observed. Regarding the complexity of the causes behind low BCS (parasitism, feed, workload, and time, etc.), a further large-scale study is required to investigate the complex interrelationship between these potential causes of weight loss.

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PARASITE CONTROL AMONG WILD HORSES – KONIK POLSKI (*E. CABALLUS*) AND PRZEWALSKI HORSE (*E. PRZEWALSKII*) – ON RESERVES IN POLAND AND UKRAINE

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Abstract
The study was performed to evaluate the parasitological situation among wild horses from nature reserves in Poland and Ukraine using the methods of diagnostic deworming, McMaster technique and post-mortem survey of horses. Gastro-intestinal (GI) parasites are represented by five nematodes (Strongylidae, Strongyloididae, Oxyuridae, Ascaridae, and Habronematidae), one cestode family (Anoplocephalida), and one larva of the insecta family (Diptera: Gasterophilidae). The present results are compared with those of earlier studies of wild horses from a similar reserve in the Chornobyl Exclusion Zone, Ukraine. A parasite control programme for wild herds is proposed.

Introduction
Horses kept in reservations need good welfare. Wild horses that live in herds need two types of human activity. One is connected with breeding and the other is special veterinary care. Human interference should be limited, but the fact that horses inhabit limited space and cannot freely migrate like wild horses in the past means that we must monitor the herds regularly. Wild harems in their natural environment are able to deworm themselves by eating special herbs. When the area inhabited by the harem is limited, animals might not be able to find the right herbs. Water and the grazing area are often contaminated by manure. Parasite control is often undervalued but it is extremely important. That is why the creation of the right parasite control programme is necessary.

In this study, we observed the parasitological situation among wild Polish primitive horses, Konik polski (*E. caballus*), living in natural reserve conditions in Poland, and compared it with the situation of Przewalski horses (*E. przewalskii*) in the Chornobyl Exclusion Zone (CEZ), Ukraine. Comparative analysis of the findings from similar reserves could be the basis for the ecological management and control of the parasitological situation in natural reserves of wild horses.

Materials and methods
The study was carried out at Popielno Station of Polish Academy of Science, Roztoczanski National Park (NP), Biebrzanski NP, Narwianski NP, Zielony Ostrow NP, Bialowieska Puszcza NP, and private farms Majdan, Siriusz, and Monki during 2007–8 in Poland. A total of 124 naturally infected Polish primitive horses with different faecal worm egg counts (eggs per gram, EPG) were examined. Faecal egg counts were carried out on the day before treatment using the McMaster technique with a sensitivity of 25 EPG [1].

Animals were treated with abamectin (4mg) + praziquantel (50mg) paste at a dose of 1ml per 20kg bodyweight (b.w.) and ivermectin 18.7mg + praziquantel 140.3mg paste at a dose of 1.07g per 100kg b.w.

Faecal sampling for expelled parasites (200g from each horse) was performed 24, 36, and 48 hours after treatment. In the laboratory, samples were washed with tap water and preserved in 40% alcohol. GI-parasites isolated from the faeces were fixed in 70% alcohol, counted and identified down to species level using keys after

Lichtenfels [2]. A total of 67,891 GI-parasite specimens were isolated after deworming.

In addition, a post-mortem survey was performed on the dead wild horses (n=8) during last the 7 years 2003–9, using partial helminthological section following the method described in [3].

Results
According to data from the coprological examination, all horses (95.2%) were infected with the strongylides (mean EPG 871.0±854.8), while only 33 horses (26.6%) were infected by ascarides (mean EPG 159.4±138.1), and 16 horses (12.9%) were infected by *Strongyloides westeri* (232.8±92.5). Faecal samples of horses that were positive for cestode infection pre-treatment were not examined for all horses (Table 1).

Table 1. Results of faecal egg counts in Konik polski (*Equus caballus*), n=124, Poland, 2007–8

Horse	Mean EPG									
	Strongylidae			Parascaris equorum			Strongyloides westeri			Cestoda
	EI, %	II	SD	EI, %	II	SD	EI, %	II	SD	
Equus caballus, n=124, Poland	95.2	871.0	854.8	26.6	159.4	138.1	12.9	232.8	92.5	0

EPG = eggs per gram
EI % = prevalence
II = intensity in infected horses

After deworming nematodes were recorded in all surveyed horses (100%), while tapeworms were found in 50 horses (40.3%) (Table 2).

Table 2. Results of diagnostic deworming survey in Konik polski (*Equus caballus*), n=124, Poland, 2007–8

Parasite	EI, %	II	SD
Strongylinae	54.8	13.8	11.1
Cyathostominae	100	526.3	348.7
Parascaris equorum	25.8	3.1	2.1
Oxyuris equi	33.1	14.1	11.8
Habronema muskae	21	5.8	6.2
Anoplocephala perfoliata	40.3	7.0	7.0
Gasterophilidae	46.0	3.4	2.6

The GI-community was represented by 4 nematodes (Strongylidae, Oxyuridae, Ascaridae, Habronematidae), 1 cestode family (Anoplocephalidae), and one larva of the insecta family (Diptera: Gasterophilidae). The nematode family Strongylidae was represented by the subfamilies Strongylinae and Cyathostominae. The nematode of the subfamily Strongylinae occurred in 54.8% of horses. While the nematode of the subfamily Cyathostominae occurred in 100% of horses.

Oxyuris equi was recorded in 33.1%, *Parascaris equorum* in 25.8%, and *Habronema muskae* in 21% of horses surveyed. Tapeworms (Anoplocephalidae: *Anoplocephala perfoliata*) were recorded in 40.3% of horses surveyed; the mean number of tapeworms per infected horse was 7.0±7.0 (Table 2). The mean number of specimens of Strongylinae was 13.8±11.1, and for Cyathostominae, 526.3±348.7. The mean number of oxyurid specimens per horse was 14.1±11.8, while that of ascarid specimens per horse was 3.1±2.1, and habronematid specimens per horse was 5.8±6.2. One non-helminth GI-parasite, the larvae of *Gasterophilus intestinalis* (Diptera: Gasterophilidae), was also recorded. The prevalence of *G. intestinalis* was 46%. The mean number of *G. intestinalis* specimens per infected horse was 3.4±2.6 (Table 2).

In the dissected Konik polski (n=8), 4 cases of stomach rupture were recorded (larvae of the *Gasterophilus intestinalis* (Diptera: Gasterophilidae) were found). Three cases of haemorrhagic nodules and blood vessels swollen by larvae of the Strongylinae (Nematoda: Strongylidae) were recorded. A single case of ileocaecal ulceration and rupture in the presence of specimens of the Cestoda: Anoplocephalidae was also recorded (Table 3). There were fatal accidents of horses connected with the adaptation period in a new territory. It is significant that all horses observed post-mortem were not dewormed before transportation into the new area. Probably this fact increased the negative influence of stress on the horses.

Table 3. Results of helminth survey of the dissected Konik polski (*E. caballus*), n=8 in the Poland, 2003–8

Horse		Place, data	Pathology	GI-parasite	Notes
No.	sex, age (years)				
1	M, 2	Biebrza NP, 2006	stomach rupture	Gasterophilidae	adaptation period after transport
2	F, 6	Biebrza NP, 2006	stomach rupture	Gasterophilidae	
3	F, 4	Biebrza NP, 2006	stomach rupture	Gasterophilidae	
4	F, 5	Biebrza NP, 2006	stomach rupture	Gasterophilidae	
5	M, 2	Biebrza NP, 2007	haemorrhagic nodules, swollen blood vessels (colic)	Strongylinae	none
6	F, 2	Biebrza NP, 2008	haemorrhagic nodules, swollen blood vessels (colic)	Strongylinae	none
7	M, 1	Majdan, 2006	haemorrhagic nodules, swollen blood vessels (colic)	Strongylinae	none
8	F, 6	Popielno Station, 2003	ileocaecal ulceration and rupture	Anoplocephalidae	none

Discussion and conclusions

The present results are comparable with the earlier studies of wild Przewalski horses which are kept under natural conditions in Chornobyl Exclusion Zone, Ukraine – similar to Polish reserve conditions [4]. Strongylinae, Cyathostominae, *Parascaris equorum, Oxyuris equi, Habronema muskae, Anoplocefola perfoliata*, and Gasterophilidae parasites were recorded in the wild Konik polski in the Polish reserves in this study. Such groups and species of parasites, except of *Habronema muskae*, were recorded in the Przewalski horses in the CEZ, Ukraine. In both species of horse, in general a higher diversity of helminths was connected with a lower intensity of the parasite infestation. Such results could have been caused by the similar methods of parasite survey and climate conditions in both areas.

Our survey suggests that a programme of parasite control of wild horses should encompass:

1. Clinical observation of horses' health: anorexia, colic, allergic reactions, pain, diarrhoea – such symptoms point to parasites problems.
2. The coprological examination of fresh faecal samples by the flotation method (McMaster technique) every 4 months (minimum twice a year). In our study some GI-parasites (*Strongyloides westeri*) were recorded by the use of ovoscopy, not by helminthoscopy (after diagnostic deworming and post-mortem survey).
3. Diagnostic deworming of all the horses removed from the harems (usually in the autumn, during the breeding selection) is a very important method because not all the internal parasites may be diagnosed during the coprological examination. Helminthoscopy of faecal samples of all dewormed horses should be done. Recovered parasites should be collected and their species identified.
4. Deworming of new horses in their place of origin and quarantine in the new place 21 days before they are introducted into the harems. Faecal examination taken before the end of the qurantine is also recommended. The period of full adaptation of the new horses is usually about 2 years.
5. Post-mortem examination of all dead horses. Cases of fatality in horses because of parasite infection are rare but during our observation 8 cases were observed: 4 cases of stomach rupture connected with bot larvae (Gasterophilidae) (horses during the adaptation period); 1 case of intestine rupture connected with tape worms (Anoplocephalidae); and 3 cases of colic connected with large redworms (Strongylinae).

Consequently, the parasitological situation among wild horses in the nature reserves in Poland and Ukraine is similar. The cases of the horses that died after parasite infection were examined. Strongylinae, Cyathostominae, *Parascaris equorum*, *Oxyuris equi*, *Anoplocefola perfoliata* and Gasterophilidae parasites were recorded in wild Konik polski in Poland and Przewalski horses in the CEZ, Ukraine using McMaster, diagnostic deworming, and dissecting methods of parasitological survey. *Habronema muskae* and *Strongyloides westeri* were recorded only in the Konik polski. A parasite control programme for wild harems is recommended.

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WHEN IS DENTAL TREATMENT REQUIRED IN WORKING EQUIDS? A SURVEY OF MEXICAN DONKEYS

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Abstract
A small survey of working donkeys in Mexico illustrated a high prevalence of dental disease (62%). However, only 18% of cases were severe enough to have an apparent impact on the a donkey's welfare and required dental treatment. Many donkeys manage well with some degree of dental disease and owner education about age-related dental disease and the need for supplemental feeding will alleviate some of the welfare implications of dental disease, particularly where resources for dental treatment are limited.

Introduction
Dental disease has been shown to be a significant problem with a high prevalence in equids [1], including working equids. It can have a negative impact on the welfare of the animal, not only by causing pain but also by decreasing the efficiency of mastication resulting in malnutrition [2, 3]. Determining the significance of dental disease in an individual animal can be complicated by the presence of concurrent disease, parasite burden, and environmental factors, e.g. poor diet. Furthermore, treatment of dental disease is limited by expertise, availability of dental equipment, time, and economics. Thus dental treatment needs to be prioritised to animals where it is likely to have an immediate positive impact on the animal's welfare. The aim of this study was to perform a clinical dental survey of donkeys presented for routine treatment to the mobile clinics run by the Donkey Sanctuary-World Horse Welfare-Universidad Nacional de Autonome Mexico programme, to determine the prevalence of all dental disease and, more specifically, significant dental disease that required immediate treatment.

Materials and methods
Ten villages in 8 geographical areas in Mexico were visited by mobile veterinary clinic teams over a 9-day period. A full clinical and oral exam using a full mouth speculum and light source was performed without sedation. Body condition score was assessed on a 1–5 grade scale utilising half grades, and the provision of supplemental feeds as reported by owners was recorded. Faeces was collected to perform faecal egg counts (FEC) using a FECPAK F100 system (FECPAK international).

All dental abnormalities including small focal overgrowths (usually on upper 06s and lower 11s) and soft tissue injuries such as dental-related buccal calluses and ulcers were regarded as dental disease. Donkeys having only sharp enamel points (overgrowths) on the buccal aspect of the maxillary arcade and lingual aspect of the mandibular arcade were not classified as having dental disease. Enamel points were graded 0–3, with 0 indicating absence of enamel points and 3 indicating very large/sharp enamel points. Age was estimated from mandibular incisor occlusal table appearance, overall body appearance, and owner information. As more accurate ageing was usually not possible, age was classified into 5 groups of 5-year intervals: 0–5 (n=53); 6–10 (n=81); 11–15 (n=15); 16–20 (n=33); ≥21 years (n=21).
Kruskal-Wallis chi-squared analyses were performed to determine whether there were any significant associations. R V2.3.1, R Foundation for Statistical Computing was used for statistical analyses. $P<0.05$ was taken as statistical significance.

Results
A total of 203 donkeys were examined and donkeys of 6–10 years represented the most common age group (range 2–25 years). BCS ranged 1–4.5 with a median of 2.5. Due to practical difficulties in acquiring faecal samples, FEC were only performed on 161 donkeys (79%). The FEC ranged 0–5750 epg with a median of 600 (100–1550).

Dental disease was observed in 62.1% (126) of all donkeys, with sharp enamel points observed in 98% of donkeys. The 4 (2%) donkeys that did not have sharp enamel points were over 20 years of age and had advanced dental disease. Serious dental disease that required urgent dental treatment (any disorders other than ulcers, calluses, and focal overgrowths) were detected in 18.2% (37) of the donkeys examined. Maxillary cheek teeth enamel points were very common (95.8%) and often very severe (60.3% were grade 3) compared to mandibular cheek teeth (68.7% sharp; 38.4% grade 1). Individual enamel points other than the buccal and lingual aspect of maxillary and mandibular cheek teeth were also observed in 70 teeth. Focal overgrowths were observed in 32.5% of donkeys, with maxillary 06s having 79% of these. Mandibular 06s were the most common overgrown tooth (31%) with 18.7% of donkeys having one or more overgrown teeth (Table 1). Maxillary 06s were the most commonly worn tooth overall (37.6%) followed by the mandibular 11s (14.9%), observed in 16.3% of donkeys. Sloping overgrowths involving most of the occlusal surface ('ramps') were present in 8.4% of donkeys and most commonly affected the mandibular 06s (91.7%).

Table 1. Prevalence of enamel overgrowths and dental disorders in 203 working donkeys examined in Mexico

Dental disorder	Disorder prevalence (%)
Diastemata	3.9
Missing teeth	0.5
Overgrown teeth	18.7
Worn teeth	16.3
Displaced teeth	1.5
Focal overgrowths	32.5
Ramps	8.4
Buccal calluses	13.3
Buccal ulcers	14.3
Pulpar exposure	0.5
Fractured teeth	2
Wave mouth	5.9
Step mouth	1.5
Smooth mouth	3.9
Shear mouth	0.5

Buccal calluses and ulcers were observed in 13.3% and 14.3% of donkeys, respectively. Calluses were mostly associated with enamel overgrowths on the maxillary 07s (32.6%), whereas ulcers were more commonly associated with maxillary 06 overgrowths (48.4%). Smooth mouth (3.9%), wave mouth (5.9%), step mouth (1.5%), and shear mouth (0.5%) were observed with a low prevalence. Other abnormalities noted were missing tooth (1), exaggerated transverse ridges (2 teeth), laterally displaced teeth (3), supernumerary tooth (1), dysplastic tooth (1), pulpar exposure (1), and fractures (4).

Dental disease was not statistically significantly associated with BCS (P=0.74; χ^2_1=0.11), but was significantly associated with age group (P<0.001; χ^2_4=31.4). The prevalence of dental disease in donkeys 0–5 years of age was significantly less than donkeys 6–10, 16–20, and >20 years of age (P≤0.009), and significantly less dental disease was present in donkeys 11–15 years of age than in donkeys >20 years of age (P=0.04). FEC was not statistically significantly associated with age groups (P=0.55) or BCS (P=0.4). Supplemental feed was not statistically significantly associated with BCS (P=0.3) or dental disease (P=0.45).

Discussion

The prevalence of dental disease in this survey of a small selection of Mexican working donkeys was only slightly less (62%) than the prevalence reported for a UK population of donkeys (73%), although this could be attributed to the greater median age of the UK population (28 years) [4]. The significance of age to the prevalence of dental disease is also illustrated in this population of working equids, with a significantly higher prevalence in donkeys over 20 years of age as seen in a UK population [5]. The clinical significance of dental disease could not be demonstrated in these Mexican donkeys, as BCS was not significantly associated with dental disease. Other factors that could affect BCS such as parasite burden and diet should also be taken into consideration. However, in this small study there was no statistically significant association of BCS to either FEC or supplemental feed, indicating that multiple factors are associated with poor BCS.

Sharp enamel points on the buccal aspect of the maxillary arcade and lingual aspect of the mandibular arcade are now regarded as a physiological rather than pathological change [6] and were observed in 98% of these donkeys. These enamel points were sometimes associated with ulcers or calluses (14.3 and 13.3% respectively), but most donkeys did not have any lesions. Therefore it seems likely that another contributing factor such as tight nose bands or head collars together with sharp enamel points were resulting in these painful lesions. This highlights the importance of owner education on correct tack and management, rather than treatment of enamel points which will reform within a few months with normal masticatory action.

Feeding of supplemental food was not associated with dental disease or BCS indicating that the feeding of food was generally dependent on the environmental factors and availability of feed, rather than donkey factors. There were 37 donkeys (18%) that required urgent dental treatment as they had direct welfare implications such as painful diastemata and displaced teeth, or 'broken mouth' (irregular overgrowths and worn teeth) resulting in inadequate masticatory surfaces. Treatment for these donkeys should be aimed at ensuring oral comfort by rasping of severe hooks and sharp points, extracting loose and fractured teeth, and floating teeth directly opposing diastemata to decrease the impaction of food into these diastemata. More importantly owners should be educated as to the need for supplemental feeds in affected animals. If time and resources allow other donkeys with less severe dental disease may be treated to slow down the progression of dental disease.

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SEROPREVALENCE OF *THEILERIA EQUI* AND *BABESIA CABALLI* IN ZAMORANO-LEONÉS DONKEYS IN ZAMORA PROVINCE, SPAIN

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Abstract

In the west of the Zamora Province in the Castilla y León region, one of the most rural and isolated areas of Spain, the Zamorano-Leonés donkey – a native endangered breed – is still playing a central role in the traditional daily rural activities practised by the local inhabitants. In February 2010 a study was carried out to understand the prevalence of equine piroplasmosis in the population of Zamorano-Leonés donkeys, involving collecting blood samples from 86 animals of different gender and age, in 13 villages in the Zamora Province. Equine piroplasmosis is a tick-borne disease of equids, caused by Theileria equi *and* Babesia caballi*. These intra-erythrocytic parasites are responsible for high morbidity and mortality rates in equids. The cELISA tests (competitive Enzyme-Linked Immunosorbent Assay) revealed a seroprevalence of 21%, with 8 of the 86 donkeys testing positive for* Theileria equi *(9.3%), 10 for* Babesia caballi *(11.7%), and 1 of these 18 animals positive for both. The results of this study clearly demonstrate the importance of equine piroplasmosis affecting the Zamorano- Leonés donkey population. As far as we know this is the first study on intra-erythrocytic parasites in endangered Iberian breeds of donkeys and the results obtained reveal its importance in order to preserve this unique genetic heritage.*

Introduction

In the west of the Zamora Province in the Castilla y León region, one of the most rural and isolated areas of Spain, is the main area of distribution of a local endangered breed of donkey, the Zamorano-Leonés (Figure 1): there are no more than 800 animals in the breeding programme (around 750 females and 50 jack) but there are only 160 foals per year, on average, according to the data in the studbooks. The local inhabitants still live in a traditional way, with the donkey playing a central role in their subsistence farming system, being the main aid in many daily rural activities (Figure 2), transportation, and production [1]. The vast majority of these animals have daily access to pasture, which increases the possibility of contact with ticks, the main biological vectors in the transmission of equine piroplasmosis. Equine piroplasmosis is a tick-borne disease of equids, caused by *Theileria equi* and *Babesia caballi* [2]. These intra-erythrocytic parasites are responsible for high morbidity and mortality rates in equids. *Theileria equi* is the more dangerous, because of recurrent clinical symptoms, even after specific medical treatment [3].

Detection and identification of piroplasms by microscopic examination of thin blood smears can be a difficult task. The World Organization for Animal Health (Office International des Epizooties, OIE) recommends the cELISA tests (competitive Enzyme-Linked Immunosorbent Assay) as the test of choice to diagnose equine piroplasmosis in animals with clinical signs or that are going to be moved into or from enzootic areas [4]. Equine piroplasmosis is often diagnosed in Spain (with reported values ranging from 3 to 77%) [5] and this study aimed to understand the prevalence of *Theileria equi* and *Babesia caballi* in the Zamorano-Leonés donkey in the main distribution area of this breed, the Zamora Province in Spain (Figure 3).

Figure 1. The Zamorano-Leonés donkey

Figure 2. Donkeys ploughing the land

Methodology

In February 2010 blood samples were randomly collected from 86 Zamorano–Leonés donkeys in 13 different villages in the west of the Zamora Province, by venipuncture of the jugular vein. A total of 172 blood samples were collected (86 samples of 10ml in sterile anticoagulant-free tubes and another 86 samples of 5ml in sterile EDTA tubes).

The relevant data about the sampled animals were collected on a short questionnaire: age, gender, body condition score (BCS), activity, previous clinical symptoms of piroplasmosis, and presence of ticks.

Blood samples were kept refrigerated at 4°C, and frozen at -20ºC at the end of the day (Figure 4). The serological analysis of the blood samples was conducted in the Parasitology Laboratory of Vasco da Gama University School, using a commercial *Theileria equi* cELISA antibody test kit and *Babesia caballi* cELISA antibody test kit (VMRD ®) according to the manufacturer's instructions.

Figure 3. Zamora Province, Castilla y LeónFigure

Figure 4. Refrigerated samples during fieldwork

Results

From a total of 86 donkeys involved in this study, 65 were females (75.6%), 8 jacks (9.3 %), and 13 geldings (15.1%). The animals were divided into 3 different age groups: 15 animals (17.4%) less than 2 years old; 49 animals (60%)

between 2 and 10 years old; 22 animals (25.6%) more than 10 years old (Figure 5). All the animals seemed healthy on clinical examination, with the vast majority of them with BCS 3 (ranging between 2 and 5). Due to lack of training of the vast majority of the owners, we were unable to gather reliable information indicating the past presence of clinical symptoms related to equine piroplasmosis infection, mainly because the clinical symptoms in donkeys are not very specific (e.g. intermittent fever, dull appearance, non-responsive to stimuli, loss of BCS) [3, 7]. No ticks were found on any of the 86 donkeys included in this study, which could be expected given the seasonal nature of these parasites and the time of sampling, February. However, 26% of owners confirmed the presence of ticks on their animals in previous years, during the spring and summer.

Figure 5. Distribution of animals by age and sex

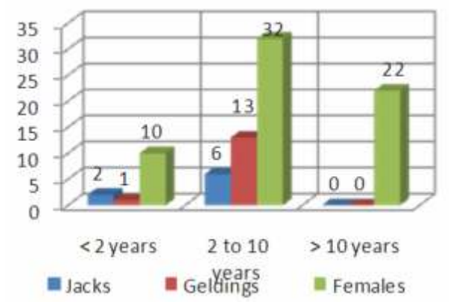


Figure 6. Serologycal analysis in the laboratory

The total seroprevalence for equine piroplasmosis was 21%, with 18 animals being positive in a total of 86 sampled (Figure 6). Anti-*Theileria equi* antibodies were observed in 8 samples (9.3%) and antibodies against *Babesia caballi* observed in 10 samples (11.7%) (Figure 7). One of the donkeys was positive to *Theileria equi* and *Babesia caballi,* simultaneously. Only females and geldings were positive to equine piroplasmosis, with no significant differences between genders (Figures 8 and 9). The jacks were all negative, probably because they are kept inside all the time, due to their aggressive behaviour, and have no contact with ticks.

Figure 7. cELISA tests results

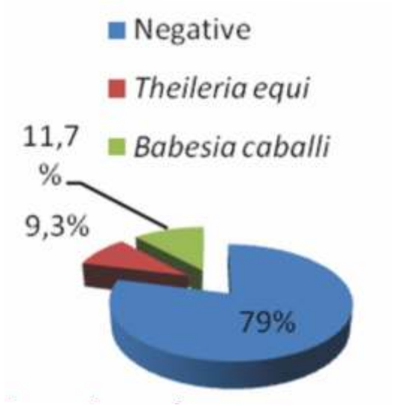


Figure 8. Distributions of animals found positive by sex and age

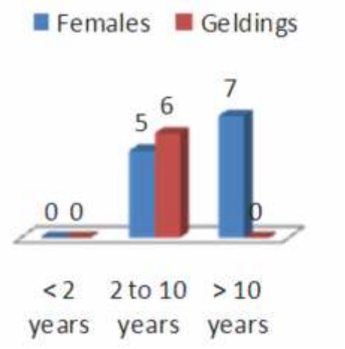
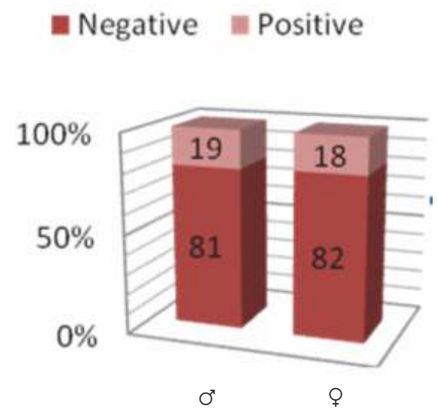


Figure 9. Distribution of positive animals by sex



DiscussionThis first report on the seroepidemiology of *Theileria equi* and *Babesia caballi* in the Zamorano-Leonés donkey population reveals that equine piroplasmosis represents a major problem, with 21% of the animals studied being infected in the Zamora Province, the main distribution area of this endangered breed. In this region of Spain, most of the animals have daily access to pasture, and are therefore exposed to ticks, the equine piroplasmosis biological vectors, which can explain the results obtained in this study.

Acknowledgments
We would like to thanks ASZAL (Asociación Nacional de Criadores de Ganado Selecto de Raza Zamorano-Leonesa) for the precious help during the fieldwork and for letting us have access to the Zamorano–Leonés studbook database.

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INTESTINAL PARASITISM IN A POPULATION OF DONKEYS (*EQUUS ASINUS*) REGULARLY DEWORMED, NORTH-EAST PORTUGAL

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Abstract

In Portugal, donkeys represent a large legacy of social, cultural, economic, and ecological importance. The only native breed of donkeys, the Mirandês donkey, is composed of a small number of animals. The aim of this study was to evaluate the parasitic infection, particularly the variation in the rate of positivity, the level of parasitic infection (LPI), and the biodiversity of parasites in a population of 62 Mirandês donkeys, exposed to anti-parasitic control every 6 months, with subcutaneous administration of 2% ivermectin (1ml per 50kg BW), between July 2005 and February 2010. During this period, there was a decrease in the positivity rate, from 87% (54/62) in 2005 to 32% (20/62) in 2010, as well as a decrease in the LPI. In 2005, 70.4% of the infected animals had levels higher than 1,000 EPG (strong LPI) and in 2010, 75% of the infected animals had levels lower than 500 EPG (weak LPI).

Biodiversity also decreased during this period: there was a decrease of Strongylinae in relation to Cyathostominae. Considering that consistent levels of parasitic infection are still observed in this population and that the most observed Strongylidae is the genus Cyathostomum, these results are worrying because this agent is frequently noted by its ability to acquire resistance to anti-parasitic drugs.

Introduction

During the last years, the number of donkeys has declined in Portugal and its disappearance is considered possible. One of the main causes was the mechanization of agriculture in the 1960s, that strongly reduced the importance of working animals [1]. Nowadays, donkeys are important not only in traditional farming activities but also they are closely associated with aging and isolation of the rural population (Figure 1. Recently, donkeys have been used in leisure activities promoting rural tourism in the Trás-os-Montes region [2, 3] (Figure 2).

Figure 1. Donkeys are used in transportation of the rural population of Trás-os-Montes, Portugal

Figure 2. Donkeys are used in leisure activities, promoting rural tourism

The Mirandês donkey (Figures 3 and 4) presents morphological and behavioural characteristics very similar to those of the Zamorano–Leonés donkey, a native Spanish breed [4, 5, 6]. These are robust animals [7] and their physical characteristics are related to their functions and use.

Figure 3. The Mirandês donkey

Figure 4. Geographic representation of Trás-os-Montes region, Miranda do Douro [5]

This native breed comprises a small number of animals. In order to study, promote, and maintain this important national genetic heritage, the Association for the Study and Protection of Donkeys (AEPGA) was created in May 2001.

Parasitic infections are common in donkeys [8, 9] and may have a negative impact on health and animal welfare, on their ability to work [9, 10], and on their body condition [11]. The average life expectancy of donkeys is related to the degree of infection by helminths [12]. Information about the biodiversity of parasites in donkeys, their prevalence, and transmission is scarce. It is important to have such information in order to adopt appropriate therapeutic measures [13, 14, 15, 16]. Treatment is important because it improves the animals' ability to work [16]. Some helminth parasites frequently found in donkeys are listed in Table 1 [17].

Table 1. Helminth parasites frequently found in donkeys

Classe	Família	Subfamília	Género ou Espécie
Nematoda	Strongylidae	Strongylinae	Strongylus vulgaris Strongylus equinus Strongylus edentatus
		Cyathostominae	
	Strongyloididae		Strongyloides westeri
	Ascarididae	Ascaridinae	Parascaris equorum
	Oxyuridae		Oxyuris equi
	Trichostrongylidae	Trichostrongylinae	Trichostrongylus axei
Cestoda	Anoplocephalidae		Anoplocephala magna Anoplocephala perfoliata Anoplocephaloides mamillana

About 70 species of intestinal strongylids are known in equids [18, 19]. This group of parasites may include 67–100% of all the intestinal nematods present in one animal [20]. In the same animal a mixed infection may be observed with more than 20 different species of strongyles [20, 21]. Strongylids, in particular small strongylids or cyathostomins, are the most important parasites in equids. They are associated with severe colitis, chronic diarrhoea, and a mortality rate of 50% [21]. The occurrence of parasitic infections at consistent levels has been observed in equids regularly dewormed [22]. Study of parasitic biodiversity allows the careful evaluation of the resistance to anthelmintics [21].

In Portugal, parasitism in equids is characterized by a high number of parasites and a large biodiversity with the presence of species potentially highly pathogenic. Despite the rapid development of anthelmintic drugs in the last years, they have not eliminated parasites, particularly gastrointestinal parasites. Understanding about the parasitic population, as well as anthelmintic administration with measures of husbandry, hygiene, and sanitation, are the key to an integrated control of parasitic diseases in equids [23].

Considering the importance of parasitic infection by strongylids in donkeys, the aim of this study was to evaluate the variation in the rate of positivity as well as the level of parasitic infection and the biodiversity of gastrointestinal parasites in a population regularly dewormed.

Method

Between July 2005 and February 2010, 62 animals from the Miranda do Douro donkey breed, belonging to rehabilitation centres at Atenor, Duas Igrejas, and Pena Branca, in Miranda do Douro County, were exposed to a anti-parasitic control every six months, with subcutaneous administration of 2% ivermectin (1ml per 50kg BW). The group is composed of entire males (n=3), castrated males (n=10), and females (n=49); they are all adults. Every year, before the spring anti-parasitic control, during February and March, individual faecal samples were collected by rectal palpation (Figure 5). The diagnosis of parasitic infection associated with gastrointestinal strongylids and faecal egg counts (EPG) were performed following the modified McMaster method [24] (Figures 6 and 7). The study of biodiversity was performed by individual faecal larva culture following the Roberts and O'Sullivan method [24] (Figure 8).

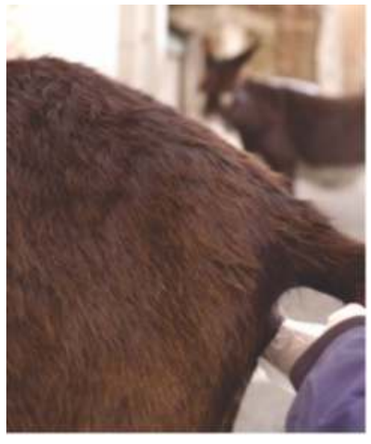


Figure 5. Faecal samples collected by rectal palpation

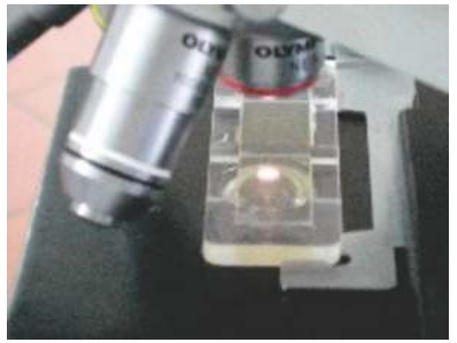


Figure 6 Procedure to evaluate faecal egg count following the modified McMaster method

Figure 7 Strongylid egg observed by optical microscopy, 400x

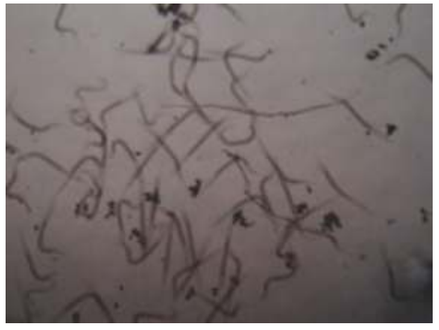


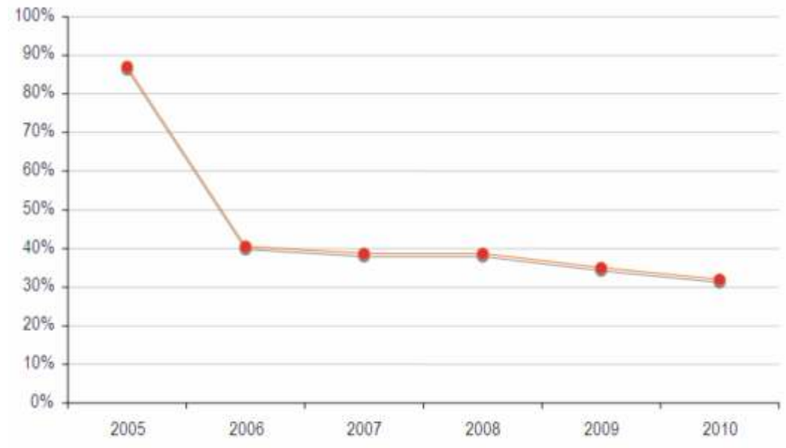
Figure 8. Sample preparation and optical microscopic observation, 40x

Figure 9. Larvae morphotypes from genus *Cyathostomum sensu latum* (400x): *Cyathostomum* type A and *Cyathostomum* type D.

Results

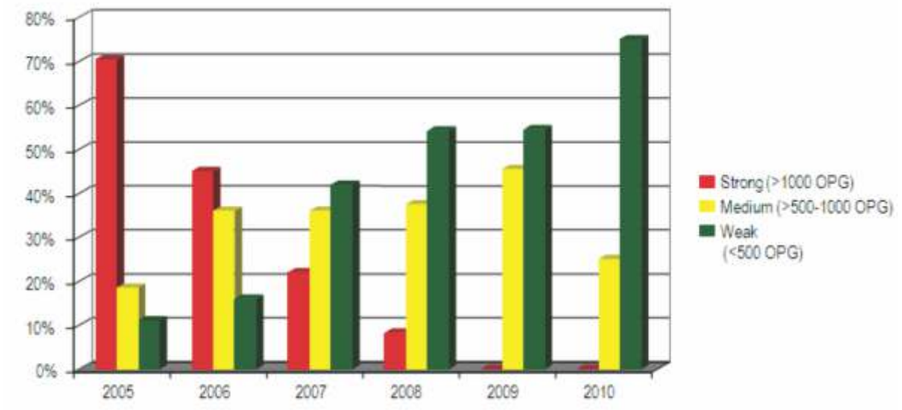
During the study, there was a decrease in the positivity rate. In 2005, it was observed that 54 (87%) of 62 animals presented strongylid eggs in faeces; in 2006, 25 animals (40.5%) tested positive; in 2007 and 2008, 24 animals (38.7%); in 2009, 22 (35%) animals; and in 2010, 20 animals (32%) (Figure 10).

Figure 10. Annual variation in positivity rate



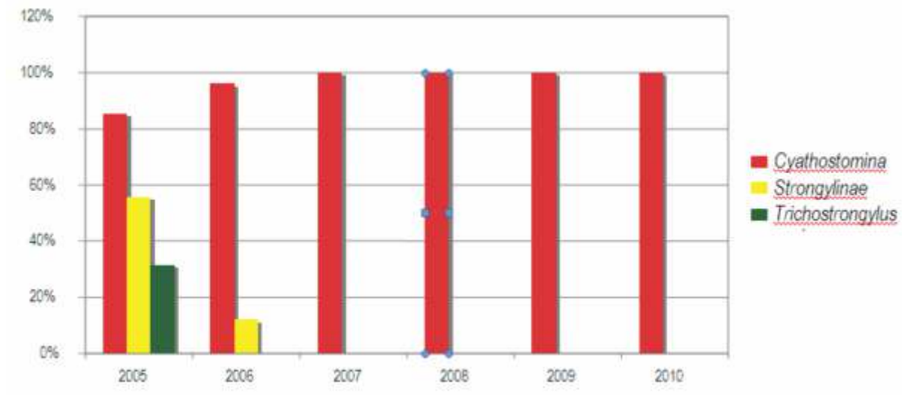
The level of parasitic infection (LPI) also decreased over the considered period. In 2005, it was observed that 38 (70.4%) of the 54 positive animals had a strong LPI (>1000 EPG); 10 (18.5%) animals had a medium LPI (>500–1000 EPG); only 6 (11.1%) had a weak LPI (<500 EPG). In 2006, 11 (45%) of the 25 positive animals had a strong LPI (>1000 EPG); 9 (36%) animals had a medium LPI (>500–1000 EPG); and 4 (16%) had a weak LPI (<500 EPG). In 2007, 5 (22%) of the 24 positive animals had a strong LPI (>1000 EPG); 9 (36%) animals had a medium LPI (>500–1000 EPG); and 10 (42%) had a weak LPI (<500 EPG). In 2008, 2 (8.3%) of the 24 positive animals had a strong LPI (>1000 EPG); 9 (37,5%) animals had a medium LPI (>500–1000 EPG); and 13 (54,2%) had a weak LPI (<500 EPG). In 2009, 10 (45.5%) of the 22 positive animals had a medium LPI (>500–1000 EPG) and 12 (54,5%) had a weak LPI (<500 EPG). In 2010, 5 (25%) of the 20 positive animals had a medium LPI (>500–1000 EPG) and 15 (75%) had a weak LPI (<500 EPG). See Figure 11.

Figure 11. Evolution of the level of parasitic infection



Throughout the study a decrease of parasite biodiversity was ovserved. In 2005, *Cyathostominae* were observed in 46 (85.2%) of the 54 positive samples, and it was possible to identify genus *Poteriostomum* (7.9%), *Gyalocephalus* (31.5%), and *Cyathostomum sensu lato* (85.2%), morphotypes A (85.2%), B (17%), C (51%), D (50%), E (3%), F (9%), G (16%), and H (6%). *Strongylinae* occurred in 30 (55.5%) of the 54 positive faecal samples and it was possible to identify *Strongylus vulgaris* (98%), *Oesophagodontus* (1%), and *Triodontophorus* (1%). *Trichostrongylus axei* occurred in 17 (31.5%) of the 54 positive samples. In 2006, *Cyathostominae* were observed in 24 (96%) of the 25 positive samples and it was possible to identify *Gyalocephalus* (12%) and *Cyathostomum sensu lato* (100%), morphotypes A (100%), C (40%), and D (60%). *Strongylinae* occurred in 3 (12%) of the 25 positive samples with the identification of *Strongylus vulgaris* (100%). In 2008, 2009, and 2010, only *Cyathostominae* were observed in positive samples with the identification of *Cyathostomum sensu lato* (100%), morphotypes A (100%) and D (40%). See Figure 12.

Figure 12. Observation of biodiversity of strongylids during study



Discussion and conclusions

Anti-parasitic control every 6 months, with subcutaneous administration of 2% ivermectin, during the last 6 years, has decreased the rate of positivity, as well as the level of parasitic infection and the biodiversity of gastrointestinal parasites. *Cyathostomum sensu lato* became the only genus of strongylid observed in the last 3 years.

Biodiversity of parasites decreases with anti-parasitic control but, nevertheless, considering that consistent levels of parasitic infection are observed in this population and that the most observed strongyle is the genus *Cyathostomum*, we must consider that these results are worrying because this parasite is known by its ability to acquire resistance to anti-parasitic drugs.

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SURGICAL EXTRACTION OF SETARIA EYE WORM IN WORKING HORSES

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Abstract
A modified surgical approach for removal of the setaria eye worm from the anterior chamber of the eye was used in 10 working horses. The method appeared easy and effective with all animals showing complete recovery over a period of 2–4 months. The details of the study are presented.

Introduction
Localization of worms in the anterior chamber of eye of equines leads to constant irritation and the problem is very painful to both animal and owners [1]. The disease is characterized by persistent itching, lacrimation, blepharospasm, and reduced performance [2]. The disease has been reported throughout the world including India [3, 4]. Various drugs like diethyl carbamazine, mercury perchloride, and ivermectin have been tried with mixed response [2, 3, 5, 6]. Most animal owners generally prefer medical management of the case, and surgery is undertaken as a last resort. The present case study was undertaken to assess the efficacy of a modified surgical intervention for extraction of the setaria eye worm in horses.

Materials and methods
Case history
Ten working horses of 3–8 years of age were presented to the veterinary clinics with the complaint of gradual development of corneal opacity and presence of a moving worm in the anterior chamber of the eye. No prior treatment was undertaken except for 1 horse which was pretreated with ivermectin and anti-inflammatory drugs with no improvement.

Clinical and laboratory findings
Ophthalmological examination of all the cases revealed varying degrees of corneal opacity with a moving worm in the anterior chamber. Blood examination was positive for micro filarae except for 1 horse which was pretreated with ivermectin. The clinical cases were classified accordingly (Table I).

Surgical approach
The affected animals were secured in lateral recumbency with the affected eye on the top after tranquillization with triflupromazine @ 0.2mg/kg b.wt., applied intravenously. Auriculopalpebral and retrobulbar nerve blocks were achieved with 2% lignocain hydrochloride. Topical anaesthesia was also achieved using 4% lignocaine hydrochloride. An 18 gauge 5cm long needle mounted on a 10ml glass syringe containing normal saline was introduced into the anterior chamber at the dorso medial position on the limbus at 11 or 1 o'clock position after nick incision with lancet. The level of the needle was manoeuvred and as the migrating parasite trespasses the level of needle, it was immediately aspirated. After the removal of the parasite, the affected eye was thoroughly washed with normal saline. Parenteral antibiotics were prescribed for 5 days. Ophthalmic ointment containing an antibacterial agent and cortisone was also prescribed along with irrigation with 2% boric acid powder in distilled water for 15 days. The animals were given ivermectin to check microfilariasis. Regular follow-up and haematological examination were advised after 10 days. The surgical approach is depicted in Figures 1, 2, and 3.

Results and discussion
All the animals showed an uneventful recovery with disappearance of corneal opacity over a period of 2–4 months. No post-surgical complications were reported by any of the owners. The haematological examination was found

negative for microfilarae on follow-up. Various drugs have been tried in clinical setariosis with mixed therapeutic response [3, 5, 6]. Therefore, surgical intervention followed by chemotherapy may be advocated as a successful treatment for cases of equine setariosis.

Acknowledgement
The authors are thankful to the Dean of the College of Veterinary and Animal Sciences for providing the necessary facilities to carry out the investigation.

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Table I. Classification and assessment of clinical cases of working horses with presence of setaria worm in the anterior chamber of eye

Case no.	Time elapsed before reaching veterinary clinic	Degree of corneal opacity	Microifilarae on blood examination	Ivermectin pretreatment
I	18 days	+++	-	+*
II	21 days	+++	+	-*
III	12 days	++	+	-*
IV	14 days	++	+	-*
V	12 days	++	+	-*
VI	7 days	+	+	-*
VII	12 days	++	+	-*
VIII	21 days	++	+	-*
IX	14 days	++	+	-*
X	24 days	+++	+	-*

+++ = Severe; ++ = Moderate; + = Mild; +* = Yes; -* = No

Figure 1. Moving worm in the anterior chamber of eye

Figure 2. Eye lancet at 11 o'clock position

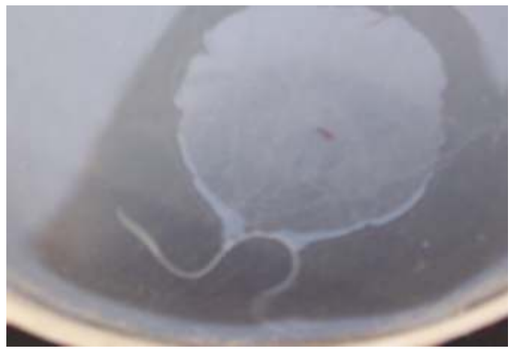

Figure 3. Removed worm in the Petri dish

CLINICAL, RADIOGRAPHIC AND ULTRASOUND ASPECTS OF LAMENESS IN URBAN DRAUGHT HORSES IN CHILE

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Introduction

Horses used for draught work represent the main source of financial income for many families in developing countries. In Chile, there is a large number of urban draught horses used in wood and garbage transportation, besides the population of farm draught horses used for on-farm work and subsistence agriculture. Horses used for these functions are usually overworked, lack ideal care and welfare conditions and manifest illness, mainly lameness. Their poor limbs and body conformation reduce their useful life, affecting the livelihoods of their owners [1, 2, 13]. Although it has been demonstrated that the majority of working horses in Chile are kept under good conditions of animal welfare [13] there is no information available concerning lameness in draught horses.

Objectives

To describe the prevalence of lameness in a group of urban draught horses in Chile and characterize the clinical, radiographic, and ultrasound aspects, associating them with animal welfare.

Materials and methods

During attendance at a weekly clinic for urban draught horses held by the Veterinary College of Valdivia-Chile, 46 horses were examined. Twenty presented lame: their lameness was graded, affected limbs determined and they were referred to the Veterinary Teaching Hospital for complete evaluation. The average age of the examined horses was recorded. Fourteen horses (70%) were taken to the hospital and were submitted to clinical, radiographic, and ultrasound examination. Clinical examination consisted of determining affected limb(s) and site(s) generating pain by observation and palpation, hoof testing and diagnostic local anesthesia. Radiographic and ultrasound evaluations were performed on areas judged lame to record bony and soft tissue disorders, respectively. Data were recorded and described the percentage distribution of horses showing clinical (spontaneous) lameness and subclinical (post forced flexion) lameness. The prevalence of radiographic and ultrasonographic findings and their distribution was obtained.

Results

Clinical findings

It was observed that 43.4% (n=20) of the total studied population were lame and the average age was 7.3 years old. Considering that some horses exhibited lameness in more than one limb and at different grades amongst them, data were organized to determine the frequency of horses presenting single and multiple limb lameness as well as prevalence of lameness grades considering affected limbs (Tables 1 and 2).

Table 1. Distribution of number of affected limbs per horse

Limbs	Horses
1	12
2	6
3	1
4	1
Total	20

Table 2. Prevalence of lameness grade considering affected limbs

Lameness grade	Limbs	%
I	3	9.7
II	8	25.8
III	13	41.9
IV	5	16.1
V	2	6.5
Total	31	100.0

Considering the total of 20 lame horses examined at primary attendance, it was observed that clinical lameness was detected at a higher prevalence (85%, n=17) compared with the subclinical form (15%, n=3) (Table 3). It was also observed that 85% (n=17) presented forelimb lameness. Amongst them, there was a 41.2% (n=7) prevalence of lameness in the right forelimb (RFL) and 29.4% (n=5) for the left forelimb (LFL) (Table 4). It was observed that 50% (n=10) presented hind limb (HL) lameness with predominance for the left hind limb (LHL) (20%, n=4) compared to 15% (n=3) for the right hind limb (RHL).

Table 3. Frequency of horses with clinical and subclinical lameness presentation among forelimbs and hind limbs (n=20)

	Lameness	
Limbs	**Clinical**	**Subclinical**
Forelimb	9	1
Hindlimb	3	0
Forelimb and hindlimb	5	2
Total	17	3

Table 4. Frequency and percentual distribution of horses with clinical and subclinical lameness presentation in forelimbs (n=17)

		Lameness
Limbs	Clinical	Subclinical
Right forelimb	7 (41.2%)	1 (5.9%)
Left forelimb	5 (29.4%)	2 (11.8%)
Right and left forelimb	2 (11.8%)	0 (0%)
Total	14 (82.4%)	3 (17.6%)

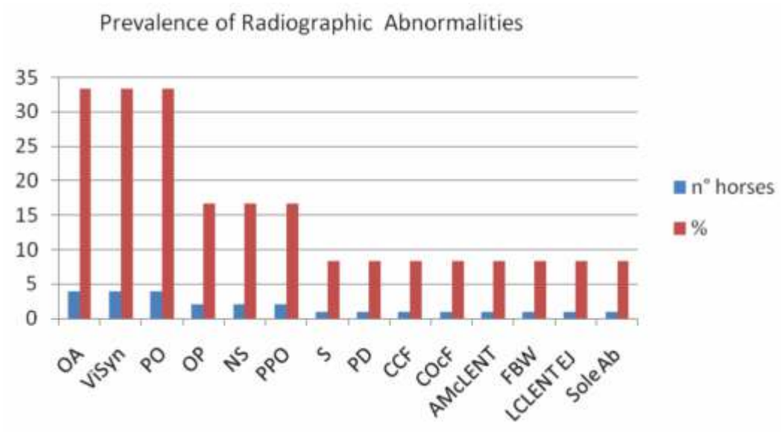
Diagnostic imaging

Imaging was divided according to modalities. Horses which presented with just soft tissue injury were submitted only to ultrasound evaluation; horses presenting with just hoof-associated lameness were submitted only to radiographic examination.

Radiographic findings

Amongst horses submitted to clinical and imaging evaluation, 85.7% (n=12) exhibited abnormal radiographic findings. Radiographic diagnosis was performed and the prevalence of abnormalities was established. The most frequent findings were associated with osteoarthritis, villonodular synovitis, and pedal osteitis (33.3%, n=4) which had the same presentation followed by osteoperiostitis, navicular syndrome, and palmar process osteitis (16.7%, n=2). Other findings presented in just 8.3% (n=1) of the sample (Figure 1).

Figure 1. Radiographic abnormal findings: osteoarthritis (OA), villonodular synovitis (ViSyn), pedal osteitis (PO), osteoperiostitis (OP), navicular syndrome (NS), palmar process osteitis (PPO), sesamoiditis (S), pyramidal disease (PD), carpal chip fracture (CCF), carpal osteochondral fragmentation (COcF), metacarpian accessory desmitis (MADesm), foreign body fistula (FBF), lateral collateral elbow desmitis (LCIEDesm), and sole abscess (SoleAb). (n=12).

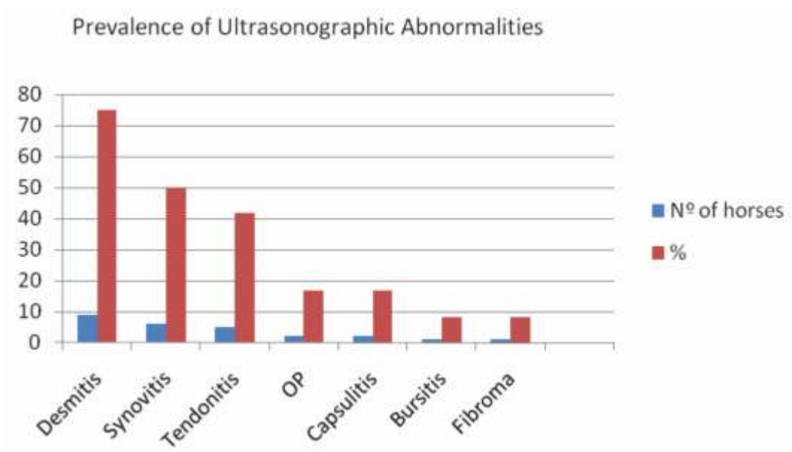


Radiographic findings associated with osteoarthritis, villonodular synovitis, and pedal osteitis were observed in 33.3% (n=4) of horses. Data related to OA corresponded to carpal, tarsal, and fetlock joints in the same proportions (33%, n=2). Villonodular synovitis was related to the metacarpophalangeal joint. The distribution of pedal osteitis was 50% (n=2) in both forelimbs, 25% (n=1) just in the RFL, and 25% (n=1) in the RHL.

Ultrasound findings

This method of diagnosis was applied to 12 horses and abnormal findings were: a group of different kinds of desmitis (75%, n=9), villonodular synovitis (50%, n=6), a group of different kinds of tendonitis (41.7%, n=5), phalangeal osteoperiostitis, capsulitis (16.7%, n=2), bursitis, and fibroma (8.3%, n=1) (Figure 2).

Figure 2. Ultrasound abnormal findings (OP = osteoperiostitis, n=12)



Ultrasonound abnormalities characterizing desmitis in 9 horses were related to suspensory ligament, inferior check ligament (44%, n=4), tarsal collateral ligament, metacarpophalangeal collateral ligaments (22.2%, n=2), carpal joint ligaments, and elbow collateral ligament (11.1%, n=1). Ultrasound findings characterizing villonodular synovitis in 6 horses were related to the metacarpophalangeal joint (66.7%, n=4) and the carpal joint (33.3%, n=2). Tendonitis, recognized in 5 horses, corresponded to insertion of the extensor tendon (40%, n=2), superficial digital flexor tendon, cunean tendon, and bicipital tendon (20%, n=1).

Conclusions

The prevalence of 43.3% (n=20) of studied horses suffering from lameness, mostly represented by severe lameness (Grade III.,V) of a chronic nature (osteoarthritis and degenerative desmitis) provides evidence for inadequate conditions of animal welfare, and its distribution suggests an association with type of work performed. Following imaging findings it was considered that persistent inefficient hoof trimming and shoeing, associated with overwork, represented the cornerstone of these horses' lameness. An initiative to control the lameness must be taken, particularly by training owners in hoof care and horse selection.

Discussion

The most common grade of lameness observed was grade 3, a severe grade of lameness, associated with persistent pain [10, 12]. This reflects the lack of adequate conditions for these horses and morphological characteristics in reference to the amount of weight carried [1, 2, 8, 13]. Repeated actions encourage the development of stress-related injuries [11], and it is expected that specific activities induce particular injuries, as

has been documented in the thoroughbred, standardbred, and quarter horse industries [4, 6, 7, 9]. Thus, given that urban traffic in Chile turns to the right side the most often, this explains why the majority of evaluated horses are RFL lame. In addition, this also explains why LHL are the most affected amongst HL, probably due to compensatory lameness [10], especially considering these horses are trotting the majority of time; exacerbating this is diagonal weight distribution [10, 12]. Even though single limb lameness was predominant and the RFL was the most affected, it is possible that because the horses' average age was 7.3 years old, ageing could transform single limb lameness into multiple limb lameness in these individuals due to chronic compensatory lameness.

The number of horses presenting abnormal radiographic and ultrasound findings was the same, supporting the idea that the presentation of bony and soft tissue disorders were presented in the same proportions.

Osteoarthritis, villonodular synovitis and pedal osteitis represent the major radiographic abnormalities. These are inflammatory, degenerative and painful conditions associated with consecutive trauma [5, 6, 7, 10, 12], except for pedal osteitis which is not necessarily degenerative. Radiographic findings associated with osteoarthritis were presented at the same sites in Brazilian urban draught horses [8], but the prevalence amongst them was different, with the tarsus being the most affected. In addition, palmar process osteitis and navicular syndrome represented the second most prevalent abnormalities; they are pedal diseases too and also degenerative [10, 12]. It has been reported in Chile [13] that hoof abnormalities make up the majority of abnormalities of urban draught horses, so the presence of these findings can be explained. Similar conditions have been reported in Mexico [1]. This results in altered limb biomechanics leading to limb hyperextension and pedal trauma [9, 10, 12]. Overworking, frequently the case for such horses [1, 2, 8], also generates muscle fatigue leading to limb hyperextension which is very often associated with consecutive trauma and chronic inflammation to carpal and fetlock joints, the most affected joints in this study [9, 10, 12].

Desmitis of the suspensory ligament, tendonitis, and villonodular synovitis represent the most common ultrasonound findings, which is very similar to data reported from Brazil and Pakistan [2,8], where tendonitis and suspensory desmitis are prevalent afflictions. These findings also represent degenerative diseases associated with biomechanical changes and muscular fatigue, overload to the suspensory and flexor apparatus, as well as chronic trauma [9, 10, 12]. Collateral ligament desmitis is not only related to first nominated etiopathogenic aspects, but is also associated with direct trauma, forced lateral flexion, and exacerbated rotation of the limb [10,12].

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REVIEW OF DONKEY HOOF LAMENESS CASES IN TWO COMMUNITIES IN EGYPT

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Lameness is a common clinical condition affecting the welfare of donkeys in this rural part of Egypt, and hoof abscess is a major cause. This paper reviews the data collected on hoof problems, particularly hoof abscess, on two communities, Abo Ghaleb and El Saf, between January 2006 and December 2009. Through a series of workshops and a questionnaire, possible contributing factors and options for treatment and prevention were investigated.

Introduction*
The Society for the Protection and Welfare of Donkeys and Mules in Egypt (SPWDME) is an NGO which has been working in Egypt since 2003. Based in Faisal, Giza, 20km south-west of Cairo, a team of vets, animal health assistants, harness makers and farriers operate mobile units throughout the towns and villages of Giza and Kalubia.This study looks at two communities, El Saf , (Helwan governorate) and Abo Ghaleb(six of October Governorate)
In these areas of operation, as in other parts of Egypt, donkeys often suffer from lameness particularly due to solar hoof abscess. The cause of this problem, and the response of the owner, is often influenced by many different factors. Social and economic insight is needed, as well as medical expertise, to address the root causes effectively.

Method
All data recorded by the mobile team related to hoof problems in the two target areas between January 2006 and December 2009 was reviewed.

A more detailed recording format for cases of hoof abscess was developed and used to record 100 cases in Abo Ghaleb between 26/8/2009 and 14/4/2010 and 100 cases in El Saf between 1/2/2009 and 2/3/2010. The details recorded for these cases included previous occurrence and treatment for abscesses, the type of work carried out, and conformation.

Two participatory workshops in Abo Ghaleb were conducted. The first used the Bridge Model technique (1), followed a few weeks later by a second workshop using the 10 seed techniques (2).
During routine clinical work, owners were engaged in semi-structured interviews looking at their use of, and attitude to, the local vet services

The bridge model technique:
The Bridge is a tool for visioning and planning, helping stockholders to identify where they are, where they want to be, and how to bridge the gap between the two

The seed technique:
This is more a technique for carrying out other PA (participatory Approaches)
Rather than a tool in itself .it involves the use of counters to represent relative amounts or preferences, and to foster a participatory attitude

* The author is very grateful for Mr. Hamed Abdel Razek and Moharam Sayed Abdalla, for the efforts they afforded to finish this paper through collecting the requested raw data .

Results

Cases treated – total and hoof abscesses

Table 1: Total cases treated, hoof cases and hoof abscess in Abo Ghaleb

Year	Total no. cases/year	No. hoof cases	% hoof cases	Total no. hoof abscess/year	% of hoof abscess
2006	2,604	434	17	152	5.9
2007	2,732	582	21.3	180	6.5
2008	2,442	640	26.2	225	9.5
2009	1,221	355	29	130	10.6

Figure 1: Hoof cases and total clinical cases seen in Abo Ghaleb

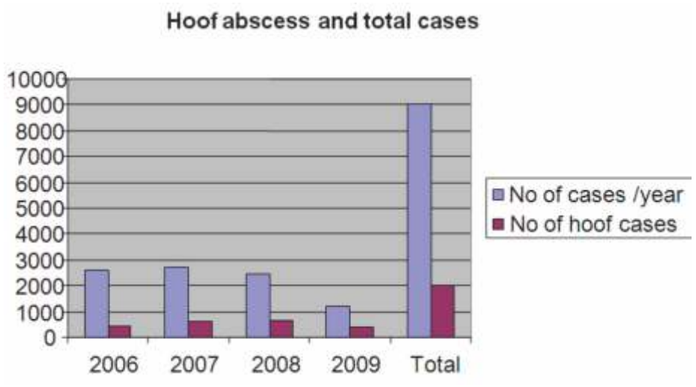


Table 2. Total cases treated, hoof cases, and hoof abscess in El Saf

Year	Total no. cases/year	No. hoof cases	% hoof cases	Total no. hoof abscess/year	% of hoof abscess
2006	2604	434	17	152	5.9
2007	2732	582	21.3	180	6.5
2008	2442	640	26.2	225	9.5
2009	1221	355	29	130	10.6

Hoof abscesses treated per month

Figure 2. Monthly variation in cases of hoof abscesses seen in Abo Ghaleb

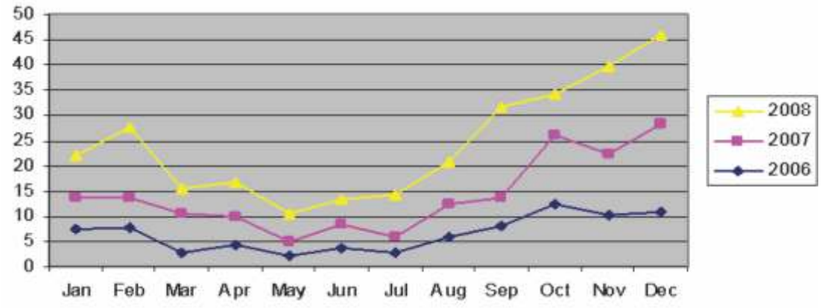
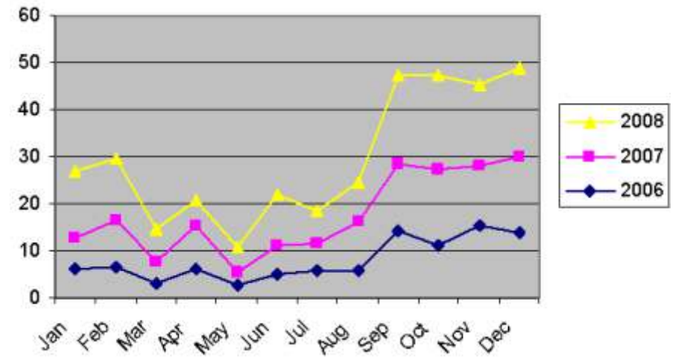


Figure 3. Monthly variation in cases of hoof abscesses seen in El Saf



Treatment options in Abo Ghaleb and El Saf

Table 3. Service providers used by owners whose donkeys go lame

	Abo Ghaleb	El Saf
Vets	6	7
Traditional treatment	5	48
Without treatment	12	15
SPWDME	40	15
Local farrier	16	0
First time lameness (without pervious lameness)	20	12
Total number of cases	99 hoof abscess case	97 hoof abscess case

Table 4. Duration of lameness before treatment, from detailed case records

	Duration of lameness	Abo Ghaleb	El Saf
1.	less than one week	69	52
2.	one to two weeks	27	20
3.	two to three weeks	2	8
4.	less than one month	2	8
5.	one to two months	0	8
6.	not clear	0	4

Table 5. Participatory workshop results from Abo Ghaleb and first choice for assistance

	Main welfare issues in Abo Ghaleb	Local farrier	Owners	Neighbours	Vets
1	Tetanus	50%	10%	25%	15%
2	Wound	25%	50%	15%	10%
3	Lameness and hoof problems	50%	10%	25%	15%
4	Malnutrition	10%	25%	50%	15%
5	Respiratory	10%	50%	30%	10%

Sex and hoof abscess

In Abo Ghaleb 687 hoof abscess cases were recorded between January 2006 and December 2009. 501 of these were in female donkeys and 186 in males.

In El Saf 964 hoof abscess cases were recorded between January 2007 and the end of December 2009. 509 were in female donkeys and 455 in males.

Location of hoof abscess and conformation

From the 200hoof abscess cases recorded by the diagnostic hoof abscess sheet, there were 147 hoof abscesses on forefeet and 53 on hind feet.

There were 96 cases with normal foot conformation, 93 with 'base narrow' and 11 with 'base wide' conformations.

Of the 93 'base narrow' conformation cases, 79 had the abscess on the lateral side of the foot, and of the 11 'base wide' cases, 10 had the hoof abscess on the medial side.

Discussion

1. Hoof problems and hoof abscesses are a major problem affecting the welfare of donkeys in El Safe and Abo Ghaleb (see tables 1 and 2).
2. The incidence of hoof abscess is high in Abo Ghaleb and in El Saf. It is also increasing from year to year in both communities (see tables 1 and 2), indicating that the owners started to depend on SPWDME instead of the local farrier in Abo Ghaleb, and on traditional treatment in El Saf, where there is no local farrier.so that the Numbers of lame donkeys we received are increasing year by year ,decreasing the numbers of lame donkeys treated by local farrier or by traditional treatment year by year
   There is quite a dramatic fall in the number of cases in 2009, that is due to reducing in number of our visits to both communities on 2009 comparing with previous years (2006, 2007, and 2008)
   Our visits for two both communities were regular on 2006, 2007 and 2008
   But our visits were not regular on 2009.
   The creation of dependency on free services from SPWDME may lead to limitation of the project. But the traditional treatment for hoof abscess in Elsaf are very worst
3. Figures 2 and 3 shows that there is a consistent seasonal variation in hoof abscess cases, with the highest number seen in December, then a decrease in the months to May, when the rate increases again in Abo Ghaleb. Also Figure 4 shows that there is a consistent seasonal variation in the number of hoof abscesses seen between September and December.
4. There are more hoof abscess cases in female donkeys than males in both villages. There are various likely reasons for this, including:
   - Female donkeys are preferred in the communities where they are used for riding
   - The owners keep their female donkeys in same stable as other animals, and the stables tend to be wet. They keep male donkeys away from the other animals to avoid the donkeys injuring other animals.
5. The type of work done by the donkeys affects the incidence of hoof abscesses. They are common in rural areas like Abo Ghaleb and El Saf where donkeys are ridden, and much less so in other sites visited by the team where donkeys pull carts in brick kilns.
6. Hoof abscesses tend to occur on the lateral side of the feet of donkeys with a narrow base, and on the medial side of the feet of those with a wide base. This is because a donkey with a narrow base bears more load on the lateral side of its food, and that acts as a risk factor. The donkey with a wide base bears more weight on the medial side and has a higher risk of abscesses on that side.
7. Table 3 shows that in Abo Ghaleb, the owners depend on SPWDME more to treat lame donkeys, and they go to the local farrier even though he is so expensive and so far away. Traditional treatments for hoof abscess are not common in Abo Ghaleb. Twelve owners left their donkeys without treatment, because they had seen cases of lameness which healed on their own because the donkey just needed to rest. In El Saf traditional remedies for lameness are the owners' first choice and 15 owners left their lame donkeys without treatment. In both communities, few owners went to the vet to treat their donkeys.
8. Table 5 shows the five main donkey welfare problems in Abo Ghaleb, and indicates that the local farrier plays an important role. The owners go to him for the treatment of tetanus and lameness, even though he is so far away and expensive, but treat wounds, respiratory problems and malnutrition themselves. When asked when they do not go to vets to get treatment for their donkeys, they say:
   - The vets do not have the skills or equipment to treat donkeys.
   - The vets are expensive.
   - Why should they go to local vets when SPWDME (free and high quality) is available?

Conclusion

Hoof problems, particularly abscesses, are a major part of the work of SPWDME in rural areas. Through understanding and working jointly with communities, more can be achieved in terms of the long term prevention

and resolution of lameness problems. The training of owners and local service providers is considered the best intervention option in these cases, and it is a strategy being pursued by SPWDME.

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EPIZOOTIC LYMPHANGITIS IN CART MULES: COMMUNITY-BASED CLINICAL TRIAL IN BAHIR DAR, NORTH-WEST ETHIOPIA

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Abstract
Data on a community-based clinical trial on epizootic lymphangitis (EZL) of cart mules in Bahir Dar were collected from September 2008 to August 2009 and analysed to assess the importance of community participation in controlling the disease.

Community members were made aware of the nature of the disease: focus group discussions (FGDs) were held on predisposing factors, the importance of early detection and presentation of cases, administering follow-up treatments, and notifying abandoned cases.

During the period 75 (25%) of the 300 cart mules in the town were found to have the disease. Proportions of cases presented were 53.3% (40) early, 38.7% (29) moderate, and 8% (6) severe, respectively. Potassium iodide (KI) at a dose rate of 0.1g/kg was administered orally with feed or water every day in the first week and every other day in the following weeks, supplemented with excision of skin nodules and application of 2–5% tincture of iodine on lesions for all clinically infected cases. Severe cases were euthanized with the consent of owners or joined another treatment regimen.

It was found that 58 (80.6%) cases recovered after 2–10 weeks of treatment; out of which 38 (65.5%) were early and 20 (34.5%) were moderate cases. No severe cases recovered. Statistically significant difference ($p<0.05$) was observed between chances of recovery of early (95%) and advanced (moderate and severe combined) (62.5%) cases which implied criticality of early identification of cases and commencement of treatment. Only 11 (3.7%) cases were left in the town by the end of the indicated period.

Introduction
Ethiopia has 376,682 mules out of which 135,908 live in the Amhara region. More than 14% of the working mules in this region are pull carts [14]. Over 300 mules (all cart pulling) live in Bahir Dar, upon which the livelihood of the same number of households depends [15]. Mule carts serve the community in the town, transporting commodities to and from market places, cement, stone and timber to construction sites, grain and flour to/from mill houses, etc. It has been recorded that animal traction significantly contributes in supporting both rural and peri-uban livelihoods in Ethiopia [22].

Despite the invaluable services mules (and all equines) provide to the national economy, they are subject to routine and frequent neglect and maltreatment [21]. Moreover, many infectious diseases affect equines in Ethiopia, and EZL is the most prevalent [17, 4]. Research conducted in horses indicates that EZL is endemic to Ethiopia [8] and its distribution covers humid and hot areas with altitude ranging 1,500–2,800 metres above sea level (masl) [4]. Although mules are said to be better resistant to EZL than horses [3], the disease was found at a prevalence of 28% in mules in Bahir Dar, where no horses survive [11].
There has been no completely satisfactory treatment against the disease [26, 16]. Inorganic iodides can be used on early cases and amphoteracine B is also recommended as a drug of choice [2]. Both of these treatment options, however, are not available in the local veterinary service partly because of cost. Even if the drugs are available, early identification of cases and intensive follow-up are critical for successful therapy [2, 12]. Especially

where owners cannot afford expensive treatment, like the cart mule owners of Bahir Dar, they have to be able to recognize the symptoms at the earliest possible time, present for treatment, and strictly follow up until the final outcome is reached.

This paper, therefore, reports on the importance of community participation in setting up a successful community-based treatment and control scheme for epizootic lymphangitis in cart mules in Bahir Dar town.

Materials and methods

Area

Bahir Dar is located in the north-western part of Ethiopia 570km from the capital Addis Ababa at 11' 29"N latitude, 37' 29"E longitude at an altitude of 1,840 masl [19]. It has a typical tropical climate with average annual rainfall of 1,434mm, humidity 57.88%, and average annual temperature of 26.4°C. The rainy season extends from early June to late September [9].

Animals

Seventy five cart mules naturally infected by EZL, out of a total population of 300 in Bahir Dar, were involved in the study from September 2008 to August 2009.

Design

All 300 mules were recorded and given ID cards. FGDs were held on the importance of the disease, preventive measures, predisposing factors, identification of cases, and follow-up treatment (Figure 1). All owners agreed that their actions were an indispensable part of the whole process and acted accordingly. Inspection and palpation were clinical examination methods used. Further confirmation was made by microscopic examination. Cases presented were classified as early (<5 nodules, only one part of body affected), moderate (6–20 nodules, 1–3 part/s of body involved), and severe (>20 nodules) [18]. Pearson's chi square was used to analyse the data collected.

Figure 1. FGD before clinic session

Figure 2. Owner watching DSE vets treating his mule

All early and moderate cases started treatment as they appeared which involved excising contents of nodules, application of topical iodine tincture (2–5%) (Figure 2), and oral administration of potassium iodide (0.1gm/kg) with feed or water every day in the first week and every other day thereafter. Severe cases were euthanized [26] with the consent of the owner or joined another treatment regimen.

Figure3. Owner cleaning skin lesions

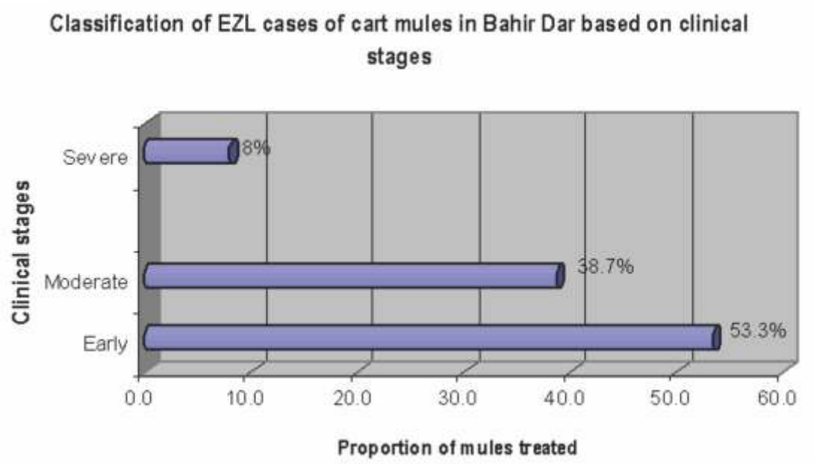
Figure 4. Owner applying iodine tincture on skin lesions

Clinic-based treatment was carried out only once a week and follow-up therapies were performed by owners the rest of the week (Figures 3 and 4). FGDs were held every week before clinic sessions to share information on progress of treatment, lessons learnt, and consider new or abandoned cases.

Results

Over the period of one year, 75 (25%) of the 300 cart mules were found to have EZL. All cases were identified by owners and confirmed by the DSE team. Forty (53.3%) were presented at an early stage, 29 (38.7%) at a moderate stage, and only 6 (8%) at a severe stage (see Figure. 5). All cases of EZL were cutaneous.

Figure 5. Stages of EZL cases when presented to DSE clinic



Of the 75 owners involved, 58 (77.3%) strictly applied follow-up treatment and put professional advice into practice. They stopped visiting the clinic only when an agreement was reached that the patient did not need any further treatment. Three (4%) owners were willing to have their severely infected mules euthanized. Three other owners did not want their mules to be euthanized and hence started treatment, but none of them recovered. The remaining 11 (14.7%) owners started treatment of their animals but were not committed to follow-up and terminated in the

middle of the process. None of mules belonging to such owners were reported to have recovered.

Of the 72 cases that started treatment, 58 (80.6%) recovered after 2–10 weeks of treatment. Thirty-eight (65.5%) of those recovered were early, 20 (34.5%) were moderate, and 0% were severe cases.

Table 1. Response to treatment at different clinical stages of EZL

	Recovered	Failed to recover	Euthanized	Total (treated)	Treatment success rate (%)
Early	38	2	0	40	95
Moderate	20	9	0	29	69
Severe	3	0	3	0	3
Total	58	14	3	72	80.5

A statistically significant difference ($p<0.05$) was found between the response to treatment of early and advanced (moderate plus severe) cases.

Figure 6. EZL lesions along the fore limbs during treatment

Figure 7. Lesion sites after treatment

Successful treatments which lasted 4 weeks or lesser were 25 (43%), out of which 19 (76%) were early cases and only 6 (24%) were moderate. The estimated cost of treatment of a mule for 4 weeks was 579 ETB ($42.25) excluding personnel costs. No mule was reported to have been re-infected once treated and recovered.

Discussion

The fact that owners played an indispensable part in identifying the problems of their mules and were involved in solving them made the intervention successful. This is in line with other reports of successful community-based animal health delivery systems in developing countries [13]. Every owner was sensitized on the grave nature of EZL and criticality of early intervention. This resulted in early presentation of the majority of the cases. This study shows that the earlier the cases are treated the better the chance of recovery and hence the lower the cost of treatment. A statistically significant difference ($p<0.05$) was found between the chances of recovery of early and

advanced (moderate plus severe) which is consistent with previous work [12].

Owners' skills in administering KI orally, either with feed or water, and topical application of iodine tincture were developed by demonstration. Subsequently, the majority (80.6%) of owners attended each clinic session once every week, and collected and administered follow-up treatments for the rest of the week. This significantly contributed to the success of the interventions. It would have been practically impossible for the DSE team to administer directly daily treatment for each and every case.
Owners were also empowered by the knowledge of how to prevent the disease which involves prevention of wounds and avoiding direct contact with infected mules and indirect contact with contaminated fomites [25]. Attention was also given to notifying abandoned severe cases. This helped preventing re-infection and is believed to have contributed to the decreasing number of new infections.

It is, therefore, recommended that community participation should be given due consideration, owners made aware of predisposing factors and preventive measures, and their skills developed on case identification and management to help control the disease in endemic areas. Making KI and iodine tincture available locally should be considered as an important input.

Further studies should be undertaken to research cheaper options for treatment and enhanced participation of the community.

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COMPARATIVE ASPECTS OF PREVALENCE AND CHEMOTHERAPY OF ECTO-, ENDO- AND BLOOD PARASITES OF DRAUGHT EQUINES IN FAISALABAD METROPOLIS, PAKISTAN

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Abstract
A total of 150 draught equines (horses, mules and donkeys, 50 each) were studied to determine the comparative prevalence of ecto-, endo- and blood parasites in randomly selected areas of Faisalabad metropolis. The response to 4 different treatment protocols for various classes of parasites affecting equines was also investigated. Ecto-parasites (ticks, flies, lice and mange mites) were diagnosed by clinical examination complemented by microscopic examination of skin scrapings after processing by concentration method. Faecal samples were examined by direct and concentration methods for worms, eggs and larvae of parasites. Blood samples were subjected to microscopic examination of wet blood films and Giemsa-stained blood smears for blood parasites such as trypanosomes, babesia and microfilariae. Thirty equids (horses, mules and donkeys, 10 each) suffering from gastrointestinal parasitism were treated with oxfendazole suspension (Systamex™) as per the manufacturer's directions. The response to treatment was evaluated by microscopic examination of faeces after one week of treatment. All positive cases suffering from ecto-parasitic (n = 14) infestations were treated with ivermectin (Inj. Ivomec™) and response to treatment was evaluated by clinical and microscopic examination of skin scrapings after one week of therapy. Similarly, all equines positive for trypanosomiasis (n = 7) were treated with quinopyramine sulphate + quinopyramine chloride (Inj. Tryban™). Cases of Babesiosis (n = 2) were treated with imidocarb dipropionate (Inj. Imizol™). Similarly, filariasis (setariasis) cases (n = 2) were treated with Ivermectin (Inj. Ivomec™) and response to treatment was evaluated by microscopic examination of blood smears at day-7 and day-14 of treatment. Out of a total 150 equines examined, 82 (54%) tested positive for endoparasites: 24 horses (48%), 27 mules (54%) and 31 donkeys (62%). The most prevalent species were identified as Strongylus spp. (large & small), Oxyuris equi and Parascaris equorum. Efficacy of oral administration of oxfendazole in reducing faecal egg counts at day-7 post treatment was 80, 70, and 80% in horses, mules and donkeys, respectively. The efficacy of ivermectin against ecto-parasites was 75, 65 and 75% at day-7 treatment in horses, mules and donkeys, respectively. The efficacy of imidocarb dipropionate (Inj. Imizol™) against Babesia spp. was 100% in both horses and mules at day-7 of treatment. Quinopyramine sulphate + quinopyramine chloride mixture (Inj. Tryban™) afforded 100% cure at day-7 treatment in 7 equines suffering from trypanosomiasis. The efficacy of ivermectin against filariasis (microfilaremia due to Setariasis) was found 0% at day-7 and 100% at day-14 of treatment.

Introduction
Horses and donkeys are very versatile animals used for a variety of purposes such as transportation of goods and people, racing, polo, tent pegging and other recreational games. It has been suggested that more than half of the world population depends on animal powers as its main energy source [1]. Many of these animals are owned by poor people who work in harsh environments [2]. There are an estimated 90 million equines in the developing world with the highest population concentration in central Asia, North and East Africa [2]. According to the National Livestock Census 2006, the total equine population of Pakistan is about 4.77 million and the equine population of Faisalabad district is 10664 horses, 3046 mules and 132444 donkeys.

Several factors affect the health and productivity of the equines. Parasitic infestations are major veterinary problems in most under-developed countries of the world [3]. The clinical signs of endoparasitism include anemia, weakness, emaciation, poor work performance and sometimes colic and diarrhoea. The most common gastrointestinal parasites in equines are *Strongylus vulgaris*, *S. equinus*, *S. edentatus*, *Parascaris equorum*, *Strongyloides westeri*, *Trichostrongylus axei*, *Gastrophilus intestinalis*, *G. nasalis* and *Oxyuris equi* [4]. Ectoparasites (mites, flies, ticks and lice) cause major problems in equines. These parasites damage the host by inflammation, neoplastic reactions, restlessness, itching and loss of hair, loss of body condition, dull body coat, anemia and dermatitis [5].

Materials and Methods
The present study was designed to check the prevalence of ecto-, endo- and blood parasites in horses, mules and donkeys

and to determine the chemotherapeutic efficacies of 4 different drugs against these parasites affecting equines.

A total of 150 equines (50 horses, mules and donkeys each) of different ages, breeds and either sex were recruited to this study from different areas of Faisalabad metropolis for coprological, blood and skin scraping examination in the Diagnostic Laboratory, Department of Clinical Medicine and Surgery, University of Agriculture, Faisalabad, Pakistan. History was taken using a questionnaire recording the animal description, general health, feeding, housing, watering, deworming and previous medication, according to the nature of infestation by ecto-, endo- and blood parasites. Clinical examination of each animal included recording rectal temperature, pulse rate, respiration rate, palpation of lymph nodes, colour of conjunctiva, texture of faeces, urine color, presence of any swelling on the extremities and presence of ectoparasites.

Five to ten grams of faeces were collected from the floor or directly from the rectum in polythene bags and labelled. All faecal samples were subject to the direct method and centrifuge flotation method for evaluation of parasites; this was carried out on the same day as collection [4], [6].

Five ml of blood from the jugular vein was taken in a disposable syringe, transferred to a glass tube containing an anticoagulant (EDTA) and labelled. All samples for confirmation of blood parasites were processed on the same day by examination of wet blood film and Giemsa-stained smears as described by [6], [7].

Skin scrapings were collected from infected, reddened, irritated and large lesion areas and placed in a test tube containing 10% KOH (potassium hydroxide) solution. Test tubes were sealed, packed tightly and labelled. The samples were processed for the presence of mange mites through concentration method as described by [8].

Drugs used in the current study were:

1) Oxfendazole suspension (Systamex™, ICI Pvt. Ltd. Pakistan)
2) Ivermectin (Inj. Ivomec™, MSD, Pakistan)
3) Quinopyramine Sulphate & Quinopyramine Chloride (Inj. Tryban™ Powder, Arab Veterinary Industrial Co., Jordan)
4) Imidocarb dipropionate (Inj. Imizol™, Scharing-Plough Animal Health)

Treatment and response measurements were as follows:

(a) Endo-parasites

Thirty equines (horse, mules and donkeys, 10 each) suffering from gastrointestinal parasitism were randomly selected from total number of diseased animals for drug trial and treated with oxfendazole suspension (Systamex™, ICI Pvt. Ltd. Pakistan) as per the manufacturer's recommendations for equines. The efficacy of drug was determined by microscopic examination of faeces after one week of treatment.

(b) Ecto-parasites

All cases suffering from ectoparasite infestations (mange mites, ticks and lices) were treated with ivermectin (Inj. Ivomec™) as per the manufacturer's recommendations. Efficacy of the drug was determined by clinical examination and microscopic examination of skin scrapings after one week of treatment.

(c) Blood parasites

1) All equines suffering from trypanosomiasis were treated with Quinopyramine sulphate + Quinopyramine chloride (Inj. Tryban™ Powder, Arab Veterinary Industrial Co., Jordan)
2) All equines suffering from babesiosis were treated with imidocarb dipropionate (Inj. Imizol™, Schering-Plough Animal Health)
3) All equines suffering from filariasis (setariasis) were treated with ivermectin (Inj. Ivomec™, MSD) as per the manufacturer's recommendations.

Efficacies of these three drugs were determined by microscopic examination of blood smears after one week of treatment.

Results

Prevalence of endoparasites

Of the total 150 animals examined, 82 (55%) were found to be positive for different endoparasites: 24 horses (48%), 27 mules (54%) and 31 donkeys (62%). The most prevalent parasitic species identified included large and small *Strongylus spp.*, *Oxyuris equi*, *Parascaris equorum*, *Trichonema spp*. and mixed infections.

Prevalence of ectoparasites

Of the total 150 horses, mules and donkeys examined, 14 (9%) were found positive for three different types of mange (Psoroptic, Chorioptic and Sarcoptic). Among the infested equines, 4 horses, 3 mules and 7 donkeys detected positive for mange mites. Three, 1 and 0 horses were found positive for Psoroptic, Sarcoptic and Chorioptic mange mites respectively. The corresponding figures for 3 different types of mange mites in mules were 2, 0 and 1. In donkeys, Sarcoptic mange was the most prevalent (n = 5) type of mange followed by Psoroptic (n = 2). None of 50 donkeys examined tested positive for Chorioptic mange. None of the 150 animals were found to be infested with ticks or lice.

Prevalence of blood-parasites

Eleven (7%) of 150 equines examined tested positive for blood parasites (Trypanosoma spp., Babesia spp. and Microfilarial spp.); these were 4 horses, 3 mules and 4 donkeys. Two, 1 and 1 horses tested positive for Trypanosoma spp., Babesia spp. and Microfilarial spp. respectively. The corresponding figures for these blood-parasites in mules were 2, 1 and 0. Of the 4 donkeys infested with blood-parasites, 2, 0 and 1 harboured Trypanosoma spp., Babesia spp. and Microfilarial spp., respectively.

Treatment trials

The efficacy of oxfendazole (Systamex®) against endoparasites at 7 days post-treatment was found to be 80, 70 and 80% in horses, mules and donkeys, respectively. The efficacy of ivermectin (Inj. Ivomec™) against mange mites was 75, 66 and 75% on day 7 post-treatment in horses, mules and donkeys, respectively. The efficacy of Quinopyramine sulphate + Quinopyramine chloride (Inj. Tryban™), Ivermectin (Inj. Ivomec™) and Imidocarb dipropionate (Inj. Imizole™) against Trypanosoma, microfilarial spp. and babesia spp. respectively in the three equine species investigated was 100%.

Discussion

Working equines (horses, mules and donkeys) are host to a variety of endo-, ecto-, and heemo-parasitic diseases. Fairly accurate estimates of prevalence of these parasites as well as determination of efficacies of different chemotherapeutics against these parasites are *sine qua non* for financial resource allocations and control interventions. Eighty-two (55%) of 150 equids investigated in the present study were found positive for endoparasites. Fourteen (9%) equines detected positive for ectoparasites (mange mites only) while 11 (7%) were found positive for blood parasites (Trypanosoma, Babesia spp. and Microfilarial spp.). These results are in agreement with those reported by [9], while [10] reported endo and blood-parasites prevalence of 75 and 10% respectively. A third study [11] determined the prevalence of ectoparasites in 200 Indian army horses in which 31 (15.5%) were found positive. In Rangers' horses in Lahore, [4] found an overall prevalence of 53% affected by endoparasites, 79% with ectoparasites and 32% with both endoparasites and ectoparasites. The prevalence of different parasites is a function of the geoclimatic and managemental conditions of the host animal. An investigation of the parasitic infestations in equines under disorganized husbandry conditions in Kashmir, using examination of faecal samples, found an overall infestation as high as 93%.In the present study, the efficacy of oxfendazole against endoparasites, ivermectin against mange mites and blood parasites, imidocarb dipropionate against babesiosis and quinopyramine sulphate + quinopyramine chloride is line with the findings of previous workers.

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LEUKOENCEPHALOMALACIA: FUMONISIN TOXICITY IN A GROUP OF DONKEYS

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Abstract
Leukoencephalomalacia is a generally fatal, rapidly progressing neurologic disease of horses (and other equids) caused by ingestion of fumonisin. Fumonisins are a group of toxic metabolites produced by Fusarium *spp. and* Alternaria *spp. fungi, especially* Fusarium moniliforme*, a species well adapted to tropical climates. The objective of this report is to introduce cases of leukoencephalomalacia in a group of crossbred Iranian donkeys which received mouldy bread for a period of 1 month. The donkeys became increasingly nervous and weak over a period of 5 days. Episodes of head pressing were also observed. On the sixth to seventh day, they were found recumbent. All donkeys died within 18–30 hours from the start of recumbency and were necropsied immediately after death. Brain tissue was macroscopically examined and selected areas were sampled for routine histopathology. After obtaining a thorough history and completing a physical examination, it was discovered that the donkeys were being fed mouldy bread. Analysis of a sample of the mouldy bread revealed fumonisin B1 at 65.2ppm. Pathological examination revealed normal cut surface of the brain. There was multifocal liquefactive necrosis of the white matter with infiltration of large numbers of macrophages in the areas of necrosis. It was characterized by liquefactive necrosis of the cerebral white matter. There were no other lesions in other parts of the body. Fumonisins are environmental toxins produced by the moulds* Fusarium moniliforme *(*F. verticilloides*),* F. proliferatum*, and other* Fusarium *species that grow on agricultural commodities in the field or during storage. Fumonisin B_1, fumonisin B_2, and fumonisin B_3 are the major fumonisins produced in nature. It has been reported that rations of equines should contain less than 5ppm ($FB_1 + FB_2 + FB_3$). The concentration of fumonisin B1 in this report was 65.2ppm, which was too high. Onset of clinical signs can occur 1–21 weeks after beginning to eat feeds containing fumonisin, but generally occur within 2–9 weeks. Time of onset depends on the concentration of fumonisins in the feed. Clinical signs of fumonisin poisoning in equids are usually related to liquefactive necrosis of the white matter of the brain and include progressive ataxia, depression, anorexia, delirium, aimless wandering, recumbency, coma, and death. Death can occur from 12 hours to 1 week after onset of clinical signs. It was concluded that the clinical signs and pathological findings of this poisoning in donkeys closely resemble those in horses.*

Introduction

Leukoencephalomalacia is a generally fatal, rapidly progressing neurologic disease of horses (and other equids) caused by ingestion of fumonisin. Equine leukoencephalomalacia has been recognized since the mid-1800s and has long been associated with the ingestion of corn contaminated with *Fusarium moniliforme*. Fumonisins are a group of toxic metabolites produced by *Fusarium* spp. and *Alternaria* spp. fungi, especially *Fusarium moniliforme* [1, 3], a species well adapted to tropical climates [5]. Among the several types of fumonisin known, fumonisin B_1 (FB1), B_2 (FB2), and B_3 (FB3) have been isolated from naturally contaminated foods and feeds. FB1, the most toxic of these compounds [6], is produced in large amounts and is responsible for various toxicoses in domestic animals, including equine leukoencephalomalacia [4], pulmonary oedema, and hydrothorax in pigs [5] and carcinogenity in rats [1]. FB1, FB2, and FB3 are generally found in feed at a ratio of 8:2:1 [6]. The dramatic clinical signs and extensive brain lesions, in both natural and experimental cases of this disease, have resulted in numerous reports on the neurological syndrome [2]. The objective of this report is to introduce cases of leukoencephalomalacia in a group of crossbred Iranian donkeys which received mouldy bread for a period of 1 month.

Description of the case

The episode occurred in a farm located in the Shiraz suburbs, Fars Province, Iran, during autumn 2008, when a 5-

year-old crossbred donkey (body weight 115kg) was affected. Two donkeys (2 and 4 years old) presented clinical signs of leukoencephalomalacia 9 days later and the fourth donkey (4 years old) showed similar signs 4 days later. The donkeys became increasingly nervous and weak over a period of 5 days. Episodes of head pressing were also observed. On the sixth to seventh day in the course of illness, they were found recumbent. All donkeys died within 18–30 hours from the start of recumbency and were necropsied immediately after death. Brain tissue was macroscopically examined and selected areas were sampled for routine histopathology. After obtaining a thorough history and completing a physical examination, it was discovered that the donkeys were being fed mouldy bread. Analysis of a sample of the mouldy bread was done.

Results

Analysis of a sample of the mouldy bread revealed FB1 at 65.2ppm. Pathological examination revealed normal cut surface of the brain. There was multifocal liquefactive necrosis of the white matter with infiltration of large numbers of macrophages in the areas of necrosis. It was characterized by liquefactive necrosis of the cerebral white matter. There were no other lesions in other parts of the body.

Discussion

Contamination of feedstuffs by fumonisin and the consequent onset of leukoencephalomalacia are known to occur worldwide [1, 6]. A seasonal occurrence of leukoencephalomalacia has also been described, associated with the ingestion of mouldy feedstuffs and the isolation of *Fusarium moniliforme* from feeds [5]. Seasonality of leukoencephalomalacia outbreaks may be linked with the humidity levels required for growth of *Fusarium moniliforme* and production of FB1 in significant amounts. The concentration of FB1 detected in our study at 65.2ppm means it was 6 times higher than the known toxic concentration for equids [4, 5]. The clinical course of leukoencephalomalacia is directly related to the amount of toxin ingested and may be influenced by individual tolerance. Clinical disease may be observed from a few hours to several days after consumption of contaminated rations, but a correct diagnosis is normally possible after an average period of 72 hours. Feed containing more than 10µg/g of FB1 is considered toxic and of high risk if administered to animals. Previous studies of leukoencephalomalacia outbreaks have shown that feed contaminated with 1–126µg/g of FB1 produces clinical signs of the disease in horses [6].

Although the signs consisting of lack of coordination, aggressiveness, recumbency, and eventual death were indicative of leukoencephalomalacia, the definitive diagnosis was based on determination of FB1 levels in the corn feed as well as gross and histological findings. Histopathology revealed areas of necrosis in the white matter of the CNS yet these lesions were not extensive. It is stated that a reduced spread of necrosis could be related to the short time of exposure to the toxin [4]. A conclusive clinical diagnosis of leukoencephalomalacia is often very difficult due to the fact that the neurological signs are similar to those consequent to the neurological alterations that occur due to encephalitis and rabies [2]. Therefore, a conclusive diagnosis must be based on gross and histopathologic alterations of the CNS together with the detection of fumonisin in contaminated rations. The disease is best prevented by not feeding fumonisin-contaminated feedstuffs to equids [2, 3, 6].

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THE INCIDENCE AND TYPE OF EQUINE SKIN TUMOURS IN SOUTH IRAN, 1995–2005

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Abstract

The skin is one of the largest organs of the body; however it rarely receives the attention given to other organ systems. The skin seems prone to many problems and the only sure way for diagnosis is removal and laboratory examination. Skin biopsy can be used to determine the histological distribution and structural alterations, and may provide a definitive diagnosis. Skin tumours are relatively uncommon and this report is the results of a survey of skin tumours in horses referred to Kazeroun Veterinary Teaching Hospital in south Iran (Fars province) between 1995 and 2005. Age, sex, colour, and use of the animals were recorded. In this period 88 horses with skin tumours were diagnosed. The tumours were surgically removed and samples were submitted for histopathological examinations. The frequencies of different types of tumours were as follows: 36 (40.1%) cases of melanoma, 27 (30.7%) cases of sarcoids, 19 (21.6%) cases of Squamous cell carcinoma, and 6 (6.8%) cases of papilloma. Male and female horses were approximately equally affected. Melanomas were seen mainly underneath the tail and external genitalia (91%). Other affected regions included the ear, eyelid, neck, lips, and limbs (9%). The sarcoids were observed on the head (61%), abdomen (24%), and around the chest, ears, and lower limbs (15%). Cases of Squamous cell carcinoma were most commonly diagnosed on the eye, conjunctiva, and ocular adnexal structures. Papillomas were seen near the rectum and close to the eyes. Melanomas were mainly observed in aged horses (9–17 years old). The sumpter horses were mostly affected by melanomas. The grey horses were mostly affected in the Kazeroun region. Other reports indicate that melanomas affect 80–100% of ageing grey horses, but occur less frequently in horses of other colours. Although it is generally understood that sarcoids are the most common tumours in horses, in this study the most commonly seen tumours were melanomas. The age range of the affected horses was 4–17 years.

Introduction

The horse's skin is its largest organ, ranging 12–24% of the animal's weight, depending on age. There are 3 major layers that make up the horse's skin. These various cellular and tissue components consist of the epidermis, dermis, and subcutis. The skin is the first line of defence between the horse's delicate innards and the hostile environment surrounding them. It protects the rest of the body from physical injury and invasions from insects, microorganisms, and poisons. It helps regulate the horse's body temperature. Horses might be confronted with a number of skin problems. They may encounter bacterial, viral, parasitic, and fungal skin diseases. Some horses suffer from saddle sores, dandruff, photosensitization, itchy skin, and allergic skin reactions. Horses also suffer from skin tumours such as sarcoids, squamous cell carcinoma, and melanomas. Sarcoids, squamous cell carcinomas, and melanomas are 3 of the most common neoplasms in horses; with early recognition, accurate diagnosis, and appropriate treatment, the prognosis for continued use and long-term survival for most horses with these tumours is good. Skin biopsy can be used to determine the histological distribution and structural alterations, and may provide a definitive diagnosis. Skin tumours are relatively uncommon and this report is the result of a survey of skin tumours in horses referred to the Kazeroun Veterinary Teaching Hospital in south Iran (Fars province) between 1995 and 2005.

Materials and methods

This study evaluated the incidence and type of equine skin tumours during the 10-year period between 1995 and 2005. The study involved the population of the affected horses that were referred to Kazeroun Veterinary Teaching Hospital. Age, sex, colour, and use of the animals (sumpter or riding horse) were recoded. The tumours were surgically removed and samples were submitted for histopathological examinations.

Results

The frequencies of different types of tumours were as follows: 36 (40.1%) cases of melanoma, 27 (30.7%) cases of sarcoids, 19 (21.6%) cases of Squamous cell carcinoma, and 6 (6.8%) cases of papilloma. Male and female horses were approximately equally affected. Melanomas were seen mainly underneath the tail and external genitalia (91%). Other affected regions included the ear, eyelid, neck, lips, and limbs (9%). The sarcoids were observed on the head (61%), abdomen (24%), and around the chest, ears, and lower limbs (15%). Cases of Squamous cell carcinoma were most commonly diagnosed on the eye, conjunctiva, and ocular adnexal structures. Papillomas were seen near the rectum and close to the eyes. Melanomas were mainly observed in aged horses (9–17 years old). The sumpter horses were mostly affected by melanomas. The grey horses were mostly affected in the Kazeroun region. The age range of the affected horses was 4–17 years.

Discussion

Horses can be afflicted with several types of skin tumour. The equine sarcoid is a locally aggressive, fibroblastic skin tumour, which can appear as a flat or cauliflower-like growth either singularly or as multiple growths, usually in a young horse. It is the most common dermatological neoplasia reported in horses. It is widely accepted that the bovine papillomavirus (BPV) types 1 and 2 are associated with the pathogenesis of sarcoids [1]. Papillomaviruses are also associated with warts in humans. Sarcoids usual appear in younger horses and may spontaneously disappear. The distribution of lesions and the epidemiology of sarcoids strongly suggest that flies are significant as vectors [2, 3]. There is no consistently effective therapy and therefore veterinarians use a variety of treatments, including: ligation, surgical excision, cryosurgery, laser surgery, topical application of cytotoxic compounds (e.g. zinc chloride, 5FU cream (called Efudex in Canada)) or intra-lesional injections of cisplatin, immunomodulation (e.g. EqStim, BCG), and autogenous polymerized tumour particles (vaccine made from a sarcoid). Commonly, when one or a few of the sarcoids are removed, an immunization response occurs and the remaining sarcoids disappear. Squamous cell carcinomas can be aggressive tumours that occur around the eye and the penis in adult horses. They are the most common penile and preputial neoplasm in the horse [4]. Smegma, the waxy exudates found around the penis and sheath is suggested as being the most likely carcinogen [5]. These tumours may metastasize to regional lymph nodes if not treated aggressively. Therefore, any change in skin pigmentation around the eye, penis, or sheath should be immediately examined by a veterinarian. Treatment options include surgical excision, cryosurgery, or laser surgery. Reoccurrence after treatment can be expected in 17–25% of cases [4]. For the Percheron breed and horses that are white or dappled in colour, the most common neoplasia is the melanoma or melanocytic tumour. It is not the case of whether a grey horse will develop a melanoma(s) but, rather, when and where it will develop. Melanomas are not a single entity but a complexity of equine proliferative cutaneous melanocytic lesions with at least 3 different forms, including: melanocytic nevi (melanocytoma), dermal melanomata (if there are multiple, confluent dermal melanomas, this is referred to as dermal melanomatosis), and anaplastic malignant melanomata [1, 6]. These tumours commonly appear under the tail, perineum, and external genitalia, as well as the parotid area (behind the jaw). They are usually slow-growing, locally-invasive tumours with the potential to metastasize internally. Surgical excision, cryosurgery, or laser surgery can be used to remove those melanomas that are bothersome to the horse and owner. Cimetidine, a histamine H2-receptor antagonist that is used in humans to inhibit the production of acid in the stomach, has been used to slow the growth of melanomas with mixed results.

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RISK FACTORS FOR WITHER LESIONS IN TOURIST-RIDING MULES OF GAURIKUND, UTTARAKHAND, INDIA

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Abstract
The pilgrimage site of Kedernath and nearby village of Gaurikund are collecting points for large numbers of working ponies and mules who carry pilgrims 14km into the mountains. These animals and their owners work long hours and suffer harsh climatic conditions. A welfare assessment in 2004 found wither lesions to be prevalent among working mules with 49% of animals suffering from the issue.

This study sought to identify risk factors for wither lesions in working mules with the aim of better informing preventative animal welfare project planning and implementation. A field-based survey was used to investigate the association between potential risk factors (identified by the local stakeholders and researchers) and the prevalence and severity of wither lesions. 140 mules and their equipment were assessed during work; whilst resting and with their saddles off and on. Linear and logistic regression was used to identify associations between variables.

Three potential risk factors were identified. Low body condition score, dirty coat hair and wet padding were all found to be associated with an increased incidence of wither lesions ($P<0.05$). These issues were shared with project staff enabling incorporation into preventative and awareness-raising messages, which were then used to inform animal welfare projects in the area.

Introduction

'The Shrines of Lord Shiva' is a pilgrimage site in the village of Kedernath in Northern India. Access to the site is limited with vehicular access available only to the village of Gaurikund, 14 km below. Thousands of pilgrims visit the site every year between May and October with many using ponies or mules to climb the steep, rocky path to the site from Gaurikund. During the pilgrimage season, large numbers of working equines and their owners congregate in Gaurikund to transport pilgrims.

In 2004, a welfare assessment of the working equines of Gaurikund was carried out, identifying that 41% of animals had lesions in the wither area. Further studies in 2007 found a similar prevalence of 33%. The equine population was found to be composed of approximately 16% ponies and 84% mules. Wither lesions were found to be a more prevalent in mules compared to ponies (49% and 14% of each species respectively). Wither lesions were identified as a significant source of pain and discomfort for these animals and therefore further investigation was recommended.

This study was designed to identify potential risk factors for wither lesions in the mules carrying pilgrims from Gaurikund to Kedernath with the aim of informing preventative measures and recommendations. In uncontrolled environments such as this, many factors may contribute towards the development of lesions in a complex and interactive manner.

Methodology

A comprehensive list of potential risk factors was generated through researcher observation and focus group discussion with animal owners, farriers and saddlers. This included factors related to the animal, resource, owner and environment. Methods for measurement/assessment of each variable were determined, tested and recorded in a guidance document. A data capture sheet was developed. Table 1 shows a selection of the measures taken in each section.

Animal	Saddle On	Saddle Off	During work
Attitude of animal	No. of girth straps	Padding cover	Pilgrim size & gender
Wither touch response	Girth attachment, tightness & position	Protrusions on saddle, girth etc	Animal pace
Body Condition score	Girth shape	Padding size, material & thickness	Track wetness
Shoe condition & fit	Padding material	Padding wetness	Pilgrim riding position
Animal size	Handling ring position	Pommel size	Driver behaviour
Coat condition	Saddle height & position	Saddle curve	Lameness
Cow hock	Stirrup length, position & fastening	Saddle condition	Animal slipping
Lesion size & severity		Breach band material, size and attachment	
Swelling		Crouper presence and attachment	
Discharge/wetness		Breast strap presence & attachment	
Gender		Girth strap dimensions & wetness	
Age			
Shoe			
Spine confirmation			

Table 1. Selection of measures recorded

The template was then tested in the field and measurements and observations were standardized between observers before data collection.

The equine population was estimated by averaging numbers gained from government records,
The total population of mules was therefore found to be approximately 2000. A stratified sampling plan was used and 140 mules were selected randomly from the population. Sampling aimed to ensure adequate representation of animals with and without lesions in the sample population.

All the animals were assessed during the animal's rest period, saddle on time, saddle off time, and during work (for this each animal was followed about 1km along the track from Gaurikund). To avoid repetition, identification marks (burgundy dye)

were applied to the forehead of the animals.

Data were entered on a spreadsheet using MS Excel and analysed using linear and logistic regression (SAS, SAS Institute Inc.). A P value of <0.05 was taken to indicate the significance level.

Results
Analysis revealed a number of significant associations between potential risk factors and the presence or absence of wither lesions.

- As the body condition score decreases (i.e. the animal gets thinner) the incidence of broken skin lesions (severity 2) at wither area increases (P= 0.0047)
- As the coat condition of the animal gets dirtier the incidence of broken skin lesions at wither area (P=0.0057) increases. See Figure 1.
- Wetness of the padding is associated with increased prevalence of broken skin lesions at wither area (P=0.0003). (Padding is the bundle of layers on the back of animal below the saddle.)

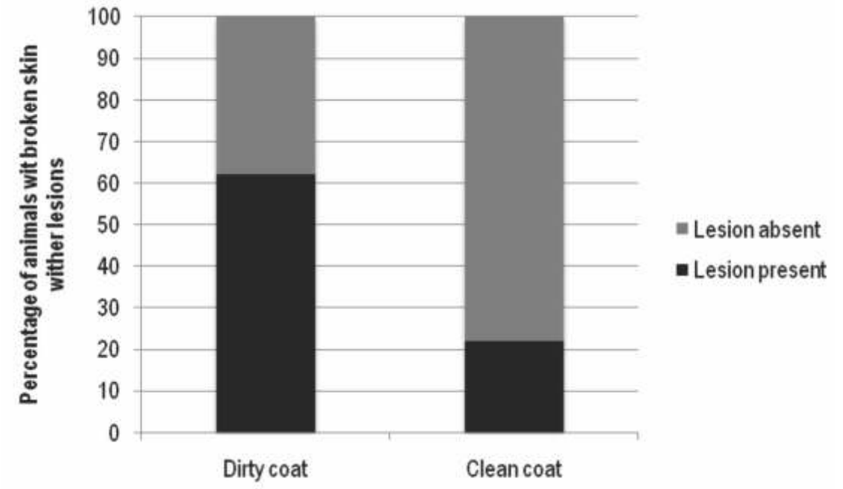

Figure 1. The association between coat condition and presence or absence of wither wounds

Discussion
Three factors were identified as potential risk factors for wither lesions in working mules. Due to the complex, multifaceted nature of this system it is impossible to be truly certain of causal factors for wither lesions. This study aims to identify the predominant risk factors, which would, if altered, be likely to lead to a significant improvement in the prevalence of wither lesions.

As the body condition score decreases the incidence of broken skin lesions at wither area increases
There may be a number of reasons why decreased body condition was found to be associated with an increased incidence of broken skin lesions. A higher body condition score implies increased muscle and fat all over the body, which may provide a natural cushion to the animal. In addition to this, increased body condition score suggests greater strength and vigour and better general health. Animals with lower body condition are often weak, with visible bony prominences and minimal amount of fat deposition, which could lead to an increased tendency for lesions to form.

As the coat condition of the animal gets dirtier the incidence of broken skin lesions at wither area increases
Dirt can produce resistance of movement of the saddle and makes the wither area and saddle soiled. Friction by the saddle (over wither) causes broken skin lesions. Dirt also may cause contamination of the lesion through micro-organisms and may

indicate lack of awareness of grooming and wound care. Burn et al (2002) have also identified an association between dirty equipment and tail lesions in working donkeys. In both situations it is unclear whether dirty coat condition may be a cause or an effect or both

Wetness of the padding is associated with increased prevalence of broken skin lesions at wither area
Padding material consists of 3–4 layers of blankets put over the back of animal before putting on the saddle. The association between padding wetness and increased lesion prevalence could be explained by increased chaffing of the skin in wet conditions. Wetness may be due to rain or sweat or may be a discharge from an existing lesion. Therefore, as with coat condition, there is a possibility that this association is an effect of the lesions rather than a cause or association.

Conclusion
Findings were shared with project staff and will be used in the development of awareness-raising materials (posters and preventative messages) for animal owners, farriers and saddlers during treatment camps and awareness-raising sessions. These findings act as guidance for the development of these materials thus improving resource allocation.

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THE REAL AND RECURRENT COSTS OF DEVELOPING AND SUSTAINING EFFECTIVE HEALTH-CARE DELIVERY SYSTEMS: 'THE ELEPHANT IN THE ROOM'

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Introduction
This is a brief review of my experience of health-care development over the last 37 years in many of the poorest countries of the world.

There are many striking similarities between the problems and the solutions of delivering human and equid health-care [1] services. The common factor is that poor people with many competing priorities for limited resources have few choices when deciding how to use their assets for the benefit of their families. They may have long-held cultural beliefs and attitudes, including harmful practices, and when care is available it is often of poor quality and may even be damaging to health. This paper focuses on the problems of developing and sustaining effective health-care delivery systems, and particularly the real and recurrent costs of ensuring quality that are often forgotten but remain 'the elephant in the room'.

In 1978, the world, through the WHO, UNICEF, and member states, made a first commitment to provide Health for All by the year 2000. The strategy to be used was defined in the Alma Ata Declaration of Primary Health Care. This remains especially relevant today as it considers 'health' (PHC) from the broadest aspect. For example, primary health care (PCH) involves, in addition to the health sector, all related sectors and aspects of national and community development, in particular agriculture, animal husbandry, food, industry, education, housing, public works, communications and other sectors; and demands the coordinated efforts of all those sectors.

The declaration was and is much more than a call to treat and prevent disease. It required a major shift in wealth distribution and in the politics of decision-making. As such, it was a document that challenged many existing political structures and economic interests. Not surprisingly, perhaps, it did not always find the practical and financial support that was crucial for its success in the long term.

Throughout the 1980s, 1990s, and the first decade of 2000, the focus of much of the effort to improve human health has been on the control and even eradication of specific diseases through the delivery of vaccines, bed nets, medicines, including antibiotics, and simple techniques like rehydration therapy. There have been many successes with these strategies, with a reduction worldwide in most of the diseases that commonly kill or disable. On the other hand, significant gains in health were made long before the advent of vaccines and antibiotics, largely attributable to improvements in public health measures including food security, water, sanitation, shelter, and education – the other social determinants of health.

In 2010, although a great deal has been achieved for many, including the eradication and control of some diseases, and a reduction of mortality in children worldwide, especially amongst the better off, 'Health for All' remains a dream. Many are denied access to these benefits. The gap between rich and poor grows. Inequity within and between countries remains and widens. And at the same time new threats are emerging, including a global economic crisis, water and food insecurity, resource conflicts, population movements, climate changes, and potential epidemics.

Health care systems: the devil is in the detail
To be able to deliver anything to anyone, anywhere, there has to be a system and this system can be likened to a chain with many links. Like any chain, its strength lies in its weakest link. The concept of health systems has been