ECONOMIC IMPACT OF GASTROINTESTINAL PARASITISM IN AMAZON BUFFALO FAR - BRAZIL

[1]LÁU, H. D.

[1] Med. Vet., PhD. Research of Embrapa Amazônia Oriental. P. Box, 48. Belém, Pará State, Brazil. CEP 66.095-100. E-mail: hugolau@cpatu.embrapa.br

ABSTRACT

Little information is available on the economic impact of parasitism in buffalo production. A major reason for this failure is the fact that is difficult to document and quantify exactly the losses caused by the parasites. This is because most buffalo have parasite burdens that are truly subclinical, with no obvious signs of parasitism but significant losses in potential production. This paper reviews the principal gastrointestinal parasites, the mechanisms of the losses due to parasitism, and the effects of parasitism on liveweight gain, milk production, carcass quality, reproductive performance and mortality of buffalo in Amazon region.

Key words: buffalo parasitism; economic disease, parasite control; production loss

INTRODUCTION

Gastrointestinal parasitism is one of the major causes of economic losses in dairy and beef buffalo production in all buffalo breeding countries. In Brazil, was estimated with 400 thousand of buffalo heads they are not productive as a direct consequence of sub-clinical and clinical parasitism. The degree of economic significance to these losses is however topic of difficult valuation because are often very insidious in nature and often difficult to prove statistically in a consistent basis. The principal components of impact is probably found in the costs of control of the nematode parasites and in the productivity losses. However, among the gastrointestinal parasitoses, most of which are endemic, in which the environment plays a key role in supporting development stages and the complete elimination or eradication of the helminthes is not scientifically acceptable. Moreover there are relatively few buffalo parasitoses in which their presence on a farm will cause the farmer extreme alarm, unlike the situation with some virus infections such as foot and mouth disease. Thus, the determination of total losses of gastrointestinal parasitose has severe limitations. The objective of the present paper was focalize the possible ways in which the economic impact of the gastrointestinal parasitism over the buffalo productivity can be evaluated in the Amazon farms.

THE PRINCIPAL PARASITES

The most common and pathogenic intestinal parasite of the young buffalo is *Neoascaris* (Syn. *Toxocara*) *vitulorum*. It is the first parasite whose eggs are detected in the faces of buffalo calves (11). The severity of infestation varies from place to place, depending upon many factors such as sanitation, management and nutrition. Buffalo calves are more susceptible to *N. vitulorum* than cattle calves under conditions of natural infection when they are raised together. Only 20% of cattle calves were found to be infected with *N. vitulorum* compared to 100% of buffalo calves. This may have been due to difference in the natural immunity of each specie (15). The usual routes of infection are transplacentally (7, 23) and transmammary (4, 21). In the first route (postnatal) the calves are infected via colostrum few hours of birth and in the second (prenatal) the foetus is infected by ingestion of larvae present on amminiotic fluid. In the adults there are no clinical significance and larvae may remain dormant in tissues. In pregnancy, however, larvae become active and can infect the foetus or sucking newborn. In weaned buffaloes the principally helminthes are the *Trichostrongyles* (*Haemonchus, Cooperia, Ostertagia, Trichostrongylus, Oesophagostomum, Bunostomum, Nematodirus).* Although there are some variations in the life cycle of this worms eggs or hatched larvae are passed to the environment from an infected animal,

usually through the faeces. If conditions are suitable, there is further development to the infection form of the helminthes, which is then available in the environment to infect other animals.

THE MECHANISMS OF LOSSES

The mechanisms by which gastrointestinal parasites alter animal productivity are results of the various pathological events which depends on many factors including the specie and number of parasites, and age, level of nutrition and resistance of the host. Probably, the most important pathogenic effect of the helminthes is the increase of the epithelial exfoliation of the intestinal cells which interfere at the post-absorptive protein metabolism. Consequently occur losses of proteins and other macromolecules into the lumen of the intestinal tract along with fluids and electrolytes with reduced availability of these nutrients for growth and development of the host. The helminthes also cause varying degrees of inflammation to the lining of the intestines, resulting in diarrhoea leading to an additional loss of nutrients which pass too quickly to be digested. Another result of the gastrointestinal parasitism is the induction of inappetence in the clinical and sub-clinical infection. It has been suggested (8) that this effect is a result of pain due to tissue damage at the site of infection, alterations in intestinal mobility and flow of ingesta, alterations of protein digestion and amino acid availability, and increased production of neural and intestinal hormones which develops reduction in voluntary feed intake.

EFFECTS ON LIVEWEIGT GAIN

The most commonly and frequently measured effect of nematode gastrointestinal is loss in body weight. The reduced body weight gain of 30 to 40 kg attributed to gastrointestinal parasitism has been frequently reported in several studies on cattle (5, 6, 19), whereas, very few reports are available on buffaloes. Weight gain following anthelmintic treatment was demonstrated by (10) in brazilian unweaned buffaloes. The difference between treated and un treated animals was 36 kg. The data support the notion that the gastrointestinal parasitism is responsible by the reduced body weight of animals. However, one study of the anthelmintic effect on the weight gain of buffaloes raised in floodable native pasture of the Low Amazon River, in Brazil, (12) observing no significant difference between treated and untreated animals. In this region the weight gain of buffaloes may be directly related with nutritional factors and the anthelmintic treatments were considered to be useless and uneconomic. Also, in India, (20) were of the opinion that levamisole treatment did influence of body weight in buffalo calves. These conclusions suggest that benefit parasite control in gain in body weight depend of the degrees of parasite infection, geographic locations, management conditions, and levels of nutrition of animals. One report from (3) confirm such evidences.

EFFECTS ON MILK PRODUCTION

Little information is available on the effects of gastrointestinal parasitism on milk production of lactating dairy buffalo. The adult buffalo cow is considered highly resistant to trichostrongyles infection (13), thus is not commonly accepted that the milk production is significantly depressed by parasite infection. Otherwise, gastrointestinal nematodes reduce nutrient availability to the heifers through both reduction in voluntary feed intake and/or reductions in the efficiency of absorbent nutrients. Its suggest that gastrointestinal parasitism may result in a reduction of milk production when the cows in first or second lactation are exposed to intensive parasitism, especially where the animals are on a lower plane of nutrition. In this manner, under tropical conditions is interesting to treat young buffaloes cows against gastrointestinal nematodes when clinical signs were observed.

EFFECTS ON CARCASS QUALITY

Is limited the information about the quality of meat from buffalo with gastrointestinal parasitism. Data collected recently (unpublished) suggests that the failure to worms control can result in an inferior product. Between uninfected and parasitised animals were significantly carcass yield. In the first had greater total muscle weight and carcass side had more total and subcutaneous fat, on the

contrary of the others where the muscles with high or moderate growth patterns were most affected. The bone weights were similar in the treated and untreated groups.

EFFECTS ON REPRODUCTIVE PERFORMANCE

Several reports have documented increases in cow cattle conception rate and reductions in the calving to breeding interval associated with parasite control (2, 22). However, the data of theme for buffaloes has received little attention. But if the weight gain increased consistently in animals deworminged, consequently in buffalo heifers parasited can occur reduction in time required to reach breeding weight. The weight gain improvements seemed to be associated with improved fertility is valid because the treated buffalo heifers with the highest weight gain also had the highest pregnancy rate. Thus, for economic reasons a reduction in the age of heifers at first services obtained with the anthelmintic treatments is important. Clinical disease due to helminthes parasites is rare in adult buffaloes. This suggests that reproductive ability of cow performance is not affected by gastrointestinal parasites.

EFFECTS ON MORTALITY

Mortality as a direct result of parasitism or as a consequence of increased susceptibility to other diseases is the common event in preweaning buffalo calves. The principal responsible is the *Neoascaris vitulorum*. The high mortality rate caused by this worm were seen in the age group of 1 to 3 months. In not controlled buffalo herds, the morbidity and mortality rates in this age group are often approaches 100% and 40% respectively (14). The principal causes of death by ascariasis are due to the obstruction of gastrointestinal tract by adult worm ball, fatal pneumonia from migration of larvae in the lungs and toxemia (15). The difference in mortality rate between sexes was not significant. In weaned calves the annual average mortality due to gastrointestinal parasitism was approximately 3%. In buffaloes to 1,5 year the losses observed is not simply in terms of mortality but more importantly in low production efficiency.

EFFECTS ON PUBLIC HEALTH

Generally when measuring the economic impact of animal disease is forgotten the public health. Certain parasitosis have very obvious additional direct effects at the societal level such as trichinosis (*Trichinella spiralis*) and the tapeworms (*Tania saginata*). Given the detrimental effects on human wellbeing , such infestations have various off-farm impacts (18). In this way, the loss of working capacity, the cost of treatment and the cost of surveillance and control of government inspection services need to be accounted. However, adverse effects of buffalo parasitism on the public health has received little attention.

THE COST-BENEFITS OF PARASITE CONTROL

The control costs added to productivity losses to derive a more comprehensive total cost of the disease. This adds another dimension to the total loss calculation, but does not significantly chance the utility of the resulting monetary Figure (1). With the exception of weight gain, many of the benefits of parasite control may be intangible and difficult the total loss calculation. Even relatively large increases in weight gain may not be noticed by producers or may not be attributed to improved parasite control. Consequently, increased attention is needed in applied research to clearly and effectively document as many of the potential benefits as possible. This generally means larger trials with more animals per group, more replicates, and the measurement of more parameters related to total herd productivity (9). The result is a substantial variety of methodologies applied to the full range of economic decisions related to animal parasitism and its control. Studies devoted simply to estimating total financial losses associated with disease are uncommon in the literature, mainly because economists do not see how the result would be relevant to decision-marking. The decisions in question typically relate to whether it is worthwhile to allocate scarce resources to use or develop a given strategy or technology to control a disease (18). Because every producer is different, has different management, has different stocking, different pastures, etc... it is impossible

to make a recommendation that will be the best strategy on every farm. However, we must utilize the information and expertise available to us to develop treatment strategies that producers will utilize. These recommendations must be simple, logical and effective (9). For estimating the cost-benefits of parasite control, it may be used the method cited by (17) such that: benefit = (1 + 4) - (2 + 3). In this equation 1 is the immediate monetary return; 2 is the not immediate additional monetary return; 3 is the additional costs; and 4 is the labor costs.

Although there is universally accepted that nematode parasite infections are one of the greatest causes of lost productivity of grazing livestock, scientific information about the economic impact of buffalo gastrointestinal parasitism and economic benefits of parasite control has received little attention. The degree of economic significance to these losses, the burdens of parasites required to cause such losses and the specific control measures of buffaloes needed to be evaluated in a consistent basis. Many of these losses are difficult to document and shown data conflicting or inconclusive. Otherwise the establishment of adequate parasite control programs requires adequate information concerning the parasite population pattern in the host, in the environment, and of the factors influencing this population. Therefore, additional studies are needed to clarify the significance of buffalo productivity losses caused by parasitic diseases and to quantify the importance of control costs and the productivity effects at the societal level.

REFERENCES

(1) BENNETT, R.; CHISTIANSEN, K.; CLIFTON-HADDEY, R. (1997). An economic study of the importance of non-noticeable diseases of farm animals in Great Britain. **Epidémiologie et Santé Animale**, 31-32: 10191-10193.

(2) BOHLENDER, R. E. (1988). Economics of deworming beef cattle. **Veterinary Parasitology**, 27: 67-71.

(3) BRYAN, R. P.; BAINBRIDGE, M. J.; KERR, T. D. (1976). A study of helminth parasites in the gastrointestinal tract of the swamp buffalo, *Bubalus bubalis*, Liderkker, in the Northern Territory. **Australian Journal of Zoology**, 24: 417-421.

(4) CONNAN, R. M. (1985). Ascaridiose of domesticated animals In: GAAFAR, S.M.; HOWARD, W. E.; MARSH, R.E. Parasites pests and predators. Amsterdam. **Elsevier Science**, 265-269.

(5) COSTA, J.; CABARET, J.; MEJIA, M. (1987). **Ganancias de peso vivo de novilhos y vaquillonas de la Pampa Humeda en relacion com el parasitismo por estrongilidos digestivos**. ITEA., 70: 38-47.

(6) DIMANDER, S. O.; HOGLUND, J.; SPORNDLY, E.; WALLER, P. J. (2000). The impact of internal parasites on the productivity of young cattle organically reared on semi-natural pastures in Sweden. **Veterinary Parasitology**, 90: 271-284.

(7) FERNANDO, S. T.; GUNAWARDENA, V. K.; WEILGAMA, D. J.; TENNAKOON, B.; WICKRAMATILAKA, G. N. (1981). Life-cycle and migratory behavior of *Neoascaris vitulorum* in buffaloes and some observations on the immunological response of the hosts. In: II RESEARCH COORTINATED MEETING OF THE USE OF NUCLEAR TECHNIQUESTO IMPROVE DOMESTICATED BUFFALO PRODUCTION IN ASIA, Bangkok. **Proceeding...** Bangkok Chulalongkorn University, 75-80.

(8) FOX, M. T. (1997). Pathophysiology of infection with gastrointestinal nematodes in domestic ruminants: recent developments. Veterinary Parasitology, 72: 285-308.

(9) HAWKINS, J. A. (1993). Economic benefits of parasite control in cattle. **Veterinary Parasitology**, 46: 159-173.

(10) LÁU, H. D. (1980). Efeito de diferentes tratamentos anti-helmínticos sobre o OPG e ganho de peso de bezerros bubalinos lactentes. Belém, EMBRAPA-CPATU, **Boletim de Pesquisa** 16, 18 p.

(11) LÁU, H. D. (1990). Aspectos sanitários da bubalinocultura na Amazônia. In: XVI CONGRESSO MUNDIAL DE BUIATRIA, Salvador, Bahia, Brasil, **Proccedings...** Salvador, 1223- 1225.

(12) LÁU, H.D.; MARQUES, J.R.F. (1991). Efeito de dosificações anti-helmínticas no ganho de peso de bubalinos criados em pastagem de terra inundável do Baixo Amazonas. **Pesquisa Agropecuária Brasileira**, 26: 473 – 477.
(13) LÁU, H.D. (1993). Helmintoses gastrintestinais dos bubalinos no Estado do Pará: epidemiologia e controle. **Documentos**, Embrapa/Cpatu. 72, 38p.
(14) LÁU, H. D. (1994). Suckling buffalo calves mortality in the Pará State. Brazil. In: IV WORLD BUFFALO CONGRESS, v 2, São Paulo, Brazil., **Proccedings...** São Paulo, 307-309.
(15) LÁU, H. D. (1994[a]). Important economic diseases in buffaloes. In: IV WORLD BUFFALO CONGRESS, v.1, São Paulo, Brazil, **Proccedings...** São Paulo, 209- 220.
(16) LÁU, H. D. (1997). Incidence of helminth infections in water buffaloes in Eastern Amazon, Brazil. **Revue d´Élevage et de Medicine véterinare des Pays tropicax**, 50 (2,): 117-120.
(17) MORRIS, R. S. (1969). Assessing the economic value of veterinary services to primary industries. **Australian Veterinary Journal**, 45: 295-300.
(18) PERRY, B. D.; RANDOLPH, T. F. (1999). Improving the assessment of the economic impact of parasitic diseases and their control in production animals. **Veterinary Parasitology**, 84: 145-186.
(19) PLOEGER, H. W.; KLOOSTERMAN, A. (1993). Gastrointestinal nematode infections and weight gain in dairy replacement stock: first-years calves. **Veterinary Parasitology**, 46: 223-241.
(20) SAINI, M. S.; SANGWAN, M. L.; GREWAL, S. S.; SENGUPTA, B. P.; CHAUDHARY, S. R. (1994) Effect of levamisole-75 on body weight and mortality in Murrah buffalo calves. In: IV WORLD BUFFALO CONGRESS, v. 2, São Paulo, Brazil, **Proccedings...** São Paulo, 335-337.
(21) STARKE-BUZETTI, W. A.; MACHADO, R. Z.; ZOCOLLER-SENO, M. C. (2001) An enzyme-lynched immunosorbent assay (ELISA) for detection of antibodies again *Toxocara vitulorum* in water buffaloes. **Veterinary Parasitology**, 97: 55 – 64.
(22) STUEDEMANN, J. A.; CIORDIA, H.; MYERS, G. H.; McCAMPBELL, H. C. (1989). Effect of a single strategically timed dose of fenbendazole on cow and calf performance. **Veterinary Parasitology**, 34: 77-86.
(23) SUKHAPESNA, V. A. (1985). A study of natural nematode infection in buffalo calves. **Buffalo Bulletin**, 4: 77.