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Best Periods for Deworming Cattle against Fasciolosis in Nigeria (A Tropical Sub-Saharan Country with Dry and Wet Seasons)

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Abstract

Best periods for deworming cattle against fasciolosis in Nigeria. A number of researches have confirmed the presence of fasciolosis and the extent of its harm both to cattle and humans in Nigeria. However, less attention has been given as to the specific periods during which cattle should be dewormed against the parasites. As a result, cattle are usually dewormed randomly at any time with just any fluckicide and in many cases are dewormed only when symptoms appear. This contributes to the lingering disease despite repetitive treatment. This study recommends specific periods in the rainy season and dry season for deworming cattle based on records of research findings in the past and of recent. A research was conducted towards the close of the rainy season (September ending and October ending, 2010) in 2 local Government Areas (Girei and Yola South) of Adamawa state in north eastern Nigeria. To fill the 5 microplates procured, blood samples were drawn randomly from the jugular vein of 225 field cattle. The sera obtained were screened for Fasciola gigantica antibodies using an indirect enzyme linked immunosorbent assay (ELISA). A prevalence rate of 55.5% was obtained in September as against 75.5% in October. Analysis with a t-test paired sample statistics indicated a significant difference ($P<0.05$) in the incidence of the disease between the months of September and October hence the best period recommended for deworming in the rainy season is early September to early October. It can be deduced from records of seasonal prevalence of fasciolosis that the best periods to deworm cattle in the dry season is January/February.

Keywords: Cattle; Fasciolosis; Deworming; Rainy season; Dry season; Nigeria;

Abbrevation

ELISA-Enzyme Linked Immunosorbent Assay

Introduction

Fasciolosis is a parasitic disease of Cattle, Buffalos, Sheep, Goats, Horses, Wild Ruminants and Humans which normally affect the animals at any stage of their life [1,2]. The disease has long been identified as the most destructive cosmopolitan parasitic disease of farm animals [3] and globally it constitutes a major source of economic losses in billions of dollars to cattle rearers annually [4,5]. Cattle in Nigeria have been greatly affected. Ogunrinade and Ogunrinade [6] estimated an annual loss due to fasciolosis of N5 million at a total liver condemnation rate of 7% and an assumed mortality rate of 2% from a cattle population of 10 million with an annual slaughter rate of 10%.

Fasciolosis is also a zoonosis that constitutes an important public health problem [7,8] of increasing concern [9]. Recent findings show that between 2.4 and 17 million people are infected currently while people living at risk of infection are up to 180 million [7,10]. Fasciola gigantica and Fasciola hepatica which are normally resident inside the bilary ducts and gall bladder of the liver are the causative agents in tropical and temperate/highland regions respectively [2,3] and the vectors are snails: Lymnae truncatula and Lymnae natalensis for Fasciola hepatica and Fasciola gigantica respectively.

Research findings indicate that wet areas of most parts of the world commonly harbor the parasites and diagnosis of the causative parasites at the right time has been a challenge especially in the developing nations [11]. The determination of the major risk periods of the disease has also been found to be complicated because the adult Fasciola, which has a life span of more than one year, lays eggs continuously [12]. In Nigeria, with a cattle population of 14.65 million where about 90% of that population is concentrated in the north [13,14]; it is unfortunate that diagnosis of the parasites is mostly done through the traditional/coprological method which has a number of limitations such as low sensitivity and it's also laborious [15-17]. In addition, eggs only appear in the faeces between 77-84 days post infection, more so, immature worms passing/tunneling through the liver parenchyma, which do not lay eggs,are the most destructive, inflicting extensive hemorrhage on the liver [18,19] and cannot be detected at that stage. Also, diagnosis of the parasites is further complicated by the fact that mineral deficiency diseases, anthrax and leptospirosis appear to show similar clinical signs with fasciolosis [4].

Fasciola parasites, however, can be detected as early as between 7 days-35days post infection by means of enzyme linked immunosorbent assay (ELISA) which is accomplished through the screening of fasciola antibodies in blood [20].This is the most commonly used assay in the developed world [21]. Fasciolosis, which tops all zoonotic helminths worldwide has been confirmed in most parts of Nigeria hence the need to consider it seriously due to its great hindrance to human health and livestock production [22]. Nigerian cattle, for instance, have been confirmed to have a mean fluke burden of 30 flukes and each fluke reduces the live weight gain by about 200g

annually [23]. Seasonal prevalence of fasciolosis has been reported to be higher in the dry season compared to the rainy season [24]. A significant difference (P<0.05) between the prevalence of fasciolosis in the dry season (25.98%) and the rainy season (18.14%) was recorded [25]. Conversely, higher prevalence in the rainy season (52.3%) compared to the dry season (21%) have also been recorded [26]. Also, a prevalence rate of 40.7% at the end of the rainy season compared to 31.7% at the end of the dry season have also been reported [27] hence there are 2 peaks in the seasonal prevalence of fasciolosis in the country. The 2 peaks are: the period immediately before and after the onset of rains and also towards the end and immediately after the end of the rainy season [14,28-30]. It was noted that cattle usually acquire the infection during the wet season and early dry season [30].

It has been reported that treatment is still the main method for the control of fasciolosis [31]. Some Nigerian researchers have recommended that animals should be dewormed/treated at least 2-3 times in a year: at the beginning of the rainy season, mid rainy season and at the start of the dry season [32]. Another researcher had recommended that anthelmintic drugs should be administered as soon as signs of fasciolosis show [4]. Despite these recommendations, it was later reported that inspite of repetitive treatment with efficient drugs, prevalence of the parasites have remained high [33]. Recently it is also recommended that cattle should be dewormed always [34].

This study aims at identifying one important cause of this persistently high prevalence inspite of repeated treatment and recommending specific periods for deworming/treating the animals within the 2 seasons (wet and dry) in this Sub-Saharan tropical country.

Materials and Methods

Study Area

The study was conducted in Yola south and Girei Local Government areas of Adamawa state which lies between latitudes 9°14 minutes N of the equator and longitude 12°18 minutes E of the Greenwich meridian. These locations in north eastern Nigeria have average daily temperatures ranging from 15.2°C-40°C at an altitude of 800m above sea level within the northern guinea savannah ecological zone. The rainy season commences fully in May and Terminates in October with the wettest month in August while the dry season sets in fully by November through April [35].

Sample collection and analysis (for the rainy season)

The random sampling method [36] was used to collect blood samples from field cattle in 8 different locations in the 2 Local government areas during September and October ending in each case. Blood samples were drawn from the jugular veins of 225 adult male and female cattle common in the areas using 10 ml syringes after carefully restraining each animal. The cattle breeds are 4 (Red bororo, White Fulani, Sokoto and Adamawa gudali). Sera samples prepared from the blood samples were collected into vacuitainer bottles and transported to a laboratory at the National Veterinary Research Institute in Vom (Jos), Plateau state in North Central Nigeria where they are stored at -20°C prior to analysis. The sera samples, distributed into 5 micro plates, each consisting of 96 wells were analyzed based on the methods and protocols adopted by Institu-pourqueir [37-39].

Statistical analysis

The use of description statistics such as percentages, tables, charts, as well as paired sample t-test (non-parametric inferential statistics) were employed. The latter was used to determine whether there is significant difference in the incidence of the disease between the months of September and October.

Results

The sera samples were diluted to 1/20 and incubated in the wells. The even numbered micro plates were already coated with "f2" antigens from the company. After the first washing, a peroxidase conjugated anti-ruminant IgG antibody was added to the wells. After a second washing, the enzyme-substrate (TMB-Tetramethyl-Benzidine) was added to each well. This was followed by the addition of revelation solution. After incubating for 20 minutes in a biosafety hood, a stopped solution was added per well and each plate shaken to homogenize the colored solution after which the underside of plate was wiped with a clean piece of cloth. Finally, the plate was placed on the ELISA reader, connected to a computer, blanked in the air and the optical densities (OD) were read at 450 nm. The validation and calculation for each plate was carried out as prescribed in the protocol and the results were analyzed and set out as shown (Tables 1 and2): the overall prevalence rate for September was 56.5% and 75.5% for October in the 2 areas while the overall prevalence for the 2 areas was 67.5%. The incidence per plate was 25 and 34 for September and October respectively [Figure1].

Month	Number of Animals examined	Number of positive cases	Average positive cases per plate	Prevalence rate
September	90	50	25	55.5
October	135	102	34	75.5
Total	225	152		67.5

Table 1: ELISA result showing the prevalence rate for September and October for 5 microplates.

Month	LGA	No.of samples	negatives	% negative	positive	% Prevalence
September	Girei	45	22.0	48.9	23.0	51.1
September	Yola south	45	18.0	40.0	27.0	60.0

October	Girei	69	20.0	29.0	49.0	71.0
October	Yola south	66	13.0	19.7	53.0	80.3
Total		225			152	67.5

Table 2: The number and% of negative and positive infestations in September and October for Girei and Yola south LGA's.

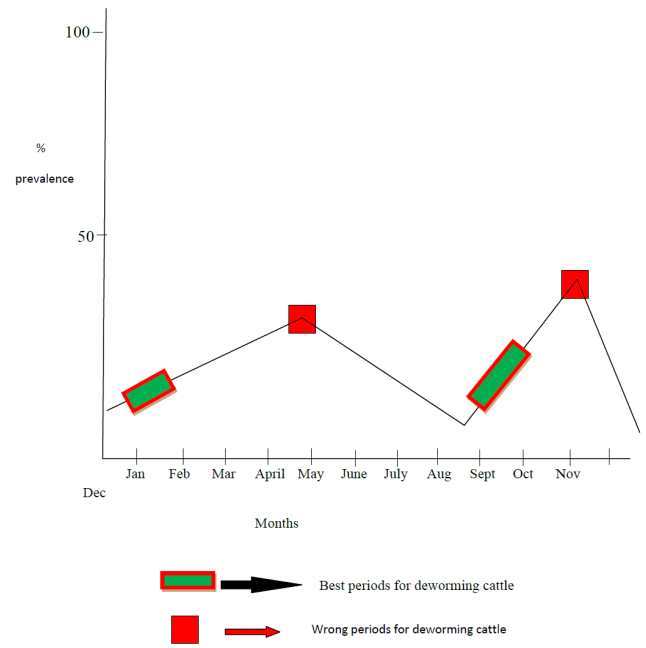

Figure 1: Average trend of fasciolosis prevalence in Nigerian cattle based on available records.

Discussion

The result which indicated an overall prevalence of 67.5% is a confirmation that despite repetitive treatment of fasciolosis with effective dewormers the prevalence rate remains high [33] This is a reflection of the situation in the whole country. The higher incidence per plate in the month of October ending (34.0) compared to the incidence at the end of September (25.0) and the higher prevalence rate in October (75.5%) compared with September (55.5%) is in line with earlier research findings in Nigeria that seasonal prevalence of fasciolosis in the rainy season is highest towards the end [14,29,30]. This is because the availability of water in September and October supports the survival of more viable metacercarial cyst which is immediately ingested during feeding. This tendency is less in August (the wettest month) due to the availability of heavy rain and running water which help to wash off viable metacercarial cysts from pasture.

A paired sample t-test statistical analysis model analysis showed that there is a significant difference ($P<0.05$) between the infection recorded in the month of September and the infection recorded in October in the 2 Local government areas. This implies that the incidence of fasciolosis in October ending (period of 2ndsampling) is significantly higher compared to the incidence recorded at the end of September (period of 1st sampling) in the 2 local government areas. This is an indication that the specific periods for cattle rearers to watchout for the manifestation of fasciolosis in the rainy season is between September ending and October ending.

The conclusion from earlier research findings in Nigeria from coprological studies was that seasonal prevalence during the rainy season was found to be highest before the end and immediately after the rainy season [14,30]. The use of ELISA screening method (which detects early infection) in this study (as opposed to coprological studies) showed a remarkable difference in the incidence of fasciolosis between September and October endings hence it is safer and preventive to employ the ELISA method of diagnosis. The significant difference recorded is an indication of an increasing level of infection which shows increasing level of fluke intake. This implies that the safer period to deworm animals during the rainy season should be within early September to early October. This will break the life cycle by killing the young (most destructive) parasites whose metacercarial cysts might have been picked by the cattle in between the last week of August and the first week of September. Deworming the animals at this period will render ineffective any ingested flukes in the animals which will further reduce the size of the fluke burden thereby preparing the cattle against fasciolosis infection in the coming dry season. So, instead of deworming cattle at the beginning of the dry season (which is November) as earlier recommended [32], cattle should be dewormed before the beginning of the dry season. (i.e., early September to early October) which is towards the end of the rainy season. This is also contrary to the earlier recommendation that anthelmintic drugs should be administered as soon as signs of fasciolosis show [4]. When anthelmintic drugs are administered only when signs of fasciolosis show up, it is possible to kill some of the mature flukes but it may be too late to rescue the liver because irreparable damage might have already occurred. This is because most of the notable pathological lesions during fasciolosis occur when immature flukes are migrating through the liver parenchyma [40] and at that time it is not possible to observe signs of fasciolosis physically. More so, sometimes the clinical signs may be due to mineral deficiency disease, anthrax and leptospirosis and may be mistaken for fasciolosis [4].

For the dry season, it is also on record in Nigeria that the scarcity of crop residues always make pastoralist to migrate their cattle to low land marshy areas in search of feed and water where fresh grasses abound hence the animals often get infected with the metcercaria of liver-flukes [41] and that seasonal prevalence of fasciolosis was found to be highest just before and after the onset of rains [29,30] which is April/May. The period of intense scarcity of crop residues when most pastoralist often graze their animals in low land areas is between January to March hence most cattle become infected with plant borne liver flukes especially where they drink water. The cattle usually start ingesting the metacercarial cysts on plants by around January (beginning of intense scarcity of fresh pasture) hence it is recommended that cattle should be dewormed by January/February (i.e., in good time before the rainy season begins) so as to break the life-cycle of the flukes by killing the immature forms inside the liver.

This conforms to the recent recommendation that control measures should be carried out in early dry season [28]. This is contrary to the earlier recommendation [32] that cattle should be dewormed at the beginning of the rainy season (i.e., late April/early May). When cattle pick Fasciola parasites around January/February and they are dewormed in April/May (period of commencement of the rainy season), it will increase not only the tendency of contaminated pasture but will also lead to more economic losses as affected animal livers would likely be in a higher state of damage.

Another group of Nigerian researchers recommended recently [34] that cattle should be dewormed against fasciolosis regularly. Again this is not too practicable as farmers would not like to feed their animals with drugs which are also expensive; hence this study recommends that for optimum productivity, cattle should be dewormed at a period when they picked up the metacercarial cysts: i.e. Between early September to early October (i.e., before the end of the rains-BER) and by January/February (i.e., before the beginning of the rains-BBR) and any additional deworming can be carried out at any other time whenever the farmer suspects the presence of fasciolosis.

Recommendation

Developing countries should be encouraged to determine best periods for deworming fasciolosis for their cattle rearers and donor agencies will do well to liase with the government of Nigeria/other bodies as well as our research institutes and universities to help validate and practicalise measures that will deal with this most destructive cosmopolitan trematode zoonosis which can be extended to other parts of the world (especially developing nations).

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