

Parasitic causes of organ condemnation in cattle slaughtered in Fako abattoirs, South-West region of Cameroon, and estimate of financial losses

Short Communication

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Abstract

An abattoir study was carried out between May and October 2016 to determine the parasitic causes of organ condemnation during meat inspection and to evaluate the attendant financial losses in Fako abattoirs, in the South-West region of Cameroon. Organs (liver, lungs, heart, tongue, kidney, spleen and intestine) were examined at meat inspection following standard procedures and the financial loss was estimated by considering the total weight of condemned organs and the price per kilogram of marketable organs, obtained from the local market. The organs of 1472 cattle were examined, of which 357 (24.38%) were condemned. The organs condemned because of parasitic infestations were the liver (333) and small intestine (24), and the infections were caused by flukes of *Fasciola* sp. and proglottids of *Moniezia* sp., respectively. Hydatid cysts and cysticerci were absent. The prevalence of fasciolosis and monieziosis was 22.62% and 1.63%, respectively. Condemnation deprived the region of 665.457 kg of meat, with an associated financial loss of CFA 1,330,902 (USD 2505), during the study period. Parasitic diseases worsen the food insecurity situation as they result in the withdrawal of a considerable amount of meat from the food chain. Fasciolosis, the leading parasitic cause of meat condemnation in Fako, is also zoonotic. It is therefore important that effective control measures are implemented countrywide against this parasitosis.

Introduction

Food security is a growing concern worldwide, as the global population increases (FAO, 2015). Approximately 793 million people worldwide still lack sufficient food for an active and healthy life, and in Africa the prevalence of undernourishment is estimated to be 19.8% (FAO, 2015). For effective control of undernourishment, an estimated daily intake of animal protein of 20 g per person is recommended, which can be achieved by consuming 33 kg of low-fat meat, 230 kg of milk or 45 kg of fish annually (Herrero *et al.*, 2014). Considering the potential of the local livestock industry in 2009, it is estimated that only 66% of the demand for meat, especially beef, was met in 2015 (MINEPIA, 2009). The demand is always increasing, in line with population growth. Condemnation of organs/carcasses by abattoirs results in significant losses of meat, leading to a reduction in meat supply and to financial loss (Alhaji *et al.*, 2017).

The causes of condemnation are manifold, but diseases have been reported to be among the most important causes (Theodoropoulos *et al.*, 2002; Jarikre *et al.*, 2014). Parasitic diseases leading to meat condemnation are either zoonotic or cause anatomo-physiological changes in the affected organs. Parasitic diseases commonly reported in ruminants include fasciolosis (Mungube *et al.*, 2006; Elshraway *et al.*, 2017), cysticercosis (Fonteh *et al.*, 2016; Hashemnia *et al.*, 2016), hydatidosis (Ahmadi & Meshkehkar, 2011; Oryan *et al.*, 2012; Miran *et al.*, 2017) and monieziosis (Theodoropoulos *et al.*, 2002). The associated losses due to these diseases include the total condemnation of the affected organs or carcasses and the partial condemnation, through trimming, of the affected part of the organ or carcass. The financial losses related to these condemnations have been evaluated in many instances and found to vary from one country to another (Alhaji *et al.*, 2017). For instance, the annual financial loss from organ condemnation due to parasitic diseases at abattoir inspection has been reported to be 99,500 GDR 292 in the Trikala region in Greece (Theodoropoulos *et al.*, 2002), USD 1,148,181 in south-western Iran (Borji *et al.*, 2012) and USD 23,659 in Bursa Province of Turkey (Yibar *et al.*, 2015).

In Cameroon, parasitism of domestic animals is common yet little is known of its impact on meat supply and on its financial implications. Thus, the objectives of this study were to determine the prevalence of parasitic causes of abattoir condemnation of organs of cattle

slaughtered in the South-West region of Cameroon, and to assess the financial losses associated with beef condemnation.

Materials and methods

Study area

The study was carried out from 1 May to 2 October 2016 in Fako Division in the South-West region of Cameroon (fig. 1). Fako, located between longitude 9° and 9°30' E and latitude 3°90' and 4°30' N, is the most urbanized Division of the South-West region, with seven subdivisions (Limbe I, Limbe II, Limbe III, Tiko, Buea, Muyuka and West Coast, also known as Idenau) (Yankam, 2013). The temperature ranges between 20°C and 28°C but may be as low as 4°C at the peaks. Annual rainfall reaches 10,000 mm at high altitude and is ~4000 mm at 1000 m altitude. The air relative humidity is 75–85% due to occult rainfall (fog and mist) induced by the orographic effect and the sea (Tassé, 2006). Animal husbandry consists of rabbit (*Oryctolagus cuniculus*), cavy (*Cavia porcellus*), poultry (*Gallus gallus domesticus*) and pig (*Sus scrofa domesticus*) rearing. There are few cattle herds on local farms of Fako, with most of the cattle in Fako abattoirs brought from markets of the Littoral and North-West regions of the country.

Abattoirs and study animals

There are six abattoirs and three slaughter slabs in the study area. Abattoirs are distributed as follows in different subdivisions:

Limbe (1), Tiko (2), Buea (2) and Muyuka (1). The slaughter slabs are distributed as follows: Ekona (1), Bafia (1) and Mutengéné (1). Beef from cattle of various breeds was the only animal material considered in this study. The number of cattle slaughtered daily in each site was fixed and did not vary.

Routine abattoir inspection for the presence of parasitic lesions

Meat inspection was carried out by assigned meat inspectors on oath in each abattoir, assisted by other assigned qualified experts and one of the investigators of this study. The procedure involved macroscopic examination, olfaction, palpation and incision of intact organs. In each animal examined, the tongue, liver, lung and intestine were carefully observed and palpated; after viewing and palpation, the liver and intestine were further examined in detail.

Data collection

In order to obtain a representative sample in the study area, data were collected rotationally in the abattoirs and slaughter slabs. All animals slaughtered in one abattoir were sampled one week, then another abattoir was visited the following week, and so on. Each abattoir and slab was visited at least twice. After slaughter and inspection, the following data were collected: types of parasitic infestations; types of parasitized organs; types of condemned organs; causes of condemnation; and weight of totally or partially

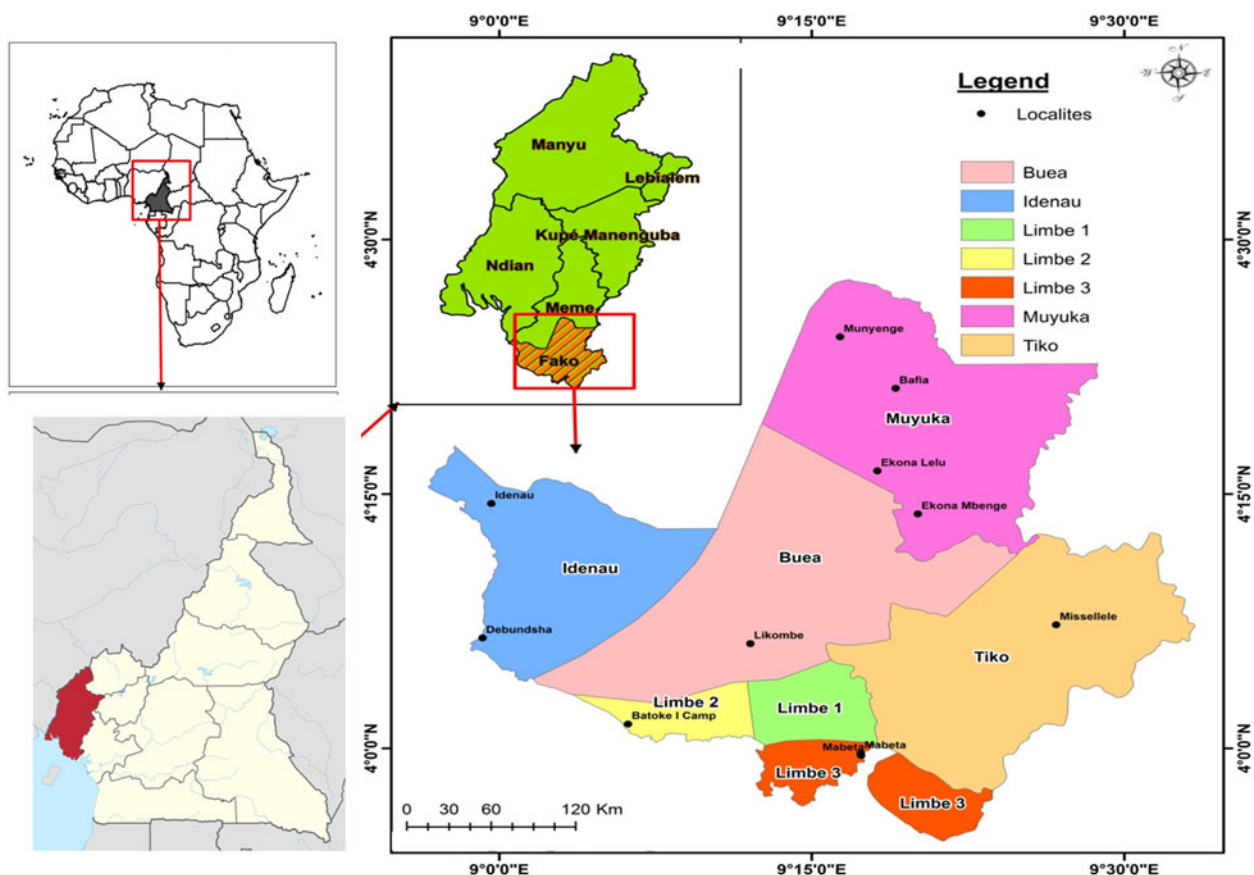


Fig. 1. Map of the geographical areas surveyed in Fako, in the South-West region of Cameroon.

condemned organs. The financial value of the condemned organs was estimated as described by Danbirni *et al.* (2015). The financial value was estimated as the product of organ weight and the average cost of the organ per kilogram. The market price of an organ was considered to be the cost of a kilogram of that organ. The overall financial loss during the study period was estimated by multiplying the total weight of the condemned organs by the cost per kilogram.

Statistical analysis

The data obtained were analysed with a descriptive statistic (frequency) using SPSS v. 13.0 (SPSS Inc., Chicago, USA).

Results

A total of 9039 cattle were slaughtered from 1 May to 2 October 2016 in Fako abattoirs. The organs of 1472 (16.29%) cattle were examined. Two parasitic diseases, namely, fasciolosis (333 out of 1472; 22.63%) and monieziosis (24 out of 1472; 1.63%) were found to be the only parasitic causes of organ condemnation. Hydatidosis and cysticercosis were absent. The overall prevalence of parasites responsible for organ condemnation was 24.25% (357 out of 1472).

The postmortem examination of organs revealed a total of 357 (24.25%) organs that were condemned. The only organs condemned due to parasitic infestations were the liver (333) and small intestine (24), caused by flukes of *Fasciola* sp. and proglottids of *Moniezia* sp., respectively. The condemnation rate was 22.62% for liver and 1.63% for small intestine (table 1).

The total weight of organs condemned because of fasciolosis was 627.691 kg, and 37.76 kg because of monieziosis (table 1). The total financial loss as a result of parasitic causes of abattoir condemnation of organs was estimated to be CFA 1,330,902 (USD 2505) (table 1). The financial loss as a result of fasciolosis was CFA 1,255,382 (USD 2363), and was incurred exclusively by liver condemnation. Similarly, the total monetary loss as a result of monieziosis was calculated as CFA 75,520 (USD 142), incurred solely by small intestine condemnation.

Discussion

This study investigated the parasitic diseases causing the condemnation of marketable organs, as well as the monetary losses associated with the occurrence of these diseases. The Fako Division within the South-West region of Cameroon hosts the regional capital, Buea. As cattle slaughtered in Fako essentially come from the markets of bordering regions, it is assumed that other divisions of the South-West region also slaughter cattle from the same markets, and therefore the results of this study can be generalized for the whole region.

Only two parasitic diseases (fasciolosis and monieziosis) were identified during post-mortem inspection as the parasitic causes of organ condemnation. The prevalence of parasites recorded was lower than previously observed in abattoirs in north-central Nigeria, where fasciolosis, hydatidosis and cysticercosis were the main parasitic causes of organ condemnation (Alhaji *et al.*, 2017). In contrast, the prevalence of parasites in this study was higher than observed in Tamale abattoir in northern Ghana, where hydatidosis was the only parasitic cause of organ condemnation found (Jarikre *et al.*, 2014). The difference in the parasite records is probably attributable to the differences in climatic

Table 1. Rate (%), quantity and financial value of condemned organs per parasitic cause of condemnation between 1 May and 2 October 2016 in abattoirs in Fako Division, South-West region, Cameroon.

Organs	Fasciolosis			Monieziosis			Total		
	No. of organs examined	Number condemned (rate)	Relative rate (%)	Quantity condemned (kg)	Financial value (USD)	Number condemned (rate)	Relative rate (%)	Quantity condemned (kg)	Financial value (USD)
Liver ¹	1472	333 (22.6)	93.27	627.691	2363.21	0 (0.00)	0.00	627.691	2363.21
Intestine ²	1772	0 (0.00)	0.00	0	0	24 (1.63)	6.72	37.76	142.16
Total				627.691	2363.21			665.451	2505.39

¹Price per kg of marketable liver = CFA 2000 (USD 3.76).
²Price per kg of marketable intestine = CFA 2000 (USD 3.76).

and environmental conditions in each country. Moniezirosis, resulting from infestation of the small intestine with *Moniezia* sp, is not commonly reported at meat inspection in Africa, probably because intestines are often inspected for tuberculosis lesions only. Our findings suggest that moniezirosis should always be investigated at abattoir inspection in Africa.

The only organs condemned because of parasitic infection were the liver and small intestine, which is consistent with the nature of the parasitic diseases recorded. Flukes are specialized in bile ducts, whereas the predilection site of adult *Moniezia* sp. is the small intestine. The rate of condemnation of liver as a result of fasciolosis is slightly lower than the rate (26.4%) reported in semi-arid coastal Kenya (Mungube *et al.*, 2006). A higher rate of condemnation as a result of fasciolosis was expected because in semi-arid areas the limited water sources (oasis, lake) offer the opportunity for increased development and transmission of parasites (Taylor *et al.*, 2007). Conversely, the rate found in this study is far greater than the rate (1.88%) observed in north-central Nigeria (Jarikre *et al.*, 2014). Because Cameroon and Nigeria are neighbouring countries and share almost the same climate and environmental conditions, the condemnation rate in the South-West region appears to be abnormally high, suggesting that control measures are urgently required. The condemnation rate of intestine as a result of moniezirosis was low (1.63%) but was worth up to 37.76 kg of marketable intestines. In the context of food insecurity, this is a significant loss in a 5-month period.

The total financial loss during the 5-month study period due to fasciolosis alone was heavy. Although the result is not comparable with other findings because of differences in length of study period, the monetary value of condemned organs due to fasciolosis is equivalent to four live adult cattle, assuming a mean cost of CFA 300,000 (USD 565) per animal. In the context of food insecurity and poverty, this is a significant and unacceptable loss. Likewise, the financial loss due to moniezirosis during the study period was considerable, equivalent to the price of a calf. In total, the monetary losses as a result of parasitic diseases amounted to CFA 1,330,902 (USD 2505), equivalent to the loss of four live adult cattle and a calf.

The absence of other parasitic infestations, in particular hydatidosis and cysticercosis, is difficult to explain because the cattle husbandry system in Cameroon is essentially an outdoor system (extensive and semi-intensive) in which animals graze on natural pastures, with open access to dogs, wild canids and human faecal matter. A previous study in an abattoir in Yaounde, in the Centre region of Cameroon (M.K. Kouam, unpublished data), identified the occurrence of cysticercosis due to *Cysticercus bovis* in slaughtered cattle, but the prevalence was very low. These parasitic diseases therefore seem to be rare in Cameroon, suggesting that neither the pastoral nor the sylvatic life cycle of these parasites is easily maintained in local conditions. Our results contrast with those of Alhaji *et al.* (2017) for north-central Nigeria, where hydatidosis and cysticercosis were among the leading causes of meat condemnation during meat inspection. The differences in the husbandry systems used in both countries may explain the contradictory findings.

In conclusion, this study provides information on the parasitic causes of organ condemnation as well as the resulting financial losses. The findings show that the prevalence of parasitic diseases causing organ condemnation in Fako abattoirs is high compared with neighbouring countries. Although very few parasitic diseases were recorded, the financial loss incurred as a result of these diseases is substantial. Appropriate control measures should be

implemented to reduce the negative impact of these parasitic diseases on meat supply in the region and nationwide.

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Conflict of interest. None.

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