



## RESEARCH PAPER

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## Risk of contamination of cattle with echinococcosis at the Man slaughterhouse (Côte d'Ivoire)

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### Abstract

Echinococcosis is a disease caused by helminths that affects cattle, sometimes leading to weight loss and a reduction in production. The objective of this research was to determine the prevalence of Echinococcosis and the associated risk factors in cattle slaughtered at the Man slaughterhouse. The study was carried out on 586 cattle consisting of females (424) and males (162). These animals were examined by post-mortem examination to demonstrate the presence of Echinococcosis by visual examination, incision and palpation of the organs according to the routine method used by veterinarians. The results showed a low prevalence of Echinococcosis in cattle (1.20%). The prevalence of this parasitosis was higher in males (3.1%) than in females (0.47%). In this study, the sex of the animal was a risk factor ( $p=0.009$ ). As for age, no significant difference was observed ( $p > 0.05$ ) even if cattle aged 2 to 4 seem to be the most contaminated (1.7%), followed by those aged 4 (1.1%) and less than 2 years (0%). Despite this low prevalence, it would be necessary to search for the main sources of contamination of cattle for better control of Echinococcosis in the region. We recommend that veterinary authorities prohibit the dumping of contaminated organs from this slaughterhouse into the Ko River to prevent the spread of zoonotic diseases.

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## Introduction

Hydatid disease, also called cystic Echinococcosis, is one of the most widespread chronic endemic helminthic pathologies. It is caused by the tapeworm metacestode *Echinococcus granulosus*. This parasite affects the health of several animals such as cattle, sheep, goats, camels, buffaloes and pigs in several developing countries (Kumsa, 2019; Romig *et al.*, 2011). Echinococcosis is characterized by the presence of cysts containing numerous tiny protocols that develop most commonly in the liver and lungs as well as the kidneys, spleen, nervous tissues, bones and other organs (Magambo *et al.*, 2006). This cosmopolitan zoonosis represents in many regions of the world a real scourge for livestock farming, leading to enormous economic losses. In addition, it is considered a public health problem (Yang *et al.*, 2005; Magambo *et al.*, 2006; Romig *et al.*, 2011). Human infection occurs accidentally through ingestion of infected eggs with contaminated water, vegetables or other foods, or through direct contact with dogs which are the definitive hosts (Budke *et al.*, 2006).

Numerous cases of Echinococcosis have been encountered in slaughterhouses among ruminants in Africa. Studies report cases in Ethiopia (Demissie and Kemal, 2014; Abdu *et al.*, 2024), Chad (Doutoum *et al.*, 2021), Congo (Mukatakamba *et al.*, 2023) and in the Ngorongoro region in Tanzania (Miran *et al.*, 2017). These ruminants constitute the main source of protein for many populations. Given their important place in food safety, these animals must be healthy and must not present any risk of danger to public health (Kiki *et al.*, 2021).

In Côte d'Ivoire, the presence of this parasite has been reported in several slaughterhouses in the South, in the regions of Poro, Béré and Haut-Sassandra in cattle and pigs in very recent studies (Dagnogo *et al.*, 2021; Kouadio *et al.*, 2024). However, studies at the Man slaughterhouse located in the Tonkpi Region are rare. A recent study by Blé *et al.* (2024) mentioned the presence

of the *Fasciola gigantica* parasite in slaughtered cattle with a prevalence of 19.4%. These data are insignificant given the place this slaughterhouse occupies in supplying the meat markets in this region. It should be noted that scientific data constitute operational support tools for decision-making in order to reduce public health risks (Dupuy *et al.*, 2015).

Thus, the search for other parasites such as Echinococcosis would make it possible to expand the data on the quality of slaughtered cattle.

This study aimed to determine the prevalence of Echinococcosis in cattle and the associated risk factors.

## Materials and methods

### Study area

The city of Man, capital of the Tonkpi region, is located in the west of Côte d'Ivoire between 07°20' and 07°35' north latitude and 07°25' and 07°45' west longitude. The climate of the Tonkpi region is characterized by two seasons: a rainy season (from April to October) and a dry season (November to March). Rainfall varies between 1300 and 2400 mm per year. The average temperature is 24°C and the humidity varies from 80 to 85%. The town of Man is marked by very rugged terrain with altitudes sometimes exceeding 1000 m. The hydrographic network is dominated by the "Ko" and "N'zo" rivers, tributaries of the Sassandra river. The MAN municipal slaughterhouse is located in the SEA camp district near the "Ko" river into which the waste from slaughter is dumped. This slaughterhouse is semi-modern with a less advanced state of degradation. It consists of a slaughter area, a livestock cattle and a building where the equipment used for slaughtering animals is stored. The livestock cattle is used to store animals before slaughter. The latter is demarcated by a wooden fence to ensure the protection of residents near the slaughterhouse. In this slaughterhouse the number of cattle slaughtered per day is estimated at 25.

### Sampling

In the period from January to March 2024, an inspection of cattle was carried out at the Man slaughterhouse to estimate the prevalence of Echinococcosis and associated risk factors. The inspected population consisted of 586 adult cattle intended for slaughter from several regional herds. The details of the cattle are mentioned in Table 1. The sampling randomly took into account the animals received at the slaughterhouse and suitable for slaughter after ante-mortem inspection of the animals.

**Table 1.** Repartition of cattle examined in Man slaughterhouse according race and sex

Sex	Number of cattle examined		Total
	Race Zebu	Race Taurin	
Female	363	61	424
Male	119	43	162
Total	482	104	586

### Ante-mortem examination

This technique consisted of examining the animals before slaughter with the help of veterinary agents. Indeed, on a living animal, any abnormalities in attitude, behavior and any clinical sign that could reveal the presence of a disease or defect were looked for (Cabre *et al.*, 2005). This made it possible to assess or identify clinical signs (symptoms) revealing certain pathologies before the slaughter of the animals (wound, scabies, nasal discharge, breathing problem). In addition, the age and sex of the animals were recorded on a sheet.

### Post-mortem examination

The post-mortem inspection method was applied to the carcasses of all 586 cattle. This inspection was carried out on four organs with the help of qualified veterinary agents. These are the kidney, liver, lung and spleen. The search for Echinococcosis was done with the routine red meat method used by veterinarians which consists of palpating and incising the organs with knives in order to visually observe their volume, color and consistency (Okoh *et al.*, 2023; Kouadio *et al.*, 2024).

The animal is declared positive for Echinococcosis when the presence of nodules containing brown liquids grafted onto the organs is observed.

The prevalence of the parasite was determined by dividing the number of infected animals by the number of animals examined.

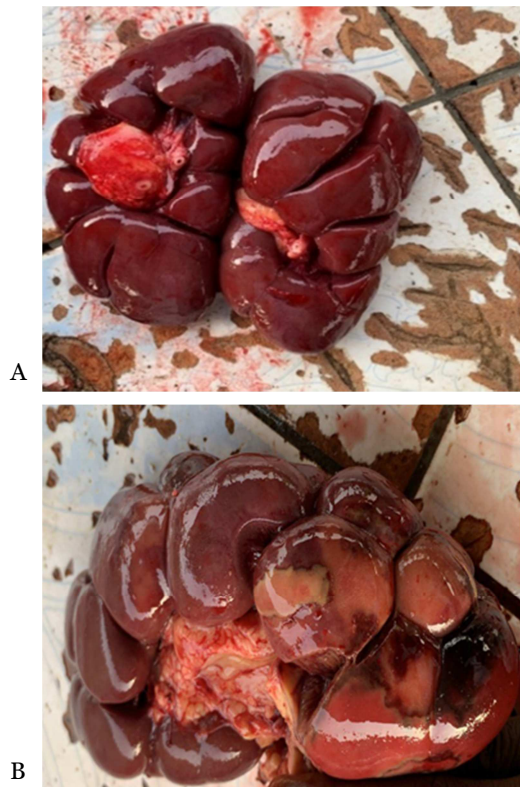
### Analysis

The collected data were analyzed using SPSS version 20. Descriptive statistics, such as percentages and frequency distributions, were used to describe the nature and quality of the data. Associated risk factors were assessed using the Chi-square test ( $X^2$ ). A statistically significant association between variables is considered to exist if the p-value is less than 0.05 at a 95 % confidence interval.

## Results and discussion

### Prevalence of Echinococcosis in cattle

The animals received at the MAN slaughterhouse come from various farms in the Tonkpi region. The results thus obtained give an idea of the infection of cattle by Echinococcosis in this region. The macroscopic examination carried out on 586 slaughtered cattle showed a low rate of Echinococcosis contamination. Only seven cattle were declared positive for Echinococcosis, representing a 1.20% (7/586) infestation rate. Cattle not infected with Echinococcosis were therefore the most numerous and represented 83.1% of the number of cattle slaughtered. This infestation rate is above that reported by Kouadio *et al.* (2024) carried out on 38,803 cattle in the regions of Poro, Béré and Haut Sassandra in Côte d'Ivoire with 0.14% prevalence. Add to this the results of Aziz *et al.* (2022) who obtained 0.76% infestation rate. On the other hand, Njoroge *et al.* (2002) in Kenya; Habtamu *et al.* (2024); Belemual *et al.* (2024) in Ethiopia, Salem *et al.* (2010) in Mauritania, Bouchbout (2018) in Algeria and Dagnogo *et al.* (2021) in Côte d'Ivoire recorded respective rates of 19.4%; 17.9%; 43.4%; 20%; 5.2% and 4% which are higher than the value obtained in this study.

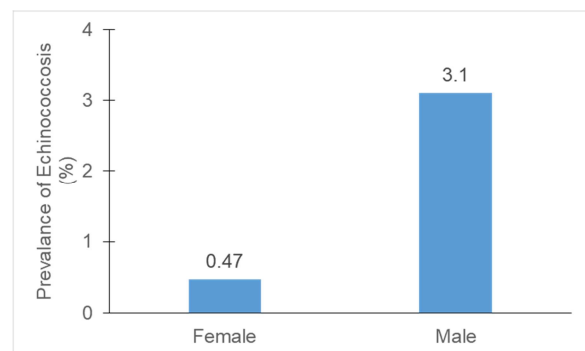


**Fig. 1.** A- Healthy bovine kidney with bright red coloring, B-Kidney contaminated with bovine by Echinococcosis with brown coloring

This difference could be explained by the fact that animal pathologies differ from one ecological zone to another (Kouadio *et al.*, 2024). Furthermore, this low prevalence obtained could be linked to the level of health maintenance of farms and the monitoring of animals in this region. Note that this zoonosis has also been detected in other animal species in several studies. Indeed Abebe and Yilma (2011); Mukatakamba *et al.* (2023) and Kouadio *et al.* (2023) recorded respectively 11.87%; 22% and 100% infestation rates in sheep and pigs in Ethiopia, the Democratic Republic of Congo and Côte d'Ivoire. A prevalence of 48% was also observed in goats in Nigeria (Okoh *et al.*, 2023). This high prevalence in these animal species could be explained by the fact that they are more sensitive to this zoonotic pathology. In cattle, the low prevalence obtained in this study indicates that they are not important intermediate hosts of Echinococcosis. The infestation of cattle by the eggs of the Echinococcosis tapeworm would occur during transhumance, through the various pastures

and water points, such as ponds and backwaters, frequented by wild carnivores.

The organ found to be contaminated with Echinococcosis was the kidney (Fig. 1). Post-mortem inspection carried out on organs such as the heart, liver and lung showed no presence of this disease. These results are contrary to those of Balemual *et al.* (2024) and Tesfaye *et al.* (2024) who reported more contamination in the lungs.

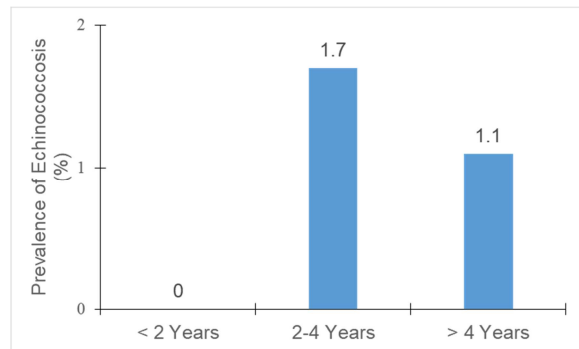


**Fig. 2.** Prevalence of Echinococcosis in cattle according to sex

#### *Prevalence of Echinococcosis according to sex and age of cattle*

The results showed that among the 424 females, two females were contaminated with Echinococcosis, representing a prevalence of 0.47%. In males, the prevalence was 3.1% (5/162) (Fig. 2). According to this study, the prevalence is significantly influenced by the sex of the animal ( $p=0.009$ ). Our results corroborate those of Abdul *et al.* (2024) who obtained a prevalence of 12.3% and 7.7% in males and females respectively and the difference was significant ( $p < 0.05$ ). The work of Berhe *et al.* (2010) also showed a high prevalence in males (7.97%) than in females (5.26%). According to Mukatakamba *et al.* (2023), this low infection rate in slaughtered female cattle would be due to the fact that on farms, prophylactic care is given more to females, who are kept for reproductive purposes in order to protect them against possible agent's pathogens and thus get the most out of them. However, several studies contradict our result with high prevalence observed more in females than in males (Luca *et al.*, 2023; Abdu *et al.*,

2024; Tesfaye *et al.*, 2024) and the sex of the animals had no effect on the distribution of Echinococcosis in this work. These authors mentioned physiological reasons, such as gestation and lactation, which force females to eat more during this period than males and would be more exposed to zoonoses.



**Fig. 3.** Prevalence of Echinococcosis in cattle according to age

Of the 7 infected cattle, 3 (42.85%) were aged between 2 and 4 years and 4 (57.1%) were over 4 years old. In addition, cattle aged 2 to 4 years were more infected (1.7%) than cattle over 4 years old (1.1%). No cases of infection were observed in cattle less than 2 years old (0%) (Fig. 3). According to this study, the prevalence of this parasitosis is not linked to the age of cattle ( $p > 0.05$ ). These observations have been reported in small ruminants in Tanzania (Miran *et al.*, 2017) and Ethiopia (Muluneh *et al.*, 2019). As for Abdu *et al.* (2024); Balemual and Sisay (2024); Okoh *et al.* (2023), they recorded in their work an equally high prevalence in adults and elderly animals but the link between the two parameters was not significant ( $p < 0.05$ ). The high prevalence encountered in adult and elderly cattle in the various studies would be linked to their exposure for as long as possible to Echinococcosis eggs in addition to their low immunity to fight the infection (Cardona and Carmena, 2013).

### Conclusion

This study shows the presence of Echinococcosis in cattle that are slaughtered at the Man slaughterhouse. This presence indicates that there is a risk of transmission of this zoonosis to the

population consuming beef. Given the location of this slaughterhouse and the lack of security, the surrounding population would also be exposed to contamination. The prevalence obtained is 1.20% with cattle aged 2 to 4 which are the most contaminated (1.7%) followed by those aged 4 years (1.1%). The practices in this slaughterhouse could lead to the spread of this disease. We therefore recommend that veterinary authorities strengthen health control and prevention measures. Infected organs must be disposed of properly. They must not be thrown into the Ko River or left to dogs roaming around the slaughterhouse to avoid this spread.

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