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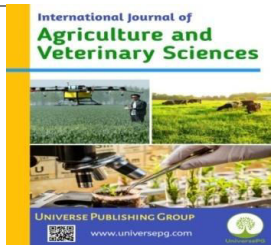

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The Main Seizures of Organs Related to Zoonoses in Ruminants Slaughtered at the Ouagadougou Refrigerated Slaughterhouse from 2018 to 2019

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Abstract

A retrospective study was conducted at the Ouagadougou refrigerated slaughterhouse using seizures data extracted from the registers and statistical databases of the Ministry of Agriculture, Animal Resources and Fisheries from January 2018 to December 2019. The aim of this study was to highlight the risk of zoonoses associated to the seizures of organs. A descriptive analysis of the data revealed that cattle were the main ruminant species in which organs seizures were made the most with a share of 92% of all ruminants. Tuberculosis (25.4 per cent) and onchocerciasis cysts (21.1 per cent) were the main reasons for seizures, followed by congestion (14.4 per cent) and putrefaction (8.8 per cent). A logistic regression analysis reveals that seizures related to carcasses OR=2.69, hearts OR=1.13, livers OR=1.22, intestines OR=1.73, and lungs OR=1.21 were associated with zoonotic diseases. The low probability values $p=0<0.0001$ confirming significantly these associations. On the other hand, the spleens OR=0.24 and kidneys OR=0.25 were less associated with zoonoses, also confirmed by the significant $p<0.0001$ values. The results also revealed that the year 2019 was more associated with the risk of having a zoonosis than 2018 with an OR=1.33 also confirmed by the significant probability value $p<0.0001$. Finally, the results suggest an important cooperation between public and animal health sectors in order to establish an appropriate strategy for the prevention and control of these zoonoses to avoid a heavy health burden and a deficit of meat for the population.

Keywords: Inspections, Organs, Seizures, Zoonoses, Risk, Slaughterhouse, and Ouagadougou.

1. Introduction

Organs seizures at the slaughterhouse are safe public health approach. It removes animals or parts of animals that could be contaminated or at risk for human consumption. The procedures at the slaughterhouse are intended to protect public health in three steps: (1) ante-mortem inspection during which animals are examined prior to be slaughtered using symptoms of diseases and (2) post-mortem inspection, during which organs are examined after slaughter to detect abnormalities and (3) seizures of contaminated or abnormal organs removing them from the meat processing system.

The criteria for recording data from seized organs include zoonotic diseases (e.g. tuberculosis, brucel-

losis, cysticercosis, fasciolosis, etc.) and abnormalities (e.g. tumours, abscesses, etc.). The seized organs are destroyed to remove them from human consumption an important measure to protect public health. Indeed, zoonoses are real risks and those such as cysticercosis, tuberculosis and fasciolosis can be transmitted from animals to humans, especially when there is an inappropriate meat inspection at the slaughterhouse. The consequences can be serious or even lethal for consumers of slaughtered products; meaning seizures through inspection procedures are crucial to protect public health. Livestock producers must be vigilant and respect herd management to minimize risks which can have devastating impact on human health. Based on these issues, strategies to prevent and control zoonoses are needed (Hayle *et al*., 2020).

The purpose of this study was to assess the level of organs seizures associated to zoonoses as well as the year of inspection according to the historical data collected from 2018 and 2019. Finaly, to enable public and animal health sectors to set up a strategy for the prevention and control of the occurrence of transmitted zoonoses from animals to humans due to a weak inspection at the meat processing plant.

2. Materials and Methods

Scope of the study

The purpose of meat inspection is to protect public health by providing risk free products to the population. It also provides information that can be utilized for control of animal diseases (Gracy *et al.,* 1999). Abattoir data is an excellent option for detecting diseases of both economic and public health importance. This study was conducted at the Refrigerated Slaughterhouse of Ouagadougou (AFO), the largest meat processing plant in Burkina Faso. The management of the slaughterhouse was entrusted to the Management office of the refrigerated slaughterhouse of Ouagadougou (SOGEAO) on 22 October 2004 by the Burkinabe State through a concession agreement. The slaughters carried out are monitored by sworn veterinarians from the Ministry of Agriculture, Animal Resources and Fisheries (MARAH) ensuring the meat inspection as well.

Study Design

The study was designed based on historical data from the slaughterhouse and the inspection records for the years 2018 and 2019 from the Ministry. The slaughtering of animals is mainly carried out on cattle, sheep, goats, pigs, sometimes donkeys and camels. Subsequent to the slaughter, organs including liver, lung, kidney, heart, and whole carcass were carefully examined by meat inspectors through palpation and incision to discover the evidence of diseases and other abnormalities which provided the data reported in the registers. From which registers, records were extracted for the purpose of this study using (Drago *et al*., 1994) guidelines.

Data processing and analysis

The data were extracted from MARAH's registers and statistical reports for the period of January 2018 to December 2019. The extraction was done exhaustively and compiled in Microsoft Excel tables covering all slaughter entries of the period. It also consisted of transforming the data compiled in the tables into readable data using the STATA 17 software thus, allowing easier analyses. Then, the descriptive analysis was carried out using Microsoft's Office 2021 Excel software and the logistic regression model fitted by STATA 17 software using the data.

3. Results

1. Descriptive results

The **Table 1** hereunder shows that tuberculosis (25.4%) and onchocerciasis cysts (21.1%) were the main reasons of seizures, followed by congestion (14.4%) and putrefaction (8.8%). Some lesions such as cachexia, cadaveric meat, etc. were absent.

Table 1: Distribution of the number of organs seized in ruminants (cattle, sheep, goats) at the refrigerated slaughterhouse of Ouagadougou from 2018 to 2019 (N=40379).

Suspected diseases	Frequences	Proportions
Abscess	2637	6,5%
Adenitis	2121	5,3%
Grips	24	0,1%
Water balls	4	0,0%

Suspected diseases	Frequences	Proportions
Kidney stones	130	0,3%
Cirrhosis	484	1,2%
Congestion	5816	14,4%
Foreign bodies	585	1,4%
Cysticercosis	716	1,8%
Fasciolosis	1092	2,7%
Echinococcosis	80	0,2%
Emphysema	587	1,5%
Poisoning	10	0,0%
Hepatization	76	0,2%
Hypertrophy	59	0,1%
Jaundice	100	0,2%
Onchocerciasis cyst	8 520	21,1%
Mammites	583	1,4%
Nephritis	539	1,3%
Parasitic nodule	1319	3,3%
Œsophagostomosis	61	0,2%
Orchitis	25	0,1%
Pericarditis	799	2,0%
Pneumopathie	142	0,4%
Putrefaction	3546	8,8%
Splenomegalia	76	0,2%
Tuberculosis	10248	25,4%
Total	40379	100,0%

Table 2 hereunder showed about 30.1 per cent of seizures due to suspected zoonoses which is quite appreciable.

Table 2: Distribution of the number of organs seized linked to suspected zoonoses in ruminants (cattle, sheep, goats) subsequent to inspections at the refrigerated slaughterhouse of Ouagadougou from 2018 to 2019.

Suspected zoonoses	Frequences	Proportions
No	28243	69,9%
Yes	12136	30,1%
Total	**40379**	100,0%

Table 3 showed that tuberculosis is most frequently suspected zoonoses. It accounts for (84.4%) of suspected zoonotic cases, followed by fasciolosis (9%) and cysticercosis (5.9%).

Table 3: Distribution of the number of organs seized among suspected cases of zoonoses in ruminants (cattle, sheep, goats) subsequent to inspections at the refrigerated slaughterhouse of Ouagadougou from 2018 to 2019.

Suspected zoonoses	Frequences	Proportions
Cysticercosis	716	5,9%
Fasciolosis	1092	9%
Echinococcosis	80	0,7%
Tuberculosis	10248	84,4%
Total	**12136**	**100,0%**

Chi² test of variables independency

The Chi² test of variable independence was made while hypothesizing and considering the existence of a significant association between seizures and zoonoses as a hypothesis to be retained. The test yielded **Table 4** hereunder. The chi² test showed an extremely low p-value, p< 0.0001 indicating that the probability of the observed differences is almost zero between the months and the different zoonoses. By rejecting the hypothesis of independence, the result revealed a significant association between months of the year and the suspected zoonoses.

Table 4: Monthly distribution of suspected zoonoses in ruminants (cattle, sheep, goats) subsequent to inspections at the refrigerated slaughterhouse of Ouagadougou from 2018 to 2019 (N= 12136)

Months	Cysticercosis	Fasciolosis	Echinococcosis	Tuberculosis	Total
jan-18	36	51	0	374	451
mar-18	29	26	0	215	270
apr-18	14	28	0	190	232
may-18	32	48	0	333	413
jun-18	33	38	0	310	381
aug-18	43	66	10	626	745
sept-18	36	24	6	483	549
oct-18	34	74	0	611	719
nov-18	21	30	4	323	378
dec-18	34	40	0	429	503
jan-19	84	168	10	1124	1386
feb-19	123	60	4	350	537
apr-19	42	79	10	406	537
may-19	44	76	4	628	752
jun-19	42	88	6	744	880
aug-19	27	70	10	901	1008
sept-19	11	76	6	1046	1139
oct-19	31	60	10	1155	1256
Total	**716**	**1092**	**80**	**10248**	**12136**

Statistic Chi² = 1214.18; Degree of Freedom (df) = 68; p-value < 0.0001

The chi² test performed with the data in **Table 5** hereunder revealed a statistically significant association ($\chi^2 = 719.51$; df = 8; $p < 0.001$) between seized organs with suspected zoonoses, indicating that the probability of detecting a zoonoses from seized organ is possible.

Table 5: Distribution of seized organs linked to suspected zoonoses in ruminants (cattle, sheep, goats) subsequent to inspections at the refrigerated slaughterhouse of Ouagadougou from 2018 to 2019.

Seized organs	Zoonoses		Total
	No	Yes	
Carcasses	78	70	148
Hearts	1765	843	2608
Livers	3638	1574	5212
Intestines	881	604	1485
Tongs	0	13	13
Lungs	6750	3086	9836
Spleens	536	48	584

Kidneys	1963	208	2171
Others (tumours, abscesses, etc.)	12632	5690	18322
Total	28243	12136	40379

Chi² Stat: **719.51;** Degree of Freedom (df) = **8;** p-value**: 4.51 × 10^{-150}**

The Chi² independence test revealed a statistically significant association between animal species and the occurrence of zoonoses (χ^2 = 921.07; df (2); p < 0.001). Cattle, goats and sheep have respectively different levels of association with zoonoses.

Table 6: Distribution of seizures by type of animal linked to a suspicion of zoonoses in ruminants (cattle, sheep, and goats).

Animal species	**Zoonoses**		**Total**
	No	**Yes**	
Cattles	25170	11908	37078
Goats	901	39	940
Sheeps	2172	189	2361
Total	**28243**	**12136**	**40379**

Chi² Stat: **921.07;** Degree of Freedom (df): **2;** p-value**: 9.82 × 10^{-201}**

Logistic regression model

The study using the data fitted a logistic regression model using STATA 17 package hypothesizing that there is an association between animal species, seized organs, year of seizure and zoonoses, we end up with the results of **Table 7** below. Indeed, the table showed that seizures of goat and sheep carcasses had a weak association with the occurrence of zoonoses. Their Odds Ratios (ORs) of OR=0.08 and OR=0.17 respectively with very low p-values, indicate that these associations, although weak, were significant and thus confirm that the risk is lower in these animal species. However, several organs showed important associations related to zoonoses, including cattle carcasses OR=2.69, hearts OR= 1.13, livers OR=1.22, intestines OR=1.73 and lungs OR=1.21. Their p-values: p<0.0001, confirm the associations. On the other hand, spleens OR=0.24 and kidneys OR=0.25 were less associated with zoonoses, also confirmed with significant p-values p<0.0001. The year 2019 with an OR=1.33 is more associated with the risk of zoonoses than 2018. The p-value being very significant p<0.0001.

Table 7: Assessment of the association of animal species, seized organs and year of seizure to zoonoses using stepwise/forward method.

Suspected zoonoses	**Odds Ratio**	**IC95%**	**p-value**
Animal species			
Cattle	1	-	-
Goat	0,08	[0,058-0,11]	4,12E-53
Sheep	0,17	[0,143-0,194]	3,7E-118
Seized organs			
Other (tumours, abscesses, etc…)	1	-	-
Carcasses	2,69	[1,911-3,774]	1,25E-08
Hearts	1,13	[1,036-1,237]	0,00619
Livers	1,22	[1,141-1,311]	1,15E-08
Intestines	1,73	[1,549-1,933]	2,75E-22
Tongs	2,05 × 10^5	[0-6,5E+51]	0,823
Lungs	1,21	[1,149-1,281]	3,2E-12

Spleens	0,24	[0,177-0,322]	6,9E-21
Kidneys	0,25	[0,217-0,291]	4,08E-76
Year of seizure			
2018	1	-	-
2019	1,33	[1,273-1,391]	2,56E-36

4. Discussion

The importance of zoonoses lies in their impact on human health, economy and food security. The detection of zoonoses at the slaughterhouse is crucial to protect public health. Ante-mortem and post-mortem inspections can detect animal diseases and abnormalities in cattle, sheep and goats. Research from (Pujol Pujol-Dupuy, 2014) has shown that slaughterhouse data can be used for the surveillance of targeted diseases such as bovine cysticercosis. It has developed robust surveillance indicators to compare the prevalence of this zoonosis in time and space. Other studies like those of (N'Da *et al*., 2024) identified the main reasons for parasitic diseases seizures in ruminants at the Farcha refrigerated slaughterhouse (AFF) from 2013 to 2018, highlighting the associated economic losses. The seizure of sheep and goat carcasses is weakly associated with zoonoses. Several factors could explain this difference such as: the production system often different from those of cattle as well as sanitary management and natural resistance.

Some zoonoses were associated with specific organs in animals, that is why inspectors are most of the time interested in certain organs from animal bearing certain zoonoses. In fact, (Pesciaroli *et al*., 2014) studied tuberculosis in domestic animals and found that the lungs and livers were the most frequently affected organs. (Kiki, *et al*. 2021) also identified the main reasons for seizures of small ruminant organs at the Parakou slaughterhouse in Benin, which were including tuberculosis lesions in lungs and livers. These studies have shown that cattle tuberculosis is an important zoonosis that mainly affects lungs, livers and their seizures at the slaughterhouse are indicators of the prevalence of the disease. Studies on brucellosis in the rural commune of Tanghin-Dassouri in Burkina Faso by (Pesciaroli *et al*., 2014) have shown that cattle brucellosis is an important zoonosis that mainly affects the reproductive organs, livers and spleens and their seizures at the slaughterhouse are also important indicators of the prevalence of the disease. (Iguercha *et al*., 2021) studied the prevalence of cattle fasciolosis with *Fasciola hepatica* at the slaughterhouses of Tala Athman, Draa Ben Khedda and Azazga in Algeria; (Siama *et al*., 2018) published a study on the prevalence and distribution of cattle fasciolosis with *Fasciola gigantica* in the main slaughterhouse of the Far North region of Cameroon and (Sriba, *et al*., 2021) studied cattle fasciolosis at the slaughterhouses of Tizi-Ouzou and Tiaret in Algeria. Other studies have also been conducted on bovine fasciolosis notably at the Seybouse slaughterhouse in Annaba, Algeria. All these studies concluded that cattle fasciolosis is a parasitic disease affecting mainly livers and bile ducts of cattle and their seizures at the slaughterhouse are important indicators of the prevalence of the disease. These relationships mean that most of the time the inspectors will systematically inspect specific organs of certain zoonoses (Khatun *et al*., 2024).

Seizures of organs at the slaughterhouse can be seasonally related. The rainy season provides favorable climatic conditions for the growth of parasites and bacteria that can increase the prevalence of diseases such as fasciolosis and cattle tuberculosis. The dry season, stressful conditions and malnutrition can increase the susceptibility of animals to zoonoses like cattle tuberculosis. Studies have shown that organs seizures at the slaughterhouse can therefore vary according to the season. For example, the Burkina Faso study of (Tialla *et al*., 2022) showed that liver and lung seizures due to cattle tuberculosis were more frequent during the rainy season (June to September). Another study in Benin by (Kiki *et al*., 2021) showed that organ seizures due to fasciolosis were more frequent during the rainy season as well (May to October). It is important to note that these results can vary depending on the region, the climate and the husbandry systems.

In order to effectively combat these zoonoses, it is essential to establish prevention and control strategy. (Pujol Pujol-Dupuy, 2014) has focused on

the implementation of strategies to control cattle cysticercosis particularly using surveillance indicators. The proposed control strategies are including: animal vaccination, early detection and treatment of cases, epidemiological surveillance, community education and awareness, and intersectoral collaboration (One Health). The importance of taking into consideration socio-economic and cultural factors in the implementation of prevention and control strategies can be effective yielding robust results. On a continental scale, Africa CDC has just set up a strategy for the prevention and control of zoonoses to mitigate economic losses and zoonoses burdens in Africa (CDC, 2025; Barre *et al*., 2026).

5. Conclusion

This work highlighted the importance of organs seizures at the refrigerated slaughterhouse of Ouagadougou and their association with zoonoses. The results of the data analyzed, showed that zoonoses such as tuberculosis, cysticercosis, Echinococcosis and fasciolosis were important zoonoses related to organs seizures, mainly affecting carcasses, lungs, livers and intestines. Organ's seizures can vary by season, with a higher prevalence during the rainy season for some zoonoses. Moreover, studies conducted in different African countries (Algeria, Burkina Faso, Benin, Chad, etc.) have shown similar results on the reasons of seizures and the consequences of related zoonoses. The prevalence of these zoonoses varies seasonally, highlighting the importance of year-round surveillance and control. These results underline the need to strengthen prevention and control measures for these zoonoses in order to protect the public health and economy of farmers and countries as well. It is essential to sustain continued efforts improving the food security and reducing economic losses related to these zoonoses. This suggests significant collaboration between public and animal health sectors in order to establish an appropriate strategy aiming to avoid the zoonoses burden and the deficit of meat provision to the population.

6. Author Contributions

K.H.: wrote the manuscript, S.E.: did the data analysis, A.S.R.T.: extracted and compiled the data from the slaughterhouse and the Ministry and H.H.T.: coordinated the team as well as the final review of the article.

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8. Conflicts of interest

This publication is free of any conflict of interest.

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