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Prevalence of Salmonella Spp Isolated from Poultry Products (Carcasses and Eggs) from Markets and Slaughterhouses of Bamako

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Abstract: In Mali, poultry farming is a valuable source of income for the population. With huge production potential, the conditions necessary to achieve the quality and safety of poultry products must be in place. This study, conducted between February 2017and May2018 had the objective of assessing the bacteriological prevalence of salmonella in eggs and poultry carcasses slaughtered in the district of Bamako. It focused on analyzing carcasses384 and112 eggs collected from poultry at markets and slaughterhouses. The individual samples were first sown on medium preenrichment and on enrichment media followed by isolation of the bacteria on selective media and identification by biochemical tests. Work has established a global prevalence of bacteriological 12, 90%which varied depending on the type of poultry forhens14.91% against10.88%guinea fowl, the nature of the sample (eggs (09, 82%) and carcasses (13.80%) and the sampling site (the more was observed at Niamakoro monitoring Boulkassoumbougou and Hamdallaye).

Keywords: Prevalence, Salmonella, Poultry, Bamako

1. Introduction

Since many years *Salmonella* is the major cause of the human digestive tract infections associated with the consumption of food of animal origin. Among these products, poultry meat and eggs are heavily involved. Despite the efforts of producers, the contamination rate of live poultry *Salmonella* is still very high. The serotype Enteritidis is currently the most widespread in the poultry sector [11]. Salmonella can be case managers of food poisoning in humans. However poultry meat and eggs are likely to be a source of pathogenic microorganisms in general and especially Salmonella. In Mali food borne diseases are poorly understood and are not subject to mandatory reporting. Typhoid fever annually kills nearly500000 children under 5years and affects 0.5% of the world population, Fofana [1]. The World Health Organization (WHO) [13] reports nearly 17million annual cases of typhoid fever 600000 deaths, Fofana [1] according to the source, contamination of food is involved in 90% of cases of typhoid fever [14]. The meat contamination by Salmonella is a public health problem [16, 10] and poultry products are often regarded as the cause of certain epidemics [2, 17]. Other salmonella prevalence studies were made in Mali. Thus following the analysis of

eggs from Bamako, an infection rate of 7.87% (20 positive/254 tested) were obtained by Sidibe [6]. A study on the evaluation of risks associated with the presence of salmonella in eggs from breeding improved the suburban area of Bamako district during the period 2008-2009 has followed through bacteriological analysis a prevalence of 11.79% (23positive/195cloacal swabs tested) and 5.76% (03positive/52 eggs tested). Sidibe [6]. Thus, a joint study by the ANSSA and LCV in some modern poultry farms in the Bamako district and its suburban area yielded bacteriological prevalence rates respectively of 15.38% (both positive cloacal swabs of 11cultured) in a breeding poultry breeding. According to the same study, the rate was 13.84% (18 positive swabs cultured on130 tested).

2. Material and Methods

2.1. Biological Material

As biological material we used essentially the organs and poultry eggs.

2.2. Methods

The approach combined the one hand, investigations survey, and also laboratory sampling and analysis.

2.2.1. Investigation Field
Study zone
The study was conducted in urban areas of Bamako. Our choice reflects the importance of slaughterhouses and poultry markets.
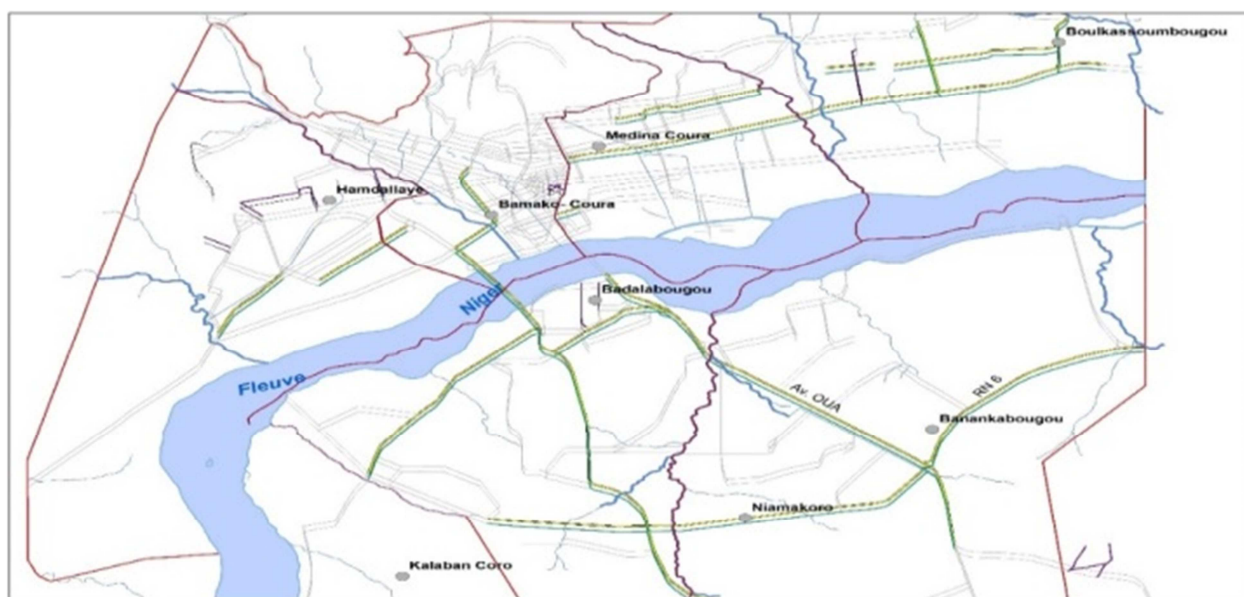

Figure 1. *Location differents ampling sites.*

Sampling and collection
Our sampling has affected 08 poultry markets. It was made randomly.384carcasses and112eggs were bought at the poultry markets. The sampling equipment was constituted by a cooler with ice serving as a source of cold at the time of transportation, a batch of plastic bags for packaging and a label for the identification of batches. The carcasses are placed under windows and chimneys in central veterinary laboratory.

2.2.2. Type and Study Period
This is an exploratory study which took place during the period from February 2017 to May2018.
Preparation of the sample to the laboratory
Whole shell eggs are opened aseptically: after rapid washing with water, the egg is cleaned with alcohol and then the shell is opened in steriles calpel. The interior of the egg is collected using a sterile pipette or is directly poured into a sterile container. Each egg is removed 05 ml, trying as possible to both the yellow as white.
Experimental protocol

The samples were first seeded on to liquids (Tetrathionate broth and Rappaport broth) incubated in an oven at37°C for 24h. On the second day, there shall be sowing on solid media (Mac Conkey agar and agar Salmonella Shigella) cultures obtained on liquid media. Then Salmonella suspect colonies appeared on the agar are transplanted on tryptic soy agar to obtain pure cultures. The pure cultures obtained on tryptic soy agar are transplanted on classic Identification media for biochemical identification.

2.2.3. Data Analysis
Data were entered in Excel 2010 and statistical analysis was done with the software SPSS.20. To compare the values of different variables, we used the chi2 test both Pearson at probability level p=5%.

3. Results

3.1. Survey Data

Information obtained from the survey sheet, were used to

determine the main factors favoring the contamination of carcasses and poultry eggs by Salmonella in slaughterhouses and markets. The results of these investigations are shown in Table 1.

Table 1. Poultry market characteristics.

Indicators	Market (N=8)	Percentage (%)
Bare ground	7	87,5
Almost home	8	100
Vermin	5	62,5
Temporary site	4	50
Cleaning market	0	0
Nearly garbage dump	3	37,5

Table 2. Hygiene in poultry slaughterhouses.

Indicators	Slaughterhouses (N=8)	Percentage (%)
Renewal of scalding (1time per day)	3	37,5
Renewal of scalding (2 time per day)	0	0
Cleaning surfaces (walls, bench, floor)	1	12,5
Open Installation	8	100
Covered building	0	0
Nearly garbage dump	2	25

3.2. Prevalence of Contamination by Salmonella Spp

Salmonella prevalence varied according to the poultry species, the nature of the levy and provenance. The results obtained from the analysis of our samples are given in the following tables.

Prevalence of Salmonella based on the species

Table3. Frequency of salmonella according to the species.

Poultry species	Negative	positive	p-value
Guinea fowl	221	27	
Hen	211	37	0,02
Total	432	64	

From the analysis of the results of Table3 shows that the 496 samples tested, 64 gave positive cultures of salmonella (12.90%). The highest infection rate was observed in the case hen (14.91%) against10.88% for the species guinea fowl.

The results showed that the salmonella prevalence varies significantly depending on the species ($p<0.05$).

Salmonella prevalence depending on the type of sample

Table4. Frequency of salmonella according to the nature of the levy.

Nature of sampling	Negative	Positive	p-value
Egg	101	11	
Organ	331	53	0,3
Total	432	64	

Analysis of the results of table 4 indicates 11 eggs (09,82%) and 53 carcasses (13.80%) had positive cultures of Salmonella.

The results showed that the prevalence of salmonella does not vary significantly according to the type of sample ($p>0.05$).

Prevalence of salmonella according to the source specimen.

Table5. Frequency of salmonella according to the source specimen.

Origin	Negative	Positive	p-value
Badalabougou	62	0	
Hamdallaye	49	13	
Niamakoro	48	14	
Banankabougou	60	2	0,001
Boulkassoumbougou	49	13	
Bamako-coura	55	7	
Médina-coura	52	10	
Kalabancoro	57	5	

From the analysis of the results of table5 shows that the contamination rate as was observed Niamakoro monitoring Boulkassoumbougou and Hamdallaye. Samples from Badalabougou all gave negative cultures of salmonella.

The results showed that the salmonella prevalence varies significantly depending on the nature of the sample ($p<0.05$).

4. Discussion

4.1. Survey Data

Visited poultry markets generally have the same characters. They are driven every day, and are mostly supplied by animals from local farms. Some animals in these markets are imported from different parts of the country and even outside. These markets are flooded with different poultry species. Unfortunately, the outlets are rarely or poorly constructed according to the standards of hygiene and sanitation. That is the conclusion that has been done Fofana [1], in his study on Assessment of contamination of typhoid fever caused by the consumption of food sold in the streets of Bamako district Affected poultry are broiler chickens, guinea fowl and chickens traditional. A common feature of these markets is the presence of pests such as mice.

The studied poultry markets are 50% located on temporary sites, and are also poorly maintained and very little developed. These markets are located near landfills (37.50%) they often are located near homes, which could be a source of unhealthy and pollution for people because manure odors and gas emissions to atmosphere. The lack of cleaning of surfaces and the no renewal of scalding water for most slaughterhouses favor carcass contamination.

4.2. Prevalence of Salmonella

This study established a Salmonella prevalence of 12, 90% in poultry products (eggs and carcasses). This rate is comparable to that achieved by the European Union [2] in Spain was12.2% and higher than that obtained by Sidibe [6] in Mali and in Tchad by Hamadou [5]. This significant prevalence could be explained by the epizootic situation of

salmonella on farms; poultry bad transport conditions to slaughter areas and slaughtering conditions of poultry and hygiene slaughter websites. Van Immerseel [7] and ELGROUD [8] have shown that infected poultry in livestock are a major source of spreading salmonella, during the various stages of processing. Thus the prevalence of contaminated carcasses is always higher than the live chickens. According to Brewer PH [3] and WHO [12] in poultry industry, once a contaminated batch is introduced into the slaughter, it is difficult to prevent contamination of other animals because of the high level of contamination across all facilities. The prevalence observed in chicken and guinea fowl species were respectively14.91% and 10.88%. This result is explained by poor breeding conditions for hens. The prevalence of Salmonella observed in eggs and carcasses were respectively 09.82% and 13.80% carcasses. Contamination of eggs at the markets is due to the poor conditions of transport and storage. Most eggs are transported in vans or motorcycles three wheels not refrigerated and stored at the shops at room temperature. Note also that eggs are put on sale in deplorable conditions as they are exposed to the sun all day. This contamination can also be explained by several factors: overcrowding leads to high production of faeces and an increase in the ambient temperature of the premises favorable for microbial growth, poor hygiene of premises and equipment promotes persistence salmonella in dust, ambient air and at the nesting surfaces. In all slaughterhouses visited poultry, practice the slaughter is done manually and is not well mastered. The observations made in the killings of farms and markets helped to distinguish different categories of hygienic practices during slaughter. These practices have a significant influence on the contamination of poultry carcasses, the indicator hygiene flora and salmonella. Bleeding from these slaughterhouses is done using rarely cleaned or disinfected knife that may allow the introduction of microorganisms in the circulatory system and muscles. This same observation was made by Ch Quinet V [4] and Julie Refregier [9]. The frequent breakdown of the digestive tract is a source of carcass contamination. The manual plucking, as well as numerous contacts with the carcasses contaminated surfaces (tables, bags, knives, tea towels...) can also be at causing cross-contamination during storage operations. Fofana [1], Agence Francaise [15]showed that the waiting time for slaughter is a time when the animals are subjected to intense stress sweakens the immune facilitate the spread of germs. The highest infection rate was observed Niamakoro monitoring Boulkassoumbougou and Hamdallaye this finding may be due to the fact that in these places, slaughter occurs at inappropriate places, such as cleaning and disinfection are poorly made and facilitate the contamination of slaughter to another.

5. Conclusion

Poultry products (eggs and carcasses) from markets and slaughterhouses of Bamako are contaminated with Salmonella. However, to reduce the risk of contamination of these products, apply the rules of hygiene at markets and poultry slaughterhouses; master the good practices of slaughter and poultry transportation conditions.

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