



# Prevalence of Escherichia Coli and Salmonella in Poultry Meat in Rabat-Morocco

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## KEYWORDS

Poultry meat, microbiological analyses, pathogenic germs, traditional killings, supermarkets, Rabat.

## ABSTRACT:

**Introduction:** Traditional poultry killings could be the source of a biological risk which must be taken into account in a general approach to assessing health and environmental risks.

**Objectives:** This study is part of the characterization of poultry meat in the Rabat region in Morocco, the objective of which is to evaluate their microbiological quality.

**Methods:** Microbiological analyzes carried out on 100 samples taken between December 2022 and April 2023 showed a significant bacteriological load: Total coliforms, E coli, fecal Streptococci, pathogenic germs such as: Salmonella.

**Results:** Of the 100 samples examined, Salmonella and E.coli were isolated in 18% and 37% of samples, respectively.

**Conclusion:** We therefore hope, in the light of the results provided by this study, to have raised awareness among the competent authorities on the strengthening and improvement intended for the quality control of poultry meat, given that the impact of germs detected in traditional killings and large stores on human and environmental health is harmful and can lead to the spread of emerging diseases.

## 1. Introduction

Biological risk is at the centre of national and international debates. It is therefore becoming a priority in the policies of many countries. State structures are increasing efforts to achieve a good level of performance in the control of these risks, to which human populations are directly and indirectly exposed.

Until now, the majority of chicken is prepared in very unhygienic conditions. In fact, according to the National Association of Industrial Poultry Slaughterhouses, Morocco currently has only 25 approved slaughter houses, and 92% of poultry production in Morocco passes through the informal circuit, which has nearly 15,000 killings [23].

From a hygienic point of view, poultry meat is susceptible to contamination during slaughter,

preparation and processing. To this end, strict hygiene measures must be introduced to prevent the alteration of the meat and the appearance of toxic infection in humans.

In Morocco, several studies have been carried out on the assessment of the hygienic quality of poultry meat ([21]; [22]). These studies reported the lack of hygiene at the time of slaughter and preparation of chicken and the presence of a real health risk related to very significant faecal contamination.

Microbiological hazards give rise to food borne illness. They are a problem for public health [12]. Indeed, the pathogenic germs Salmonella enterica, E.coli O157:H7, are the cause of a significant number of foodborne illnesses each year world wide the transmission of these germs can be done by the fecal-oral route, mainly through the consumption of contaminated food. The



latter are foods that are eaten fresh or that have not undergone sufficient industrial or domestic processing. The epidemics caused by these germs vary in size, depending on the time frame for reporting and the control measures adopted [13].

Millions of people develop illnesses each year as a result of eating contaminated food, although significant progress is being made in many countries through improved food safety[14].

It is important to note that foodborne bacteria can be separated into three distinct groups. Salmonella spp. belongs to the first group that includes invasive or intracellularly multiplying bacteria, triggering the disease by invading intestinal cells [15].

It is estimated that Salmonella spp is responsible for more than 90 million cases of diarrheal diseases world wide per year, 85% of which are linked to the consumption of contaminated food. The literature reports the number of illness cases attributed to salmonella ranging from 200 million to more than one billion cases world wide each year [17].

It is estimated that non-typhoid salmonella is responsible for more than 59,000 deaths world wide and more than 78 million cases of foodborne illness each year. The number of food borne bacterial diseases, particularly non-typhoid salmonellosis, is high in several countries around the world, but it is higher in African countries [18]. In Europe, food borne illnesses are responsible for 23 million cases of illness and 5000 deaths each year, in addition to the loss of 400,000 Disability-Adjusted Life Years (DALYs) [19]. The severity weighting assigned to non-typhoidal Salmonella using a semi-quantitative logarithmic scale, expressed as the number of DALYs, is 10 to 99 DALYs/1,000 cases [20].

In Morocco, several thousand people suffer from foodborne illnesses every year. Indeed, according to the report of the retrospective study prepared in 2011 by the Directorate of Epidemiology and Disease Control on the epidemiology of foodborne illnesses during the period 2001-2010 in Morocco, 13339 cases of TIAC were reported during the period from January 2001 to December 2010, including Salmonella, which ranks second among the bacteria responsible for foodborne illnesses in Morocco with a rate of 27% of cases after Staphylococcus aureus with a rate of 31% [16].

The aim of this work is to determine, through the results obtained from bacteriological analyses, the level of hygienic quality of poultry meat.

## 2. Objectives

This work aims to evaluate the microbiological quality of poultry meat in the Rabat region of Morocco, following a structured approach based on the choice of a representative sample of poultry meat from various sources, such as local markets and supermarkets. After collecting the samples using sterile techniques and transporting them under appropriate conditions to the laboratory to avoid contamination, several microbiological tests were carried out. These tests aim to evaluate the presence of specific microbiological agents such as Salmonella, E. coli which are essential for food safety. The presence of other indicators of hygiene and potential deterioration, such as coliforms and Streptococcus was studied.

## 3. Methods

### 3.1 Geographical location

Rabat is the administrative capital of Morocco, it is located on the edge of the Atlantic and on the left or south bank of the Bouregreg River. The population of Rabat is estimated at 1,959,388. [6], and it area is 118 km<sup>2</sup>[5].

The prefecture of Rabat is composed of 2 urban municipalities:

-The urban municipality of Rabat composed of

5 districts: Agdal-Ryad, Al Youssoufia, Hassan, Souissi, Yaacoub El Mansour. -The urban commune of Touarga .

In this study, we randomly collected 100 samples from different sites in the districts of Hassan and Agdal (traditional slaughter and supermarkets) in the following zones :

#### HASSAN district:

- HASSAN :Supermarkets and traditional slaughter
- OCEAN : traditional slaughter
- AAKARI : traditional slaughter
- LES ORANGERS : Supermarkets

#### AGDAL district:



- AGDAL :supermarkets

### 3.2 Study method

#### 3.2.1 Microbiological analysis protocol

The microbiological parameters sought in this study are pathogenic germs (Salmonella, E coli) and fecal streptococci.

#### 3.2.2 Testing for salmonella

The isolation was carried out according to the horizontal method for the detection of Salmonella: Moroccan Standard NM ISO 6579-1 IC 08.0.103 version 2017.

After pre-enrichment of 25g of the sample to be analysed in pepton water (BPW) and enrichment in the selective medium of Vassiliadis Soja Rappaport (SVR) (Broth), isolation is carried out on Xylose-Lysine-Deoxycholate (XLD) agar. Verification of the presence of Salmonella is done by Chromagar .Testing for esherichia coli

The inoculation of food products is done by transferring, using sterile pipettes, 1 ml of the mother suspension of the sample to be analysed into petri dishes (one dish for E.coli and one dish for total coliforms). A quantity of approximately 15 ml of the previously melted and cooled VRBL medium is poured into each of these dishes. Incubation of the dishes for 21 h at 37°C for total coliforme numeration and at 44°C for E.coli enumeration is followed by colony reading. The color of Escherichia coli colonies is purple [24].

Table 1: Presentation of the distribution of sampling at different sites.

	Broiler		turkey	
	Pectoral part	Liver	Pectoral part	Liver
HASSAN	203	6	3	
OCEAN	144	4	1	
AGDAL	62	2	0	
AAKARI	114	6	5	
LES	42	2	1	
ORANGERS				
<b>TOTAL</b>	<b>5515</b>	<b>20</b>	<b>10</b>	

## 4. Results

The results of this study are presented in the following table [Table 2]. The prevalence of E.coli taken into account corresponds to those whose concentration is greater than 500 CFU/g, designating the non-compliance of the meat according to the Moroccan standard. [7]

Table 2: Prevalence of Salmonella and Escherichia coli in different types of specimens.

## 5. Discussion

	Broiler		Turkey	
	pectoral part	liver	pectoral part	Liver
<b>E coli</b>	23/55	5/15	6/20	3/10
<b>Salmonella</b>	9/55	4/15	3/20	2/10
<b>Fecal streptococci</b>	12/55	2/15	11/20	5/10

The results of this study showed that the total prevalence of Salmonella and E. coli found in the 100 samples analysed is 18% and 37%, respectively. The prevalence of Salmonella is lower than that found by Karib et al. [8], equal to 20% and higher than those found by Motassim et al.[9] and by M.Khallaf et al.[10] which are relatively 12.73% and 12.66%. The prevalence of E.coli is higher than that found by Lounis et al. [11] which is 13.33%;

E. coli contamination is most significant in samples from the pectoral parts of the chicken collected at the different sampling sites. It is also noted that the pectoral parts of chicken and turkey meats have the lowest levels of Salmonella contamination. The fraction of Streptococci, indicators of fecal contamination, present in turkey meat is higher than that found in chicken meat. Samples from the pectoral portion of chicken meat are most contaminated by E coli. However, streptococcal contamination of samples from the pectoral portion of turkey meat is highest [Table 2].

Table 3: Prevalence of Salmonella and Escherichia coli at different sampling sites

	TS	GS
<b>Number of samples</b>	89	11
<b>Salmonella prevalence</b>	13/89	5/11



<b>Prevalence of Escherichia coli</b>	28/89	9/11
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TS : traditional slaughter  
Supermarkets S :

Table 4: Presentation of the origins of Salmonella and E coli in the different sampling sites.

	<i>Salmonella</i>	<i>E coli</i>
<b>OCEAN</b>	2/18	9/37
<b>AAKARI</b>	7/18	16/37
<b>HASSAN</b>	5/18	7/37
<b>AGDAL</b>	2/18	2/37
<b>LES ORANGERS</b>	2/18	3/37

The results showed the existence of a relationship between the level of contamination by the different germs and the sampling sites. Samples collected from the AAKARI quarter have the level of contamination with Salmonella and E. coli, followed by samples collected from HASSAN [Table 4]. Thus, the differences in contamination of poultry meat noted are not due to differences in the level of compliance with good hygiene practices. High contamination rates are not noted in traditional slaughter, which are characterized by unsatisfactory or less satisfactory hygienic practices than those found in supermarkets [Table 3].

Indeed, during slaughter operations, intercontamination phenomena can occur, which induces a proliferation of pathogens on initially healthy carcasses [1]. Meat is the product of muscle transformation after the death of the animal. It can be considered as the vehicle for many foodborne illnesses in humans due to hygienic effects [2], [3]. The hygienic quality of this food depends, on the one hand, on contamination during slaughter and cutting operations and, on the other hand, on the development and growth of contaminating flora during cooling, storage and distribution [2], [4]. However, according to our study, intercontamination is not necessarily related to the quality of hygiene practices. It is likely to be a simple monetary exchange between two sites, either directly between the sellers, or indirectly by the consumers..It has also been proven that it is not solely responsible for the presence of germs in meat. A few chicken and turkeys samples taken from the same site showed the presence of germs only in the pectoral part or only in the liver.

The results of the present study revealed that contamination may not be related to hygiene practices

and occurs in several cases in the stages of rearing (feeding, farmer practices,..)

It should be noted that the improvement of the safety and hygienic quality of these meats, the application of good hygiene practices as well as continuous microbial monitoring by the authorities is an absolute necessity to protect the health of consumers.

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