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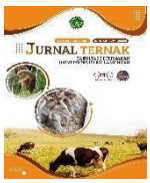

Contamination of Salmonella sp. Bacteria on Broiler Chicken Meat

Dharwin Siswantoro[a], Rizqi Annas Mubarok[a], Anang Febri Prasetyo[a], Rosa Tri Hertamawati[a], Satria Budi Kusuma[b]*

[a] *Poultry Business Management Study Program, Department of Animal Husbandry, State Polytechnic of Jember, Jember, Indonesia*
[b] *Livestock Production Study Program, Department of Animal Husbandry, State Polytechnic of Jember*

Corresponding author : dharwin@polije.ac.id

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ABSTRACT

This study aims to identify the contamination of *Salmonella sp.* on broiler chicken circulating in traditional markets in Jember Regency. This study uses a survey method with purposive sampling technique. Observation of *Salmonella sp.* was done through carrying out inoculation of *Salmonella sp.* on SSA media, identifying KOH and gram staining on *Salmonella sp.*, and doing observation using a microscope. The parameters of this study were testing the content of *Salmonella sp.* on broiler chicken meat and counting the number of colonies of *Salmonella sp.* Data analysis used in this study were the binomial test and descriptive analysis. The test results for *Salmonella sp.* in the sample of meat sold at Traditional Markets in Jember Regency was above 0 cfu/g. This meant that there was contamination of *Salmonella sp.* on the observed meat samples, while SNI (3924-2009) requires that consumption of chicken meat products must be negative from contamination by *Salmonella sp.* The results of the binomial test showed a significant difference (P <0.05) against SNI (3924-2009). Contamination value of *Salmonella sp.* The highest contamination was found in sample (P8) which was 7.22 x 10^6 bacteria. Meanwhile, the lowest contamination was found in the sample (P10) which was 3.02 x 10^4 bacteria. Based on the results of this study, it can be concluded that there is contamination of *Salmonella sp.* on broiler chicken circulating in traditional markets in Jember Regency. This is not in accordance with SNI (3924-2009).

1. Introduction

Population growth in Indonesia, which tends to increase, has also triggered growth in demand for food, including the food sector with animal protein sources [1]. Efforts to balance the increasing demand for meat are carried out by developing the livestock industry [2]. Broiler chicken is one of the livestock that produces animal protein sources [3]. Livestock health and food safety for livestock products are one of the problems faced in the world of animal husbandry [1][4]. Broiler chicken meat is susceptible to be contaminated by *Salmonella sp.* Sources of contamination can come from farms, slaughterhouses, shops, and/or during the food processing process. Humans can be potentially infected with *Salmonella sp.* if the process of cooking chicken meat is not done properly.

Along with the increasing consumption of chicken meat, especially broilers, it is necessary to control the quality of broiler chicken meat. Food ingredient standards have been regulated in the Republic of Indonesia Law no. 18 of 2012. Referring to the regulation, food ingredients and food consumption must meet the requirements of being safe, hygienic, quality, nutritious, not contradicting with religious norms, beliefs and culture of the community. Safe food is food that is free from biological, chemical, and other contaminants that can interfere, harm, and endanger human health. Biological

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contamination can be in the form of microbial contamination, both bacteria, viruses, molds, yeasts and other pests. Based on the regulations issued by (BPOM) RI Number 16 of 2016 concerning microbiological criteria in processed food, microbial contamination is food contamination from microbes that harm and endanger human health. Microbial contamination decreases food quality, and even poisoning.

One of the microbes that contaminates food is *Salmonella sp.* The microbe can potentially be the main cause of foodborne diseases and attacks the digestive tract, the disease caused by this bacterium is called salmonellosis. *Salmonella sp.* is a bacterium or microorganism that causes typhoid fever[5]. Indonesian National Standard (SNI 7388:2009) [6] concerning the Maximum Limit of Microbial Contamination in Food and the Indonesian National Standard (SNI 3924-2009) [7] concerning the Microbiological Quality Requirements for Chicken Meat stipulate the contamination of *Salmonella sp.* must have negative maximum limit per 25 grams of fresh or frozen chicken meat. In other words, the bacteria *Salmonella sp.* will not be tolerated in chicken meat.

Based on the description of the cases that have been described, and along with the increasing consumption of broiler meat, it is necessary to control the quality of food, one of which is by monitoring the contamination of *Salmonella sp.* on broiler chicken. The latest research on *Salmonella sp.* on broiler chicken meat in traditional markets in Jember Regency is still very limited. Addressing the gap, this research is conducted to analyze the contamination of *Salmonella sp.* on broiler chicken circulating in traditional markets in Jember Regency.

2. Materials and Methods

2.1. Materials

This research was conducted from January 2020 to March 2020 in Jember Regency. The focus of this research is to analyze the contamination of *Salmonella sp.* on broiler chicken that sold in traditional markets in Jember Regency. The selection of the location (market) was determined using purposive sampling technique with the following criteria.

1. The sub-districts as sample candidates have traditional markets
2. The population in the district was at least 80,000 people
3. Minimum number of merchants in the market were 8 merchants.

Afterwards, the sampling of broiler chicken meat was based on zoning as broiler meat merchants in the market are spread over several locations, namely as follows.

1. Zone 1 (9 merchants): 20% x 9 = 1.8 merchants (Round to 2 merchants)
2. Zone 2 (68 merchants): 20% x 68 = 13.6 merchants (Round to 14 merchants)
3. Zone 3 (18 merchants): 20% x 18 = 3.6 merchants (Round to 4 merchants)

2.3. Method

The implementation of this research used a survey method. The sampling technique was carried out by purposive sampling. Inspection of *Salmonella sp.* was done through carrying out inoculation of bacteria *Salmonella sp.* on SSA media, confirming by giving KOH solution and gram staining on bacterial colonies *Salmonella sp,* and doing observation microscopically. Colony counts were carried out using a standard named the Standard Plate Count (SPC). Analysis of the data used in this study were binomial test and descriptive analysis[8].

3. Results and Discussion

The results of the examination or test of *Salmonella sp.* of 20 samples of broiler chicken meat in traditional markets in Jember Regency can be seen in (Table 1) as follows.

Table 1. Test Results for *Salmonella sp.* On broiler chicken

Code	Total *Salmonella sp.* (cfu/g)	SNI

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Sample		*Salmonella sp.* (cfu/g)
P1	2.09×10^6	negative
P2	8.30×10^5	negative
P3	2.37×10^5	negative
P4	6.70×10^6	negative
P5	1.77×10^6	negative
P6	$3.79x\ 10^5$	negative
P7	5.00×10^5	negative
P8	7.22×10^6	negative
P9	2.74×10^5	negative
P10	3.02×10^4	negative
P11	2.39×10^5	negative
P12	2.94×10^5	negative
P13	1.32×10^5	negative
P14	2.09×10^5	negative
P15	1.09×10^5	negative
P16	1.07×10^5	negative
P17	1.20×10^5	negative
P18	1.57×10^5	negative
P19	1.81×10^5	negative
P20	1.63×10^5	negative

The test results of *Salmonella sp.* showed that all samples of broiler meat circulating in traditional markets in Jember Regency had contamination above 0 cfu/g. The results of the binomial analysis can be seen in (Table 2) as follows:

Table 2. The results of the TPC Binomial Test against SNI

Binomial Test

Parameters		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Salmonella sp.	H_0	According to SNI	0			
	H_1	Not in accordance with SNI	20	1.00	0.50	0.000
Total			20	1.00		

Note: sig= 0.000 < 0.05 (P < 0.05) then H0 is rejected.

As the results of the Binomial Test also show that there was a significant difference (P<0.05) against SNI (3924-2009), H0 was rejected. This means that broiler chicken sold in traditional markets in Jember Regency was not in accordance with SNI (3924-2009). The highest *Salmonella sp.* bacterial contamination value was found in the sample (P8) which was 7.22×10^6 bacteria. Meanwhile, the lowest contamination was in the sample (P10) which was equal to 3.02×10^4 bacteria. *Salmonella sp.* on broiler chicken meat in traditional markets in Jember Regency was suspected to be contaminated. Precedingly, broiler chickens were suspiciously infected with *Salmonella sp.* from farms that had poor sanitation, allowing the bacteria *Salmonella sp* to live and multiply in the chickens' digestive tract. *Salmonella sp.* can be found in the intestinal tract of animals or humans, but most commonly in poultry. Previous research [9] showed that 54.2% (13 of 24 samples) of beef and 66.7% (24 of 36 samples) of chicken meat were contaminated with *Salmonella sp.* bacteria. This proves that *Salmonella sp.* are more commonly founded in chicken meat than beef.

Meat containing *Salmonella sp.* are most likely to be found in the farm that has cases of salmonellosis. *Salmonella sp.* infection occurs as the hens suffer from salmonellosis, or it can also come from soil and feces containing the bacteria *Salmonella sp.* Infection can also occur in transportation, slaughterhouses, and marketing places [9]. *Salmonella sp.* in broodstock which cause salmonellosis can infect and spread into the meat [10].

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Cases of salmonellosis on farms can also be caused by feeding or drinking places that previously were contaminated with livestock manure. All individuals infected with Salmonella are carriers, so that they become the sources of transmission by excreting these bacteria in feces for varying periods of time [5]. This transmission can also be caused by insects that previously came into contact with feces, which then came into contact with feed, making it easy to contaminate livestock feed and drinking. Environment that can be a place to settle *Salmonella sp.* are soil, water and insects [11].

Contamination can also occur at the time of cutting or slaughtering, hair removal, scalding, and evisceration to the distribution process. Meat contamination by microbes can occur before and after the animal is slaughtered. Sources of transmitters are: 1) animals (skin, nails, contents of innards), 2) workers/humans who contaminate livestock products, 3) equipment (knives, cutting tools/cutting boards, knives, boxes), 4) buildings (floor), 5) environment (air, water and soil), and 6) packaging [8]. Equipment contaminated with *Salmonella sp.* can cause cross-contamination from one carcass to another. Salmonella contamination in the poultry slaughter house environment can be caused by cross contamination. Cross-contamination is contamination of foodstuffs through intermediaries. Thus, the carcass condition that was contaminated by Salmonella bacteria was more found after the slaughter process, compared to before the slaughter [12].

The morphology of the colonies of *Salmonella sp.* on SSA media can be seen in (Figure 1) and (Table 3) below.

(A) (B)

Figure 1. SSA media containing *Salmonella sp.* (A) and SSA media that did not contain *Salmonella sp.* (B).

Table 3. Observations of Colony Morphology of *Salmonella sp.* on SSA Media

Shape and Size	Colony color	Surface	Elevation
Round, small-medium	Red Black with clear yellow edges	Fine	Convex

Colonies of *Salmonella sp.* on SSA media was red to black. SSA test results *Salmonella sp.* gave a yellow zone between the black colonies and microbial growth from red to black. *Salmonella sp.* Growing and fermenting lactose produced acid and turned the indicator pink to dark red. Microbes reduced Na-thiosulfate to sulfate and the colonies turned black [13]. The results of observations in (Figure 1) and (Table 3) above are in accordance with this statement.

Salmonella sp. is a gram-negative bacterium which when gram staining absorbs the red color. This is in accordance with previous studies which explained that the bacteria *Salmonella sp.* It is a gram-negative bacterium with straight rods [5]. Colonies of *Salmonella sp.* were bound with gram D paint, namely safranin which resulted to be reddish. The results of observations of *Salmonella sp.* on a microscope can be seen in Figure 2.

Figure 2. *Salmonella sp.* on a Microscope with 100x. Magnification

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Table 4. Bacterial Morphology of *Salmonella sp.* on Gram Stain

Number of Samples	Form	Color	Bacterial group
20	short stem	Red	Gram Negative

Table 4 above shows that the bacteria *Salmonella sp.* on gram staining. Viewed under a microscope, *Salmonella sp.* is marked with a rod shape and red. This is in accordance with previous research which stated that *Salmonella sp* is a part of the gram-negative rod-shaped bacteria [14]. Gram-negative bacteria can also be proven by giving KOH which has alkaline properties when mixed with gram-negative bacteria which have thick lipids, and slimy [15]. The test results for *Salmonella sp.* with KOH can be seen in Figure 2.

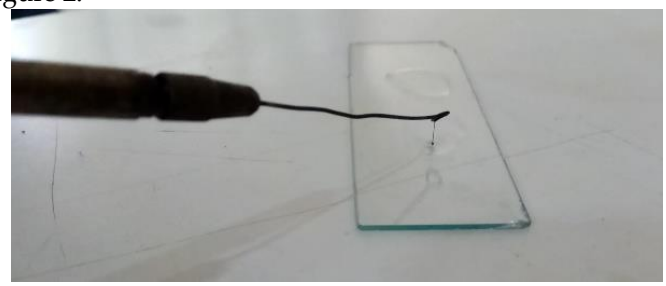

Figure 3. *Salmonella sp.* given KOH solution

Based on (Figure 3) above, it can be seen that the bacteria given KOH liquid produced mucus, indicating that they were gram-negative. KOH liquid which produces mucus strengthens that the bacteria found were *Salmonella sp.*

4. Conclusion

Based on the results of this study, it can be concluded that there is contamination of *Salmonella sp.* on broiler chicken circulating in traditional markets in Jember Regency, which is not in accordance with the provisions of SNI (3924-2009).

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