Level of escherichia coli contamination of broiler chicken meat in Ambon City Market

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Abstract. Chicken meat is a source of animal protein that is very popular with all people, especially in Indonesia. The meat also contains nutrients that are good for the body. However, broiler meat also has a weakness because it is a food that is easily damaged; most of the damage is caused by poor handling, thus providing opportunities for growth microbes. Broiler meat is easily contaminated by various microorganisms that are in the environment. This study aimed to determine the level of microbial contamination in broiler chicken meat in the Ambon city market. The study used a random sampling technique and used 12 samples from the market in Ambon city. Parameters of microbiologic status observed total plate count and E. coli. Data were described descriptively. The result showed that total plate count (TPC) and E-coli was not more than the standard. The microbial contamination of broiler chicken meat markets in Ambon city was not in excess with the National Standardization Agency (NSA, 2009). Thus, broiler meat is safe for consumption.

1. Introduction

The data on the consumption of purebred chicken is according to the 2017 Central Bureau of Statistics (CBS) Staple Consumption Study of 12.13kg/capita/year. Based on statistical data, the consumption of purebred chickens in 2017 has increased. Based on statistical information, the consumption of purebred chickens in 2017 has increased by 11.2% compared to the previous year [1]. In reality, the increase in demand for chicken meat has not been in line with the rise in meat quality, especially in terms of food safety related to nutritional and microbiological content of meat-related to microbial contamination and from a health perspective.

Broiler chickens are a source of chicken meat in Indonesia. The high market demand for chicken meat is directly proportional to chicken meat production. People tend to consume chicken meat because it does not require a long processing time, relatively affordable prices, and low-fat content [2]. The increase in demand for chicken meat impacts the spread of diseases originating from animal origin to humans or foodborne disease.

Escherichia Coli (E. coli) is a pathogenic bacterium that attacks poultry meat [3] worldwide. During animal slaughter, contamination can occur through animal intestines and spread to humans, causing disease [4]. In normal circumstances, E. coli can grow in the digestive tract [5] [6] but can be pathogenic...
and able to attack animals and humans in certain conditions such as digestion disorders. Diseases in humans, including urinary tract infections, neonatal meningitis, and sepsis [7][8][9][10].

One of the factors in the spread of disease is through chicken meat due to trade between regions. To obtain quality chicken meat or processed products is to meet the quality requirements of poultry products set by the National Standardization Agency for Indonesia. One of the requirements for poultry products’ quality is that they are free of pathogenic microbes, including E. coli, which cannot exceed the maximum microbial contamination limit for chicken meat [11]. Pathogenic microbial contamination in chicken meat and its processed products can cause various diseases for the human who consume them. Chicken meat can be contaminated with pathogenic microbes due to water from poor sanitation for the cutting and processing of chicken meat [12].

Poultry meat is suitable as a medium for microbial development because poultry tends to be dirty. Poultry meat contamination in Indonesia can also be caused by the low level of knowledge of breeders, cleanliness of cages, water, and feed sanitation. Poor cage microbes, such as E. coli in chicken meat, can cause public concern about the dangers of consuming chicken meat. Thus it becomes essential to ensure the health of consumers. Based on chicken meat's potential as a medium susceptible to E. coli bacteria contamination, the researchers wanted to know E. coli contamination in broiler chicken meat found in Ambon City markets.

2. Methods

This study used an experimental method, namely the analysis of microbial contamination in chicken meat samples scattered in several markets in Ambon City. The research was started by taking chicken breast and thigh samples from 5 market locations in Ambon City. The sample used was chicken meat that had been stored for three days. E. coli then carries out the contamination test at the Laboratory of Industrial Research and Standardization Center Ambon.

The sample is weighed as much as 25g of solid and semi-solid samples, measured the liquid sample as much as 25 ml aseptically, and then put in a sterile container. Add 225 ml of 0.1% BPW solution into the clean bag containing the sample, homogenize it with a stomacher for 1 minute to 2 minutes (except for liquid milk samples). This is a solution with a 10-1 dilution.

Testing using a series of 3 tubes, isolation-identification test, and biochemistry test. Transfer 1 ml of the 10-1 dilution solution with a sterile pipette into a 9ml 0.1% BPW solution to obtain a 10-2 dilution. In the same way as above, a 10-3 dilution is made. Pipette 1 ml each from each dilution into a series of 3 LSTB tubes containing Durham tubes. Incubate at 35°C for 24 hours to 48 hours. Note the presence of gas-forming in the Durham tube. The test result is positive if gas is formed. Testing should always be accompanied by using positive controls. Transfer the positive culture from 4.3.5.1.1 d) using an inoculation needle from each LSTB tube into the ECB tube containing the Durham tube. Incubate the ECB at 45.5°C for 24 hours ±2 hours; if the result is negative, incubate for 48 hours ± 2 hours. Note the presence of gas-forming in the Durham tube. The test result is positive if gas is formed. Use the Most Probable Number (MPN) table to determine the MPN value based on the number of positive ECB tubes containing gas in the Durham tube as the number of E.coli per milliliter or per gram.

The number of coliforms in the test sample is interpreted by matching the number of tubes that show a positive result, based on the MPN value table (Appendix A). The combination is taken, starting from the highest dilution, which still produces all positive tubes, while in the next dilution, there are negative tubes. The combination has taken consists of three dilutions. The sample MPN value is calculated as follows:

\[
\text{MPN samples (MPN/ml atau MPN/g = \text{nilai MPN table}} \times \text{dilution factor in the middle}
\]

The data obtained were described as descriptively.
3. Results and Discussion

The research data in Table 1 show that E. coli contamination in broiler chicken meat in the Ambon City market ranges from < 2 - < 3 cfu/g. The presence of E. coli in meat shows a sign that the treatment process carried out is not hygienic because E. coli can be transferred directly from hand to mouth or passively through food and tools, and materials. Equipment contaminated with E.coli can be transmitted into the meat to become a means for E.coli bacteria to enter the blood and passively spread throughout the livestock body. E.coli that contaminated chicken meat generally comes from the room, equipment, and table where the chicken is slaughtered and the water used during chicken meat slaughter.

| Samples | E. coli Contamination |
|---------|-----------------------|
|         | Chest | Thigh |
| A       | < 2   | < 2   |
| B       | < 2   | < 2   |
| C       | < 3   | < 2   |
| D       | < 2   | < 3   |
| E       | < 3   | < 3   |

In addition, the increase in the number of E. coli is also influenced by the intrinsic factor of the food product. E.coli contamination in chicken meat is possible due to the use of water that has been contaminated with E. coli. The samples; background also affects the total number of bacterial contaminants [12]. Research conducted by Romanda [13] states a significant relationship between personal and E. coli in food. The factors that can affect the number of E. coli contaminants in chicken meat samples include the hygienic location and processing. In addition, the water used can be a direct cause of contamination in meat as well as indirect contaminants from the place of slaughter and sanitation from the origin of the meat during the slaughtering process that has not implemented proper hygiene and sanitation as well as personal hygiene that acts in slaughter and processing and treatment meat after slaughter.

Furthermore, the environment where chicken meat is sold is also very influential on the number of E. coli bacteria contaminants. Hence, it is necessary to pay attention to the place/market the meat comes from because the slaughterhouse does not experience contamination. It can still provide an opportunity for E. coli bacterial contamination when it is in the sales place or market jerking on the meat.

In the market as a place for selling meat, it is not enough to implement hygiene and sanitation for meat containers. The temperature in the market, which is a temperature above the temperature for meat storage, can impact the growth of E. coli bacteria [14]. Temperature, humidity, and sanitation will significantly determine whether E. coli bacteria will contaminate the place or meat or not. If the environmental conditions are optimal and suitable, it will be possible for E. coli to grow well.

Research conducted by [15] stated that the percentage of positive samples for E. coli in chicken slaughterhouses was 11.5%, while the percentage of negative samples for E. coli was 88.5%. Based on the research results by Selfiana et al. [16], the number of E. coli contamination in broiler chicken meat sold in Banda Aceh Market was carried out on four traders, all of which exceed the threshold set by NSA. In addition, research [17] stated that broiler meat in supermarkets was contaminated with E. coli with an amount exceeding the NSA limit. From the study's conclusion, E. coli probably came from contamination with the environment (mostly water) during treatment.

Poor sanitation from the handling and processing management processes results in contamination by E. coli bacteria, which are environmental contamination bacteria [18]. E. coli contamination's height is the lack of hygiene and sanitation from slaughter, treatment, and selling meat.
E. coli bacteria's increased contamination will significantly reduce the meat's quality not to be consumed and cause digestive disorders for humans such as diarrhea. One of the pathways for E. coli bacteria to enter the human body is through the digestive tract. Meat that has been contaminated with E. coli bacteria if the processing is not carried out adequately, such as cooking until cooked, the bacteria can enter and develop in the human body who consume it. Consumption of food that E. coli bacteria have contaminated will undoubtedly be very detrimental because diarrhea is a deadly disease. The diarrhea disease can occur to E. coli bacteria's presence, resulting in fatal consequences such as death due to the toxins produced.

Acute diarrhea caused by E. coli bacteria accompanied by dehydration, causing nausea and vomiting, and can even cause bleeding. Some of the symptoms that often appear in sufferers of diarrhea include vomiting, heat, weakness, no appetite. Even in the feces, there are mucus and blood.

Acute diarrhea that can occur due to the E. coli bacteria, over the limit, is the second cause after rotavirus. This diarrhea will be accompanied by dehydration, which will result in morbidity and mortality, especially in children.

The sample is said to be high microbial if the number of bacterial contaminants exceeds the predetermined limit, and vice versa if the sample is said to be low microbial if the number of contaminants follows the NSA's limits 7388:2009, namely 1x 10^1 colony/g.

Hygiene requirements are essential in the chicken slaughtering business, including cleanliness of the buildings, equipment, and tools used not to become a source of chicken meat contamination. Sanitation management includes cleaning using detergents and disinfectants to clean the room and the equipment used. In producing chicken meat, producers and consumers are expected to apply Good Manufacture Practices (GMP) and apply a food safety system or HACCP. The resulting chicken meat is safe and healthy for consumption [19].

Thus, the data obtained shows that E. coli contamination does not exceed the NSA's (2009) contaminant limit, which means that broiler chicken meat is fit for consumption to reach consumers safely. The low E. coli contamination can be caused by adequate handling and sanitation. Personal hygiene and environmental sanitation are essential factors in contaminating E. coli bacteria, including the hygiene of the equipment used in meat processing, even locations/places for meat management such as sales or markets.

4. Conclusions
Escherichia coli bacteria contaminants in 12 samples of chicken meat tested were at the NSA's threshold, making it safe for public consumption.

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