Analysis of *Escherichia coli* O157:H7 contamination in chicken meat sold in traditional markets in Makassar, Indonesia

A Amalia, A M S Apada and R Ridwan
Veterinary Medicine Study Program, Hasanuddin University, Makassar, South Sulawesi, Indonesia

E-mail: magfira.apada@gmail.com

**Abstract.** *Escherichia coli* O157: H7 is one of the pathogenic strains of *E. coli*, which causes enterohaemorrhagic *E. coli* (EHEC) and appears as a major source of food outbreaks. This study aimed to determine the contamination of *E. coli* O157:H7 by culture methods, in broiler chicken meat sold in Traditional Market in Makassar. Twenty-four chicken meat samples were taken from four traditional markets. Isolation and identification of *Escherichia coli* were carried out by the conventional culture method using the Eosin Methylene Blue Agar, then the identification of the *E. coli* O157:H7 using the Sorbitol MacConkey Agar. Results showed that 15 of 24 chicken meat samples were contaminated with *E. coli* O157:H7. The poor personal hygiene of sellers and dirty market environments concerned with causing contamination in chicken meat sold in the four traditional markets.

1. Introduction

Chicken meat is a food source of protein for humans [1]. Broiler chicken meat is widely consumed in Indonesia [2]. Chicken meat is in great demand by consumers because it tastes good and healthy [3]. Animal origin foods had high nutritional content but can endanger human health if not hygienic. Thus, the food safety aspect is an absolute requirement for all consumers [4]. Recently, food safety gained serious concerns since many cases appeared related to food poisonings, such as mad cow disease, foot and mouth disease, avian influenza, and microbial contaminants [5].

The microbial contaminants could grow and survive during food processing and storage. These microbes contaminate food through the process of slaughtering, direct animal microbiota, chicken slaughterhouse environment, and others [6]. In developing countries, outbreaks of food-borne diseases from bacteria mostly caused by *Escherichia coli* and *Salmonella* spp. *E. coli* is the most common pathogenic bacteria and is often responsible for food poisoning and food-related infections [7]. One strain of *E. coli*, which is pathogenic, is *E. coli* O157:H7 [8].

The well-known pathogenic strain of *E.coli* O157:H7 is enterohaemorrhagic *E. coli* (EHEC), which had emerged as a major source of food outbreaks and had been estimated to cause 9,000 human diseases and 70 deaths per year in the United States [8]. Until now, information on the existence of *E. coli* O157:H7 as a zoonotic agent in Indonesia is still very rarely revealed. However, Shiga toxin produced by this bacterium could pose a fatal danger, especially in children, with very high levels of morbidity and mortality [9]. This research was conducted to determine the occurrence of *E. coli* O157:H7 contamination in chicken meat sold in the traditional market in Makassar, Indonesia.
2. Materials and method

Twenty-four samples were obtained from chicken meat sold in 4 traditional markets in Makassar. A total of 25 grams of meat is taken from each chicken and put into sterile plastic for further testing [10,11].

2.1. Dilution method

The 25 grams of sample was put into Erlenmeyer. Then 225 ml of 0.1% BPW solution (Buffered peptone water 0.1%) was added and homogenized with stomacher for 1-2 minutes. The homogeneous sample was a solution with a 10^{-1} dilution. One milliliter of the 10^{-1} dilution suspension then transferred with a sterile pipette to a 9 ml BPW solution to obtain a 10^{-2} dilution. Dilution was carried out until 10^{-4}.

2.2. Escherichia coli selective media evaluation

From each dilution, 0.1 ml of each dilution was taken using a micropipette then cultured on Eosin Methylene Blue Agar (EMBA) media with a spread method for E. coli confirmation. The culture was incubated at 37℃ for 24 hours [9].

2.3. Identification of Escherichia coli O157:H7

The isolate grew on EMBA media then transferred to the nutrient broth and incubated at 37℃ for 18 hours. Further, bacteria culture was carried out on Sorbitol MacConkey Agar media to detect E. coli O157: H7. The culture was incubated at 37℃ for 24 hours.

3. Results and discussion

Eosin Methylen Blue Agar (EMBA) was used to identify E. coli, which produced a metallic green colony on the media. Bacteria that grow in EMBA produced a metallic green color showing strong fermentation from the production of lactose and acids, which precipitate green metal pigments [12]. Results showed that 16 samples produced metallic green colonies on EMBA media. The E. coli colony in the EMBA media was presented in figure 1. Escherichia coli in the EMBA was identified as a round, slippery colony with a metallic green color and a black spot in the middle [13]. The presence of eosin and methylene blue helped sharpen differences with other colonies [14].

![Escherichia coli colony in EMBA media](image)

*Figure 1. E. coli colony in EMBA media*

Escherichia coli contamination could occur from internal (endogenous) and environmental (exogenous) factors. Internal contamination occurred when previously slaughtered chickens have been infected by bacteria or poor sanitation of the farm. The environment contamination might come from the process of slaughtering, handling, air, long storage, and unhygienic storage. To reduce contamination, hygienic handling with a good sanitation system was important. The amount of
Microorganism contamination would determine the quality and storability of meat [15]. Identification of *E. coli* O157:H7 bacteria by culture method on Sorbitol MacConkey (SMAC) media showed that 15 samples produced colorless/clear colony colors, e.g., A1, A2, A3, A5, B1, B2, B3, B4, C1, C2, C3, C4, D2, D3, and D4 samples. Colonies with clear colored on SMAC media were identified as *E. coli* O157: H7 since the O157:H7 could not ferment sorbitol [16].

The chicken sellers in the four traditional markets were located at several points because of the vast market area. The chicken meats were sold close to other meat sales. Chickens were transported from the vending car using a wheelbarrow to a chicken cage located close to the slaughterhouse, and there was no separation between clean and dirty areas. Some sellers used flowing water for slaughtering while some other used water in containers. All chicken sellers used wooden cutting boards and used the same knife for several chickens without proper washing. Personally, all sellers had not used hygiene equipment, such as aprons, napkins, masks, and head cap.

The market conditions as above affected contamination in chicken carcasses sold. In traditional markets, buying and selling activities occurred directly [17]. Traditional markets were usually synonymous with a dirty and messy place, and the chicken meats were sold on the table without any mat to cause bacterial contamination.

### 4. Conclusion

Chicken meats sold in four traditional markets in Makassar were found contaminated with *E. coli*. The bacteria were detected in 16 of 24 samples and the *E. coli* O157:H7 was identified in 15 samples (16.66%).

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