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Food Handler Hygiene and Escherichia Coli Bacteria Content in *Se'i* Cows

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Abstract: Food handlers who do not adhere to proper health and hygiene standards can significantly contribute to the risk of cross-contamination during food preparation. In the case of se'i beef (a traditional Indonesian smoked beef dish), such lapses can lead to contamination with harmful pathogens, including Escherichia coli (E. coli). Not washing hands thoroughly after using the restroom, handling raw meat, or touching contaminated surfaces can transfer E. coli from handlers to the beef. Using unclean knives, cutting boards, or other tools can spread bacteria from one food item to another.. The aim of the research was to assess the hygiene conditions of food handlers and the content of Escherichia coli bacteria in se'i beef. The research method is a survey with a cross sectional design. The research results showed that 70% of food handlers did not wear head coverings, 50% did not wear masks correctly, 100% spoke when handling food, 80% did not use aprons, did not use tools/equipment/hand pads when handling 70% of food and 90% of cow samples contained Escherichia coli bacteria.

Keywords: Bacteria; Eschericia coli; Food handlers; Hygiene

Introduction

Se'i is a processed meat product typical of East Nusa Tenggara (NTT) (Saubaki, 2013) and is one of the typical food products in NTT (Adu, 2017). Se'i meat originates from Rote Ndao district, but is now widely known by urban communities in Kupang City (Adu, 2017). Processed beef se'i meat is cut lengthwise and can be seen as in Figure 1.

Figure 1. Beef se'i meat

Se'i meat contains between 30-32% protein and a water content of 63%. The high protein content and water content can be a good medium for microbial growth if the se'i meat is contaminated by microbes. This causes the shelf life of se'i to be very short, namely less than 3 days (A Adu et al., 2017).

Microbial contamination of se'i meat can occur at the food storage, food processing and food serving stages. Food handlers have a role at each of these stages. Thus, food handler hygiene has the potential to be a risk factor for contamination of se'i meat. One of the microbes that can contaminate se'i meat is Escherichia coli bacteria. Escherichia coli bacteria are indicator bacteria for pollutants originating from feces, and their presence in food, including se'i meat, is not permitted (Rahmayani & Simatupang, 2019).

Food handlers who do not use Personal Protective Equipment (PPE) when processing food can increase the

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risk of bacterial contamination of food (Almasari & Prasasti, 2019). This can cause food-borne diseases, which to this day continue to be a major public health problem in both developed and developing countries. Foodborne disease and diarrhea can be caused by unhygienic food processing (Sari, 2017). Foodborne diseases often cause outbreaks and extraordinary events (KLB), so the detection of bacteria in food is very important in monitoring and preventing outbreaks and food poisoning (Fortuna et al., 2012).

Method

This research method is a survey research method with a cross sectional design. The survey was carried out using an observation sheet (check list) (Mann, 2003; Wang & Cheng, 2020). The research population is se'i beef and food handlers in all places selling se'i beef in Kupang City, totaling 10 places. The research sample is the total population taken according to the following criteria: for samples of se'i beef, 500 grams were taken from each sales place; and for the sample of food handlers, 1 handler was taken from each sales place as a respondent. Respondents were given a consent form in the form of an informed consent.

Se'i beef samples were tested at the Kupang Health Polytechnic Laboratory to identify the presence of Eschericia coli bacteria. Testing is carried out using conventional methods through several test stages, namely presumptive tests, confirmation tests and complete tests. At the presumptive test stage, the sample was weighed 25 grams and diluted with 225 ml of distilled water, then inoculated into Lactose Broth (LB) media and incubated at 37oC. A positive result is indicated by the reaction that occurs, namely the discovery of gas bubbles in the Durham tube as a result of bacterial fermentation. Positive results are continued to the confirmation test stage by transferring the specimen into Escherichia Coli Broth (ECB) media and incubating at 44 ^{o}C. Positive confirmation test results are also indicated by the presence of gas bubbles in the Durham tube. Then the test continued to the complete test stage by growing colonies on the selective media Eosin Methylene Blue Agar (EMBA) and incubating at a temperature of 37oC. Escherichia coli bacteria in EMBA media were identified by the characteristics of metallic green bacterial colonies.

Result and Discussion

This research was located in Kupang City, East Nusa Tenggara Province. The focus of this research is on food handlers at places selling se'i beef in traditional markets and shops/depots spread across several sub-districts in Kupang City.

Table 1. Distribution of Food Handlers Who Use Head Covers/Hairnets

Variable	Amount	Percentage (%)
Use a head covering/hair net	3	30
Do not use a head covering/hair net	7	70
Total	10	100

Table 1 shows that 30% of food handlers use head coverings/hair nets and 70% do not use head coverings/hair nets. Cattle food handlers who do not use head coverings/hairnets when handling food often become a source of contaminants or result in cross contamination (Ramadani et al., 2017).

Table 2. Distribution of Food Handlers Who Use Masks Correctly

Variable	Amount	Percentage (%)
Use the mask correctly	5	50
Not using a mask/using a mask incorrectly	5	50
Total	10	100

Table 2 shows that 50% of food handlers use masks correctly.

Table 3. Distribution of food handlers who do not speak while handling food

Variable	Amount	Percentage (%)
Not while talking while touching food	0	0
While talking while touching food	10	100
Total	10	100

Table 3 shows that all food handlers (100%) spoke when touching food. The behavior of cow food handlers who do not wear masks when working, always talk when touching food and also blow food wrappers is behavior that is not recommended because some bacteria are found in the mouth and on the lips. When talking without a mask covering the mouth or when blowing on the plastic that will be used to wrap the cow se'i, a number of bacteria from the mouth and lips can move into the air and can contaminate the food that is being handled (Ministry of Health of the Republic of Indonesia, 2006).

Table 4. Distribution of Food Handlers Who Use Aprons

Variable	Amount	Percentage (%)
Using an apron	2	20
Don't use an apron	8	80
Total	10	100

Table 4 shows that 20% of food handlers use aprons. As many as 80% of cow food handlers do not use aprons when handling so that they can become a source of contaminants or result in cross-contamination (Ramadani et al., 2017). One way to prevent cross-contamination which poses a risk of disease transmission from food handlers is to get used to wearing clean clothes or using an apron (Syafirah & Andrias, 2012).

Table 5. Distribution of Food Handlers Who Use Tools/equipment/handpads when handling food

Variable	Amount	Percentage (%)
Use tools/equipment/hand pads when touching food	3	30
Do not use tools/equipment/hand pads when touching food	7	70
Total	10	100

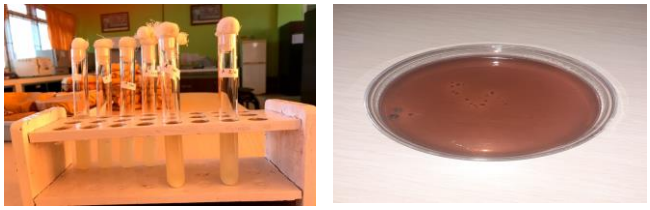
Table 5 shows that 30% of food handlers use tools/equipment/hand pads when handling food. As many as 70% of food handlers directly use their hands to pick up food without using tools such as spoons or tongs. Bacterial contamination can occur through food handlers who have poor personal hygiene (Augustin et al., 2020; Das et al., 2010; Kamboj et al., 2020). Food handlers' hands are the main source of microbes, if these hands have direct contact with food that is being prepared and served. Bacteria on the hands can come from feces that stick to hands that are not washed with an antiseptic, such as soap, after defecating or before touching food. Food handlers with poor personal hygiene will facilitate the spread of bacteria and often become a source of contaminants or result in cross contamination (Nyawo et al., 2021; Ramadani et al., 2017; Todd, 2023).

A food handler in carrying out food handling service activities must meet the requirements, including: not suffering from easily contagious diseases, for example: coughs, colds, influenza, diarrhea, similar stomach diseases, covering wounds (open wounds/boils or other wounds, keeping hands, hair, clean). nails, and clothes, wearing an apron and head covering, washing hands every time you want to handle food, touching food must use tools/equipment, or with hand pads, not while smoking, scratching body parts (ears, nose, mouth or other parts, and not coughing or sneezing in front of the snacks being served and/or without covering your mouth or nose. This is supported by research which shows there is a significant relationship between food handlers' fingernails and food contamination going to the toilet, is a source of contaminant that has quite an impact on the cleanliness of food ingredients, besides that, smoking is also often seen while they are waiting for buyers (Iqbal & Rochmah, 2023).

Table 6. Escherichia coli bacteria in Se'i Beef

Criteria	Amount	Percentage (%)
Qualify	1	10
Not eligible	9	90
Total	10	100

Table 6 shows that of the 10 beef se'i meat samples tested, there were 9 samples (90%) that did not meet the requirements because they contained Escherichia coli bacteria that exceeded the specified threshold value. The presence of Escherichia coli bacteria in se'i beef can occur due to cross-contamination from food handlers. The personal hygiene conditions of cow food handlers who do not meet the requirements have a risk of contaminating the food they sell (Baringbing, 2023; Widyaningrum & Resi, 2021). The Eschericia coli bacteria content test was carried out using lactose media to determine the fermentation reaction and selective media to determine Eschericia coli bacterial colonies (Arshad et al., 2006; Sultana et al., 2021; Triadi et al., 2022). The test results can be seen in Figures 2.



(a) (b)

Figure 2. The fermentation of Eschericia coli bacterial colonies: (a) E. coli fermentation test (+); and (b) E. coli colony (+)

A food handler is a person who is directly in contact with food and equipment starting from the preparation, cleaning, processing, transportation to serving stages (Ehuwa et al., 2021). In the food processing process, the role of food handlers is very important. These food handlers have the opportunity to transmit disease. Many infections are transmitted through food handlers, including the Ecshericia coli germ which can be transmitted through the skin. Therefore, food handlers must always be healthy and skilled (Yuspasari, 2012). Contamination that occurs in food can be caused by poor

personal hygiene of cow se'i sellers as food handlers (Tambekar et al., 2009). Poor hygiene practices from cow se'i sellers who touch food can contribute to foodborne disease outbreaks) (Kadju et al., 2021; Kibret & Abera, 2012; Zainal et al., 2021). Personal hygiene or personal hygiene that is not maintained properly can result in the health status and level of food handlers being unsatisfactory or not meeting the requirements, therefore, good personal hygiene must be possessed by food handlers to reduce the level of risk of contamination of food (Mudey et al., 2010; Sativa, 2023).

Conclusion

Food handlers who fail to meet the required health and safety standards can significantly contribute to the contamination of Escherichia coli (E. coli) bacteria in se'i beef. Improper handling, lack of sanitation, and failure to follow guidelines for safe food preparation and storage create an environment where harmful bacteria can thrive. Given the potential health risks associated with E. coli contamination, it is essential that food handlers are properly trained, adhere to hygiene protocols, and maintain the highest standards of food safety. By ensuring these measures are consistently followed, the risk of contamination can be minimized, safeguarding public health and maintaining the integrity of the food supply

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