Food Safety on Meat Products Based on Coliform Contamination

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ABSTRACT

Meats commonly consumed by the Indonesian people are derived from cattle, buffalo, sheep, goats, chickens, ducks and rabbits. Meat is needed to fulfill nutritional needs. Meat can be processed into products such as minced meat, nuggets, corned beef, meatball, sausage and crispy fried chicken. Consumers interested in buying crispy fried chicken sold by street vendors without paying attention into sanitation aspects. Minced meat and corned beef can be obtained in traditional markets. The purpose of this research is to investigate the presence of coliform bacterial contamination on meat products (crispy fried chicken, corned beef, chickens carcass) sold in traditional and modern markets. This research is an explorative study. The sample of crispy fried chicken was obtained from street vendors, while minced meat and corned beef in sachets were obtained from modern market with five replications of each samples. Parameters of this research were the number of coliforms using MPN and observation on fecal and non-fecal colonies. The data obtained analyzed descriptively and compared with Maximum Limit of Microbial contamination of BPOM in 2009 The results showed that the amount of coliform of crispy fried chicken, corned beef and chicken carcass were safe to consume which were lower than the requirement of BPOM 2009 that was 10 MPN/g. However, non-fecal and fecal colonies found were needed to be anticipated.

Keywords : Meat, Sanitation, MPN, Fecal, Non-fecal

INTRODUCTION

Meat is a good medium for bacterial growth. The dominant bacteria on the meat surface come from the soil, such as *Salmonella sp., Shigella sp., Escherichia coli, Bacillus proteus, B cereus, Staphylococcus aureus, Staphylococcus albus, Clostridium welchii* and *Streptococcus* which commonly present in the feces. *Enterobacter* and *Escherichia* are included in Coliform bacteria groups. Coliform is a group of bacteria that is used as an indicator of fecal pollution and poor sanitation conditions against water, food, milk and dairy

products. The presence of Coliform bacteria in food or beverages indicates the possibility of enteropatogenic and/or toxigenic microorganisms that are harmful to health (Koes Irianto, 2013).

Coliform in raw meat grows at 37^{o}C and also can grow at -2^{o}C (Jay, 2000) temperature which is also used in the meat product showcase. The pathogenic bacteria in the fecal Coliform group such as *Escherichia coli* can cause infections and food poisoning that can be harmful to humans. *Enterobacter aerogenes* is a type of non-fecal Coliform that can produces slime. Contamination of microorganisms in minced meat products can occur during handling of raw materials, hand habit, cross contamination, thawing, cutting, mixing of raw materials with remaining meat, direct contact with non-hygiene equipment and tools during processing phases, packaging and food serving (Le loir, *et al*., 2003; Kotsouman and Sofos, 2004). The source of contamination in corned beef and crispy chicken can occur at trade market when meat products are stored at room temperature. BPOM (2009) establishes the Maximum Limit of Microbe Contamination for Coliform which is 10 MPN/g.

MATERIALS AND METHODS

This research was an explorative study. The sample of crispy fried chicken was obtained from street vendors, while minced meat was obtained from modern market and corned beef in sachets obtained from modern market and traditional market with five replications of each samples. Parameters of this research were the number of coliforms using MPN through presumptive and confirmatory test with observation on fecal and non-fecal colonies. The MPN methods were utilized Lactose Broth medium in 15 test tubes, with dilution 1 : 1; 1: 10 and 1: 100, each test tube was inserted upside down by Durham tube. If gas presented in the Durham tube, it indicated positive samples. Total positive tubes calculated and compared with MPN Table from FDA's bacterial analytical manual. Positive samples inoculated in EMBA medium for qualitative analysis to distinguish bacteria colonies by its color. Fecal coliform was appeared to have a metallic green colonies whilst Non-fecal coliform being pink. The data obtained was analyzed descriptively and compared with Maximum Limit of Microbial contamination of BPOM in 2009.

RESULTS AND DISCUSSION

The present of coliform bacteria in food did not always indicated contamination from feces. It presence was an indicator of processing condition or poor sanitation. The result could be seen on Figure 1 below.

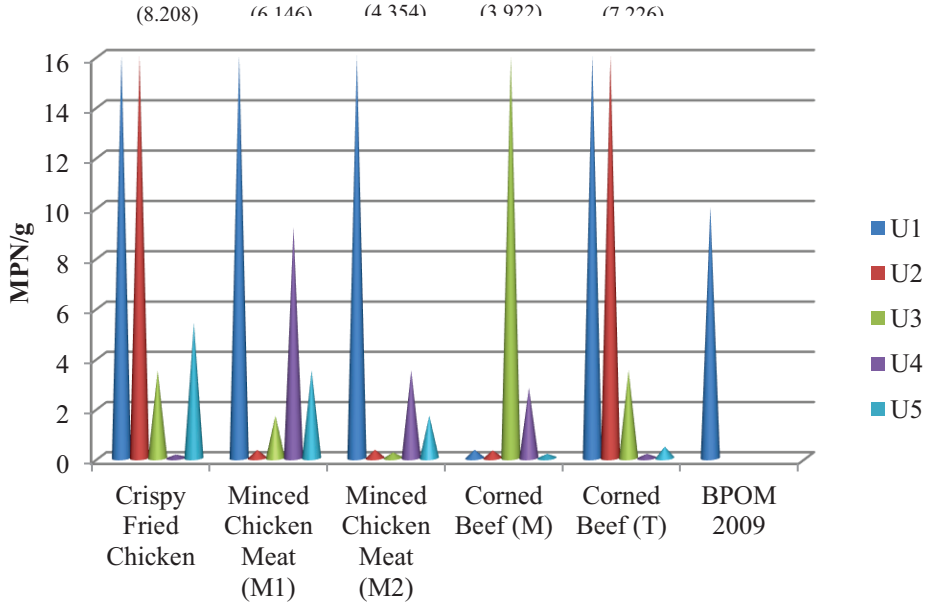

Figure 1. Coliform bacteria in various meat products

Notes: Number in parenthesis showed the average number of each samples

U1, U2, …, U5 stand for number of replications

Figure 1 illustrated the dynamics population of Coliform bacteria from each replication of all samples. The highest average number of Coliform bacteria was crispy fried chicken (8,206 MPN/g), followed by corned beef sachet from traditional market (7,226 MPN/g), minced chicken meat from modern market 1 (6,14 MPN/g), minced chicken meat from modern market 2 (4.354 MPN/g) and corned beef from modern market (3.922 MPN/g). This condition occurred in accordance with the processing environment situation i.e. storage temperature, hand habits, water, equipment and mixing raw materials with remaining chicken meat. As an example in crispy fried chicken, traders mostly traded on the sidewalk, meat storage at room temperature and many other sources of contamination. In line with Ray's opinion, (2004), contamination occured on the meat surface after slaughter and despite being stored at low temperatures meat remains contaminated by microorganisms derived from the knives or other tools during processing procedures and the environment.

Normal flora microorganism cuold be found in both in living or freshly plucking poultry such as chickens, turkeys, ducks and geese, between 100-1000 per cm^2 in good sanitary conditions, but could contain 100 times or more microorganisms in bad sanitary condition.

Bacteria found in poultry feather were species *Pseudomonas, Acinetobacter, Escherichia, Flavobacterium* and *Salmonella* (Mead, 2000).

Corned beef in plastic packaging sold in the modern market showed a low number of Coliforms due to a relatively clean environment, however because storage of the product at room temperature, Coliform was still detectable. Corned beef products in plastic packaging were very risky to sell in traditional markets because stored at room temperature and inadequate environment. Minced chicken meat sold in modern market, places and storage temperatures were eligible, but an increase in the number of Coliforms occured due to mixing with remaining meat. According to Gülay, *et al*. (2015), mincing meat might cause a higher bacterial contamination.

Table 1. Bacteria Colonies in EMBA medium

Repetition	Crispy Fried Chicken	Minced Chicken Carcass		Corned Beff	
		M1	M2	M	Trad
R1	F/NF	F	F/NF	F/NF	NF
R2	F/NF	F	F	NF	NF
R3	F/NF	F/NF	F	NF	NF/F
R4	NF	F/NF	NF	F/NF	NF/F
R5	NF	NF	F/NF	F/NF	NF/F

Notes: F = Fecal Coliform, NF = Non-Fecal Coliform, M = Modern market, Trad = Traditional Market

Observation on bacteria colonies in EMBA medium (Table 2) showed the result of confirmatory test presented colonies grow was dominated by non-fecal colonies (pink color) in all samples. All samples of crispy fried chicken, corned beef and minced chicken meat had both fecal and non-fecal (metallic green color) bacteria colonies. Microorganism contamination on chicken meat from digestive tract will became important food hygiene problem especially contamination from Enterobacteriaceae (fecal bacteria) such as *Salmonella Spp, E.coli*, Proteus including *Klebsiella Spp* (Zhao, 2001; Paterson, 2006). Coliform bacteria can cause indigestion. The contamination of chicken or meat products by feces may occur because of cross contamination directly or indirectly during processing procedures. The presence of *Escherichia coli* is the most specific indicator for fecal bacterial contamination and is the most common coliform group found in poultry carcasses (Mead. 2003).

CONCLUSION

Food safety of meat products examined through Coliform bacteria contamination still within the safety threshold. The presence of fecal Coliform bacteria on products has been contaminated since the initial processing treatment and affected by storage temperature.

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