

***Escherichia coli*'s Contaminated Food from Faculty Canteen in University X, Jakarta**

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The objective of this study is to analyze the most associate factors to *Escherichia coli* bacteria contamination in food at faculty canteen of University X. The design of this study is cross sectional design, by using primary data through laboratory test of 70 food samples and direct interview to 70 food handlers with questionnaire. The laboratory test results showed that 60% food were contaminated with the *Escherichia coli* bacteria. There were significant association between hygiene and sanitation of cooking utensils ($p=0.005$) and canteen environment ($p=0.010$) with *Escherichia coli* food contamination and statistically no significant between hygiene and sanitation of food handlers, food processing and canteen facilities with *Escherichia coli* food contamination. Based on multivariate analysis, the most influenced factors in this research were hygiene and sanitation of food processing, cooking utensils and canteen environment. Therefore, training of food handlers are necessarily in order to minimize *Escherichia coli* food contamination.

Keywords: *Escherichia coli*, food, contamination; canteen, university.

Food is one of the most important human's consumption need to keep body healthy. On the other hand, food can also as a source of diseases through the contaminants inside and it comes mostly from public food production like canteens and restaurants that poor in hygiene and sanitation so the foods are not safe to consume. There was a decrease in 42-48% of students who were absent due to illness in elementary schools in China which were compared with students who did not receive the intervention school about hand sanitary and hygiene.¹ Nowadays, the food poisoning or foodborne diseases are still frequently found in canteens and restaurants in schools, university, streets, offices and others in Indonesia because of food safety issues. Biological hazard is one of potential hazards in food and one of biological

hazard mostly be found is *Escherichia coli* (*E. coli*).² From previous researches, there are many factors that cause the existence of *E. coli* from the foods.^{3,4,5,6,7}

E. coli is derived from human or animal feces, infected by food handler's behavior and health, kitchen utensils washing that are not clean or contaminated water⁸. BBC (2011) reported about *E. coli* outbreaks in Europe countries such Germany, Sweden and Denmark. The outbreaks caused infection and death for hundred people.⁹ *E. coli*'s food contamination are still high in Indonesia.¹⁰ Head of Health Research and Development (2015) stated that 200 foodborne disease outbreaks occurred in a year in Indonesia and the most common cause of foodborne diseases are *E. coli* food contamination.¹¹

Canteens in universities are places that serve foods and drinks for lecturers, students and any staffs. In many universities in Indonesia, there are no program for protecting foods and drinks

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served by canteens and as the impact, there are poor hygiene and sanitation of foods they prepared. Some studies have reported.^{5,7} Previous research has also been conducted in canteen faculty in university X and showed that there are 52.8% of *E. coli* food contamination.¹² However, the research of how the food's hygiene and sanitation in the canteens in universities in Indonesia need to be explored and the objective of this research is to determine the factors that contribute to hygiene and sanitation of food prepare in canteens.

METHODS

The design of this research was cross sectional study which is conducted on May to June 2015. The population of this research were food counters and its food handlers in faculty's canteens in University X. The total of population in this research were 200 food counters. The number of samples were calculated by proportion estimated with limited population formula.¹³

$$n = \frac{Z_{1-\alpha/2}^2 \times p(1-p)N}{0,1^2 (N-1) + Z_{1-\alpha/2}^2 \times p(1-p)}$$

- N : Minimal sample required
- $Z_{1-\alpha/2}$: 1.96 on confidence interval 95 %
- D : Degree of accuracy required (10%)
- N : Population of food counters in canteen: 200 counters

P : Estimated proportion of foods contaminated by *E. coli* in canteen faculty in university X = 52.8%⁶

Based on the research sample calculation above, there were 64 samples. To anticipate the dropped out samples, the samples were added 10 percent, so the total samples were 70. The samples of food samples were collected by simple random sampling from counters in each canteen faculty that the food handlers were interviewed. with questionnaire. After that, the *E. coli* from the food samples were tested.

RESULTS

Results of laboratory test showed that food samples contained *E. coli* were (42%), not qualified canteen facilities 36 (51.4%), food handlers 29 (41.4%), kitchen utensils 25 (35.7%), food processing 22 (31.4%) and poor quality canteen environment were 37 (52.9%). (Figure 1). Based on bivariate analysis result, hygiene and sanitation of canteen facilities, food handlers and food processing did not have any significant association with *E. coli* contamination with P value were 0.961; 0.586 and 0.227 respectively (p>0.005). On the other hand, hygiene and sanitation of kitchen utensils and canteen environment have significant association with p value of each variables were less than 0.05 (0.005 and 0.010) as shown in Figure 2 and Figure 3. After that, the selected multivariate variables which p value <0.05 means

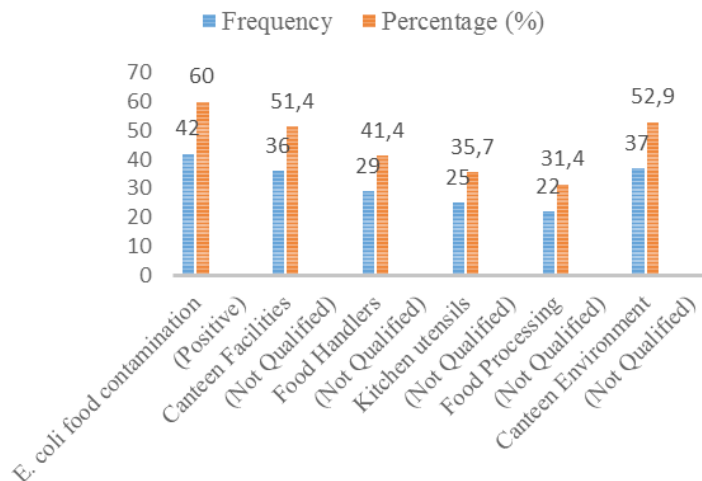


Fig. 1. Frequency Distribution of Independent and Dependent Variables

significant association listed to be the second selected multivariate variables and the variables with p value >0.05 were eliminated. The result of final selected showed that the dominant factors of this research are hygiene and sanitation of kitchen utensils, food processing and canteen environment, because p value were <0.05.

In order to determine the dominant factors which associated with *E. coli* food contamination in canteen faculty in university X, the next step that was multivariate analysis. The selected multivariate variables were the result from bivariate analysis selection and statistically have significant association with p value less than 0.25.

The equation of logistic regression was:

$$\text{Logit } Y = k + ax_1 + bx$$

Y: *E. coli*'s food contamination,

k: Constant

Logit Y = -3.45 + 1.667 hygiene and sanitation of kitchen utensils + 1.685 hygiene and sanitation of food processing + 1.405 hygiene

and sanitation canteen environment. It means that *E. coli* food contamination were influenced by hygiene and sanitation of food processing, kitchen utensils and canteen environment simultaneously.

The next step after the result of multivariate analysis was interaction test on independent variables. Interaction test was conducted by suspected variables that have interaction substantively. Interacted variable is the variable which have p value <0.05. After that, eliminate step by step to variables which p value >0.05 and the highest value. After through several interaction test, the final result of interaction test consist of food processing hygiene and sanitation variable and interaction between canteen environment and kitchen utensils, because p value of each variables are <0.05.

Based on the final result of interaction test, the regression logistic equation was:

Logit Y = -2.516 + 1.616 hygiene and sanitation of food processing + 2.265 canteen environment*kitchen utensils

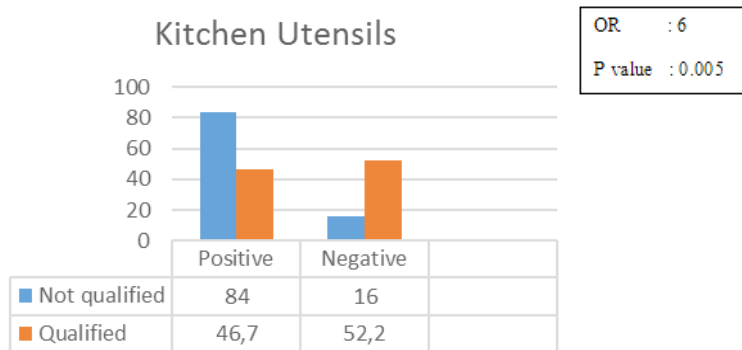


Fig. 2. Hygiene and sanitation of kitchen utensils

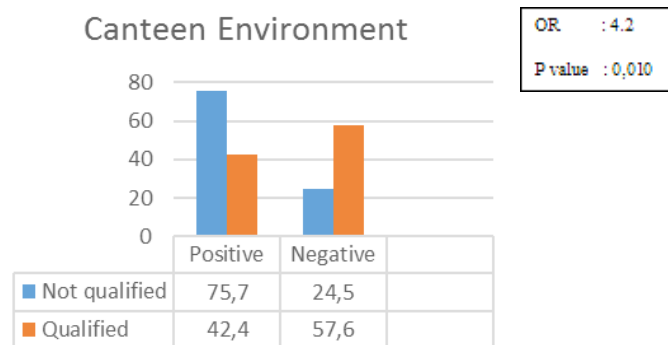


Fig. 3. Hygiene and sanitation of canteen environment

From logistic regression above, it showed that *E. coli* food contamination was influenced by hygiene and sanitation of food processing, and there was interaction between hygiene and sanitation of canteen environment and kitchen utensils after controlled by another variables collectively in this research.

DISCUSSION

The research result showed that the *E. coli* bacteria in food contamination at the canteen faculty of university X, more than half of food samples were positive contaminated (60%). This result showed the higher percentage than previous research (52.8%).¹² Kitchen utensils variable have significant association with *E. coli* food contamination. Previous research showed similar result, there were significant association between kitchen utensils sanitation with *E. coli* contamination¹² and the research about kitchen utensils hygiene and sanitation at canteen of IPB dormitory, founded coliform bacteria in kitchen utensils, especially in chopping board, serving plate and eating plate.¹⁴ The research results indicated that hygiene and sanitation of kitchen utensils have significant association because kitchen utensils is one of source contamination. A chopper or chopping board used to chop/cut the raw materials, if those kitchen utensils have not clean well, pathogen will contaminate and it could be serious threat for food safety.¹⁵ This is similar with other study that showed a significant association between the variable of food handlers' hygiene knowledge with *E. coli* contamination, the food handlers' behavior with *E. coli* contamination, equipment sanitation variable with *E. coli* contamination, the storage of raw materials with *E. coli* contamination.³

Canteen environment variable has significant association with *E. coli* food contamination. Of 70 samples, known that 37 (52.9%), canteen which environment were not qualified such canteen with the toilets, but the toilets are dirty and not inadequate. With the dirty toilet that could certainly affect contamination through food by pest such cockroaches, ants, flies or an animal that can transmit disease. The existence of pests and other animals like dog and cat are one of the media that can contaminate food with organisms derived from the ditch, the garbage

and other sources through its hairy, urine, feces or saliva. In addition, the hand wash facilities for food handlers or consumer hand wash facilities must be available with water flowing with soap and canteen have to cooperate with department of health to train the food handlers in each food counters in university X with hygiene and sanitation practice so the quality of food will be better. Our research is also relevant with the result from other studies^{4,5,7}. Therefore, the role of food handlers is really significant in the prevention of disease by maintaining and improving food handling practices and personal hygiene because food handlers can be a food polluting.¹⁶ The handlers' knowledge and good behavior will decrease the contamination if the means and facilities are available. The lack of hand-washing facilities, unavailability of soap to wash the hands that will compromise the quality and safety of food served.¹⁷

CONCLUSIONS

From seventy food samples at canteen faculty of University X, there were 42 food samples (60%) positively contaminated by *E. coli*. The research proved that there are significant association statistically between hygiene and sanitation of canteen environment and kitchen utensils with *Escherichia coli* food contamination at canteen faculty in university X. Based on multivariate analysis, there were most influence factors in *E. coli* food contamination, there are hygiene and sanitation food processing, kitchen utensils and canteen environment simultaneously. Therefore, the management of canteens have to link with health unit in the university to monitor and supervise to all food handlers at canteen faculty in university X, related to canteen facilities, food processing, kitchen utensils and canteen environment periodically. Food handlers should be more careful to keep the hygiene of canteen facilities, hand towel, and clean toilets for food handler and not open directly to food processing room¹⁸.

Another variable such hygiene and sanitation of canteen facilities, food handlers and food processing do not have any significant association. Based on interaction test result, there were interaction hygiene and sanitation of kitchen utensils and canteen environment which p value

was 0.000 ($p < 0.05$) and Odds Ratio = 9.636 means there were interaction between hygiene and sanitation of canteen environment with hygiene and sanitation kitchen utensils which cause food contaminated by *E. coli* simultaneously with another variables and they have interaction and encourage each other.

To overcome this issues, the management of quality of food, their personal hygiene, kitchen utensils and canteen environment and to the college students have to be more careful to choose the food to consume and the students have to see carefully about the hygiene of canteen facilities, food handlers, food processing and the environment so the quality of food will not cause the foodborne disease or *E. coli* contamination disease.

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