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Bacterial Contamination that Causes Food Poisoning in Fruit Salads in Banjarbaru Indonesia

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Abstract: Fruit salad is one food combination that often causes food poisoning because it contains cheese and milk. This study aims to analyze the bacterial contamination that causes food poisoning in fruit salads sold in Banjarbaru, Indonesia, and the factors that play a role in such pollution. Food poisoning from fruit salad can be anticipated by knowing bacterial contamination and the factors that play a role in it. This study uses an observational method with a cross-sectional design. The sample in this study was fruit salads from 18 different producers sold in Banjarbaru, Indonesia. Fruit salad with criteria containing fruit, cheese, and mayonnaise. The bacteria that caused food poisoning to find in the fruit salad, namely *Staphylococcus aureus*, and *Bacillus cereus*. In conclusion, his research found the contamination of bacteria that cause food poisoning in Fruit Salad in Banjarbaru City with a percentage of 22 percent. The types of bacteria are *Staphylococcus aureus* (11 percent) and *Bacillus cereus* (11 percent). It recommends that salad sellers wash their hands before processing, use running water to wash fruit, and use secure salad packaging.
Keywords: Bacteria that cause food poisoning; *Staphylococcus aureus*; *Escherichia coli*; fruit salad

INTRODUCTION

Salad is one of the food combinations often involved in food poisoning because it contains cheese and milk. It is one of the food additives that is vulnerable to pathogenic bacterial contamination[1]. Microorganisms can contaminate food by causing chemical changes that make the food not edible or even poisonous[2]. Food poisoning is acute gastroenteritis due to consuming food contaminated with live bacteria or toxins produced by bacteria in food[3].

Based on reports from the Food and Drug Control Agency (BPOM) that since 2010-2017 there were 48,824 cases of poisoning, poisoning, the most common cause of food poisoning was household cooking with an incidence of (46.9%), food service with as many events (18.9%) and snacks with a frequency of (18.3%). According to Arisman (2009), one of the bacteria that can cause food poisoning is one of the bacteria *Bacillus cereus*[4], because this bacterium can contaminate food starting from bacterial spores that have settled and lived on the ground for years, becoming airborne contaminants[5] then carried by the wind and attached to the wind food that is not maintained hygienic so that

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contamination occurs. Foods that can be contaminated include children's snacks[6], rice[7,8], honey[9].

Bacillus cereus bacteria can cause food poisoning when consuming foods that contain enterotoxins produced by *Bacillus cereus* bacteria. Endospores of *Bacillus cereus* usually cause the presence of enterotoxins in food. Endospores can then sporulate and develop to form toxins[10].

Bacillus cereus produces extracellular enzymes that can hydrolyze proteins, fats, starches, and carbohydrates. Types of food vulnerable to contamination with *Bacillus cereus* include meat, milk, vegetables, and fish. Cases of food poisoning due to *Bacillus cereus* with symptoms of vomiting caused by food products made from rice, foods that contain starch, potatoes, and cheese.

Another bacterium that can cause food poisoning is *Staphylococcus aureus*. Research conducted by Sundus Saifullah et al. (2018) fresh ready-made salads sold on the local market in Quetta in Pakistan. Of the 100 samples tested, 54 were positive for *Staphylococcus aureus*[11]. Research by Daniel Sergelidis, et al. (2012) Fast food salad food in Northern Greece, positively contaminated by *Staphylococcus aureus*[12].

Fruit salads sold in Banjarbaru, Indonesia, are generally stored at room temperature by the producers; these features increase bacterial growth, especially *Staphylococcus aureus*. If the number of *Staphylococcus aureus* bacteria reaches 1×105 CFU/gram or more, it will cause enterotoxins in food products[13]. Enterotoxins are enzymes that can survive in hot conditions and are resistant to alkaline conditions in the intestine that can cause food poisoning[14].

There have been studies of bacterial contamination that causes food poisoning in Pakistan[11]. Still, salads sold in the city of Banjarbaru have not known the presence of bacterial contamination. This study aims to determine the bacterial contamination that causes food poisoning in fruit salads sold in the city of Banjarbaru, Indonesia, along with the factors that play a role in bacterial contamination.

MATERIALS AND METHODS

This research uses an observation method with a Cross-Sectional design. In this study, the sample was fruit salads from 18 different producers sold in Banjarbaru, namely fruit salads with the criteria of containing fruit, cheese, and mayonnaise. This research conduct at the Bacteriology Laboratory of Health Analyst Health Polytechnic of the Banjarmasin Ministry of Health in January 2020. This study approves by Health Research Ethics Committee Poltekkes Kemenkes Banjarmasin.

Research using media: Mannitol Salt Agar (Merck), Trypticase Soy Broth (Merck), Dnase (Merck), Muller Hinton (Merck), Blood Agar Plate (Merck), confectionery media: glucose, lactose, maltose, mannitol, saccharose (Merck), SIM (Merck), Simon citrate agar (Merck), TSIA media (Merck), Vp / Mr (Merck) media.

Examining *Staphylococcus aureus* by selecting the colonies on MSA selective media, Gram staining, DNase test, Novobiosin sensitivity test, and coagulase test with plasma citrate. *Bacillus cereus* examination carried out by planting on Blood Agar Plate media, Gram staining, Spores, Test sugar, Indol Test, Vp/MR Test.

RESULTS AND DISCUSSION

The study results (Table 1) showed 4 (22%) contaminants of bacteria that cause food poisoning in fruit salads sold in the Banjarbaru area. The bacteria are *Staphylococcus aureus*: 2 (11%) and *Bacillus cereus*: 2 (11%).

Table 1. Results of Laboratory Tests of Bacteria That Cause Food Poisoning in Fruit Salads

Bacteria that Cause Food Poisoning			Other Bacteria	
	Frequency (n=18)	Persentage (%)	Frequency (n=18)	Persentage (%)
S. aureus	2	11	-	-
B. cereus	2	11	-	-
Total	4	22	14	78

Table 2. Questionnaire Results and Observation of Factors Causing Bacterial Contamination in Fruit Salads

Causative Factor	Bacterial Contamination that Causes Food Poisoning			
	Positive	Persentage (%)	Negative	Persentage (%)
Habits of Sellers Washing Tools				
Yes	4	22	14	78
No	0	0	0	0
Wash Your Hands Before Processing Salad				
Yes	2	11	12	67
No	2	11	2	11
Use of Assistive Devices (gloves / spoon)				
Yes	4	22	14	78
No	0	0	0	0
Use of Running Water to Wash Fruit				
Yes	1	5,5	16	89
No	1	5,5	0	0
Use of Closed Packaging				
Yes	3	16,5	14	78
No	1	5,5	0	0
The Fruit Salad Seller's Place is Near the Highway				
Yes	3	16,5	4	22
No	1	5,5	10	56

The results of the questionnaire on the fruit salad seller (table 2) showed that all the vendors had washed the equipment to make fruit salad while washing their hands before processing the fruit salad there were still four people who did not do that, and 2 of them were fruit salad sellers who contaminated with bacteria that cause food poisoning. All salad sellers have used tools to process fruit salad with gloves or spoons, but the use of secure packaging not make by one seller whose salad products contaminate with bacteria that cause food poisoning. Observation Results Fruit Salad was selling places adjacent to the highway found in 7 sellers with the results examined bacteria that cause positive food poisoning in 3 sellers.

Based on the results of the questionnaire in Table 2. Four Fruit Salad sellers did not wash their hands before processing the Fruit Salad. This result could be a possibility for a bacterial contaminated Fruit Salad. Research on *Staphylococcus aureus* before and after washing hands with antiseptic soap found *Staphylococcus aureus* in 1 of 6 samples examined[15]. Personal hygiene is essential because it is one of the factors in the presentation of food and drinks that must meet the requirements such as health and hygiene of the seller, do not suffer from a disease, and not the carrier of a disease. According to Purnawijayanti (2001), a food handler recommended carrying out healthy behaviors related to food handling, one of which is to wash their hands diligently before work because the sides can be an intermediary media for transmission of infectious and skin diseases[16].

Based on table 2. it is found that the behavior of the Fruit Salad seller who is washing does not use running water. This result is a possibility where the bacteria in the fruit salad processing equipment that do not pass clean move to contaminate the processed Fruit Salad. Research on Germ counts in several washing tableware methods shows that tableware washed with running water and soap has met the health standard requirements according to the RI Ministry of Health 2004 based on the Republic of Indonesia Minister of Health Regulation. No 1204/Menkes/SK/X/2004, which is less than 100 colonies/cm2[17].

Based on the questionnaire results in Table 2, it found that the behavior of one Fruit Salad seller does not use a lid on the Fruit Salad when selling. 7 Fruit Salad sellers are trading near the highway, increasing the risk of bacterial contaminated Fruit Salad. *Staphylococcus aureus* is a bacterium that is everywhere, such as air, dust, wastewater, water, milk, drinks[18], food, rice[7] and eating utensils, environment, human body, diabetic wound[19], nose[20,21] and respiratory tract. *Bacillus cereus* can contaminate food starting from bacterial spores that persist and live on the ground for years and then carried by the wind and stick to less hygienic foods to maintain contamination. Fruit Salad sellers who do not use the lid on the Fruit Salad and sell close to the highway are very at high risk of contaminating the Fruit Salad with bacteria that cause food poisoning. Contact between food and dust, dirt, and various types of microorganisms present in the air can increase the risk of contamination.

Widodo Suwito (2010) research on bacteria that often contaminate milk, bacteria that infect fluid found, namely, pathogenic bacteria and decomposing bacteria, is the bacterium *Bacillus cereus*. Milk is a highly nutritious food ingredient containing protein, glucose, lipids, mineral salts, and vitamins with a pH of 6.8, causing microorganisms to multiply in milk and produce milk contaminated with bacteria. Bacterial contamination of milk begins during the milking process until consumption[22].

Bacteria that contaminate food can cause food poisoning that is harmful to the body. Salad is one of the food combinations that often causes food poisoning because it contains cheese and milk because, according to BPOM (2012), cheese is one of the food additives that are susceptible to contamination of pathogenic bacteria.

The limitation of this study is that the sample used is still tiny, and no calculation makes of the number of bacteria that cause food poisoning in each sample. So there is a possibility that the number of bacteria is still tiny and can not produce food poisoning because the dose is still small.

CONCLUSION

Found the bacteria contamination that caused food poisoning in Fruit Salad in Banjarbaru City with a 22% percentage. The types of bacteria are *Staphylococcus aureus* (11%) and *Bacillus cereus* (11%). Factors causing bacterial contamination that cause food poisoning from the results of the questionnaire/observation are the seller's habits of washing hands before processing, the use of running water to remove the fruit, the use of closed containers, a place to sell on the side of the highway. Therefore, sellers must pay more attention to the cleanliness of food sold during processing and when serving and personal hygiene, so bacteria or other microorganisms do not easily pollute that food.

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CONFLICT OF INTEREST

The authors declare no conflict of interest and have not received any funds for this study.

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