

IDENTIFICATION OF COLIFORM BACTERIA IN SAMBAL IN FOOD STALLS AROUND GORONTALO CITY SNACK MARKET

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ABSTRACT

Unsafe food will be the cause of health problems in the community. Chili sauce is a sauce based on chili that is crushed until the water content comes out so that it appears spicy. Chili sauce is processed in a simple way so that it can trigger contamination of microorganisms, one of which is coliform bacterial contamination.

This research aims to look at the contamination of coliform bacteria in Chili sauce offered to eat around the snack market of Gorontalo City. This research is a descriptive study with a qualitative approach and examination of Coliform bacteria using the Most Probable Number (MPN) method. The population in this study was 14 samples with Accidental Sampling techniques. Coliform bacterial test results showed that in Chili sauce samples found positive results contaminated with Coliform bacteria, namely 11 samples with a percentage of 78.6% and negative results as many as 3 samples with a percentage of 21.4%. Based on the results can be concluded that a positive result was found 1 sample from the fecal coliform bacterial group in this case suspected *Escherchia coli* bacteria and 10 samples from the nonfectual coliform bacterial group.

Keywords: sambal, coliform bacteria, food stalls

INTRODUCTION

Food Stalls is a place that sells food and drinks. Food stalls are located in a public environment. A food stall is a building that closes with equipment used for the manufacturing and sale or presentation of food and beverages to the public, where the process of making and selling or serving food is intended for the general public and the way it is presented at a certain time [8].

The quality and safety of the food provided in the food stall must be maintained because every food processing process contains potential contamination that needs to be controlled to ensure the safety of food consumed, therefore it is necessary personal hygiene in food

marketers in accordance with its existence then food stalls should be able to provide services or provide food and drink needs to good food stall consumers will be able to cause comfort to consumers so that it can also be profitable for food stalls [5].

The requirements are stated in the Decree of the Minister of Health of the Republic of Indonesia No. 715/Menkes/SK/V/2003 on Jasaboga Sanitary Hygiene Requirements covering the location, buildings and facilities of disposal and management of construction waste, floors, walls. lighting of treatment plants and clean water sources. Factors to note in order to be able to organize effective food sanitation are food factors, human factors, and equipment factors.

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Food is a source of human energy in order to be active. Food that is well consumed is a healthy and safe food. Food is one of the three basic sources of need for human life in addition to food and food. Sandang and food are a basic human necessity because they are useful for providing protection for each other [6].

Bacterial contamination of food indicates the risk of various food-borne diseases that are harmful to public health and should be sought solutions. Many studies state that *Escherichia coli* causes diarrhea. There are now 4 groups of *Escherichia coli* that can cause diarrhea, namely ETEC, EPEC, EIEC, and EHEC. Humans can be exposed to these bacteria when consuming food or drink that has been contaminated by faeces from the livestock. *Escherichia coli* is dangerous because it produces toxins commonly known as shiga toxins that can penetrate the intestines and interfere with the function of other organs. Food Safety needs to be considered in order to improve the degree of health and avoid the degree of disease [12].

Foodborne disease is a common public health problem. Around the world there are millions of people due to foodborne diseases. Each year, there are approximately 1,500 million cases of diarrhea and an estimated 70% of cases of diarrhea disease occur due to contaminated food. One of the bacteria that can cause foodborne disease is coliform bacteria that can have an impact on diarrhea disease [12].

Diarrhea disease is still a public health problem in developing countries such as in Indonesia. The target coverage for people with diarrhoea of all ages (SU) who come to health care is 10% of the estimated number of people with Diarrhea SU (Incidence of Diarrhea SU multiplied by the number of residents in one working area within one year). In 2017 the number of people with SU diarrhea served in

health facilities was 4,274,790 sufferers and there was an increase in 2018 to 4,504,524 sufferers or 62.93% of the estimated diarrhea in health facilities. The incidence of diarrhea of all ages nationally is 270/1,000 inhabitants [9].

Prevalence of diarrhea in Indonesia in 2017 the number of people with diarrhea of all ages (SU) served in health facilities as many as 4,274,790 sufferers, and there was an increase in 2018 to 4,504,524 sufferers or 62.93% of the estimated diarrhea in health facilities. The incidence of diarrhea of all ages nationwide is 270/1,000 inhabitants. The Central Bureau of Statistics of Gorontalo Province (2018) also recorded 22,117 cases of diarrhea and in Gorontalo City there were 3,189 cases. This diarrhea is caused by contamination of microbial agents, namely coliform bacteria in food consumed [7].

Coliform bacterial contamination due to lack of hygiene and sanitation in food such as Chili sauce processing. Chili sauce is a companion food that is part of the eating culture known to Indonesians from Sabang to Merauke. Chili sauce can be served in conjunction with other foods as flavorings. Each region has different Chili sauce recipes that are often added with local plants known in the area. Chili sauce is often added with famous foodstuffs in certain areas. This is what makes Chili sauce have a distinctive taste in each region [14].

The addition of chili sauce as a companion food is able to invite appetite and reduce the taste of blandness in food. Chili sauce is a product that has been very well known by the public because it is able to accompany almost all kinds of processed foods. The high level of Chili sauce consumption makes consumers want to consume it in a practical form. This makes Chili sauce often used as a business opportunity in the form of instant Chili sauce [11].

Inappropriate processing practices can be seen from hiegene food cookers, sanitary equipment and foodstatives used, as well as the location of selling will also affect the quality of the chili sauce [15].

Food commonly sold in food stalls around Gorontalo city is usually served with additional chili sauce. Chili sauce is a sauce based on chili that is crushed until the water content comes out so that it appears spicy. There are various variations of Chili sauce. Each variety demands a variety of ingredients and condiments as well. Although the simple process of making chili sauce can't be taken lightly. All seasonings, ingredients, and ways of making them should be properly considered. That resulted in a delicious spicy taste [13].

The fact in the field is found that the people of Gorontalo love food that has a spicy taste, without thinking about the quality of the Chili sauce itself. In the process of making Chili sauce is made simply. In addition to the simple way of making it, the Chili sauce in this food stall has also been served on the dining table, so these people do not know if this Chili sauce has good quality or not.

From unknown quality and simple way of making it can certainly be one of the factors of declining public health level when consuming Chili sauce that is easily polluted by various types of micro organisms such as coliform bacteria [13].

Based on Indonesian National Standard (SNI) No. 12-7388-2009 recommends the maximum limit of coliform bacterial contamination in Chili sauce with the most likely number (APM) coliform which is $< 3/g$. Based on SNI 7388-2009 about the maximum microbial limit on chili sauce for MPN Coliform 100/ml. And Regulation of the Head of the Food and Drug Control Board of the Republic of Indonesia Number HK.00.06.1.52.4011. About the maximum limit of microbial and chemical

contamination in food with APM Coliform maximum 100/g.

Based on that background, researchers are interested in conducting research with the title of identification of coliform bacteria in Chili sauce in restaurants around gorontalo city snack market.

RESEARCH METHODS

The type of research used is descriptive observative with a qualitative approach, i.e. researchers observe directly the objects to be studied, then described descriptively to know the or not of coliform bacteria in Chili sauce in food stalls around the city's snack market Gorontalo. The number of samples as many as 14 Chili sauce samples taken by accidental sampling method.

Coliform bacteria identification data is obtained through testing in the microbiology laboratory of Universitas Bina Mandiri Gorontalo using mpn method (Most Probable Number) series 3 tubes. Isolation stage and identification stage using 3 stages of testing namely, identification test using Lactose Broth media (LB), second stage booster test using Eosin Methylen Blue Agar (EMBA) media, and third stage complementary test by performing gram coloring technique. On identification tests and booster tests for recent results use positive and negative categories.

The positive category if the results of the test are proven to contain Coliform bacteria by evidenced from the identification test results using lactose broth media (LB) shows the appearance of noise and gas formation, and in the booster test showed bacterial growth in the media Eosin Methylen Blue Agar (EMBA) with characteristics of metallic green colonies for coliform bacteria fecal group and colonies with pink and transparent color with mucus for non-fecal coliform bacteria. For the results of gram coloring examined in the microscope at 1000x magnification

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produces rod-shaped bacteria and is gram negative characterized by the result of red gram coloring. This corresponds to the morphological characteristics of *Escherchia coli* bacteria and *Enterobacter aerogenes*. The negative category if the test results are not proven to contain Coliform bacteria in accordance with the test results in the laboratory using the Most Probable Number (MPN) method with Lactose Broth (LB) and Eosin Methylen Blue Agar (EMBA) media.

The data analysis was conducted by comparing the results of coliform bacteria identification testing on Chili sauce presented in table form and described based on SNI 7388-2009 about the maximum microbial limit on chili sauce for MPN Coliform 100/ml. And Regulation of the Head of the Food and Drug Control Board of the Republic of Indonesia Number HK.00.06.1.52.4011. About the maximum limit of microbial and chemical contamination in food with APM Coliform maximum 100/g.

RESEARCH RESULTS

Microbiology tests on sambal conducted in the Microbiology Laboratory of Universitas Bina Mandiri Gorontalo obtained the following results:

Coliform Bacteria Guessing Test On Lactose Broth Media (LB)

Based on the research that has been done, the results and observations of the guessing test using lactose broth media (LB) by looking at the absence of coliform bacteria characterized by the onion of noise and the formation of gas in the media are presented in the following table:

Table 1.

Coliform Bacteria Guessing Test Results In Lactose Broth Media (LB)

Sample Code	Guessing Test		MPN value
	(+)	(-)	

Sample 1	✓	43
Sample 2		-
Sample 3	✓	150
Sample 4	✓	>2,400
Sample 5	✓	>2,400
Sample 6	✓	>2,400
Sample 7		-
Sample 8	✓	4
Sample 9		-
Sample 10	✓	15
Sample 11	✓	>2,400
Sample 12	✓	>2,400
Sample 13	✓	>2,400
Sample 14	✓	>2,400

Source: Primary Data 202

The results of coliform bacterial examination in Chili sauce samples at food stalls around gorontalo city snack market in lactose broth media showed that there were 11 positive samples with a percentage of 78.6% of the 14 samples. The growth of bacteria in the media lactose broth (LB) characterized by the formation of gas and the formation of noise, and 3 negative samples with a presentase value of 21.4%. Preliminary analysis results on coliform guessing test were found positive results in a sample of 1 mpn 43/ml, 3-digit MPN 150/ml sample, sample 4, 5, 6, 11, 12, 13, 14 MPN number >2,400/ml, MPN number sample 8 4/ml and sample 10 MPN 15/ml number characterized by gas formation in durham tubes and discoloration or noise in media lactose broth (LB).

Coliform Bacterial Booster Test On Eosin Methylen Blue Agar (EMBA) Media

Based on the research that has been done, the results of coliform bacterial booster test on Chili sauce using Eosin Methylen Blue Agar (EMBA) media are presented in the following table:

Table 2.

Coliform Bacteria Booster Test Results in Eosin Methylen Blue Agar (EMBA) Media

Colony Colors	Sample Count	Percentage
Metallic Green	1	9 %
Pink	10	91 %
Total	11	100 %

Source: Primary Data 2020

The result of bacterial growth in the media Eosin Methylen Blue Agar (EMBA) was found 1 sample that had a metallic green colony with a percentage of 9% which is the characteristic colony of fecal Coliform bacteria in this case suspected to be Escherichia coli bacteria and 10 other samples had pink and transparent colonies with mucus which is a colony of nonfekal Coliform bacteria in this case suspected enterobacter aerogenes bacteria.

Coliform Bacteria Supplement Test On Gram Staining

Based on the research that has been done the results of coliform bacterial complementary tests on gram staining are presented in the following table:

Table 3.

Coliform Bacteria Supplement Test Results on Gram Staining

Complementary Test	Appearance on 1,000x Magnification Microscope
Cell Shape	Stem
Nature	Gram Negative

Source: Primary Data 2020

The results of the gram coloring test on the sample examined in the microscope at 1000x magnification resulted in stem-shaped bacteria and gram-negative

characterized by red gram coloring results. This corresponds to the morphological characteristics of bacteria Escherchia coli and Enterobacter aerogenes.

DISCUSSION

Chili sauce is a sauce of chilli base that resembles porridge and is usually added to other ingredients such as salt, shallots and garlic. Chili sauce has a taste that varies according to the level of sasan. Chili sauce in its manufacture is still quite simple so that it can allow the onion of pollution in food^[14].

Coliform is a group of stem-shaped gram-negative bacteria that generally produce gas if bred in lactose medium. The presence of Coliform in food indicates that it was once contaminated by stools and it is likely that it contained Escherchia coli, however, these results are not an absolute result because non-pathogenic bacteria and not from the gut can also lead to positive Coliform test results^[13].

Pollution in food is the entry of unwanted foreign objects/materials contained in a food. Broadly, food contamination is divided into four types, namely mechanical contamination, biology, chemistry, and microbiological contamination. This microbiological contamination is one of which is that there are coliform bacteria in food that can cause health problems in humans^[10].

Coliform is a bacterium used as an indicator of human or animal feces pollution and shows poor sanitation of food and drink. The arrival of enteropathogenic or toxic microbes that are harmful to health. Coliform bacteria are used as indicators of organisms because they are easy to find in a simple way. The absence of Coliform in food and drink indicates that the food and drink is contaminated with bacteria and is the cause of the health disorder diarrhoea^[15].

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Based on the results of research that has been done on Chili sauce samples in the food market around Gorontalo city snack market conducted in the Microbiology Laboratory of Bina Mandiri Gorontalo University, from the results of the examination in the guessing test showed that from the 14 samples examined there were 11 samples with a percentage of 78.6% tainted with Coliform bacteria. In the results obtained there are 8 samples that have mpn coliform value $>100/\text{ml}$ which proves that the Chili sauce sample does not meet the requirements specified by SNI. Based on SNI 7388-2009 about the maximum microbial limit on chili sauce for MPN Coliform 100/ml.

Coliform consists of 2 groups namely fecal coliform group and nonfecal coliform. In the test of 11 positive samples and implanted suspension in emba media aseptic using inoculation needles obtained the results of 1 sample that had a greenish-red colony with metallic lightning was a colony of fecal Coliform bacteria in this case suspected *Escherichia coli* bacteria and 10 other samples had pink and transparent colonies with mucus being colonies of nonfecal Coliform bacteria.

Fecal coliform bacteria are bacteria derived from human and animal excrement. From the results found is a group of fecal coliform bacteria that contaminate Chili sauce suspected to be *Escherichia coli* bacteria. This is evidenced by the growth of bacteria in petri dishes resulting in a metallic green colony. The metallic green colony indicates that the pH in the lactose fermentor is quite low, while the pink colony indicates that the lack of acidity and enzymatic containing of gelatin is a source of nitrogen. Non-fecal Coliform bacteria are bacteria derived from dead animals/plants. Coliform testing if it shows positive coliform results in food or

drink means it is possible that the food or drink contains *Escherichia coli*^[15].

Coliform bacterial pollution in Chili sauce can occur due to various factors, namely, unhygienic equipment, processing process, as well as raw materials and environmental sanitation. The market conditions of Gorontalo city are located near each other and are on the roadside, which can potentially be polluted by pollution and dust. Coliform bacteria in food indicate the arrival of toxic microbes that are harmful to health. The higher the level of coliform bacterial contamination, the higher the risk of the presence of other pathogenic bacteria, the presence of other pathogenic bacteria, the presence of coliform is indicative of inadequate process or sanitation conditions^[10].

Most of the samples were positively contaminated with coliform bacteria due to the poorly maintained condition of food stalls and there were many flies around the stalls. Insects that become vectors of the spread of disease-causing bacteria such as *Escherichia coli* (causing diarrhea) one of them is flies. Food stalls that are the site of some research are adjacent to trash cans that can affect or can be a source of contamination^[11].

Contamination in chili sauce can occur not only from environmental factors or insects that become vectors of bacterial carriers but can also occur due to sellers who in the presentation of food do not wash their hands using soap first. Dirty or contaminated hands can be an intermediary for the transfer of bacteria or other microorganisms into the food served. Sellers who do not wash their hands using soap first can cause the possibility of bacteria in their hands and contaminate the chili sauce^[12].

Hand washing is an important thing that workers should do if they are involved in food handling. Although it appears to be a mild and often trivial

activity, it has proven to be quite effective in preventing contamination of food. Shop owners and workers usually only wash their hands using water, some even use laundry water and only clean that is visible to the eyes. This is in line with previous research suggesting that what can affect food and beverage contamination by bacteria is the cleanliness of the seller, the poor hygienic practices of merchants and the poor behavior and knowledge of the learner^[11].

Food ers in the snack market do not pay attention to hygiene and sanitation when processing food, which is in accordance with the Decree of the Minister of Health of the Republic of Indonesia No. 1096/Menkes/PER/VI/20-11. This is due to a lack of knowledge from the seller about the hygiene requirements of the behavior of the learner when processing food. Personal hygiene when processing food is necessary to produce food that avoids the fatal effects of food poisoning and avoids coliform bacterial contamination.

As for some ways that can be done to prevent the contamination of Coliform bacteria, namely to maintain environmental hygiene, not mix food waste with raw food ingredients, cook chili sauce until completely cooked, and in its presentation the seller is expected to always wash hands first.

In addition there are several other ways to prevent contamination of E.coli bacteria in food, namely, Wash hands before and after preparing food and before meals, wash fruits and vegetables clean, avoid cross contamination by using clean appliances, pans, and serving plates, keep raw meat away from other foods and from other clean goods, only drink pasteurized dairy products (avoid raw milk, do not prepare food if you are attacked with diarrhea, and ensure that all meat is cooked properly and cooked

CONCLUSION

Based on the results of research that has been conducted on chili sauce at food stalls around gorontalo city snack market from all samples there are 11 positive samples with a percentage of 78.6% containing coliform bacteria and 3 negative samples with a percentage value of 21.4%. A positive result was found in one sample of fecal Coliform bacteria suspected to be Escherchia colibacteria, and 10 samples were suspected of nonfectual Coliform bacteria.

REFERENCE

- [1] Adi, Febri Prasetyo. 2017. Undercover Science: Understanding what Science Hides in Other Ways. Yogyakarta: Diandra Kreatif.
- [2] Arisman. 2012. Nutrition in Life Cycle. EGC. Jakarta : 193-195.
- [3] Arnia., Citizen, Efrida. 2013. Identification of Coliform Bacterial Contamination In Fresh Beef Sold In Markets Around Bandar Lampung City. MAJORITY (Medical Journal of Lampung University). ISSN 2337-3776.
- [4] Central Bureau of Statistics. 2018. Number of Cases of HIV/AIDS, STI, DBD, Diarrhea, TB, and Malaria by District/City. Gorontalo: BPS.
- [5] Chandra , 2012. Introduction to Environmental Health. Jakarta: EGC Medical Book Publisher.
- [6] Ministry of Health. 2010. Indonesia Health Profile. Jakarta, Indonesia.
- [7] Depkes RI. 2015. Profil Kesehatan Indonesia. Jakarta.
- [8] KBBI, Kamus Besar Bahasa Indonesia. Arti Kata Warung Makan/Kantin. <http://kbbi.web.id/kantin>. Diakses Pada Tanggal 06 November 2020.
- [9] Kemenkes. Profil Kesehatan Indonesia. Jakarta: Kementrian Kesehatan Republik Indonesi. 2018.

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Snack Market*

- [10] Kuswiyanto. 2015. Bakteriologi 1 (Buku Ajar Analisis Kesehatan). Jakarta: ECG.
- [11] Mega Mirawati, dkk. 2014. Salmonella pada Jajanan yang Dijual di Warung dan Luar Warung Sekolah Dasar. Jurnal Ilmu dan Teknologi Kesehatan. Vol. 1 No. 2. 2014. Hal 145.
- [12] Saadah Putri Farida. 2017. Analisis Bakteri Coliform Dalam Es Batu Dari Berbagai Kantin Di Universitas Islam Negeri Raden Intan Lampung. Karya Tulis Ilmiah. Jurusan Pendidikan Biologi, Fakultas Tarbiyah dan Keguruan, Universitas Islam Negeri Raden Intan. Lampung.
- [13] Septiana, Rini dkk, 2015. Analisis Cemaran Bakteri Coliform Pada Saus Tomat Yang Dijual Di Wilayah Banjarmasin Utara Dengan Metode Most Probable Number (MPN). Tangerang: Akademi Farmasi ISFI.
- [14] Sutomo, Budi. (2014). Chili sauce & Saus. Jakarta: PT Kawan Pustaka.
- [15] Wardani, Devi Listiana dan Setianingrum Zulia. 2019. Identifikasi Bakteri Escherichia Coli Pada Saus Makanan Jajanan Di Sekitaran Kampus Universitas Muhammadiyah Surakarta. Jurnal Kesehatan. 12 (2) 2019, 91-101.