

Consumer awareness and the presence of coliform bacteria in sweet sauce used by the street food vendors

*Jasten Keneth D. Trecene, MIT

Engineering Department
Eastern Visayas State University – Tanauan Campus
Leyte, Philippines
jastentrecene5@gmail.com

Ma. Veronica Wenn Carmela A. Zabala

Engineering Department
Eastern Visayas State University – Tacloban Campus
Tacloban, Philippines

Shiela Mae M. Estonilo

Science, Technology, Engineering & Mathematics (STEM) Department
AMA Computer College - Tacloban
Tacloban City, Philippines

Abstract—People are not aware on the level of coliform bacteria present in sweet sauce used by the street food vendors and if it is in the safe level on the human body. The purpose of the study is to determine the amount of coliform bacteria present in the sweet sauce and to provide awareness to the consumers who are fond of eating street foods. A couple of sweet sauce sample was gathered among the street food vendors in downtown area of Tacloban City, Philippines. The researchers commissioned a laboratory test at the Department of Science and Technology – Region 8 to test the presence of the bacteria in the sample. Additional information was given by certified Medical Technologists on the risks of contamination of Coliform bacteria. The test sufficiently proves that the Coliform Bacteria are present in both sweet sauce samples. However, the result of the tested specimens was lesser than three point zero MPN/mL (<3.0 MPN/mL) this means that the presence of the bacteria in the sweet sauce are in the safe level.

Keywords - Coliform Bacteria, Sweet Sauce, Street foods, coliform bacteria awareness, consumer awareness

I. INTRODUCTION

Coliforms can be found in the aquatic environment, in soil and on vegetation; they are universally present in large numbers in the feces of warm-blooded animals. It is common in soil and surface water, may even occur on skin and mostly found in well water. It comes from the contaminated water and could be present in sweet sauce used by the street food vendors, because the process of making this sauce requires water.

Sauce is a worldwide tradition not only for street foods but also from international cultures too. The idea of dipping and dunking food in liquid for added flavor and moisture can provide problems. Nowadays, local authorities, international organizations and consumer associations are increasingly aware of the socio-economic importance of street foods but also of their associated risks. The major concerns are sanitation problems (waste accumulation in the streets and the congestion of waste water drains), traffic congestion in the city also for pedestrians (occupation of sidewalks by street vendors and traffic accidents) and especially the health hazards that affect the consumers. (FAO of United Nations, 2013).

Street food is more than just a convenient food source in the Philippines, it is an integral part of the landscape and culture. Filipinos are known to enjoy the average three meals a day plus snacks. They race to the streets to satisfy their hunger for their favorite street foods for a few penny. The types of foods sold in the street and certainly are favorites and are found in almost every place in the Philippines include “*kwek-kwek*” (made of quail eggs covered in orange dough and deep fried), “*isaw*” (chicken intestine put on a stick and grilled), “fish balls” (minced fish rolled into balls), “*balut*” (pre-hatched duck egg), “*Betamax*” (a cubed, curdled blood of a chicken), “*adidas*” (the marinated grilled chicken’s feet), “*atay*” (marinated and barbequed liver of chicken), and “*helmet*” (the grilled head of a chicken) [6]. These are the available street food that are dipped in variety of sauces mainly, sweet, spicy, and sour.

Dipping street food in a bowl of sauce is one way of transferring the sauce to the food. Gradual or double dipping in the sauces may cause food-illness from different causes. Direct double dipping can directly transfer saliva – there are different mouth bacteria that can be transferred in the sauce through direct dipping, species such as *Streptococcus*, *Prevotella*, and *Veillonella*. *Streptococcus* species causes strep throat, skin disease and nausea which leads stomach to vomiting [1].

Total coliform bacteria are defined as aerobic or facultative anaerobic, Gram negative, non-spore forming, rod shaped bacteria, which ferments lactose and produce gas at 35°C [4]. Total coliforms include bacteria of known faecal origin such as *E. coli* as well as bacteria that may not be of faecal origin such as *Klebsiella spp*, *Citrobacter spp*, *Serratia spp* and *Enterobacter spp* which are found in nutrient rich water, soil decaying vegetation and drinking water with relatively high levels of nutrients [7].

Thus, this study determined the presence of coliform bacteria in sweet sauce used by the street food vendors in Tacloban City, Philippines and to provide awareness on the harmful effects of the bacteria in the body.

Specifically, it sought answers to the following questions:

1. Is coliform bacteria present in the sweet sauce of street foods?
2. Is the amount of coliform bacteria present in sweet sauce critical to the health of consumers?
3. How harmful is coliform bacteria to the human body?
4. What are the possible diseases can a person get caused by the bacteria?

II. MATERIALS AND METHODS

A. Research Procedures

Sweet sauce samples were collected from the ambulant vendors around in Downtown Area (Salazar Street and Del Pilar Street). Sample sauces were gathered late afternoon at 5:00 o'clock P.M. considering that lots of people buy street foods during that time and the sauce were already used since morning. The vendors were informed that their sauce will be used in the study and the researchers will get a sample of their sauce. A weight of approximately 100 grams was collected in each sauce for the analysis.

In addition, three (3) random medical technologist were chosen as participants of the study to discuss the effects of coliform bacteria in the human body.

The study was conducted in Tacloban City, Philippines particularly those small food stalls frequently visited by consumers. Food stall 1 is located at Salazar Street, and Food Stall 2 is located at Del Pilar Street beside 578 mall. The microbial analysis to determine the amount of coliform bacteria present in sweet sauce was conducted at Regional Standards and Testing Laboratories of the Department of Science and Technology Region 8 (DOST-RO8). Moreover, LTB Tubes, Test Tubes, Biosafety Cabinet, Autoclave, Covered Water bath with Circulating System, Incubator, Drying Oven, Balance, Hot Plate Stirrer, pH Meter, Vortex mixer, has been used to test the samples.

B. Ethical Consideration

The researchers did not include the names of the vendors, pictures (food stalls) and the oil used for cooking. This study will not also include the population of consumers, hygiene practices and health status of the street vendors and the ways that they sanitize the containers used for storing the vended sauce because the study is not liable to this since its focus on the coliform bacteria.

III. RESULTS AND DISCUSSIONS

TABLE I. SAMPLE ANALYSIS

Analysis of the Samples			
<i>Sample Number</i>	<i>Sample Information</i>	<i>Parameter</i>	<i>Method</i>
MIC – 0116	Sample placed in LDPE bag at 193.06 grams labeled as Sweet Sauce Sample 1; produced on 21 March 2018/ 5:00 o'clock PM at Tacloban City.	Total Coliform (MPN) Count	Multiple – Tube Fermentation Technique
MIC - 0117	Sample placed in LDPE bag at 92.16 grams labeled as Sweet Sauce Sample 2; produced on 21 March 2018/ 5:00 o'clock PM at Tacloban City.	Total Coliform (MPN) Count	Multiple – Tube Fermentation Technique

Sample Analyses shows the Sample Number which are MIC – 0116 and MIC – 0117 for sweet sauce sample 1 and 2, Sample Information in sweet sauce sample 1 states that “Sample placed in LDPE bag at 193.06 grams labeled as Sweet Sauce Sample 1; produced on 21 March 2018/ 5:00 o'clock PM at Tacloban City” and sweet sauce sample 2 states that “Sample placed in LDPE bag at 92.16 grams labeled as Sweet Sauce Sample 2; produced on 21 March 2018/ 5:00 o'clock PM at Tacloban City”, the parameter that was used by the Microbiological Analyst was Total Coliform(MPN) Count and the method that has been used to test the Sweet Sauce Sample 1 and 2 is Multiple – Tube Fermentation Technique.

TABLE II. SWEET SAUCE SAMPLE 1

<i>Sample dilution/volume</i>	<i>Lauryl Tryptose Broth/ Lauryl Sulfate Broth</i>	
	<i>24hr</i>	<i>48hr</i>
10 ⁻¹	-	-
10 ⁻²	-	-
10 ⁻³	-	-
10 ⁻⁴	-	-
10 ⁻⁵	-	-
10 ⁻⁶	-	-
Controls		
(+) E. coli.	+	
(-) S. aureus	-	-
Dilution Water	-	-
Uninoculated Tubes/Blank	-	-
Biosafety/ Air Monitoring (Open Plate)	NO GROWTH	
Note: No need to conduct confirmatory test since presumptive test result was negative. LTB (Lauryl Tryptose Broth) LSB (Lauryl Sulfate Broth)		

Sweet Sauce Sample 1 shows the negative result of Coliform Bacteria in 24 hrs and in 48 hrs. There are six LTB/LSB (Lauryl Tryptose Broth) and (Lauryl Sulfate Broth) 10⁻¹ to 10⁻⁶ and each LTB/LSB has three sample tubes, if the first three tubes in 24 hours become negative, it will continue to incubate for 48 hours until it will be positive. To know the result if positive or negative, the positive tube has bubbles on the upper LTB tube while the negative has no bubbles on the LTB tube.

The E. Coli was positive, S. Aureus was negative, Dilution Water was negative, Uninoculated Tubes/Blank was negative and Biosafety/ Air Monitoring (Open Plate) has no growth of Coliform Bacteria in the result.

TABLE III. SWEET SAUCE SAMPLE 2

<i>Sample dilution/volume</i>	<i>Lauryl Tryptose Broth/ Lauryl Sulfate Broth</i>	
	<i>24hr</i>	<i>48hr</i>
10 ⁻¹	-	-
10 ⁻²	-	-
10 ⁻³	-	-
10 ⁻⁴	-	-
10 ⁻⁵	-	-
10 ⁻⁶	-	-
Controls		
(+) E. coli.	+	
(-) S. aureus	-	-
Dilution Water	-	-
Uninoculated Tubes/Blank	-	-
Biosafety/ Air Monitoring (Open Plate)	NO GROWTH	
Note: No need to conduct confirmatory test since presumptive test result was negative. LTB (Lauryl Tryptose Broth) LSB (Lauryl Sulfate Broth)		

Sweet Sauce Sample 2 shows the negative result of Coliform Bacteria in 24 hrs and in 48 hrs. There are six LTB/LSB (Lauryl Tryptose Broth) and (Lauryl Sulfate Broth) 10^{-1} to 10^{-6} and each LTB/LSB has three sample tubes, if the first three tubes in 24 hours become negative, it will continue to incubate for 48 hours until it will be positive. To know the result if positive or negative, the positive tube has bubbles on the upper LTB tube while the negative has no bubbles on the LTB tube.

The E. Coli was positive, S. Aureus was negative, Dilution Water was negative, Uninoculated Tubes/Blank was negative and Biosafety/ Air Monitoring (Open Plate) has no growth of Coliform Bacteria in the result.

TABLE IV. RESULTS OF ANALYSIS

Results of analysis				
Sample Number	Weight of the sample	Parameter	Method	Results
MIC-0116/Sweet Sauce 1	193.06g	Total Coliform (MPN) Count	Multiple-Tube Fermentation Technique	<3.0 MPN/mL
MIC-0116/Sweet Sauce 1	92.16g	Total Coliform (MPN) Count	Multiple-Tube Fermentation Technique	<3.0 MPN/mL

Note: MIC (Minimum Inhibitory Concentration), MPN(Most Probable Number), mL (Milliliter), g (Grams)

Results of Analyses shows the Sample Number, Weight of Sample, Parameter, Method and Results. The sample numbers of the sweet sauce samples that the researcher gave are (MIC-0116) and (MIC-0117), and the weight of the first sample is 193.06 g and 92.16 g on the second sample, the parameter they used for the both samples is Total Coliform (MPN) Count, because the research needs only the number of Coliform Bacteria in the sweet sauce samples, the method was Multiple –Tube Fermentation Technique. The result of the test using the method (Multiple –Tube Fermentation Technique) came up with only one result of the two samples are < 3.0 MPN/mL.

The four tables show the Sample Analyses, Sweet Sauce Sample 1, Sweet Sauce Sample 2 and the Results of Analyses. These tables were formulated through microbiology analysis. The <3.0 MPN/mL were the result of the presence of Coliform Bacteria in sweet sauce used by the street food vendors. The result of <3.0 MPN/mL is in the safe level and it is no need to proceed to confirmatory test since presumptive test result was negative and the Biosafety/ Air Monitoring (Open Plate) has no growth of Coliform Bacteria in the result.

According to the Medical Technologists, the Coliform Bacteria is an organism that can be found in soil on vegetation and in the intestinal tract of warm blooded animals. It includes a large group of many types of bacteria that, “indicator organisms” –indicate potential presence of disease - causing bacteria in water. Common symptoms of the said bacteria are fever, abdominal cramps, nausea, vomiting, and diarrhea. School children, elderly, malnourished and immune-compromised individuals are at the high risk of the said illness caused by the bacteria. Moreover, anywhere where there is no proper sanitation and poor observance of proper hygiene are places that the bacteria could penetrate. It can also be expected in broken water pipes contaminated with fecal dirt- either from human or animal stool. The best medication of this bacteria are – fluid support hydration and anti-bacteria /antibiotics and the Medical Technologists advised to drink boiled water and well cooked food and wash hand properly. Coliform Bacteria are very harmful and if it left unattended it can cause death.

IV. CONCLUSION

Based on the result of the study, the number of coliform bacteria present for the both samples are lesser than three point zero MPN/mL (<3.0MPN/mL). This result is in the safe level to the health of the consumers.

REFERENCES

- [1] Barcelon, E., Collado, D., Eustaquio, S., Luna, M., Santos, K., Sombrano, M., & Villaceran, D. (2015). Consumer Perception and Microbiological Analysis on Safety of Street Food Dipping Sauces (6th ed.). College of Education, Department of Food Technology, University of Santo Tomas, España, Manila, 1015 Philippines: Asian Journal of Agriculture and Food Sciences.
- [2] Bonde, G. J. 1977. Bacterial indication of water pollution, p. 273-364. In M. R. Droop and H. W. Jannasch (Eds.), Advances in Aquatic Microbiology. Academic Press, New York.
- [3] Castro, N. (2018). Microbiological Quality of Street Foods. Academia.edu. Retrieved 9 March 2018,
- [4] Franklin, B. (2018). What are coliforms?. Bfhd.wa.gov. Retrieved 27 March 2018
- [5] Ma, Patricia, V., Azanza and Arlyn I.G., "Microbial Hazards of Street Vended Grilled Chicken Intestine" Science Diliman, Vol. 10, Mo.2, July-December 1998, pp. 1-1 1.
- [6] Tacio, H.D., (2012). Street food: To eat or not to eat. Sunstar Philippines. Retrieved March 27, 2018 from <https://www.sunstar.com.ph/article/243287>
- [7] WHO (World Health Organization) Guidelines for Drinking-water Quality, Incorporating 1st and 2nd Addenda, Volume 1, Recommendations. 3rd ed. WHO; Geneva, Switzerland: 2008.