

**BACTERIAL ANALYSIS OF LUKOT (*SEA HARE EGG STRANDS*)
SOLD IN WET MARKET IN CALAMBA, MISAMIS OCCIDENTAL**

A RESEARCH PAPER

Presented to
the Faculty of Bachelor of Science in Medical Technology
Misamis University
Ozamiz City



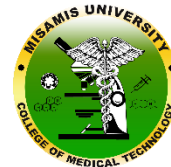
In Partial Fulfillment
of the Requirements for the Degree
BACHELOR OF SCIENCE IN MEDICAL TECHNOLOGY

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ABSTRACT

Lukot (sea hare egg strands) from *Dolabella auricularia* is a commonly consumed seafood product in the Philippines and is widely sold in wet markets. However, seafood products are highly susceptible to microbial contamination due to environmental exposure, improper handling, and inadequate sanitation practices, which may pose potential foodborne health risks. This study assessed the bacterial contamination of lukot sold in the wet market of Calamba, Misamis Occidental by determining the presence and bacterial load of *Salmonella* spp. and *Vibrio* spp. using standard bacteriological methods. A descriptive research design was employed. Samples collected from three vendors were subjected to serial dilution, selective enrichment, culturing on selective media, colony-forming unit (CFU/g) enumeration, and Log₁₀ CFU/g computation. Vendor hygiene, handling, and environmental sanitation practices were evaluated through direct observation using a structured checklist. Descriptive statistics (mean $\pm$ standard deviation) were used to summarize bacterial counts, while the Shapiro–Wilk test assessed data normality. Differences in bacterial contamination levels among vendors were analyzed using One-Way Analysis of Variance (ANOVA) at a 0.05 significance level. Results confirmed the presence of *Salmonella* spp. and *Vibrio* spp. in all sampled vendors, with Vendor C exhibiting the highest mean bacterial counts. However, all samples were classified as no-to-low risk based on established Log₁₀ CFU/g thresholds. ANOVA revealed no significant differences in contamination levels among vendors (*Salmonella* spp., $p = 0.521$; *Vibrio* spp., $p = 0.242$). Observed sanitation deficiencies included inconsistent handwashing, simultaneous handling of food and money, use of non-potable water, inadequate utensil sanitation, and exposure to pests. These findings emphasize the importance of proper hygiene and sanitation practices in ensuring the microbiological safety of lukot sold in wet markets.

Keywords: *Colony-forming units, Salmonella species, Seafood safety, Vendor hygiene, Vibrio species*

DEDICATION

This research paper is humbly and wholeheartedly dedicated to our Almighty God, whose endless grace, wisdom, strength, and guidance sustained us through every challenge and achievement in the completion of this study. His blessings gave us the courage to persevere and the hope to continue striving for excellence despite the difficulties we encountered along the way.

We sincerely dedicate this study to our dear parents and families, whose unconditional love, sacrifices, prayers, encouragement, and unwavering support became our greatest source of inspiration. Their patience, understanding, and constant belief in our capabilities motivated us to pursue this endeavor with determination and dedication. Every success we have achieved is deeply rooted in their guidance and selfless efforts for our future.

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Lastly, this study is dedicated to future researchers, students, and individuals who may find value in this work. May this research serve as a source of knowledge, inspiration,

and contribution to the advancement of science, public health, and the betterment of the community.

Shai, Leah, & Trisha

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FROM THE BOTTOM OF OUR HEARTS, THANK YOU!

Shai, Leah & Trisha

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INTRODUCTION

Background of the Study

Marine ecosystems are recognized as important sources of food, livelihood, and biological resources that contribute significantly to human nutrition and public health. Among the marine organisms commonly found in tropical coastal waters is the sea hare (*Dolabella auricularia*), a shell-less marine gastropod belonging to the family Aplysiidae. Sea hares are known for producing gelatinous egg strands locally referred to as “lukot” or “spaghetti seaweed,” which are traditionally consumed in several regions of the Philippines, particularly in the Visayas and Mindanao islands, as well as in Pacific countries such as Samoa, Tonga, and Fiji (Singh & Vuki, 2008). In the Philippines, lukot is commonly eaten raw as salad or incorporated into local dishes such as *tinolang isda* and shellfish-based viands (Pepito et al., 2015). Because of its accessibility, affordability, and nutritional value, lukot has become a common seafood product sold in wet markets and coastal communities.

Seafood products are considered excellent sources of high-quality protein, essential amino acids, vitamins, minerals, and omega-3 fatty acids that are beneficial to human health (Mol & Coşansu, 2022). Despite their nutritional value, seafood products are highly susceptible to microbial contamination due to direct exposure to aquatic environments and improper handling practices throughout the food chain. Contamination may occur during

harvesting, transportation, storage, processing, distribution, and vending, especially when sanitation and hygiene measures are poorly maintained (Abebe et al., 2020). Seafood is particularly vulnerable to microbial growth because of its high moisture content, favorable pH, and nutrient-rich composition, which support bacterial survival and multiplication.

Foodborne diseases remain a significant global public health concern. According to the World Health Organization (WHO, 2015), approximately 600 million individuals worldwide suffer from foodborne diseases annually, resulting in about 420,000 deaths. Seafood products have been identified as a major food category associated with foodborne illnesses because they may harbor pathogenic microorganisms that can cause infections in humans. The risk increases when seafood products are consumed raw or lightly cooked, or when they are improperly handled or stored.

Several studies have emphasized the relationship between seafood handling practices and microbial contamination. Akdemir Evrendilek (2026) explained that seafood-processing environments are highly vulnerable to microbial contamination due to high humidity, wet surfaces, fluctuating temperatures, and the accumulation of organic residues, which favor bacterial growth. Poor sanitation, contaminated utensils, improper temperature control, inadequate drainage systems, and poor worker hygiene contribute significantly to the survival and spread of microorganisms such as *Salmonella spp.*, *Vibrio spp.*, *Listeria monocytogenes*, and *Escherichia coli*. The study further emphasized that biofilm formation on food-contact surfaces makes bacterial contamination more persistent and difficult to eliminate despite regular cleaning procedures.

Similarly, Baptista et al. (2020) reported that inadequate hygiene practices and low food safety awareness among seafood handlers and consumers significantly increase the

risk of microbial contamination. Improper handwashing, cross-contamination, unsafe storage conditions, and poor sanitation practices were identified as major contributors to seafood-associated foodborne diseases. The researchers also noted that a significant proportion of foodborne illnesses occur in household settings due to unsafe food handling and inadequate food safety knowledge. These findings highlight the importance of proper hygiene, sanitation, and safe handling practices in minimizing microbial contamination in seafood products.

Among the microorganisms associated with seafood contamination, *Escherichia coli* (*E. coli*) is considered one of the most important indicators of fecal contamination and poor sanitary conditions. According to Costa (2013), *E. coli* has long been used as a microbiological indicator in seafood because its presence suggests contamination originating from human or animal fecal matter. The author explained that seafood harvested from polluted aquatic environments may become contaminated with pathogenic microorganisms before reaching consumers. Contamination may also occur during post-harvest handling, processing, transportation, and market distribution, especially under unsanitary conditions.

Costa (2013) further emphasized that shellfish and marine products harvested from coastal waters are particularly susceptible to contamination because they are directly exposed to polluted environments. Historical reports have linked seafood consumption to outbreaks caused by pathogenic *E. coli*, including enteroaggregative and enterohemorrhagic strains. The study highlighted that improper food-handling practices and poor sanitation among food handlers were significant contributors to contamination and disease transmission. Even non-pathogenic *E. coli* strains should not be ignored

because they indicate fecal contamination and the possible presence of other harmful enteric pathogens.

Similarly, Gündüz et al. (2024) investigated the presence of *E. coli* and *Salmonella spp.* in seafood products sold in local markets. They found significant levels of bacterial contamination, indicating substantial microbiological risks to consumers. The study identified untreated sewage discharge, environmental pollution, poor hygienic practices, and inadequate handling conditions as major contributors to seafood contamination. The high prevalence of *E. coli* detected in the samples strongly suggested fecal contamination and poor sanitation in seafood production and marketing environments. Their findings emphasized the importance of food safety monitoring and strict hygienic measures in seafood handling and distribution.

Shellfish and marine food products are highly vulnerable to contamination because they may accumulate microorganisms from polluted aquatic environments. Marceddu et al. (2017) reported that shellfish harvested from coastal areas may contain pathogenic microorganisms, including *E. coli* VTEC, *Salmonella spp.*, *Vibrio spp.*, and Norovirus, particularly in waters contaminated by agricultural runoff and sewage discharge. Because shellfish filter large volumes of water, they can readily accumulate pathogenic microorganisms and serve as vehicles for foodborne disease transmission, particularly when consumed raw or minimally cooked.

Mudadu et al. (2022) further explained that *E. coli* is commonly associated with warm-blooded animals and serves as an important indicator of fecal contamination in aquatic environments. Although seafood monitoring systems and purification procedures are implemented in some production areas, contamination may still occur during post-

harvest handling, transportation, and storage. The study emphasized that maintaining proper sanitation and continuous microbiological monitoring throughout the seafood supply chain is essential in ensuring food safety and protecting public health.

Likewise, Oranusi et al. (2018) identified sewage discharge, improper disposal of fecal waste, agricultural runoff, environmental pollution, and poor hygienic handling practices as major contributors to microbial contamination in seafood products. Their findings demonstrated unacceptable levels of fecal microorganisms in seafood collected from markets, indicating poor sanitary conditions and inadequate environmental sanitation. The study highlighted the importance of maintaining proper hygiene and environmental cleanliness to reduce the risk of contamination in seafood products.

Foodborne pathogens such as *Salmonella spp.* and *Vibrio spp.* are among the most significant bacterial contaminants associated with seafood products. *Salmonella spp.* are Gram-negative, facultatively anaerobic bacteria frequently associated with foodborne infections and commonly transmitted through contaminated food and poor food-handling practices (Naushad et al., 2023). Several ecological factors, such as pH, water activity, temperature, and handling conditions, influence the survival and growth of *Salmonella* in food products (Olgunoğlu, 2012). The bacterium may spread through contaminated seafood products, unclean utensils, or direct handling by food workers who fail to practice proper hygiene.

On the other hand, *Vibrio spp.* are naturally occurring marine bacteria commonly found in estuarine and coastal waters. According to Baker-Austin et al. (2017), infections caused by *Vibrio* species are usually associated with the consumption of raw or undercooked seafood or exposure to contaminated seawater. These bacteria thrive in warm

saline environments, making seafood products highly vulnerable to contamination. DePaola et al. (2003) further reported that seafood products harvested from coastal waters frequently contain *Vibrio* species because of their natural occurrence in marine environments.

In the Philippines, seafood consumption forms an essential part of the daily diet, particularly in coastal communities where marine products are readily available and economically accessible. Wet markets remain common centers for seafood distribution and selling. However, seafood products sold in wet markets are often exposed to environmental contaminants, improper storage conditions, pests, and unsafe handling practices, which may contribute to microbial contamination and the transmission of foodborne diseases.

Despite the popularity of lukot as a traditional seafood delicacy, few studies have examined its microbiological quality and food safety risks. Existing local studies primarily focus on the nutritional composition and ecological significance of *D. auricularia* egg strands, while information regarding their bacterial contamination, vendor hygiene practices, and microbial safety remains scarce. Given that lukot is commonly sold in open wet markets, where exposure to contaminants and poor handling practices may occur, assessing its bacteriological quality is essential for protecting consumer health and promoting seafood safety.

Therefore, this study aimed to assess bacterial contamination in lukot (*Dolabella auricularia* egg strands) sold at the wet market in Calamba, Misamis Occidental, by determining the total bacterial load and detecting the presence of pathogenic bacteria, including *Salmonella spp.* and *Vibrio spp.* using standard bacteriological methods. Furthermore, the study evaluated the hygiene, handling, and environmental sanitation

practices of vendors and their possible contribution to bacterial contamination. The findings of this study may provide valuable information on the microbiological safety of lukot, promote awareness of proper seafood handling and sanitation practices, and provide baseline data for future studies on seafood microbiology and food safety in the Philippines.

Objectives of the Study

The study aimed to conduct bacterial analysis of Lukot (sea hare egg strands) sold in the wet market in Calamba, Misamis Occidental. The study specifically aimed to:

1. Assess the extent of bacterial contamination of *Salmonella spp.* and *Vibrio spp.* in lukot (sea hare egg strands) sold in the wet market of Calamba, Misamis Occidental, by determining the total bacterial load and detecting the presence of pathogenic bacteria using standard bacteriological methods; and
2. Evaluate the hygiene, handling, and environmental sanitation practices of vendors and their possible contribution to the bacterial contamination of lukot samples.

Significance of the Study

This research is significant as it seeks to fill the data gap regarding the bacteriological profile of lukot at wet markets in Calamba, Misamis Occidental. Lukot is a popular local food, and handling it poorly would, hence, be a potential source of foodborne pathogens. The study provides relevant information about the safety of the seafood product through tests for the presence of *Salmonella spp.* and *Vibrio spp.* The results will therefore help promote safer food practices and raise consumer awareness of the health hazards

associated with contaminated lukot. The study can therefore also inform vendors and wet market operators about the need for proper handling, cleaning, and storage to improve product quality. The information may be used by local health authorities, together with local government units (LGUs), to formulate evidence-based guidelines to promote safer seafood products within the community. Finally, the study can serve as a reference for research on seafood microbiology in Mindanao, thus bridging a gap in the local literature.

Scope and Delimitations

This study focused mainly on analyzing the bacterial load of egg strands, or "lukot," from the sea hare species (*D. auricularia*) sold in the wet market in Calamba, Misamis Occidental. Bacterial analysis of the specific organisms, such as *Salmonella spp.* and *Vibrio spp.*, which are the common causes of foodborne infection.

Moreover, the study is confined to certain limitations. First, it is restricted to microbiological assessment only to the two target organisms and does not encompass other potential bacterial, viral, or parasitic contaminants. Second, the sample collection is geographically limited to Calamba, Misamis Occidental. Third, extrinsic factors such as harvesting methods and transportation are not examined comprehensively, although they may significantly influence contamination levels. Lastly, this study does not extend to consumer health outcomes or epidemiological correlations, as it focuses mainly on the isolation and quantification of bacterial contaminants in the collected samples.

MATERIALS AND METHODS

Research Design

This study used a descriptive research design to determine the bacterial load of lukot sold in the wet markets. Samples are collected from selected vendors, processed, tested for the presence of *Salmonella spp.* and *Vibrio spp.*, and the bacterial count is analyzed. The results are summarized for the overall level of contamination.

Research Setting

This study was carried out in Calamba, Misamis Occidental, Mindanao, 7210, Philippines, at coordinates: 8°33'24.06"N 123°35'52" E, where lukot (*D. auricularia* sea hare egg strands) is widely available in the public wet market. Lukot is greatly accessible in the market. It is especially popular at the town's bazaar, where seafood is sold in large quantities. The main source of the lukot samples is Baliangao, Misamis Occidental, a coastal municipality known for its rich marine biodiversity and thriving fishing grounds where sea hares are commonly found and harvested. This setting is ideal for the study, as it provides access to multiple vendors and our samples, allowing us to assess the bacterial load in commercially available lukot. Furthermore, the bacterial analysis of the collected samples will be conducted in the Natural Science Building laboratory and the Maria Mercado laboratory at Misamis University, H. T. Feliciano St., Ozamis City 7200, Philippines, at the coordinates: 8°09'00.80"N 123°50'27.06"E, where standard microbiological procedures and controlled conditions will be ensured to maintain the

accuracy and reliability of the results.

Figure 1 illustrates the overall study area map showing the sampling and laboratory sites involved in the study. The map depicts the spatial relationship between the locations where the lukot samples were collected and where the microbiological analyses were conducted, providing an overview of the study area and the workflow from sample collection to laboratory examination.

Figure 2 presents the specific locations of the sampling and laboratory sites. Lukot samples were obtained from selected vendors in the Calamba Public Market and subsequently transported under appropriate handling conditions to the designated laboratory for microbiological analysis. The laboratory served as the site for detecting and enumerating *Salmonella* spp. and *Vibrio* spp. in the collected samples.

Figure 3 shows the location of the study area within the Philippines, highlighting the Municipality of Calamba in the Province of Misamis Occidental, Northern Mindanao. This map provides the geographical context of the study area at the national and regional levels.

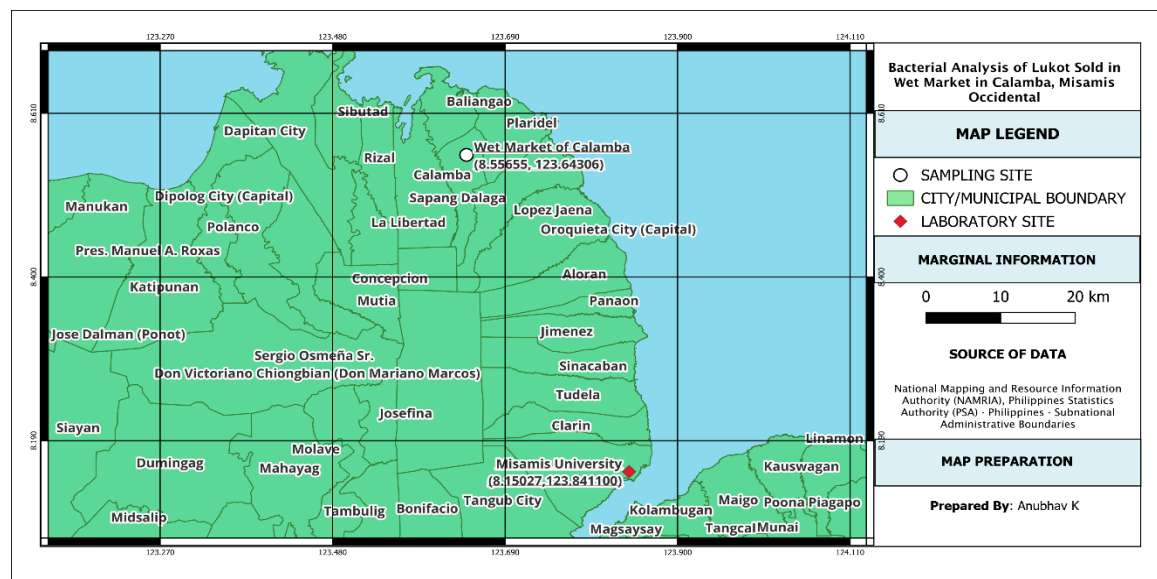


Figure 1. Study Area Map Showing Sampling and Laboratory Sites

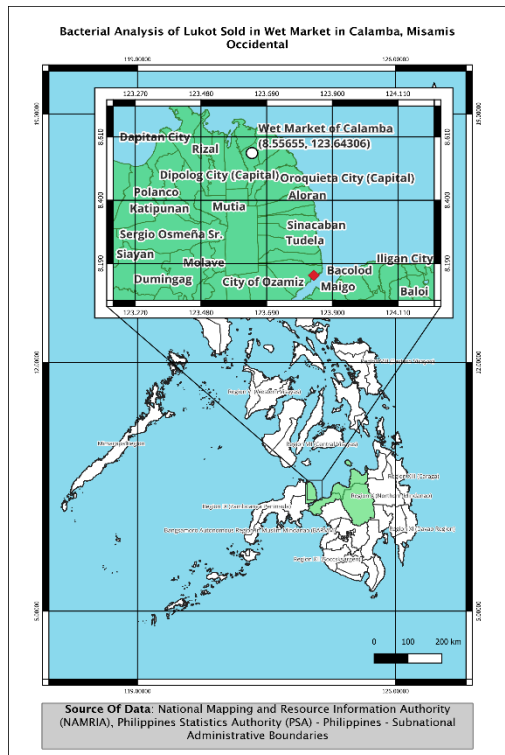


Figure 2. Sampling Site and Laboratory Location Map

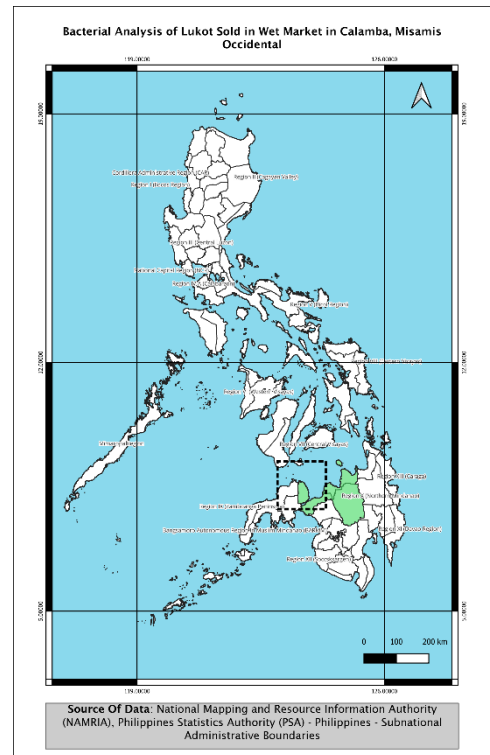


Figure 3. Location of the Study Area in the Philippines.

The selection of sampling and laboratory sites was based on their relevance to the study's objectives, accessibility, and roles in the distribution and analysis of seafood products within the municipality. The study setting provided an appropriate environment for assessing bacterial contamination in lukot sold at the local wet market and examining the potential influence of handling and sanitation practices on product safety.

Sample Collection, Storage, and Transport

A total of 300 grams of lukot (*D. auricularia* sea hare egg strands) were obtained from each of the selected vendors in the marketplaces of Calamba, Misamis Occidental. This was accomplished through convenience sampling, which enabled the collection of 100 grams of lukot from each vendor. Purposive sampling was employed to select vendors

selling lukot during the sample collection period. Figure 4 displays the sample being sold in the Calamba wet market. Three vendors were selected based on product availability. The number of samples was adequate for the total viable count and for detecting *Salmonella* spp. and *Vibrio* spp.

Furthermore, samples were purchased and processed weekly to ensure that all purchased samples were used as fresh *as possible*. The purchased samples were placed in an icebox container and maintained at a proper temperature of 7°C to 10°C to prevent changes in bacterial levels. Figure 5 presents the medium used in transportation. The samples were then transported from Calamba to the Natural Science Building Laboratory of Misamis University in Ozamiz City, Misamis Occidental, for processing within 24 hours (Lao et al., 2025).



Figure 4. Lukot Samples Displayed for Sale at Calamba Wet Market



Figure 5. Icebox Container Used for Transporting Lukot Sample

Sample Preparation and Isolation

Salmonella species

To detect *Salmonella* spp., a pre-enrichment procedure was performed by blending 100 grams of sea hare (*D. auricularia*) egg strands with buffered peptone water in a sterile blender to create a 1:5 dilution by transferring 1 mL of strained sea hare (*D. auricularia*)

into 9 mL of buffered peptone water. Then, the (BPW) homogenates were incubated at 37°C for 18 hours. (Villicana et al. 2019; Canini et al. 2023). All procedures were performed in triplicate to ensure the accuracy and reliability of results. The detection of *Salmonella spp.* was performed following the standard procedures outlined in the US FDA Bacteriological Analytical Manual, with modifications in the sample size and dilution ratio to accommodate the available sample volume (Canini et al., 2024; Tan et al., 2020). A 3-mm loopful from the prepared Buffered Peptone Water (BPW) culture was streaked onto Salmonella Shigella Agar (SSA) using a sterile inoculating loop. The inoculated plates were then incubated at 35-37°C for 18-24 hours to allow the growth and isolation of presumptive Salmonella colonies. (FDA, 2004; Castello et al., 2023).

In Salmonella Shigella Agar (SSA), as shown in Figure 4, *Salmonella spp.* were observed as colorless colonies with black centers, a characteristic morphology associated with hydrogen sulfide production. Figure 4 presents the isolated *Salmonella spp.* colonies obtained from the analyzed sample. The isolated colonies of *Salmonella spp.* were then subcultured in Xylose Lysine Deoxycholate (XLD) Agar. In Figure 5, *Salmonella spp.* on Xylose Lysine Deoxycholate (XLD) Agar appeared as red colonies with black centers.



Figure 6. Salmonella-Shigella Agar (SSA)



**Figure 7. Xylose Lysine Deoxycholate
(XLD) Agar**

Vibrio species

To detect *Vibrio spp.*, a pre-enrichment procedure was performed by blending 100 grams of sea hare (*D. auricularia*) with alkaline peptone water in a sterile blender to obtain a 1:5 dilution, transferring 1 mL of strained sea hare (*D. auricularia*) egg strands into 9 mL of alkaline peptone water. Then, the APW homogenates were incubated at 37°C for 18 hours. (Villicana et al. 2019; Canini et al. 2023). All procedures were performed in triplicate to ensure the accuracy and reliability of results. The detection of *Vibrio spp.* was based on the standard procedures of the US FDA Bacteriology Analytical Manual, with modifications in the sample size and dilution ratio to accommodate the available sample volume (Canini et al. 2024; Tan et al. 2020). Following enrichment, a 3-mm loopful from the APW tubes containing the highest dilution of the sample was aseptically streaked onto Thiosulfate Citrate Bile Salts Sucrose (TCBS) agar plates using a sterile inoculating loop. The inoculated plates were subsequently incubated at 35–37°C for 18–24 hours. Following incubation, colonies exhibiting typical *Vibrio* characteristics were enumerated. Growth of *Vibrio spp.* on Thiosulfate Citrate Bile Salts Sucrose (TCBS) agar is shown in Figure 6. On TCBS agar, *Vibrio spp.* appeared as yellow colonies due to sucrose fermentation (Stratev et al., 2021).



Figure 8. Thiosulfate-Citrate-Bile Salts-Sucrose (TCBS) agar

Observed Vendor Handling and Hygiene Practices

This study gathered samples from three vendors operating in the wet market of Calamba, Misamis Occidental. Throughout the sample collection process, direct observations of the vendors' handling and hygiene practices were systematically conducted. The observations focused on the use of personal protective equipment, including aprons, hair caps, and gloves; personal cleanliness, such as hand and nail hygiene and the wearing of jewelry; handwashing practices and the availability of handwashing facilities; food handling and money-handling behaviors; waste management practices; environmental sanitation conditions; the presence of pests within the selling area; the cleanliness and handling of tools, utensils, and equipment; the source and use of water during product handling; and the apparent health condition of the vendors. These observations were conducted to evaluate potential sources of contamination and to assess the relationship between vendor hygiene and handling practices and the bacterial contamination levels detected in the lukot samples. The collected samples were subsequently tested for the presence of common foodborne pathogens, namely *Salmonella spp.* and *Vibrio spp.*

Data Analysis

Colony-forming unit (CFU) counting was utilized to quantify the isolated bacteria within the confirmed colonies. The CFU per gram was calculated by multiplying the number of colonies by the dilution factor, then dividing by the volume plated.

$$\text{CFU/g} = \frac{\text{Number of Colonies} \times \text{Dilution Factor}}{\text{Number of Volume Plated}} \quad (1)$$

The microbial counts of bacterial isolates positive for *Salmonella spp.* and *Vibrio spp.* were determined for each sample obtained from the selected vendors, and the CFU/g values were converted to log₁₀ values (Canini et al., 2024).

Bacterial contamination levels for samples from each selected vendor were classified as follows: if the log values were ≥ 5.0 log₁₀ CFU/g for *Vibrio spp.* and ≥ 3.0 log₁₀ CFU/g for *Salmonella spp.*, the samples were classified as medium-to-high risk. If the values were ≤ 5.0 log₁₀ CFU/g for *Vibrio spp.* and ≤ 3.0 log₁₀ CFU/g for other pathogens, the samples were classified as no-to-low risk (Lao et. al., 2024).

Statistical Analysis

The bacterial log₁₀ CFU/g data were summarized as mean $\pm$ standard deviation (SD). Before inferential analysis, the Shapiro–Wilk test was performed to assess the normality of the data distribution. Since the data met the assumption of normality, a One-Way Analysis of Variance (ANOVA) was conducted to determine whether significant differences existed in the mean colony counts of *Salmonella spp.* and *Vibrio spp.* among the three vendors. Statistical significance was set at $p < 0.05$. The analysis was used to evaluate variations in bacterial contamination levels among lukot samples obtained from different vendors.

Ethical Consideration

This study adhered to ethical research standards to ensure the rights and safety of the persons involved were protected. Necessary approvals were obtained before proceeding with sample collection. Names are not used in all records and reports; instead, vendor and store names are replaced with codes to help maintain vendor confidentiality. All samples obtained are utilized for research purposes only. All laboratory practices adhered to biosafety protocols, including the use of personal protective equipment and safe housekeeping procedures to ensure proper removal and disposal of waste.

RESULTS AND DISCUSSION

Bacterial contamination of *Salmonella spp.* and *Vibrio spp.* in lukot

The findings revealed the presence of pathogenic bacteria, specifically *Salmonella spp.* and *Vibrio spp.*, in the collected samples. Microbial contamination levels varied among the samples, reflecting differences in handling, hygiene practices, and environmental exposure during selling and distribution. Laboratory analysis confirmed the presence of positive isolates in some samples, indicating possible microbial contamination and potential risks to food safety.

The positive isolates were quantified as colony-forming units (CFU)/g and then converted to Log₁₀ CFU values (Canini et al., 2024). Table 1 presents the confirmed *Salmonella spp.* colonies in the collected samples from the three vendors, along with their calculated CFU/g and Log₁₀ CFU values. Among the vendors, it is apparent that vendor C showed the highest value of contamination.

Table 1. Colony count of *Salmonella spp.* with its calculated CFU/g and Log₁₀ CFU/g values

Vendor	Sample	Colony count	CFU/g	Log ₁₀ CFU/g
A	1	31	155	2.19
	2	10	50	1.70
	3	45	225	2.35
B	1	20	100	2.00
	2	17	85	1.93

	3	34	170	2.23
	1	20	100	2.00
C	2	70	350	2.54
	3	34	220	2.34

The confirmed colonies of *Vibrio spp.* are presented in Table 2. Similar to the *Salmonella spp.*, vendor C demonstrated the highest numbers of colonies counted, calculated CFU/g, and its Log₁₀ CFU values. The consistently higher bacterial counts observed in Vendor C may reflect comparatively poorer handling practices, greater environmental exposure, or increased opportunities for cross-contamination during vending operation.

Table 2. Colony count of *Vibrio spp.* with its calculated CFU/g and Log₁₀ CFU/g values

Vendor	Sample	Colony count	CFU/g	Log₁₀ CFU/g
A	1	97	485	2.69
	2	103	515	2.71
	3	75	475	2.68
B	1	61	305	2.48
	2	49	245	2.39
	3	0	0	0
C	1	103	515	2.71
	2	172	860	2.93
	3	83	415	2.62

The Log₁₀ CFU/g values obtained from the detected organisms in the collected

samples were classified into risk levels, following the criteria of Lao et. al. (2024). Table 3 presents the risk level of the organisms on the samples. Using the Log10 CFU/g values, the mean and standard deviation were calculated for the samples from each vendor. These metrics were then used to classify the overall risk level of the lukot sold by the three vendors in Calamba, Misamis Occidental. Although the bacterial levels are classified as no-to-low risk based on Log10 CFU/g thresholds, the detection of pathogenic organisms remains significant because seafood products are commonly consumed with minimal processing or improper storage, which may allow bacterial multiplication before consumption.

Table 3. One-Way Analysis of Variance (ANOVA) of *Salmonella spp.* and *Vibrio spp.* among Three Vendors

Microorganism	F-value	p-value	Decision	Conclusion
<i>Salmonella spp.</i>	0.728	0.521	Fail to reject H ₀	Not significant
<i>Vibrio spp.</i>	1.815	0.242	Fail to reject H ₀	Not significant

*Significant at $p < 0.05$

The One-Way ANOVA results in Table 4 revealed no statistically significant differences in the mean Log₁₀ CFU/g values of *Salmonella spp.* and *Vibrio spp.* among the three vendors ($p > 0.05$). Since both p-values were greater than the 0.05 level of significance, the null hypothesis was not rejected. These findings indicate that the bacterial contamination levels observed among the three vendors were statistically comparable despite the higher numerical values recorded for Vendor C. The absence of significant

differences suggests that contamination may be influenced by similar environmental conditions, sourcing practices, transportation methods, and market handling conditions shared among vendors.

Table 4. Risk Level Classification of *Salmonella* spp. and *Vibrio* spp. in Lukot Sold in the Wet Market of Calamba, Misamis Occidental

Vendor	<i>Salmonella</i> spp. Log ₁₀ CFU/g (Mean ± SD)	Risk Level	<i>Vibrio</i> spp. Log ₁₀ CFU/g (Mean ± SD)	Risk Level
A	2.08 ± 0.34	No-to-Low Risk	2.69 ± 0.02	No-to-Low Risk
B	2.05 ± 0.16	No-to-Low Risk	2.44 ± 0.06	No-to-Low Risk
C	2.29 ± 0.27	No-to-Low Risk	2.75 ± 0.16	No-to-Low Risk

**Salmonella* spp.: ≤ 3.0 Log₁₀ CFU/g = no-to-low-risk and ≥ 3.0 Log₁₀ CFU/g = medium-to-high-risk

**Vibrio* spp.: ≤ 5.0 Log₁₀ CFU/g = no-to-low-risk and ≥ 5.0 Log₁₀ CFU/g = medium-to-high-risk

The values did not exceed the safety thresholds established by international guidelines. However, the microbial assessment revealed consistently elevated levels of *Vibrio* spp contamination across vendors. Although the levels were not very high, the presence of this pathogen still indicates contamination and potential health risks. Similarly, a study by Lao et al. (2024) on oysters also detected elevated levels of *Vibrio* spp. This is attributed to *Vibrio* spp. being a halophilic bacterium that naturally inhabits certain coastal environments, such as saltwater and brackish water (CDC, 2024). The study by DePaola et al. (2003) emphasized that most seafood products are highly vulnerable to *Vibrio* spp

contamination due to their aquatic origin and environmental conditions.

Evaluation of the hygiene, handling, and environmental sanitation practices of vendors

To further explain the possible sources of contamination detected in the microbiological analysis, the hygiene, handling, and environmental sanitation practices of vendors were evaluated through direct, simple observations. These observations were correlated with the microbiological findings, particularly the detection of pathogenic bacteria, including *Salmonella* spp. and *Vibrio* spp. Observational assessments are valuable for identifying food-handling behaviors that may contribute to microbial contamination and for establishing possible links between vendor practices and food safety risks (Hartantyo et al., 2023).

Regarding the physical hygiene of the vendors, most were observed not wearing aprons while selling, and two out of three did not wear hair caps. Although the vendors' hands and nails appeared clean and no jewelry was worn, none of them used gloves while handling the products. In addition, vendors were frequently observed touching their faces or hair while simultaneously handling lukot. These practices may increase the likelihood of cross-contamination through direct contact between food products and potential sources of microorganisms. Food handlers are recognized as important contributors to food contamination when appropriate hygiene measures are not consistently practiced during food handling and preparation activities (Errico et al., 2022). Similarly, Mohamed and Evans (2024) reported that inadequate hygiene behaviors among food handlers increase the risk of microbial contamination of food products.

Hand hygiene was identified as a particular concern during the observations. No

designated handwashing station was available within the vending area. Although vendors had access to nearby water sources and were occasionally observed washing their hands, handwashing was not performed consistently during critical handling periods. Effective hand hygiene is considered one of the most important measures for preventing the transmission of foodborne pathogens. Hands can serve as vehicles for transferring microorganisms from contaminated surfaces, equipment, money, and the surrounding environment directly to food products. Mohamed and Evans (2024) reported that food handlers frequently fail to comply with recommended hand hygiene practices, thereby increasing the potential for microbial contamination. Likewise, Hartantyo et al. (2023) found that deficiencies in food safety practices and hygiene controls were associated with higher microbial counts in food-preparation environments. Furthermore, the World Health Organization (2022) recognizes inadequate handwashing and improper food handling as major contributors to the global burden of foodborne diseases.

Another notable practice observed among all vendors was the simultaneous handling of money and food products. Vendors commonly received cash from customers and immediately resumed handling lukot without washing their hands. The absence of a dedicated individual for cash transactions further increased the risk of cross-contamination. Currency is frequently exposed to numerous environmental sources of contamination through continuous public circulation and may harbor a variety of microorganisms. Feglo and Nkansah (2010) reported the presence of several bacterial species on paper currency, including *Escherichia coli*, *Shigella dysenteriae*, and *Enterococcus faecalis*. Consequently, the transfer of microorganisms from contaminated currency to food products through direct hand contact may have contributed to the bacterial contamination detected in the samples.

Environmental sanitation practices were also evaluated. Each vendor maintained an individual waste-disposal area; however, flies, cockroaches, and rodents were observed in the wet market. The open and crowded nature of the market may facilitate the presence and movement of these pests, which are recognized carriers of pathogenic microorganisms. Their presence in food vending areas may increase the risk of contamination through contact with exposed food products, surfaces, and equipment.

Additionally, the utensils and tools used in handling lukot were not washed or rinsed between uses. The repeated use of unclean utensils may facilitate bacterial accumulation and cross-contamination. The use of non-potable tap water for cleaning and general handling was also observed. This practice may increase the risk of introducing contaminants into food products, particularly seafood, which is highly susceptible to microbial growth and contamination. According to the Food and Agriculture Organization (2020), the use of clean and potable water is essential in seafood handling to minimize microbial contamination and maintain product safety.

Although all vendors appeared physically healthy and exhibited no visible wounds, coughing, or other signs of illness during sample collection, the absence of apparent illness does not eliminate the risk of food contamination. Poor hygiene, improper handling practices, and inadequate sanitation can still contribute significantly to the introduction and spread of foodborne pathogens.

The findings of the observational assessment suggest that several handling and sanitation practices may have contributed to the microbial contamination detected in the lukot samples. The presence of *Salmonella* spp. and *Vibrio* spp. may be associated with inadequate hand hygiene, direct contact between money and food products, exposure to

pests, the use of non-potable water, and insufficient sanitation of utensils and vending areas. Although certain hygiene measures were observed, multiple unsafe food handling practices remained evident. These conditions may increase the risk of bacterial contamination and pose potential health hazards to consumers.

Despite the significant findings of this study, several limitations should be acknowledged. The study was limited to selected vendors in the wet market of Calamba, Misamis Occidental, and to environmental conditions, as differences in seafood sourcing may influence contamination levels. Furthermore, the study focused only on selected pathogenic bacteria and did not include antimicrobial susceptibility testing or molecular identification techniques. Future studies involving larger sample sizes, multiple sampling locations, and more comprehensive microbiological analyses are recommended to provide a broader assessment of the microbial safety of lukot sold in local markets.

CONCLUSION AND RECOMMENDATION

This study confirmed the presence of *Salmonella* spp. and *Vibrio* spp. in lukot (*Dolabella auricularia* egg strands) sold in the wet market of Calamba, Misamis Occidental. Although Vendor C exhibited the highest mean bacterial counts, statistical analysis showed no significant differences in contamination levels among vendors. Based on the established Log₁₀ CFU/g thresholds, all samples were classified under the no-to-low-risk category. However, the detection of these pathogenic bacteria indicates potential food safety concerns. Direct observations also revealed hygiene and sanitation deficiencies, including inconsistent handwashing, simultaneous handling of money and food, use of non-potable water, inadequate sanitization of utensils, and exposure to pests, which may have contributed to bacterial contamination. These findings emphasize the importance of proper hygiene and sanitation practices in ensuring the microbiological safety of lukot.

Based on the findings of this study, Vendors should strictly observe proper hygiene, sanitation, and food handling practices, including regular handwashing, use of potable water, and proper cleaning of utensils and food-contact surfaces. Market authorities should strengthen sanitation measures, waste management, and pest control programs to reduce contamination risks. Food safety education for vendors is likewise recommended to promote safer handling practices. Future studies involving larger sample sizes and additional microbiological analyses are also encouraged to further assess the microbial safety of lukot and related seafood products.

DECLARATION OF THE USE OF AI TOOLS

The researchers would like to acknowledge the use of Grammarly in reviewing the manuscript for grammatical accuracy, spelling, punctuation, sentence construction, coherence, and overall clarity during the final stages of the writing process. The suggestions generated by the software were carefully examined and selectively incorporated by the researchers to improve the organization, readability, and technical accuracy of the manuscript. All revisions, interpretations, and final decisions remained solely under the discretion and responsibility of the researchers.

Additionally, the researchers acknowledge the use of QuillBot [<https://quillbot.com/>] in assisting with paraphrasing, sentence refinement, and grammatical checking throughout the preparation of this paper. The tool was utilized only to enhance language clarity and improve the academic flow of the manuscript, while preserving the original meaning and intent of the researchers' work.

The researchers also acknowledge the use of ChatGPT [<https://chatgpt.com/>] as an auxiliary tool in generating ideas, organizing concepts, paraphrasing selected statements, and identifying related literature relevant to the study.

The following prompts were used during the development of the manuscript:

- “Paraphrase sentences to improve clarity, coherence, and academic tone”
- “Provide related studies supporting bacterial contamination in lukot (sea hare egg strands)”
- “Provide supporting literature on hygiene, handling practices, and microbial

contamination of seafood products”

- “Suggest related concepts and discussions relevant to bacterial analysis of seafood sold in wet markets”

The outputs generated by these artificial intelligence tools served only as supplementary assistance and preliminary references in the preparation of the manuscript. All information, interpretations, and written content included in the study were critically reviewed, revised, verified, and validated by the researchers to ensure accuracy, maintain originality, avoid plagiarism, and uphold the principles of academic integrity and responsible research writing.

LITERATURE CITED

- Abebe, E., Gugsu, G., & Ahmed, M. (2020). Review on major food-borne zoonotic bacterial pathogens. *Journal of Tropical Medicine*, 2020(1), 4674235.
- Akdemir Evrendilek, G. (2026). The hygiene continuum in seafood processing: Integrating design, sanitation, and workforce safety for sustainable food systems. *Hygiene*, 6(1), 6.
- Baker-Austin, C., Oliver, J. D., Alam, M., Ali, A., Waldor, M. K., Qadri, F., & Martinez-Urtaza, J. (2018). *Vibrio* spp. infections. *Nature Reviews Disease Primers*, 4(1), 1–19.
- Baker-Austin, C., Trinanes, J., Gonzalez-Escalona, N., & Martinez-Urtaza, J. (2017). Non-cholera vibrios: The microbial barometer of climate change. *Trends in Microbiology*, 25(1), 76–84.
- Baptista, R. C., Rodrigues, H., & Sant’Ana, A. S. (2020). Consumption, knowledge, and food safety practices of Brazilian seafood consumers. *Food Research International*, 132, 109084.
- Canini, N. D., Cadelinia, E. E., & Olarte-Bala, J. J. (2024). Occurrence of potentially pathogenic bacteria in commercially sold seafood from Misamis Occidental, Philippines. *European Journal of Nutrition and Food Safety*, 16(2), 42–51.
- Costa, R. A. (2013). *Escherichia coli* in seafood: A brief overview. *Advances in Bioscience and Biotechnology*, 4(3), 450–454.
- DePaola, A., Nordstrom, J. L., Bowers, J. C., Wells, J. G., & Cook, D. W. (2003). Seasonal abundance of total and pathogenic *Vibrio parahaemolyticus* in Alabama oysters. *Applied and Environmental Microbiology*, 69(3), 1521–1526.
- Ekici, G., & Dümen, E. (2019). *Escherichia coli* and food safety. In *The Universe of Escherichia coli*.
- Errico, E. A., Licata, F., Maruca, R., & Costantino, N. (2022). Preventing food contamination: Preliminary results of a cross-sectional study among food handlers. *European Journal of Public Health*, 32(Supplement_3), ckac130.103.
- Feglo, P., & Nkansah, M. (2010). Bacterial load on Ghanaian currency notes. *African Journal of Microbiology Research*, 4(22), 2375–2380.

- Food and Agriculture Organization. (2020). *Code of practice for fish and fishery products*. FAO/WHO Codex Alimentarius Commission.
- Gündüz, H., Öztürk, F., & Adıgüzel, H. (2024). Investigation of the presence of *Escherichia coli* and *Salmonella spp.* in seafood sold in Izmir. *Sustainable Aquatic Research*, 3(3), 161–168.
- Hartantyo, S. H. P., Selvaraj, R., Ho, J., Oh, J. Q., Er, J. C., Li, A., & Aung, K. T. (2023). Food safety controls during bulk food preparation—An observational analysis. *Foods*, 12(12), 2376.
- Kuhnert, P., Boerlin, P., & Frey, J. (2000). Target genes for virulence assessment of *Escherichia coli* isolates from water, food and the environment. *FEMS Microbiology Reviews*, 24(1), 107–117.
- Kumar, S. A. N. A. T. H. (2017). Incidence of potentially pathogenic *Escherichia coli* in fresh seafood in Mumbai. *Pollution Research*, 36(3), 541–546.
- Lao, K. M. O., Balais, M. L. P., Castañeda, N. A., Napigkit, T. B. C., & Canini, N. D. (2025). Comparative analysis of bacterial contamination in three species of commercially sold oysters in Mindanao, Philippines. *European Journal of Nutrition and Food Safety*, 17(7), 170–185.
- Marceddu, M., Lamon, S., Consolati, S. G., Ciulli, S., Mazza, R., Mureddu, A., & Meloni, D. (2017). Determination of *Salmonella spp.*, *E. coli* VTEC, *Vibrio spp.*, and Norovirus GI-GII in bivalve molluscs collected from growing natural beds in Sardinia (Italy). *Foods*, 6(10), 88.
- Mohamed, A. I. A., & Evans, E. W. (2024). Observation of food handlers' hand hygiene behavior during production at a sandwich-making factory. *Journal of Food Protection*, 87(12), 100386.
- Mol, S., & Coşansu, S. (2022). Seafood safety, potential hazards and future perspective. *Turkish Journal of Fisheries and Aquatic Sciences*, 22(6).
- Mora, C., McKenzie, T., Gaw, I. M., Dean, J. M., von Hammerstein, H., Knudson, T. A., ... & Franklin, E. C. (2022). Over half of known human pathogenic diseases can be aggravated by climate change. *Nature Climate Change*, 12(9), 869–875.
- Mudadu, A. G., Spanu, C., Pantoja, J. C. F., Dos Santos, M. C., De Oliveira, C. D., Salza, S., ... & Tedde, T. (2022). Association between *Escherichia coli* and *Salmonella spp.* food safety criteria in live bivalve molluscs from wholesale and retail markets. *Food Control*, 137, 108942.
- Naushad, S., Ogunremi, D., & Huang, H. (2023). *Salmonella*: A brief review. In H. Huang & S. Naushad (Eds.), *Salmonella—Perspectives for low-cost prevention, control*

and treatment (pp. 1–22).

- Olgunoğlu, İ. A. (2012). *Salmonella* in fish and fishery products. In *Salmonella: A dangerous foodborne pathogen* (pp. 91–105).
- Oranusi, S., Effiong, E. D., & Duru, N. U. (2018). Microbiological quality assessment of seafood products and associated public health implications. *African Journal of Clinical and Experimental Microbiology*.
- Pavon, R. D. N., Mendoza, P. D., Flores, C. A. R., Calayag, A. M. B., & Rivera, W. L. (2022). Genotypic virulence profiles and associations in *Salmonella* isolated from meat samples in wet markets and abattoirs of Metro Manila, Philippines. *BMC Microbiology*, 22(1), 292.
- Pepito, A. R., Delan, G. G., Asakawa, M., Ami, L. J., Yap, E. E. S., Olympia, M. S., ... & Lamayo, M. H. A. (2015). Nutritional quality of the egg mass locally known as “lukot” of the wedge sea hare *Dolabella auricularia* (Lightfoot, 1786). *Tropical Technology Journal*, 19(1), 7.
- Prabhakar, P., Lekshmi, M., & Nayak, B. B. (2017). Pathogenic *Escherichia coli* in seafood: Status and public health significance. *Journal of Food Science and Technology*.
- Roux, F. L., Wegner, K. M., Baker-Austin, C., Vezzulli, L., Osorio, C. R., Amaro, C., ... & Huehn, S. (2015). The emergence of *Vibrio* pathogens in Europe: Ecology, evolution, and pathogenesis. *Frontiers in Microbiology*, 6, 830.
- Singh, S. K., & Vuki, V. C. (2008). An ecological study of the sea hare, *Dolabella auricularia*, on the south-eastern coast of Viti Levu, Fiji.
- Tayone, J. C., Del Rosario, R. M., & Canencia, O. P. (2019). Extracts from egg strings of sea hare (*Dolabella auricularia*): Yield, antioxidant activity, zoochemical profile, and toxicity. *International Journal of Advanced and Applied Sciences*, 6(1), 24–28.
- Tayone, J., Morales, J., & Jimenez, L. (2015). Nutrient and chemical composition of sea hare, *Dolabella auricularia* in Pujada Bay, Davao Oriental. *Davao Research Journal*, 11(1), 6–14.
- U.S. Food and Drug Administration. (2004). *BAM chapter 9: Vibrio*. Bacteriological Analytical Manual.
- U.S. Food and Drug Administration. (2026). *BAM chapter 5: Salmonella*. Bacteriological Analytical Manual.
- World Health Organization. (2015). *WHO estimates of the global burden of foodborne diseases*. World Health Organization.

World Health Organization. (2022). *Food safety*. World Health Organization.

APPENDICES

Appendix A – Approved Letters / Forms

 **MISAMIS UNIVERSITY** 
Ozamiz City
College of Medical Technology
CERTIFIED: ISO 9001:2015 Quality Management System – DNV-GL Pty Limited Australia
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)
GRANTED: AUTONOMOUS STATUS by the Commission on Higher Education (CHED)

Date: January 16, 2026

DR. HAYDEE D. VILLANUEVA
Dean, College of Arts and Sciences
Misamis University
Ozamiz City

Subject: *Request for Permission to Use Laboratory Equipment, Facilities, and Reagents for Research Data Gathering*

Dear Dean Villanueva,

Good day.

We, the undersigned undergraduate researchers from the College of Medical Technology, respectfully request permission from your good office to **utilize selected laboratory equipment, laboratory rooms, and reagents** located at the Natural Sciences Building of the College of Arts and Sciences. This request is in line with the conduct of our approved undergraduate research entitled:

“Bacterial Analysis of Lukot Sold in Wet Markets of Calamba, Misamis Occidental.”

The experimental procedures of this study are scheduled to be conducted from **February to April 2026**, subject to the availability of laboratory facilities and resources.

We give our full assurance that all laboratory activities will be carried out in **strict accordance with university rules and regulations, under the proper supervision of authorized faculty members or laboratory personnel**. We further commit to observing appropriate **laboratory safety protocols, equipment handling procedures, cleanliness standards, and waste disposal guidelines**, as well as ensuring the responsible and economical use of all reagents and materials. Any facilities used will be restored to their proper condition after use.

Furthermore, all information and data obtained from this research will be **utilized exclusively for academic and research purposes**, and due acknowledgment will be given to the College of Arts and Sciences and the Natural Sciences Building in all related research outputs, reports, and presentations.

Appendix A – cont'd



MISAMIS UNIVERSITY

Ozamiz City

College of Medical Technology



CERTIFIED: ISO 9001:2015 Quality Management System – DNV-GL, Pty Limited Australia
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)
GRANTED: AUTONOMOUS STATUS by the Commission on Higher Education (CHED)

In this regard, we humbly request your approval and support for the conduct of this academic endeavor. Your favorable consideration will greatly assist us in completing our research requirements. Thank you very much for your time and kind consideration.

Respectfully yours,

TRISHA MAE A. SAJULGA

Researcher

BS MedTech Year 3

SHENNA MAY L. AMATO

Researcher

BS MedTech Year 3

JAN LEAH B. PASA

Researcher

BS MedTech Year 3

Noted by:

MR. JONAS T. HINGCO
Research Adviser

ARJADE O. ALCABAZA, RChT
Laboratory In-Charge

Recommending Approval:

DR. NELFA D. CANINI
Chairperson, Department of Natural Sciences

Approved by:

DR. HAYDEE D. VILLANUEVA
Dean, College of Arts and Sciences

Appendix A – cont'd



MISAMIS UNIVERSITY
Ozamiz City
College of Medical Technology



CERTIFIED: ISO 9001:2015 Quality Management System – DNV-GL Pty Limited Australia
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)
GRANTED: AUTONOMOUS STATUS by the Commission on Higher Education (CHED)

Date: March 04, 2026

MS. EVANGELINE M. SEÑEDO, RMT, MATMRS
Dean, College of Medical Technology
Misamis University

Subject: *Request for Permission to Use Laboratory Facilities and Reagents for Research Data Gathering*

Dear Dean Señedo,

Good day.

We, the undersigned undergraduate researchers from the College of Medical Technology, respectfully seek permission to **utilize selected laboratory equipment, laboratory rooms, and reagents available** of the College of Medical Technology for the purpose of **research data gathering** for our approved study entitled:

“Bacterial Analysis of Lukot Sold in Wet Markets of Calamba, Misamis Occidental.”

This study aims to investigate the **bacterial load present in lukot**, with particular emphasis on its implications to public health and food safety.

We assure your good office that all laboratory activities will be **carried out strictly under the supervision of authorized faculty members or laboratory personnel**. Furthermore, we commit to observing proper **laboratory safety protocols, equipment handling procedures, and waste disposal guidelines**, as well as the responsible and economical use of all materials and reagents entrusted to us.

Rest assured that all data gathered will be used **solely for academic and research purposes**, and proper acknowledgment will be given to the College of Medical Technology in all related research outputs, reports, and presentations.

We sincerely hope for your kind consideration and approval of this request. Your support will greatly contribute to the successful completion of our research.

Appendix A – cont'd



MISAMIS UNIVERSITY
Ozamiz City
College of Medical Technology



CERTIFIED: ISO 9001:2015 Quality Management System – DNV-GL Pty Limited Australia
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)
GRANTED: AUTONOMOUS STATUS by the Commission on Higher Education (CHED)

Thank you very much for your time and consideration.

Respectfully yours,


TRISHA MAE A. SAJULGA

Researcher

BS MedTech Year 3


SHENNA MAY L. AMATO

Researcher

BS MedTech Year 3


JAN LEAH B. PASA

Researcher

BS MedTech Year 3

Noted by:


MR. JONAS T. HINGCO

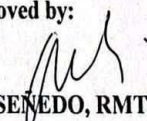
Research Adviser

Recommending Approval:


DR. NELFA B. CANINI

Chairperson, Department of Natural Sciences

Approved by:


MS. EVANGELINE M. SENEDO, RMT, MATMRS

Dean, Dean, College of Medical Technology

Appendix A – cont'd

 **Misamis University**
Ozamiz City

MISAMIS UNIVERSITY RESEARCH CENTER
CERTIFIED: ISO 21001: 2018 Educational Organizations Management System by DNV
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)

MU-RC-042/13 November 2024

Thesis/Research Data Gathering Approval Form

Date: 01-26-2024

Name of Authors: AMATO, VHENNA MAY L.; PATA, JAN LEAH B.; VASILGA, TRISHA MAE A.
College/Department: MEDICAL TECHNOLOGY
Research Title: Bacterial analysis of Lukot sold in wet Markets of
Calamba, Misamis Occidental

Data Gathering Procedure:

a. Type of Research: (Kindly check)

☐ Quantitative	☐ Qualitative	☒ Experimental
☐ Approved Research Title & Problem/Objectives	☐ Approved Data Gathering Procedure	☐ Approved Data Gathering Instrument/Data Sheets

b. Respondents/Participants/Subject/Samples to be Collected: LUKOT

c. Procedure:

☐ Survey	☐ Interview	☐ Experimentation	☒ Laboratory Testing
---------------------------------	------------------------------------	--	--

d. Place of Implementation/Study Area: Misamis University

If to be conducted outside the school campus, indicate the nature of transportation to be used:

☐ Own private vehicle	☒ public utility vehicle	☐ rental	☐ Others, please indicate _____
--	--	---------------------------------	--

e. Date/s of Implementation/Sampling: February 2024

Attachments:

☐ Approved Letter of Consent from the designated authority in the area/place where the study is to be conducted
☒ Signed Parents' Consent

The thesis proposal mentioned above is hereby recommended for the commencement of data gathering implementation.

Recommended by:

<u>Jorge T. Hingco</u> Thesis/Research Adviser	<u>Nelfa D. Carini</u> Thesis/Research Instructor
---	--

Approved by: M. EVANGELINE M. VENEZO, RMT, MATMRS
College Dean

CONTROLLED DOCUMENT

Appendix B – Parent's Consent Form



MISAMIS UNIVERSITY
Ozamiz City
Department of Student Affairs & Services

MU-DSAS-006/02June2023

PARENT'S CONSENT

College of Medical Technology
Sponsoring Group/Organization

I am allowing my son/daughter/ward, Jan Leon B. Pasa, to join the Research Vamping (activity) to be held on February 2024 at Calamba, Misamis Occidental under the supervision of Mr. Jovan S. Ringco (Adviser/Faculty).

I understand that Misamis University exercises the necessary safety precautions in this activity.

In consideration of the benefits to be derived from the above activity, I expressly waive any and all claims against the administration or any member of the faculty and staff of the Misamis University on account of any unforeseen accident or injury that my son/daughter/ward might incur in connection with the aforementioned activity.

NATALIE BERGADO
Signature over printed name of
Parent/Guardian

01-22-24
Date

JAN LEON B. PASA
Signature over printed name of
Student

01-22-24
Date

Important: This form shall be submitted to the DSAS Office at least two (2) days before the conduct of the activity.

SUBSCRIBED AND SWORN to before me, this ____ day of ____ at _____, Philippines, that the herein affiant personally came and appeared with his/her _____, as evidence of his/her personal identity.

Doc. No. 267
Page No. 45
Book No. 19
Series of 20 26

ATTY. REY B. BINAG, RMT

Notarial Commission No. 2025-18

Notary Public for Ozamiz City and Clarin

Mal Drive, Bernad Subdivision, Aguada, Ozamiz City

PTR No. 6007751; 01/05/2026; Ozamiz City

P.O.R. No. 576165; 12/20/2025; Pasig City

Attorney's Roll No. 10043

Compliance No. VIII-0014121 Vol 1 until 04/14/2028

Notary Public

Until _____
PTR No. _____
IBP No. _____
TIN No. _____
Roll No. _____

(For DSAS Personnel only)

Attested by:

RODEL L. BALDADO, MHist, MAEd
OIC, Department of Student Affairs & Services

Date: _____

Appendix B – cont'd



MISAMIS UNIVERSITY
Ozamiz City
Department of Student Affairs & Services

MU-DSAS-006/02June2023

PARENT'S CONSENT

College of Medical Technology
Sponsoring Group/Organization

I am allowing my son/daughter/ward, Shenna May L. Amato, to join the Research Camping (activity) to be held on February 2026 at Calamba, Misamis Occidental under the supervision of Mr. Udal J. Hingco (Adviser/Faculty).

I understand that Misamis University exercises the necessary safety precautions in this activity.

In consideration of the benefits to be derived from the above activity, I expressly waive any and all claims against the administration or any member of the faculty and staff of the Misamis University on account of any unforeseen accident or injury that my son/daughter/ward might incur in connection with the aforementioned activity.

Shenna May L. Amato
Signature over printed name of
Parent/Guardian

01-22-26
Date

Shenna May L. Amato
Signature over printed name of
Student

01-22-26
Date

Important: This form shall be submitted to the DSAS Office at least two (2) days before the conduct of the activity.

SUBSCRIBED AND SWORN to before me, this ____ day of _____ at _____, Philippines, that the herein affiant personally came and appeared with his/her _____, as evidence of his/her personal identity.

Doc. No. 265
Page No. 95
Book No. 18
Series of 20 26

ATTY. REY A. BIRAS, RMT
Notarial Commission No. 2025-18
Notary Public for Ozamiz City and Clarin
City Drive, Bernad Subdivision, Aguada, Ozamiz City
PTR No. 6007751; 01/05/2026; Ozamiz City
ICP O.R. No. 576165; 12/29/2025; Pasig City
Attorney's Roll No. 70043
MTC Compliance No. VIT-CU14127, Valid until: 03/14/2028

Notary Public

Until _____
PTR No. _____
IBP No. _____
TIN No. _____
Roll No. _____

(For DSAS Personnel only)

Attested by:

RODEL L. BALDADO, MHist, MAEd
OIC, Department of Student Affairs & Services

Date: _____

Appendix B – cont'd



MISAMIS UNIVERSITY
Ozamiz City
Department of Student Affairs & Services

MU-DSAS-006/02June2023

PARENT'S CONSENT

College of Medical Technology
Sponsoring Group/Organization

I am allowing my son/daughter/ward, Mima Mae A. Rajulga, to join the Research Campung (activity) to be held on February, 2026 at Calamba, Misamis Occidental under the supervision of Mr. Jomar T. Hingwa (Adviser/Faculty).

I understand that Misamis University exercises the necessary safety precautions in this activity.

In consideration of the benefits to be derived from the above activity, I expressly waive any and all claims against the administration or any member of the faculty and staff of the Misamis University on account of any unforeseen accident or injury that my son/daughter/ward might incur in connection with the aforementioned activity.

MA. QUEEN JELIN M. CHARES
Signature over printed name of
Parent/Guardian

01-22-26
Date

MIMA MAE A. RAJULGA
Signature over printed name of
Student

01-22-26
Date

Important: This form shall be submitted to the DSAS Office at least two (2) days before the conduct of the activity.

SUBSCRIBED AND SWORN to before me, this ____ day of _____ at _____, Philippines, that the herein affiant personally came and appeared with his/her _____, as evidence of his/her personal identity.

Doc. No. 266
Page No. 45
Book No. 14
Series of 20 26

ATTY. RUEL BALDADO, RMT
Notarial Commission No. 2025-18
Notary Public for Ozamiz City and Clarin
City Drive, Bernad Subdivision, Agulada, Ozamiz City
PTR No. 0007751; 01/05/2026, Ozamiz City
IBP O.P. No. 576165; 12/29/2025, Pasig City
Attorney's Roll No. 70640
Notary Public
Until
PTR No. _____
IBP No. _____
TIN No. _____
Roll No. _____

(For DSAS Personnel only)

Attested by:

RODEL L. BALDADO, MHist, MAEd
OIC, Department of Student Affairs & Services

Date: _____

Appendix C - Adviser's Consultation Form



Misamis University

Ozamiz City



MISAMIS UNIVERSITY RESEARCH CENTER

CERTIFIED: ISO 21001: 2018 Educational Organizations Management System by DNV

ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCCA)

MIS-RC-049/19 August 2025

ADVISER'S CONSULTATION FORM

NAME OF THE ADVISER: MR. JONAS T. HINGCO

TITLE OF THE STUDY: Bacterial Analysis of Lukot Sold in Wet Market in Calamba, Misamis Occidental

NAME OF PROPONENTS: AMATO, SHENNA MAY L.
PASA, JAN LEAH B.
SAJULGA, TRISHA MAE A.

Date of Consultation	Purpose	Adviser's Comments	Adviser's Signature
January 2026	Consultation to conduct study	Prepare the needed materials, from samples to reagents, to be used in the study. Ensure that all required laboratory supplies are complete, properly labeled, and compliant with standard laboratory protocols prior to the start of experimentation.	
February 23, 2026	Consultation for methods	Revise some parts of the methodology and follow the standard microbiological methods. Ensure that all procedures are aligned with established protocols to maintain accuracy, reliability, and reproducibility of results.	
April 06, 2026	Consultation for facility usage for experimentation	Agreed on the change of facility for experimentation and will facilitate its use. Ensure that the selected facility is properly prepared, equipped, and meets all biosafety and procedural requirements needed for the study.	
May 06, 2026	Consultation for results	Discuss everything conducted during the experiment, including the obtained results. Provide a clear presentation of findings and ensure that all data are properly organized, validated, and interpreted before final reporting.	
May 10, 2026	Consultation for Results and Discussion	Add more supporting discussion and interpretation of the results. Explain possible reasons behind the observed findings to improve the depth of the discussion.	

** There must be at least 5 consultations before the proposal defense and at least 5 consultations before final defense.*

CONTROLLED DOCUMENT

Appendix D – Documentations



Calamba, Misamis Occidental Wet Market

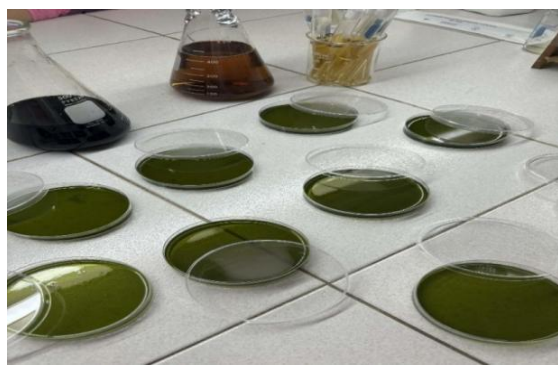
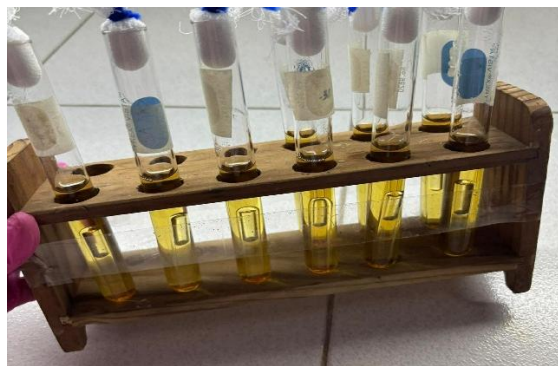


Storage of Samples

Appendix D – cont'd



Extraction of Lukot samples

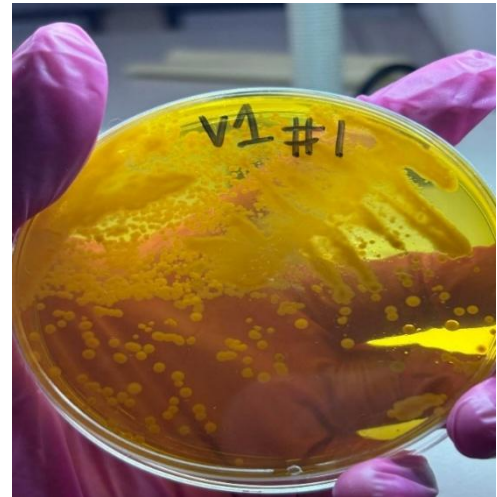


Preparation of media

Appendix D – cont'd

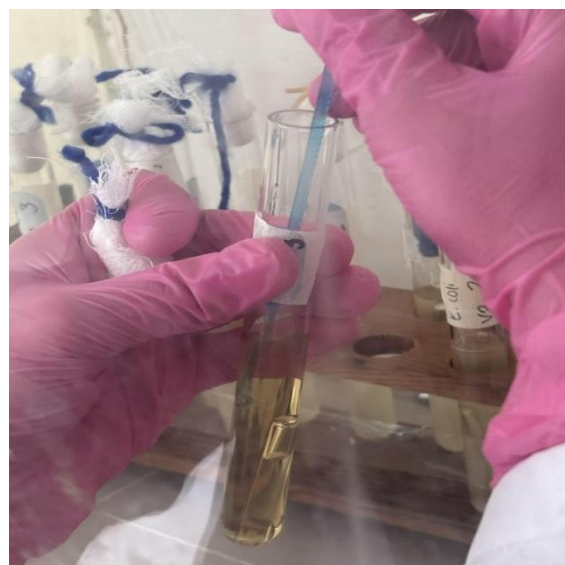


Identification of *Salmonella* spp. in Salmonella-Shigella Agar (SSA)

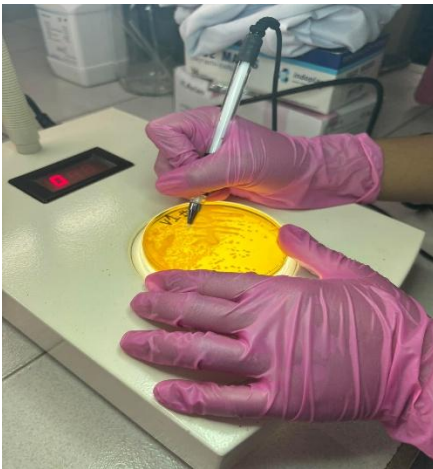


Identification of *Vibrio* spp. in Thiosulfate-citrate-bile-sucrose-salt (TCBS) Agar

Appendix D – cont'd



Appendix D – cont'd



Appendix E – Sampling Computation

Computed Data of <i>Salmonella spp.</i> Colonies Counted				
Vendor	Sample	Colonies counted	CFU/g	Log10 CFU/g
A	1	31	155	2.19
	2	10	50	1.7
	3	45	225	2.35
B	1	20	100	2
	2	17	85	1.93
	3	34	170	2.23
C	1	20	100	2
	2	70	350	2.54
	3	34	220	2.34
Computed Data of <i>Vibrio spp.</i> Colonies Counted				
Vendor	Sample	Colonies counted	CFU/g	Log10 CFU/g
A	1	97	485	2.69
	2	103	515	2.71
	3	75	475	2.68
B	1	61	305	2.48
	2	49	245	2.39
	3	0	0	0
C	1	103	515	2.71
	2	172	860	2.93
	3	83	415	2.62
Computed Mean $\pm$ SD of Isolates				
Organism	Vendor A	Vendor B	Vendor C	
<i>Salmonella spp.</i>	2.08 $\pm$ 0.34	2.05 $\pm$ 0.16	2.29 $\pm$ 0.27	
<i>Vibrio spp.</i>	2.69 $\pm$ 0.02	2.44 $\pm$ 0.02	2.75 $\pm$ 0.16	

ANOVA					
Microorganism	df Between	df Within	F-value	p-value	Decision
<i>Salmonella spp.</i>	2	6	0.728	0.521	Fail to reject H ₀
<i>Vibrio spp.</i>	2	6	1.815	0.242	Fail to reject H ₀

Appendix F – Grammarly report

Report: Bacterial Analysis of Lukot Sold in Wet Market in Calamba, Misamis Occidental

Bacterial Analysis of Lukot Sold in Wet Market in Calamba, Misamis Occidental

by Misamis University

General metrics

38,373	5,448	403	21 min 47 sec	41 min 54 sec
characters	words	sentences	reading time	speaking time

Score



This text scores better than 99% of all texts checked by Grammarly

Writing Issues

1

Issues left



Critical

1

Advanced

Plagiarism

This text hasn't been checked for plagiarism

Appendix G - Turnitin results



Page 2 of 44 - Integrity Overview

Submission ID trn:oid::28447:144256844

25% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

Filtered from the Report

- Bibliography

Match Groups

-  **142 Not Cited or Quoted 21%**
Matches with neither in-text citation nor quotation marks
-  **23 Missing Quotations 3%**
Matches that are still very similar to source material
-  **1 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
-  **0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 9%  Internet sources
- 6%  Publications
- 22%  Submitted works (Student Papers)

Integrity Flags

0 Integrity Flags for Review

No suspicious text manipulations found.

Our system's algorithms look deeply at a document for any inconsistencies that would set it apart from a normal submission. If we notice something strange, we flag it for you to review.

A Flag is not necessarily an indicator of a problem. However, we'd recommend you focus your attention there for further review.

CURRICULUM VITAE

PERSONAL DATA

Name : Shenna May L. Amato
Date of Birth : May 25, 2005
Place of Birth : Calamba , Misamis Occidental
Home Address : Purok 3, East Poblacion Rizal,
Zamboanga del Norte, Philippines
Gender : Female
Civil Status : Single
Contact No. : 09304399137
Email : shennamayamato@gmail.com



EDUCATIONAL BACKGROUND

Elementary : Elementary- Rizal Central School
West Poblacion, Rizal Zamboanga del Norte
2013-2017

Secondary : Colegio de San Francisco Javier
East Poblacion, Rizal Zamboanga del Norte
2017-2021

Senior High School : Rizal National high School

West Poblacion Rizal, Zamboanga del Norte
2021-2023

College : Misamis University
H.T. Feliciano St., Aguada, Ozamis City
Misamis Occidental

\

CURRICULUM VITAE

PERSONAL DATA

Name : Jan Leah B. Pasa
Date of Birth : July 31, 2005
Place of Birth : Calamba , Misamis Occidental
Home Address : Purok 5, Don Bernardo A. Neri
Calamba Misamis Occidental,
Philippines
Gender : Female
Civil Status : Single
Contact No. : 09453556725
Email : janleahpasa2@gmail.com



EDUCATIONAL BACKGROUND

Elementary : Calamba Central School
E. Medija Street, Calamba
Calamba Misamis Occidental
2013-2017

Secondary : Sacred Heart College, High School Department
Matunog Street, Calamba
Calamba Misamis Occidental
2017-2021

Senior High School : Sacred Heart College, High School Department
Matunog Street, Calamba
Calamba Misamis Occidental
2021-2023

College : Misamis University
H.T. Feliciano St., Aguada, Ozamis City
Misamis Occidental

CURRICULUM VITAE

PERSONAL DATA

Name : Trisha Mae A. Sajulga
Date of Birth : January 08, 2005
Place of Birth : Ozamis City, Misamis Occidental
Home Address : Poblacion, Buug,
Zamboanga Sibugay, Philippines
Gender : Female
Civil Status : Single
Contact No. : 09653627269
Email : sajulgaatrishamae@gmail.com



EDUCATIONAL BACKGROUND

Elementary : Buug Pilot Central School
Dagohoy St., Poblacion, Buug,
Zamboanga Sibugay
2011-2013

Dawa-Dawa Elementary School
Brgy. Dawa-Dawa, Alicia,
Zamboanga Sibugay
2013-2017

Secondary : St. Paul School of Buug, Inc
Datu Panas, Buug,
Zamboanga Sibugay
2017-2021

Senior High School : Marian College, Inc
Climaco St., Poblacion, Ipil
Zamboanga Sibugay
2021-2023

College : Misamis University
H.T. Feliciano St., Aguada, Ozamis City
Misamis Occidental