

Determination of *Escherichia coli* in Some Seafoods Sold at the Iligan City Public Markets

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Many seafoods sold in the markets such as a algae (lato), sea cucumbers, sea urchins and some bivalves are usually eaten uncooked. To many people especially those that live along the coastal areas, these seafoods have been become a part of their daily diet.

However, with industrialization, increased mining activities and the ever increasing human population, the sea has become the dumping ground of many wastes. At present, there is therefore no assurance that these seafoods are still safe to be eaten raw since contamination of these with human and animal wastes is inevitable. Furthermore, improper handling of these stuff can also be considered a source of fecal contamination.

Human pathogens vary in kind (bacteria, protozoa and viruses) and in number. It is therefore impossible to test the presence of each pathogen in the sample. Instead, an indicator organism, *Escherichia coli*, is usually used. The presence of this bacterium suggests the possible presence of other pathogens as it indicates contamination with fecal matter (Frobisher et al., 1969; Pelczar et al., 1978.)

E. coli is a gram-negative, nonspore-forming; facultatively anaerobic rod which ferments lactose to acid and gas at 35°C in 48 hours. This bacterium is found only in fecal material of warm-blooded animals hence its presence provides a strong evidence of fecal contamination and potential infection with human pathogens (Burdon, and Williams, 1969; Volk and Wheeler, 1980).

This study was therefore conducted to determine the presence of *E. coli* in some seafoods usually eaten uncooked sold at the public markets in Iligan City. Results of this study would serve to provide warning on the possible adverse effects resulting from the practice of eating uncooked seafoods.

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Materials and Methods

Samples of lato (*Caulepa* sp.) (Figure 1), lokut (egg case of seahare, *Aplasia* sp.) (Figure 2), suwaki (*Tripnuestes* sp.) (Figure 3), balat (holothurians) (Figure 4) and some bivalves like litub (*Andara* sp.) (Figure 5), bug-atan (*Venus* sp.) (Figure 6), punaw (*Tellina* sp.) (Figure 7) and tuway (*Corbicula* sp.) (Figure 8) were purchased periodically from the two public markets in Iligan City from January to March 1990.

The samples were washed with sterile tap water and were rinsed with sterile distilled water. The cleaned samples of lato, and balat were cut into smaller pieces using sterile scalpel. The suwaki and bivalves were opened using a sterile knife and the contents were emptied into sterile beakers. Each sample was homogenized using a sterile blender in sterile phosphate buffer (pH 7) to suspend the sample. The presence of *E.coli* in each homogenate was determined as summarized in the Figure 9.

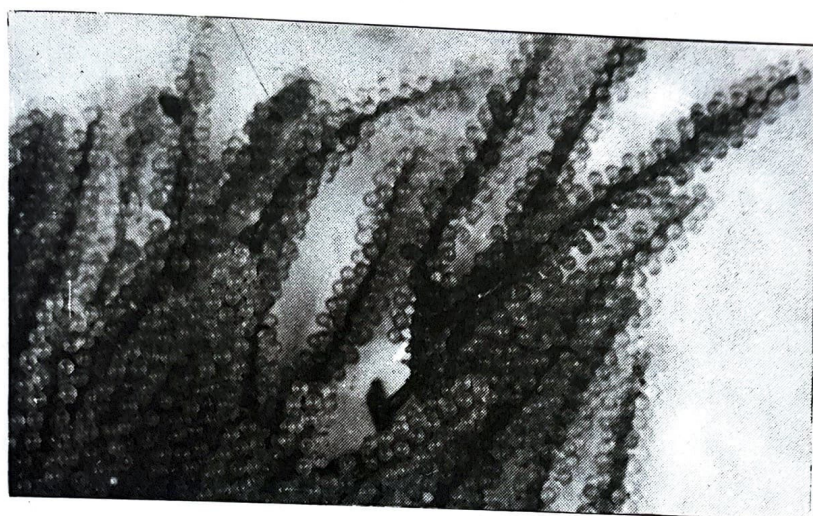


Figure 1. Lato (*Caulerpa* sp.)

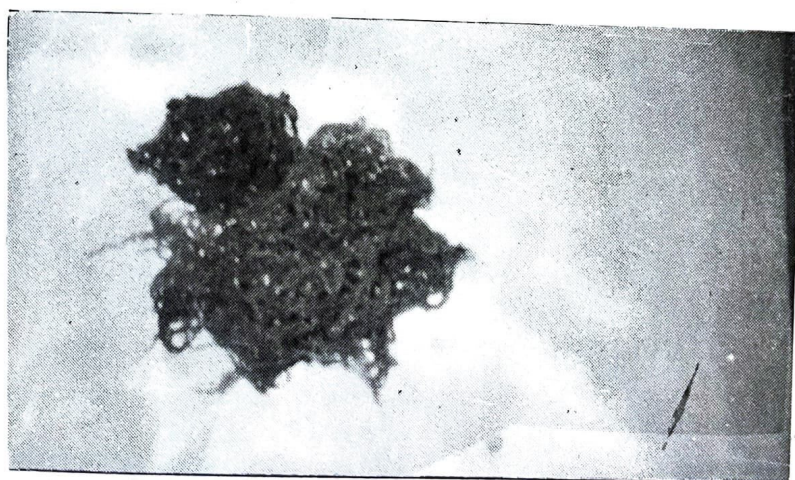


Figure 2. Lokut (eggcase of seahare, *Aplasia* sp.)

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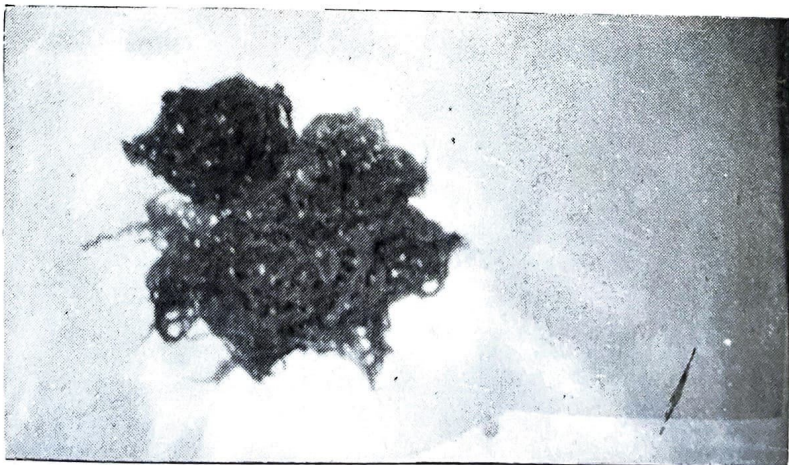


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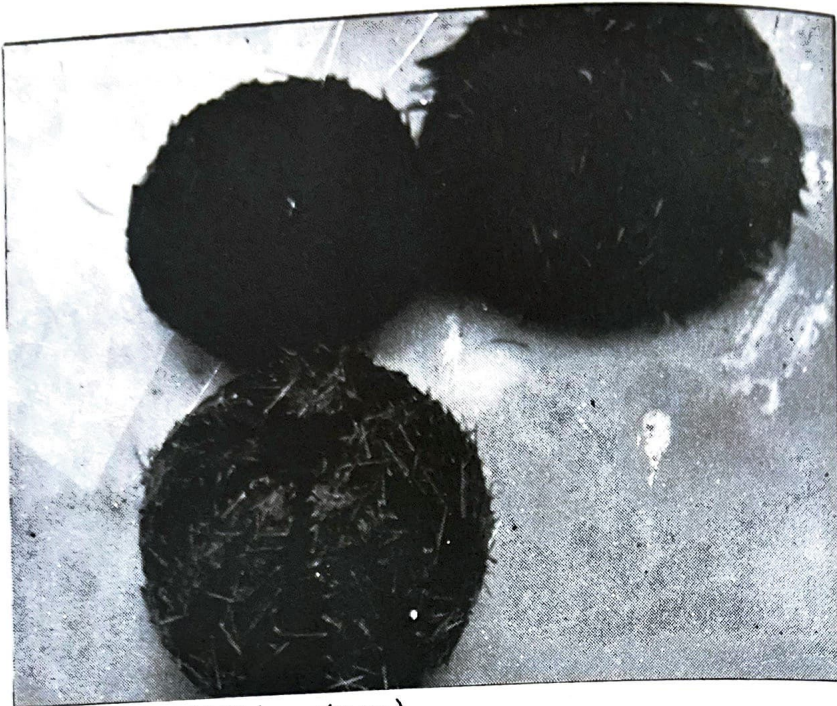


Figure 3. Suwaki (*Tripneustes* sp.)



Figure 4. Balat (*holothurian*)



Figure 5. Litub (*Anadara* sp.)



Figure 6. Bug-atan (*Venus* sp.)



Figure 7. Punaw (*Tellina* sp.)



Figure 8. Tuway (*Corbicula* sp.)

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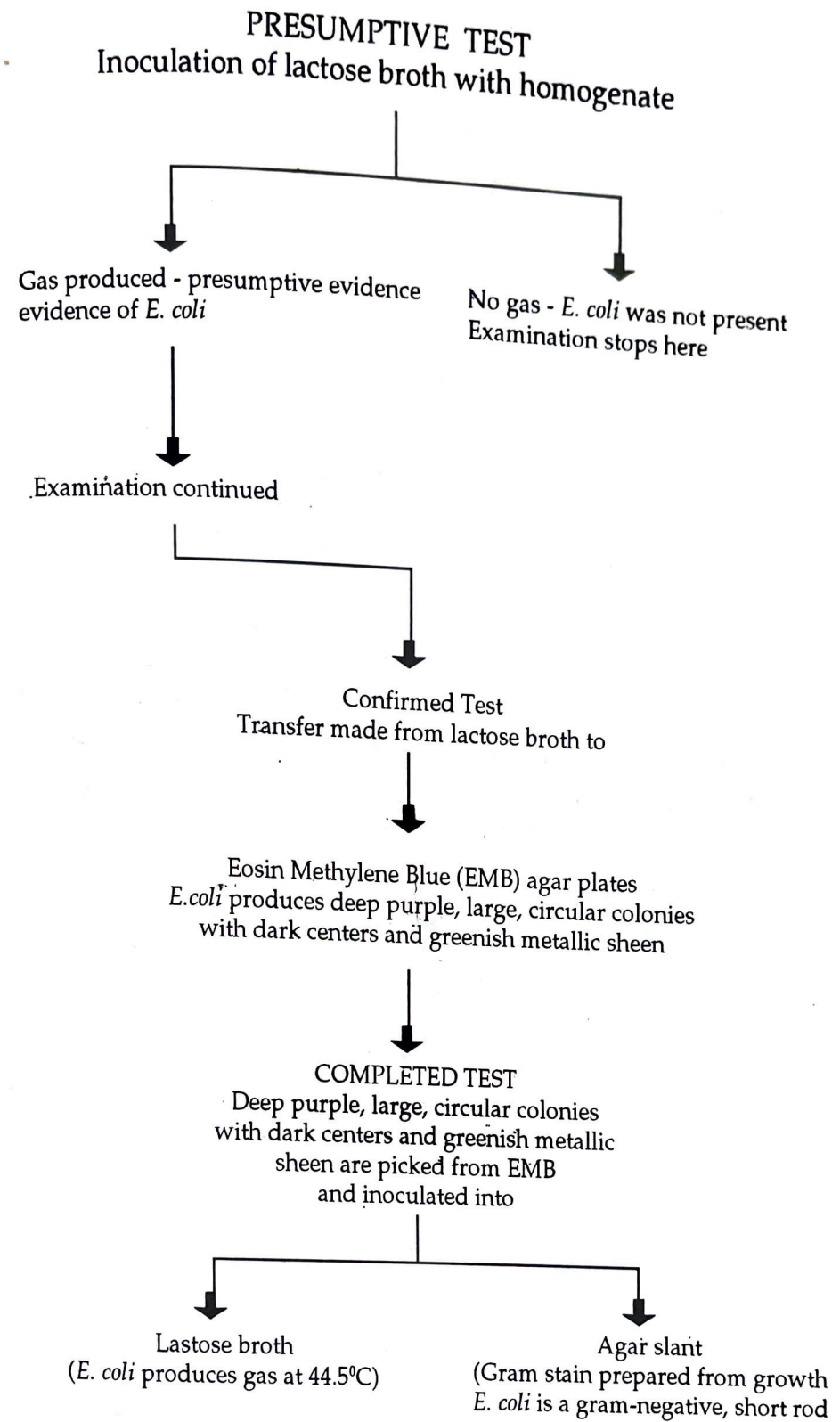


Figure 9. Laboratory testing to detect *Escherichia coli* in the seafood samples

Results and Discussion

Table 1 shows the most probable number (MPN) of coliforms in the samples of seafoods purchased from the Iligan City public markets from January to March 1990. The results of the MPN coliform per ml of sample was greater than 0.1. Coliforms are normal inhabitants of the intestine of man and other animals. The abundance of these bacteria in a given sample is a strong evidence that intestinal wastes have polluted the samples (Burdon, 1969). Based on the British Ministry of Health, water is regarded unsatisfactory for human consumption if it contains 10 coliforms per 100 ml or 0.1 coliform per ml (Freeman, 1979). Based on the results of three trials, the samples tested may be generally regarded unsatisfactory for raw consumption.

Table 2 summarizes the results of the three-part test used to detect the presence of *E.coli* in the seafood samples. The results showed that most of the seafood samples were contaminated with animal feces. The presence of *E.coli* in the stuffs might be a result of fecal contamination of their natural habitats or some became contaminated in transit as some of them like lato came from the neighboring islands such as Cebu or Siquijor. Still, other seafoods became contaminated due to improper or unhygienic handling of the stuff by the market vendors.

Table 1. Most probable number (MPN) of coliforms in some seafood sample purchased from the public markets of Iligan City.

SAMPLE	MPN OF COLIFORMS PER ML OF SAMPLE		
	Trial I	Trial II	Trial III
lato	110	110	9.3
lokut	>240	>240	>240
balat	>240	46	>240
suwaki	25	*	*
litub	>240	46	>240
bug-atan	>240	>240	>240
punaw	>240	>240	>240
tuway	110	>240	>240

* Not available at the time of sampling.

Table 2. Presence of *E.coli* in some seafood samples commonly eaten uncooked purchased from the public markets in Iligan City

Sample	T R I A L		
	I	II	III
lato	absent	present	present
lukot	present	present	present
balat	present	present	absent
suwaki	absent	*	*
litub	present	present	present
bug-atan	present	present	present
punaw	present	present	absent
tuway	present	absent	absent

* Not available at the time of sampling.

Since most of the seafood samples were positive for the presence of *E.coli*, some practical control measures were tested to kill if not to inhibit the growth of *E. coli* and other bacteria in few samples. However, due to the inavailability of the other seafood samples, only lato and punaw were used for this part of the study.

Immersing the lato in boiling water for 15 seconds or in salt-vinegar solution in 5 to 10 minutes seemed effective in reducing the bacterial count and in eliminating the *E. coli* from the foodstuff (Table 3). In both cases, the lato still retained its freshness and crispness.

However, soaking the punaw in salt-vinegar solution for 5 to 10 minutes did not totally eliminate the *E. coli* (Table 4). This is was probably due to the fact that *E. coli* was present not only in the surface of the meat but also within the animal's alimentary canal. Soaking the meat of punaw in the salt-vinegar solution may have eliminated only the bacteria in the surface.

Table 4. Bacterial count and test for the presence of *E. coli* in lato after immersing in boiling water or in salt vinegar solution.

TREATMENT	IN BOILING WATER		INSALT-VINEGAR SOLN	
	No. of bacterial/ml	<i>E.coli</i>	No. of bacteria	<i>E.Coli</i>
sample untreated (control)	TMTC*	present	2.65×10^2	present
sample + <i>E. coli</i> (positive control)	4.4×10^3	absent	1.50×10^2	absent
sample	4.0×10^2	absent	0.19×10^2	absent

*TMTC - too many to count

Table 5. Bacterial count and presence of *E. coli* in punaw after soaking in salt-vinegar solution from 5 to 10 minutes.

TREATMENT	5 MINUTES		10 MINUTES	
	No. of bacteria/ml	<i>E.coli</i>	No. of bacteria/m	<i>E. coli</i>
sample untreated (control)	TMTC	present	TMTC	present
sample + <i>E. coli</i> (positive control)	TMTC	present	TMTC	present
sample	TMTC	present	TMTC	present

TMTC - too many to count

Recommendations

On the basis of the above results, it is recommended that:

1. Lato and lukot must be thoroughly washed with clean water, and if possible, be either immersed in boiling water for 15 seconds or soaked in salt-vinegar solution for 5 to 10 minutes.
2. Balat or sea cucumbers must be thoroughly washed with clean water, the intestines removed, and if possible, must be soaked in salt-vinegar solution for 5 to 10 minutes before eating them, and
3. Bivalves are not advisable to be eaten raw.

Literature Cited

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