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Observation of Coliform Bacteria in Five Coastal along Kelantan

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Abstract

The observation of coliform bacterial counts along Kelantan coasts was studied on July and September 2011. Samples of coastal water were collected at five sampling stations along Kelantan coasts, the selection of beaches bases on popularity, population density and suggested by Department of Environment (DOE). The samples analyzed using multiple-tube fermentation technique as described in 21st edition of Standard Method for Examination Water and Wastewater. Irama beach shows high of coliform bacterial counts, 377 MPN/100 mL. However Sri Tujuh beach shows lower coliform bacteria count, 4 MPN/100 mL.The results obtain were compared with Malaysia Interim Marine Water Quality Standard (IMWQS). Coastal water with coliform bacteria counts more than acceptable limit consider unsafe for shell fishing and swimming activity.

Introduction

Microbial contamination from human and animal excreta enter marine water through rain water river runoff, land runoff and housing waste, agriculture waste, industrial waste and sewage with organic and inorganic contain also polluted marine water (Swarnakumar *et al.*, 2008). Regarding survey conducted by DOE (2006) Malaysia costal water majority polluted by suspended solid, *Escherichia coli* and oil and gasses. *E. coli* categories as one of coliform bacteria, other than *Escherichia, Enterobacter* and *Klebsiella* also classified as coliform group bacteria. Usually it use as indicator because this group of bacterial easily to identify and quantify (Hamzah *et al.*, 2011). It found in most warm blooded animal and extremely abounded in feces.

Nowadays, along with the development of coastal areas, coastal along Kelantan also not separated from coastal water pollution. Therefore, the objective of this study is to predict microbial contamination along Kelantan coast using coliform bacteria as indicator.

Materials and Methods

The study was conducted at five difference locations along Kelantan coasts. Three samples were taken at each location. The location chosen in this study based on DOE suggested and almost the location located at popular recreation as shows in Figure 1.

Coastal water sample (125 mL) were collected at three points from five sampling location on July and September, 2011 in sterilized biological bottle. The water samples were transported without filter and preserved in ice box and should be kept at 4°C until analysis. The analysis must begin within 48 h after sampling to ensure result is valid.

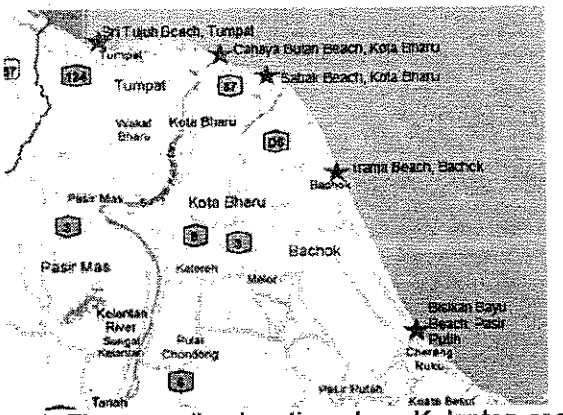

Figure 1: Five sampling location along Kelantan coast.

Multi-tube fermentation technique divided to three stages first presumptive, second confirmed and third completed stage. In presumptive stage the samples with difference quantity 10, 1.0 and 0.1 mL was pipette into series of culture tube contain lactose broth. Incubate inoculated tubes for 48 h at 35 ± 5°C. The positive presumptive was indicate by presence of gas bubble. The number of positive tubes recorded and compared with standard most probable number (MPN) table. The positive tubes proceed to confirmed stage.

Transfer a loopful of each positive presumptive broth to eosin methylene blue (EMB) agar. Incubate for 24 h at 35 ± 5°C. The positive confirmed was indicating by presence of dark centers and green metallic sheen.

The completed test is required to analyzed the colonies appeared on EMB agar plate. Isolated colony was picked from positive confirmatory stage and incubated cultured tubes contain lactose broth and streaked on nutrient agar slant. The result was observed after 24 h incubation, colonies on agar slant use to perform gram stain.

Results and Discussion

The coliform bacteria detected as indicator for determination the degree of water pollution. Presented in Figure 2 are observations of the presumptive, confirmed and completed stages. The positive presumptive was indicate by presence of gas bubble in series of fermentation tube. The confirmed was indicating by presence of dark centers and green metallic sheen. Eosin methylene blue (EMB) contains the dye methylene blue, which inhabits the growth of gram-positive organisms. The result was characterizing as *E. coli,* it is the major indicator of fecal pollution. Gas formation in secondary lactose broth tube and the demonstration of gram-negative, rod shaped bacteria present a positive completed stage.

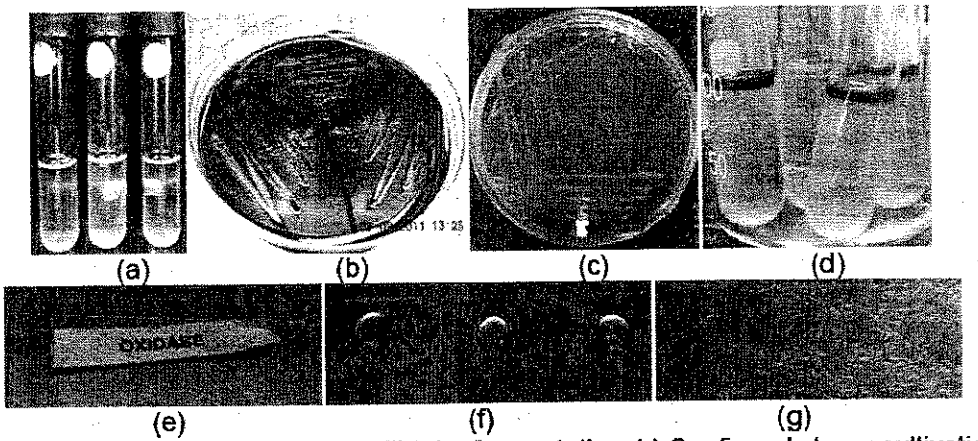

Figure 2: a) Presumptive stage: multi-tube fermentation, b) Confirmed stage: cultivation on eosin methylene blue (EMB) agar plate, c) Completed stage: isolation single colony on Nutrient agar, d) Indole test, e) Oxidase test f) Catalase test and g) Gram stain.

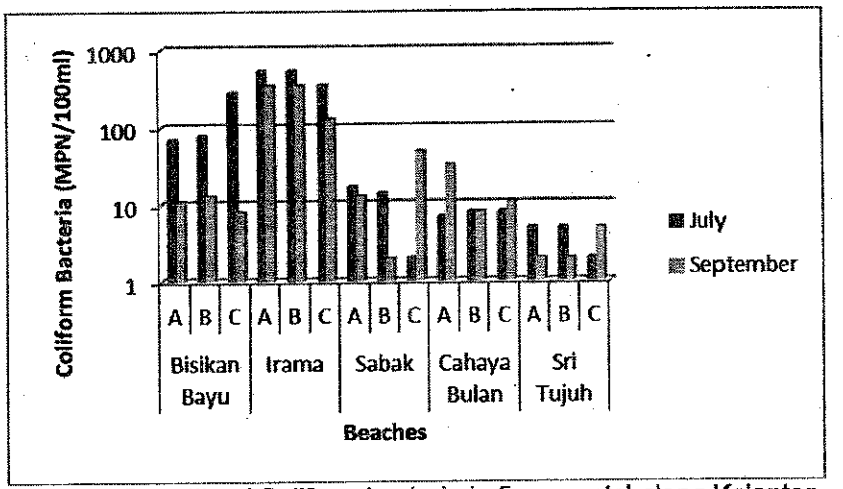

Figure 3: Quantity of Coliform bacteria in five coastal along Kelantan.

According to Malaysia Interim Marine Water Quality Standards (IWQS) (DOE, 2011) acceptable *Escherichia coli* count is 100 MPN/100 mL. Figure 3 shows the quantity of coliform bacteria for three points at five differences coastal along Kelantan on July and September 2011. Irama beach shows higher of coliform bacteria counts especially on July which are 540 MPN/100 mL at points A and B and 350 MPN/100 mL at point C. In September the value was decrease but it still more than acceptable limit. Otherwise, Sri Tujuh beach shows lower of coliform bacteria count it below than 10 MPN/100 mL on July and September 2011.

From the observation drain and wastewater reservoir near Irama beach affecting coliform bacteria counts compare with other location such as Sri Tujuh beach, this coast is located far from drain and housing area. The water from the drain flow into river and enter directly into beaches near the sampling location at Irama beach. Other than that factors, raining also give significant effect to coliform bacterial count. Bacterial in costal water remained elevated up to five days after rain before the condition back to normal after three days (Ackerman *et al.*, 2003). Unstable weather conditions influence the level of coliform bacteria during study period.

Conclusion

As a conclusion the coastal that located near populated area with high population density of more vulnerable to pollution. Coastal with high of colifom bacteria count such as Irama beach not suitable for bathing and others coastal water activity. Coliform bacteria level as follow Irama Beach > Bisikan Bayu Beach > Sabak Beach > Cahaya Bulan Beach > Sri Tujuh Beach.

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