

## ***Escherichia coli* SURVIVAL IN LAGOON WASTE WATER UNDER DIFFERENT TEMPERATURE AND pH**

THEN, Y. P., LING, T.Y. AND APUN, K.

*Faculty of Resource Science and Technology, Universiti Malaysia Sarawak,  
94300 Kota Samarahan, Sarawak  
Email: tyling@frst.unimas.my*

### **ABSTRACT**

*Escherichia coli* (*E. coli*) is a common bacteria of fecal contamination. Its existence in the ecosystem is important in microbiological examination for water quality. This study was carried out to determine the interaction between different pHs and temperatures in affecting the survival of *E. coli*. Information related to the survival of *E. coli* in piggery waste water is still lacking in the literature. This study investigated *E. coli* population die-off in waste water from the secondary lagoon in a pig farm located at Gedong, Sarawak. The study was carried out to determine the survival of *E. coli* population in the waste water at 2 different temperatures (20°C and 30°C) and pH levels of pH 5-10. The results show that *E. coli* survived up to 44 days at 20°C, pH 8. At 30°C under pH 10, *E. coli* population decreased quickly to detection limit in 3 days. The *E. coli* population survived the longest in pH 8 at both temperatures instead of the mean neutral pH of 6-7. The die-off of *E. coli* was faster at 30°C when compared to those at 20°C. Results of this study indicated that temperature and pH are important factors affecting the survival of *E. coli* in waste water. This information may assist in the prediction of the retention time required for pig waste treatment in a lagoon prior to discharge to the environment.

---

### **INTRODUCTION**

In Malaysia, pig farming grown rapidly from Chinese family activity to industrial livestock farms due to high markets demand (Kinson *et al.*, 2001). There are more than 225 commercial farms operating in Sarawak, with a concentration of farms in the Kuching-Bau-Serian-Samarahan region (Chemsain Konsultant S/B, 2004). According to Kinson *et al.* (2001), the pig industry is one of the most polluting livestock industries in Sarawak resulting water and air pollution.

Waste water lagoon is widely used for waste water treatment due to its low costs, simple operation and low-skilled management. In tropical countries, shallow lagoons with large surface areas can effectively treat domestic and agricultural wastes (Hosetti and Frost, 1995). In Malaysia, farm operators must build at least two oxidation ponds to treat pig wastes within four months after the issue of licences to commercial pig farms (Kinson *et al.*, 2001).

Waste water in the lagoons is subjected to change due to various physical and chemical factors including temperature (Marais, 1974), pH (Parhad and Rao, 1974), solar radiation (Calkins *et al.*, 1976) and dissolved oxygen (Curtis *et al.*, 1992). Crane and Moore (1986) reported that both acidic and alkaline conditions in aquatic system increased die-off rates while neutral pH extended bacterial survival. McFeters & Stuart (1972) observed that the optimum pH for *E. coli* survival is around 5.5 to 7.5 using deionized water. Mayo (1995) stated that *E. coli* was removed rapidly at pH 9.3 in the waste stabilization ponds.

According to Crane and Moore (1986), pH and temperature are key abiotic factors affecting *E. coli* die-off. Due to the lack of quantitative information of *E. coli* survival in piggery waste water in different pH and temperature, and interaction between these two factors is still lacking in literature, therefore the objective of this study was to investigate the survival of *E. coli* in piggery waste water in secondary lagoon under different pH and temperatures.