

## Prevalence of Antibacterial-Resistant *E. coli*: A Study of Sungai Congkak, Hulu Langat

Muhammad Adlan Osman<sup>a\*</sup>, Wan Razarinah Wan Abdul Razak<sup>a</sup>

### Structured Abstract

**Background:** Irresponsible and excessive use of antibiotics leads to development of increasing resistance by bacteria through various mechanisms. This can result in the emergence of multidrug-resistant bacteria, posing global threats which deem antibiotics ineffective. *Escherichia coli* is a Gram-negative coliform, acting as an ideal faecal indicator organism for water quality assessment, signalling the likelihood of faecal contamination simultaneously other intestinal pathogens' presence. Sungai Congkak, Hulu Langat is a popular water recreational spot that receives high numbers of visitor of varying ages. The presence of antibacterial-resistant *E. coli* in Sungai Congkak can indicate potential antimicrobial-resistant genes contamination, putting visitors at risk.

**Methods:** Water and soil samples were acquired from four sites (A&B located inside of Sungai Congkak Recreational Forest, C&D located outside, along the river). Standard plate count and total coliform count were performed by spread-plate method on nutrient agar and eosin methylene blue (EMB) agar, respectively. Samples were also inoculated onto EMB agar and Sorbitol MacConkey agar for *E. coli* detection and isolation. Further biochemical tests including the IMViC test, oxidase test, and catalase test were performed. Antibiotic susceptibility testing (penicillin, ampicillin, gentamicin, tetracycline, erythromycin, & norfloxacin) was performed on the confirmed *E. coli* isolates, by disc diffusion on Mueller Hinton agar.

**Results:** For standard plate count, "Site-AB" and "Site-CD" groups showed a significant difference ( $p < 0.001$ ) for water samples, whereas soil samples depicted an insignificant difference ( $p = 0.0124$ ). The total coliform count between "Site-AB" and "Site-CD" showed insignificant differences for both water samples ( $p = 0.079$ ) and soil samples ( $p = 0.234$ ). Moreover, all soil samples showed confirmed *E. coli* detection, whereas none of the water samples did. Further antibiotic susceptibility testing showed *E. coli* isolates to be "completely resistant" to penicillin 10 $\mu$ g, "resistant" to (ampicillin 10 $\mu$ g, tetracycline 5 $\mu$ g, and erythromycin 15 $\mu$ g), "intermediate" to gentamicin 10 $\mu$ g, and "susceptible" to norfloxacin 10 $\mu$ g.

**Conclusion:** Findings suggested that Sungai Congkak is safe, as samples' total coliform counts were in safe category for recreational activities (Class IIB) by Department of Environment, Malaysia, besides the absence of *E. coli* detection in water samples. This indicates minimal faecal contamination in the areas. Furthermore, norfloxacin proves to be an effective antibiotic against *E. coli* isolates.

**Keywords:** Antibacterial-resistant, *E. coli*, Sungai Congkak, antibiotics, recreational river

\*Correspondence: [nurnadiah@uitm.edu.my](mailto:nurnadiah@uitm.edu.my)

<sup>a</sup> School of Biology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia