

## **Isolation and characterization of an acid and metal tolerant *Enterobacter cloacae* NZS strain from former mining lake in Selangor, Malaysia**

### **ABSTRACT**

Background: Metal polluted environments have been found to harbor acid and metal tolerant bacterial communities. Metal oxidizing bacteria in particular are industrially important microorganisms that can be utilized for potential applications in biomining and bioremediation. However, some well-characterized strains are not readily culturable as they are obligate and fastidious chemolithotrophs requiring special techniques for their cultivation. Hence, this study was aimed at isolating, identifying, and characterizing indigenous metal tolerant heterotroph(s) from abandoned mines that can potentially be used for biomining or bioremediation processes in the future. Results: Seventeen bacteria from former mining lakes were isolated and identified using 16S rRNA. Minimal inhibition concentration (MIC) and growth study of isolated bacteria carried out in Luria-Bertani media containing three different metals ions, zinc (II), copper (II), and iron (II), showed that a particular isolate termed *Enterobacter cloacae* NZS was found to exhibit better growth and tolerance for copper (up to 90 mM), zinc (up to 200 mM), and iron (up to 170 mM). Growth of the strain was notably well in the presence of iron (II). Compared to all the isolates, only *E. cloacae* NZS was able to be enumerated at pH lower than 5 while other strains were culturable only at pH 7. Its capability in iron (II) oxidation was preliminary assessed based on the pH, cell count, glucose consumption, and amount of iron oxidized throughout incubation in 9K media. *E. cloacae* NZS strain was found to be capable of oxidizing iron (II) supplied in 9K media to iron (III). Conclusion: As preliminary investigation showed that *E. cloacae* NZS was able to oxidize iron (II) in 9K media at pH2, further optimization on the strain, medium, and culture conditions in future may be able to provide a better insight on this strain to be possibly used as an iron oxidizer for various applications.

**Keyword:** *Enterobacter cloacae* NZS; Metal ions; Metal tolerant; Iron oxidation