

Isolation and optimisation of phenol degradation by antarctic isolate using one factor at time

ABSTRACT

Phenol has been classified as a priority pollutant by the United States Environmental Protection Agency (US EPA) due to its high toxicity. The increased level of phenol concentration in the Antarctic environment causes a significant risk to the aquatic and terrestrial lives there due to its persistence, biomagnification and accumulation in the food chain. The biodegradation of phenol in Antarctica is considered highly challenging owing to its harsh and extremely cold climate. Therefore, actions of bioremediation are crucial to overcome this problem. To date, little data is available regarding the biodegradation of phenol by aboriginal Antarctic bacteria, and reports on the utilisation of phenol as sole carbon source by strains isolated from Antarctic soil are scarce. In the present study, bacteria isolated from Antarctic soil and identified as *Arthrobacter* sp. strain AQ5-15 based on 16S rRNA sequence was screened and optimised through conventional method for efficient phenol degradation. Based on preliminary screening, AQ5-15 strain was capable of completely degrading 0.5 g/L phenol within 108 h at 10°C. A study on the effects of significant factors including nitrogen source and concentration, salinity, pH and temperature was carried out to optimise the conditions for phenol degradation. Finding revealed that this strain is a psychrotolerant with optimum temperature at 20°C and prefer neutral or near-neutral condition for phenol degradation. The basic knowledge obtained from this study will provide the benefits on custody of the Antarctic environment especially in removing phenol and its derivatives at low temperature.

Keyword: Antarctica; *Arthrobacter* sp.; Cold-tolerant; Bioremediation; Phenol