

## **Optimization of phenol degradation by Antarctic bacterium *Rhodococcus* sp.**

### **ABSTRACT**

This study focused on the ability of the Antarctic bacterium *Rhodococcus* sp. strain AQ5-14 to survive exposure to and to degrade high concentrations of phenol at 0.5 g l<sup>-1</sup>. After initial evaluation of phenol-degrading performance, the effects of salinity, pH and temperature on the rate of phenol degradation were examined. The optimum conditions for phenol degradation were pH 7 and 0.4 g l<sup>-1</sup> NaCl at a temperature of 25°C (83.90%). An analysis using response surface methodology (RSM) and the Plackett-Burman design identified salinity, pH and temperature as three statistically significant factors influencing phenol degradation. The maximum bacterial growth was observed (optical density at 600 nm = 0.455), with medium conditions of pH 6.5, 22.5°C and 0.47 g l<sup>-1</sup> NaCl in the central composite design of the RSM experiments enhancing phenol degradation to 99.10%. A central composite design was then used to examine the interactions among these three variables and to determine their optimal levels. There was excellent agreement ( $R^2 = 0.9785$ ) between experimental and predicted values, with less strong but still good agreement ( $R^2 = 0.8376$ ) between the predicted model values and those obtained experimentally under optimized conditions. *Rhodococcus* sp. strain AQ5-14 has excellent potential for the bioremediation of phenol.

**Keyword:** Bioremediation; One-factor-at-a-time; Response surface methodology