



Article

Production of Lipopeptide Biosurfactant by a Hydrocarbon-Degrading Antarctic *Rhodococcus*

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Abstract: Rhodococci are renowned for their great metabolic repertoire partly because of their numerous putative pathways for large number of specialized metabolites such as biosurfactant. Screening and genome-based assessment for the capacity to produce surface-active molecules was conducted on *Rhodococcus* sp. ADL36, a diesel-degrading Antarctic bacterium. The strain showed a positive bacterial adhesion to hydrocarbon (BATH) assay, drop collapse test, oil displacement activity, microplate assay, maximal emulsification index at 45% and ability to reduce water surface tension to < 30 mN/m. The evaluation of the cell-free supernatant demonstrated its high stability across the temperature, pH and salinity gradient although no correlation was found between the surface and emulsification activity. Based on the positive relationship between the assessment of macromolecules content and infrared analysis, the extracted biosurfactant synthesized was classified as a lipopeptide. Prediction of the secondary metabolites in the non-ribosomal peptide synthetase (NRPS) clusters suggested the likelihood of the surface-active lipopeptide production in the strain's genomic data. This is the third report of surface-active lipopeptide producers from this phylotype and the first from the polar region. The lipopeptide synthesized by ADL36 has the prospect to be an Antarctic remediation tool while furnishing a distinctive natural product for biotechnological application and research.

Keywords: surface-active lipopeptide; biosynthetic gene clusters; fellfield soil; Antarctica

1. Introduction

Antarctica is generally perceived as one of the most pristine environments on Earth. Nevertheless, Antarctica's environments are not immune to impacts from human activities occurring both globally and locally within the region. In fact, growing research interest and exploration have already substantially altered some areas, particularly in regions with a high concentration of multinational activities and presence of research stations. Fuel spills and hydrocarbon pollution are one of the most frequent effects of human impacts. The contamination of hydrocarbon components in the Antarctic has caused great concern as their environmental recovery rate is expected to be very slow, therefore having the potential to cause pronounced and long lasting environmental impacts [1,2].