**Title: PHYSIOLOGICAL RESPONSE TO NICKEL IN BACTERIA ISOLATED FROM CERRADO SERPENTINE SOIL**

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**Abstract**

Nickel is essential to microorganisms since it is a cofactor of several enzymes. However, high concentrations of this metal cause nonspecific interaction with cell components and are toxic to bacteria. Several mechanisms to avoid the toxicity of nickel are known, such as the export of the metal via efflux pumps, or its sequestration inside or outside the cell. Serpentine soils naturally contain toxic concentration of heavy metals, especially nickel; therefore it is expected that bacteria from these soils possess at least one of these tolerance mechanisms. In a previous study twelve bacteria were isolated from serpentine soil located in the Brazilian Cerrado; they were affiliated with the phyla Actinobacteria, Proteobacteria, and Bacteroidetes. The objective of the present work was to evaluate their physiological responses to nickel aiming for a future biotechnological application such as bioremediation or biomining. Maximum Tolerated Concentration (MTC) to nickel was determined on R2A solid medium containing increasing concentrations of $NiCl_2$ or $NiSO_4$. Actinobacteria isolates exhibited the highest tolerance to both sources of nickel tested, 64 mM; whereas Proteobacteria and Bacteroidetes MTC were 16 mM. Physiological responses to nickel toxicity were evaluated by morphological modifications of the colony and bacterial cell. Pigment production was increased in some Actinobacteria isolates when the media was amended with Ni. Furthermore, sporulation and mycelial branching were affected. Actinobacteria are known to produce a wide range of secondary metabolites, in the case of metal resistance, pigments may be responsible for chelating the metals from soil. Proteobacteria isolates developed a circular inclusion body when subjected to nickel-amended media, but it is still unclear the composition of this inclusion. The Bacteroidetes colony, on the other hand, exhibited growth enhancement on media amended with $NiSO_4$, compared to the control without nickel and amended with $NiCl_2$, indicating the metal or sulfate may have a positive effect on cell division. Therefore, the physiological response is dependent on the source of nickel and the taxonomic affiliation of the bacteria tested. The molecular mechanisms involved in the high tolerance to nickel exhibited by these bacteria will be further investigated, and they will be then evaluated for biotechnological applications.

**Keywords**: Nickel tolerance, Metal tolerance, Actinobacteria, Serpentine soils, Cerrado.

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