IMPLICATIONS OF THE VARIATION ON THE PIGMENTS PROFILE OF THE POLYEXTREMOPHILE BACTERIUM *DEINOCOCCUS RADIODURANS* UNDER SIMULATED EXTREME ENVIRONMENTAL CONDITIONS FOR THE BIOSIGNATURE DETECTION PROBLEM.

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Introduction: The polyextremophile microorganism *Deinococcus radiodurans* is widely studied due to its high resistance to different forms of environmental stress, induced by dissecation, ultraviolet radiation and ionization radiation, thus being a model organism for astrobiology related studies, such as on the search for life on other planets. One of its several strategies of protection against radiation is the production of pigments, which protects not only against UV-radiation, but also against oxidative stress [1,2]. In this project, the profile of all major carotenoids (both in higher and lower concentrations) from a standard culture (cultivation in mild environmental conditions) and in samples exposed to extreme conditions [3] such as radiation and oxidative stress, simulating Martian conditions, were studied using liquid chromatography. The changes on the carotenoid profile, related to the metabolic response due to the simulated extraterrestrial conditions were analyzed, aiming to refine our knowledge of this potential biosignature.

Methods:

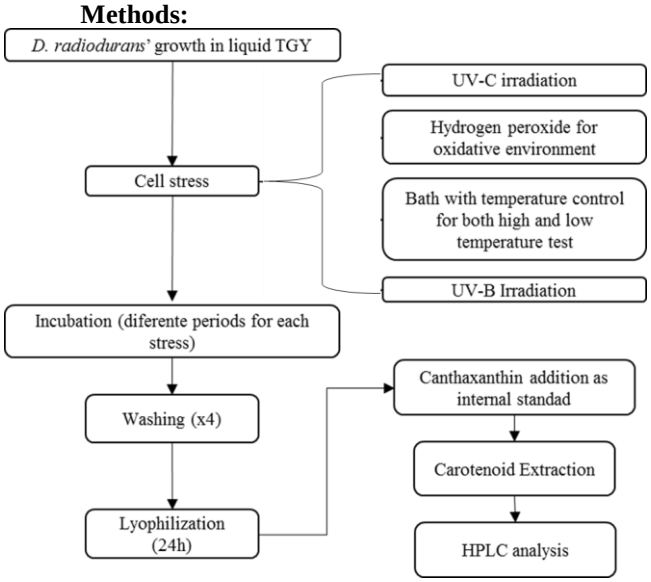

Figure 1. Schematics of the experimental procedures adopted.

Results and Discussion: Variation of the pigment's profile of *D. radiodurans* was not observed for 1.5kJm^{-2} UV-C irradiation, suggesting that the following 12 hours of incubation gave the cell time to fully recover. Subsequent tests suggested that under oxidative, low temperature (0ºC), UV-B irradiation (160kJm^{-2}) and high temperarute's (42ºC) cellular stress, the overall pigment production decreased, specially deinoxanthin [4], carotenoid of main importance for the study. As an example, cells under oxidative stress presented a decrease of approximately, 50% on the production of carotenoids identified as 2 (deinoxanthin), 3, 6 and 11 (Figure 2).

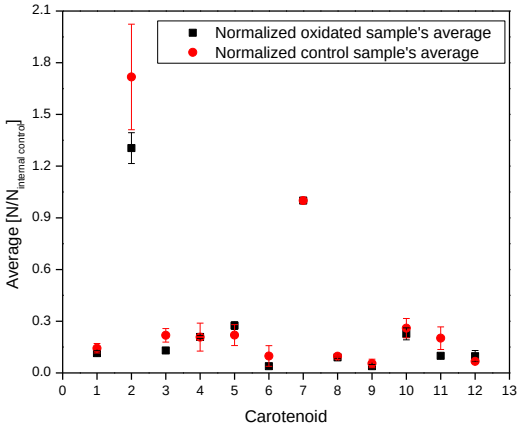

Figure 2. Average values of pigments` production for cultures exposed to 60µM of hydrogen peroxide in liquid growth medium (TGY), simulating oxidative environment. and for control samples in pure growth medium, after 2 hours of incubation. The production of deinoxanthin (2) decreased considerably. Carotenoid identifyed as 7 corresponds to the internal standard (*trans*-Canthaxanthin).

Conclusion: Cells of *D. radiodurans* presented the capacity of fully recover its pigments` production after exposure to UV-C irradiation and subsequent incubation. Nonetheless, the additional environmental stress simulations performed suggest that variation of quatities in different pigments are possible to detect through chromatographic methods. Future tests will be done in order to minimize the errors attributed to the mesurements and to refine the chemometrics analysis.

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