TITLE: STUDY OF THE RESISTANCE TO ULTRAVIOLET RADIATION ON PIGMENTED ORGANISMS

AUTHORS: MARINATO, B. T. V.[1]; RODRIGUES, F.[2]

INSTITUTION: 1. INTERUNITIES GRADUATE PROGRAM IN BIOTECHNOLOGY, UNIVERSITY OF SÃO PAULO (2415 PROFESSOR LINEU PRESTES AVENUE, SÃO PAULO, SP, 05508-900, BRAZIL); 2. CHEMISTRY INSTITUTE, UNIVERSITY OF SÃO PAULO (748 PROFESSOR LINEU PRESTES AVENUE, ROOM 1257, SÃO PAULO, SP, 05508-000, BRAZIL).

ABSTRACT:

Ultraviolet radiation can cause instability in the genome, which can lead to oxidative damage and even disruption of the DNA molecule. In the context of Astrobiology, UV-C radiation reaches the surface of environments without a significant atmosphere, for example, as it occurs on Mars. The evolution of life on Earth was probably influenced by UV-C radiation when it, billions of years ago, still reached the Earth's surface. Some radioresistant organisms produce pigments that can protect them from the effects of UV radiation. Although Brazil does not have classic extreme environments, there are regions with extreme characteristics. For example, near the city of Diamantina (MG) has a high iron content, water stress, high temperatures and high UV doses. The aim of this study was to isolate pigmented microorganisms from environmental samples from the ferriferous region of Minas Gerais and resistant to UV-C radiation. The pigmented isolates and *Deinococcus radiodurans* strain R1 (control) were exposed to a mercury lamp (λ = 254 nm). The methodology applied for the irradiation assay consisted of the serial dilution technique, followed by plating and counting of CFUs. Survival fractions compared to controls were obtained using N_t/N_0 (N_t = number of viable cells after irradiation. N_0 = number of viable non-irradiated cells). Isolates P20.30.R2A.8 and P9.30.TGY.3 showed greater resistance, surviving the fluence of 600 J/m², followed by isolate P10B.30.TGY.2 which resisted up to 550 J/m². Isolates P9.30.R2A.1 and P20.30.TGY.4 resisted doses of 350 and 250 J/m², respectively. All of the above isolates showed yellow colonies. Isolates P11B.30.TGY.8 (orange), P11B.30.TGY.18 (brown) and P11B.30.TGY.33 (red) resisted 250 J/m²; and isolate P11B.30.TGY.14 (purple) withstood 300 J/m². 16S rRNA gene sequencing revealed high identity (>97%) with the genera *Arthrobacter*, *Brachybacterium*, *Burkholderia*, *Microbacterium*, *Serratia*, *Sinomonas* and *Staphylococcus*. The D_{37} dose for ultraviolet light is approximately 550 J/m² for cultures of *D. radiodurans*, one of the most resistant microorganisms to radiation; therefore, some isolates from this work carried out in a Brazilian environment may be good candidates for more detailed studies on the resistance of organisms in places with a high incidence of ultraviolet radiation, not only on Earth, but also in extraterrestrial environments.

Keywords: ultraviolet radiation; astrobiology; pigments; Brazil; *Deinococcus radiodurans*

Development Agency: National Council for Scientific and Technological Development (CNPq) (133815/2018-8). Serrapilheira Institute (Brazil) (grant number: G-1709-20205).