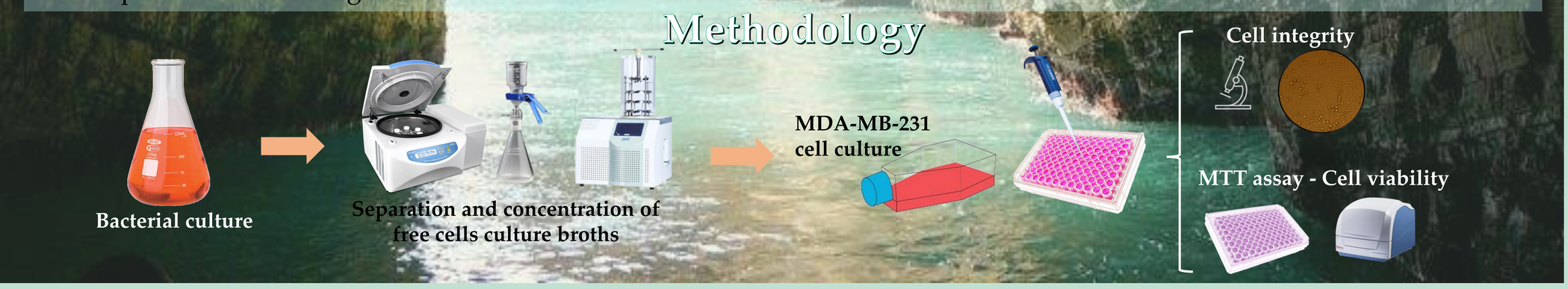
Antiproliferative Activity of Bioactive Compounds Produced by Bacterial Isolates from Pristine Environments

Introduction

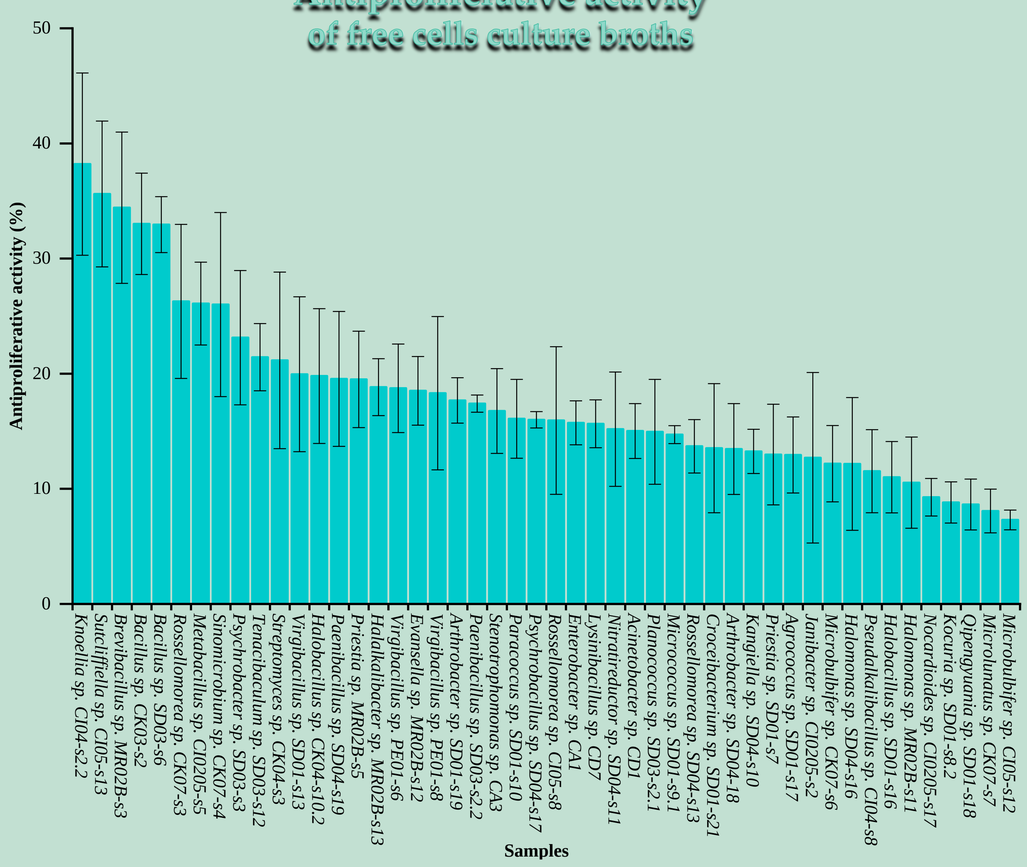
Pristine environments, such as caves, represent distinctive ecosystems that remain untouched by human influence and are exposed to extreme environmental conditions [1]. These habitats serve as bountiful reservoirs of microbial diversity, with the microorganisms inhabiting them evolving specialized traits and metabolic pathways in response to the unique selective pressures exerted by their surroundings. To survive, these microorganisms usually have the ability to produce metabolites that prevent the growth of other organisms, which can have an effect on different cells, including tumor cells. This study aims to search for new bioactive compounds with antitumoral activity produced by bacterial strains belonging to the phyla Actinomycetota, Bacillota, Bacteroidota and Pseudomonadota, which were isolated in marine, Paleolithic, and volcanic caves. The antitumor potential of culture supernatants of bacterial strains was tested against a breast cancer epithelial cell line MDA-MB-231 at different concentrations, and very promising results were obtained for some of the strains studied. These compounds produced by the bacteria could potentially be used as nutraceuticals or complementary agents in future cancer therapies. Bioprospection and discovery of new compounds represent an opportunity for the study of these natural habitats, allowing new products obtained by fast and low-cost biotechnological processes to be implemented as novel green-safe and sustainable solutions. solutions.

Methodology

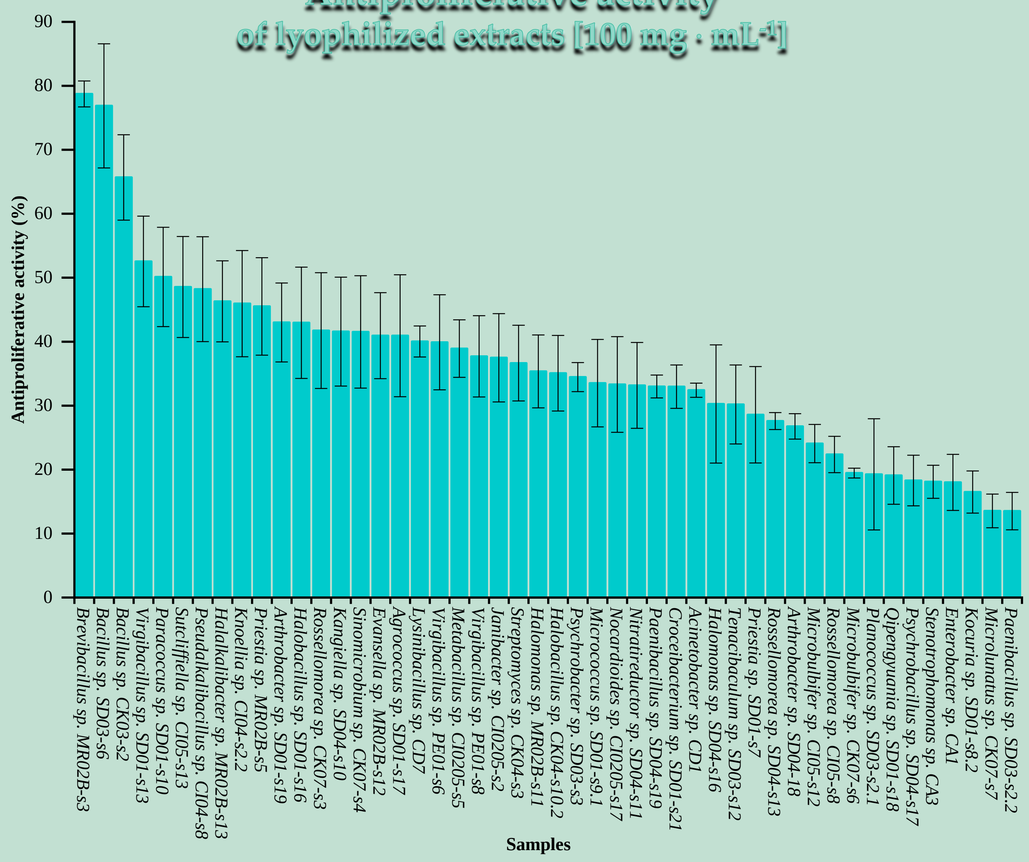


Results

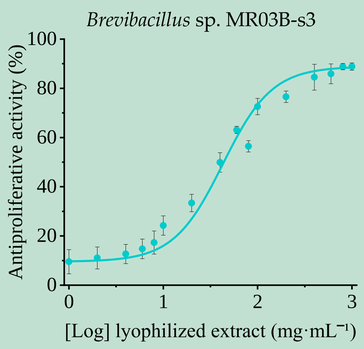
Antiproliferative activity of free cells culture broths



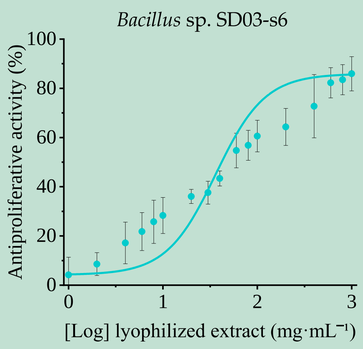
Antiproliferative activity of lyophilized extracts [100 mg · mL⁻¹]



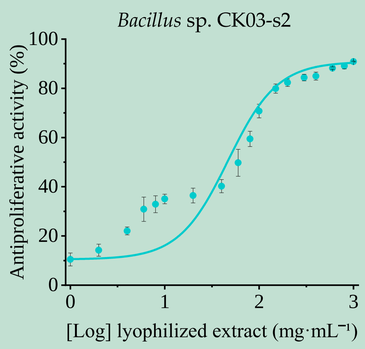
Dose response study and EC_{50}



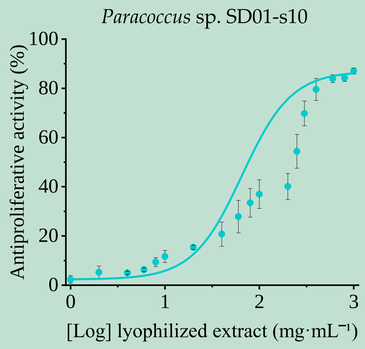
EC_{50} = 42.78 ± 2.84 mg·mL^{-1}



EC_{50} = 36.19 ± 3.36 mg·mL^{-1}

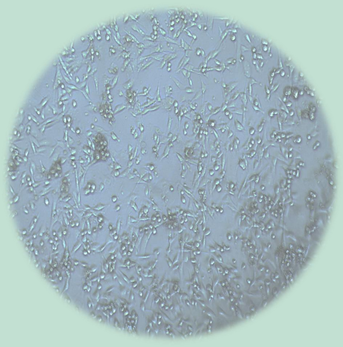


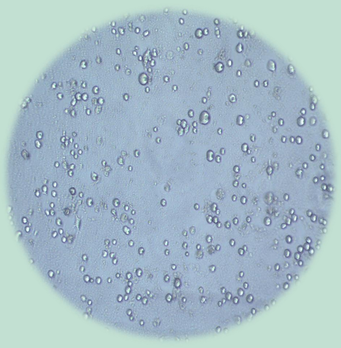
EC_{50} = 46.94 ± 7.32 mg·mL^{-1}

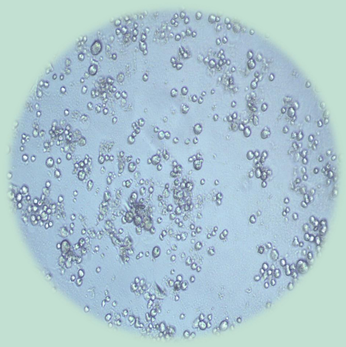


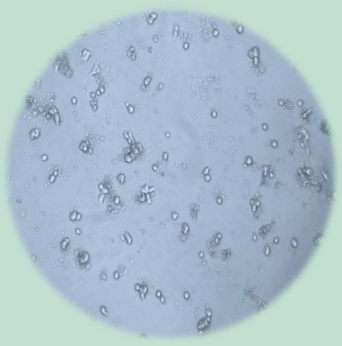
EC_{50} = 65.65 ± 8.20 mg·mL^{-1}

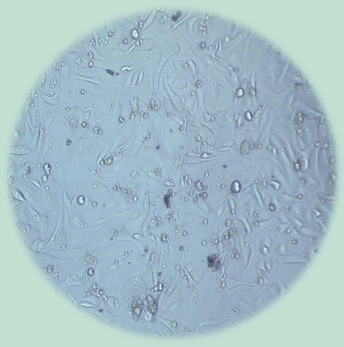
Negative control











Photographs (100X) of MDA-MB-231 cells 48h after addition of lyophilized extracts [100 mg · mL^{-1}]. In these images it is possible to observe the loss of cell adhesion when compared with the negative control, which is in accordance with the EC_{50} values obtained for each extract.

Remarks

Some of the bacteria under study seem to produce compounds with high antiproliferative activity, in the future, it would be interesting to identify these compounds present in free cell culture broths.

Brevibacillus sp. MR03B-s3, *Bacillus* sp. SD03-s6, *Bacillus* sp. CK03-s2 and *Paracoccus* sp. SD01-s10 show a low EC_{50}, which indicates that a small concentration of extracts induces cell death in 50% of the population. It could be interesting to study the activity of these bacteria in other tumour cell lines and compare with normal cell lines.

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Keywords:

Antiproliferative activity, Biotechnology, Caves, Tumor cells, Sustainability.

References:

[1] P. Gatinho, C. Salvador, A. M. Silva, and A. T. Caldeira, "Prokaryotic Communities from Pristine Cave Environments : Biotechnological Potential with Sustainable Production," pp. 1–22, 2023, doi: 10.3390/su15097471.

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