REDESIGN OF THE WINOGRADSKY'S COLUMN AS AN EXPERIMENTAL CHAMBER FOR EVALUATING THE EFFECT OF MARTIAN ATMOSPHERE ON THE ECOLOGY OF A HIPERSALINE MICROCOMMUNITY. R. A. O. Abans[1]; F. Rodrigues[2]; I. G. Paulino-Lima[3] and D. Galante[4], [1]rodrigo.abans@lnls.br, [2]farod@iq.usp.br, [3]ivan.g.paulinolima@nasa.gov , [4]douglas.galante@lnls.br.

Introduction: Over the last years, many discoveries have been made about Mars' past environment and the possibility of extinct or extant signs of life. Furthermore, manned missions to the red planet are becoming more and more feasible, urging for a deeper knowledge on which biosignatures to search for. To that end, it is of upmost importance to understand not just isolated species, but how a whole complex microbiome reacts to certain martian conditions in matters of community's survival and change in the bioprecipitates deposition patter.

Regarding the evidences of a past ocean on Mars and the theories of how the planet dried[1], a hipersaline microbiome may be a good example of life that may have existed on Mars. In some cases on Earth, microcommunities like this can precipitate minerals, such as dolomite, a carbonate mineral that does not form in low temperatures and rich-sulfate environments abiotically[2]. Thus, it could pottentialy serve as a biomarker on Mars. To isolate such microbiome, the Winogradsky's column[3] shows a great potential to be adapted as an experimental chamber. Finaly, it is intended to study the species composition and dolomite precipitation changes under a Mars-like atmosphere composition.

Methodology: Based on the literature, the dimensions and materials for the Winogradsky's column were chosen. Conceptual designs were made using a CAD software and the best models were built under different setups to identify flaws and their feasibility. The hipersaline microcommunity was collected in the saline lakes of the Araruama region[4] (Rio de Janeiro, Brazil). A gas mixture (95% CO_2 and 5% N_2) was used as a martian atmospheric analog, but kept inside the columns at ambient temperature and pressure, for simplicity of the first test. As for the ligh, it was used lamps with broad spectrum and small quantities of UVB and A in a 12h cycle. For analysis, a longitudinal cut will be made to sample many points along the vertical axys for microbial identification using 16s sequencing and for dolomite detection using X-ray difraction and/or µRaman at the Brazilian Synchrotron Light Laboratory.

Preliminary results and discussion: The design of the adapted Winogradsky's column was sucessfully achived. Its major features are: simple *in situ* assembly and disassembly (composed of four parts, depending of experiment setup); easy manipulation and moving of its content for sampling (a thin plastic film wrapped as a cilinder holds the contents inside the column's hard walls); liquid and gas tight (tested for both slightly positive and negative pressure); a eslastomer (polydimethylsiloxane, PDMS) cover 0.4mm thin making possible a transmitance above 80% down to 240nm, bellow which it falls exponencially.

Figure: Left: a photo of one of the experimental columns. Right: design of the assembly of the adapted winogradsky's column.

On Dec. 2016, the hypersaline mud, including thick biofilm, was collected from the *Lagoa Vermelha* (Red Lagoon) in the Araruama region. On the next day, after substituting the gas phase for a martian analog, it was observed an intense gas consumption by the "martian" columns, which were kept under continuous flow of the gas mixture to avoid rupture of the system.

In comparison, the columns kept under Earth's atmosphere responded as expected with a slight positive pressure due to air heating by the artificial lights. After one month enclosed, these columns started showing a negative pressure, probably caused by a shift in the microbiome population due to increasing anoxia. In one month more, the columns will be dismanteled for analysis and the data regarding community diversity and bioprecipitate deposition differences between Earth and Mars-like conditions will be presented.

References:

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