BIOMARKERS DETECTION IN MARS ANALOGUE SITES WITHIN MASE PROJECT

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Introduction: Life is a physico-chemical process by which tell-tale signals or traces are left on the environment. These signals are indicators of life and are known as biomarkers.

Besides, the traces of some kinds of microorganisms can be well preserved, provided that they are rapidly mineralized and that the sediments in which they occur are rapidly cemented [1].

The search for these traces of life is one of the main objectives of Mars exploration [1] and to improve and optimize the search and detection of them forms part of MASE project targets.

In MASE project (Mars Analogues for Space Exploration) we work to improve approaches and methods for biomarker detection in samples with low biomass from Mars analogue sites.

A developed antibody multiarray competitive immunoassay (MACIA) for the simultaneous detection of compounds of a wide range of molecular sizes or whole spores and cells [2] [3] has revealed as suitable option to achieve this purpose.

Methods and objectives: Samples from the three MASE campaigns in Iceland (Graenvatun Lake), United Kingdom (Boulby Mines) and Germany (Regensburg) was used in microarray immunoassays to determine the presence of biomarkers.

Within the MASE project some isolates have been achieved from these sample sites and some of them have been induced to mineralization/fossilization process.

Some of our objectives are the improvement of the biosignatures detection in these Mar´s analogous sites and to study its preservation in samples and fossilized isolates by the assessment of antigen-antibody binding.

Results: Signals of the presence of some microorganisms groups especially psycrophiles, iron and sulfur oxidizers (Iceland and Boulby), perchlorate reducers (Regensburg), cyanobacter group and others alike to those which frequently appear in rock and sedimentary environments have detected in MASE samples using microarrays in sandwich immunoassay.

Upcoming results will allow us to check the changes in biomarkers detection at different points along the mineralization/fossilization process. Which means that we will be able to evaluate the loss or preservation of signals in this process and to correlate it with our results from DTIVA technique (automated tools for microbial life detection).

References:

[1] Westall F, Foucher F, Bost N, Bertrand M, Loizeau D, Vago JL, Kminek G, Gaboyer F, Campbell KA, Bréhéret JG, Gautret P, Cockell CS (2015). *Astrobiology*. 15(11):998-1029**.**

[2] Fernández-Calvo, P., Näke, C., Rivas, L. A., García-Villadangos, M., Gómez-Elvira, J., & Parro, V. (2006). *Planetary and Space Science*, 54, 1612-1621.

[3] Parro V, Fernández-Calvo P, Rodríguez Manfredi JA, Moreno-Paz M, Rivas LA, García-Villadangos M, Bonaccorsi R, González-Pastor JE, Prieto-Ballesteros O, Schuerger AC, Davidson M, Gómez-Elvira J, Stoker CR. (2008). *Astrobiology*. 8(5):987-99

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