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Detecting biochemical evidence for life with the signs of life detector (solid) in an anaerobic microorganism under fossilization conditions

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The definitive detection of biosignatures in the context of astrobiological missions to Mars is not without difficulty. Could it be possible to detect biomarkers from an extinct form of life in a very ancient material? The traces of some microorganisms can be well preserved thanks to rapid mineralization of the organisms and cementation of the sediments in which they occur [1]. Thus biosignatures could be indicators of either extant or extinct life, the search for which is one of the main objectives of Mars exploration [1].

The central motivation of the MASE project (Mars Analogues for Space Exploration) is to gain knowledge about the habitability of Mars by the study of the adaptation of anaerobic life forms to extreme environments, their environmental context, and the methods used to detect their biosignatures. Within this background a fundamental target of MASE project is to improve and optimize methods for biosignature detection in samples with low biomass from certain Mars analogue sites.

In this context we applied antibody multiarray competitive immunoassay to follow the evolution of specific biochemical signatures from a culture under fossilization conditions. An antibody multiarray competitive immunoassay 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 MASE purpose. It consists in a rapid strategy to detect a huge set of different epitopes in extracted samples by a sandwich multiarray immunoassay in a slide or LDChip (Life Detector Chip) where huge range of different antibodies are coated.

In this report, we present the results from an experiment in which we followed the biochemical signatures from a growing culture of an isolate of *Yersinia sp.* in fresh media and in a culture growing under fossilization conditions in silica and gypsum.

A decrease in the signal of relative fluorescence of antibody-antigen binding (biomarkers detected) is observed when comparing an untreated *Yersinia sp.* culture and those induced to mineralization at different time points.

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Literature

(l) Westall F, Foucher F, Bast N, Bertrand M, Loizeau D, Vago JL, Kminek G, Gaboyer F, Campbell KA, BreheretJG, Gaut ret P, Cockell CS (2015). Astrobiology. 15(11):998-1029.

(2) Fernandez-Calvo, P., Näke, C., Rivas, L. A., Garcfa-Villadangos, M., G6mez-Elvira, J., & Parro, V. (2006). Planetary and Space Science, 54, 1612-1621.

(3) Parro V, Fernandez-Calvo P, Rodriguez Manfredi JA, Moreno-Paz M, Rivas LA, Garcfa-Villadangos M, Bonaccorsi R, Gonzalez-Pastor JE, Prieto-Ballesteros 0, Schuerger AC, Davidson M, G6mez-Elvira J, Stoker CR. (2008). *Astrobiology.* 8(5):987-99