Raman spectroscopy of the melanized fungi from the hyperarid Atacama Desert gypsum crust

J. WIERZCHOS[1], O. ARTIEDA*[2], A. CULKA[3], J. JEHLIČKA[3], L. LÓPEZ-OCAÑA[4], R. AZNAR[4], V. SOUZA-EGIPSY[5], M. C. CASERO[1] AND C. ASCASO[1]

[1]Museo Nacional de Ciencias Naturales – CSIC, 28006 Madrid, Spain

[2]Univ. de Extremadura, 10600 Plasencia, Spain (*correspondence: oartieda@unex.es)

[3]Charles Univ. 128 43 Prague, Czech Rep.

[4]Coleccion Española de Cultivos Tipo (CECT), 46980 Paterna (Valencia), Spain

[5]Instituto de Ciencias Agrarias – CSIC, 28006 Madrid, Spain

The hyperarid core of the Atacama Desert (northern Chile) represents one of the driest places on Earth with an exceptional occurrence of microbial life coping with extreme environmental stress factors [1]. Hence, the area is considered as one of the most important Martian-analog sites. The gypsum crusts have been found to harbor diverse microbial communities in this area [2]. We present a Raman spectroscopic data, complemented by microscopic imaging using fluorescence and SEM-BSE microscopy of new discovered endolithic microbial communities composed by eukaryotic algae and fungi colonizing the interior of gypsum crusts from the hyperarid zone of the Atacama Desert. This lithobiontic habitat is an example of survival in an extremely hyperarid and high solar and UV radiation environment.

We detected molecular signs of life in these endolithic microhabitats using Raman spectroscopy in the form of microbial pigments. The 514.5 nm excitation wavelength employed was found to be the correct source for studying pigment composition. Among those pigments, the most important is eumelanin, a UV-absorbing compound that some fungi produce. The eumelanin and carotenoids Raman signal was distinctly detectable on fungi hyphae cultivated from the gypsum endoliths. Similar spectral signatures were also obtained from naturally endolithic habitats. In the context of future missions designed to search for life on Mars, we were able to utilize rock samples from the Atacama Desert, using Raman spectrometer, to assess the performance of Raman systems to detect biomarkers inside the rocks.

Acknowledgements: CGL2013-42509P

[1] Wierzchos *et al*. (2012) *Int. Microbiol*.**15**, 171-181. [2] Wierzchos *et al*. (2011) *Geobiol*. **9**, 44-60.