CHEMOLITHOTROPHY, A FUNDAMENTAL METABOLISM FOR CONTINENTAL SUBSURFACE ECOSYSTEMS. LESSONS FROM THE IBERIAN PYRITE BELT SUBSURFACE LIFE (IPBSL) DRILLING PROJECT R. Amils[1,2], V. Parro[1], , D. Fernández-Remolar[1], F.P. Fernández[1], M. Oggerin[1], F.J. López,[1], M. Sánchez-Román[1], E. Omoregie[1], F. Puente-Sánchez[1], C. Briones[1], F. Gómez[1], O. Prieto-Ballesteros[1], F. Tornos[1], N. Rodríguez[1], M. García[1], A. Arce-Rodríguez[3], K. Timmis[3], J.L. Sanz[4] and the IPBSL team, [1]Centro de Astrobiología (INTA-CSIC), ctra Ajalvir km 4, Torrejón de Ardoz 28850, Madrid, Spain ramils@cab.inta-csic.es, [2] Centro de Biología Molecular Severo Ochoa (CSIC-UAM), Universidad Autónoma de Madrid, Cantoblanco, Madrid 28049, Spain, [3]Institut für Mikrobiologie, Technische Universität Braunschweig, BS, Germany, [4] Departamento de Biología Molecular, Universidad Autónoma de Madrid, Cantoblanco, Madrid 28049, Spain.

Introduction: The Iberian Pyrite Belt Subsurface Life (IPBSL) is a drilling project desiogned to characterize the subsurface bioreactor responseble of the extreme conditions existing in the Río Tinto basin [1]. Río Tinto is considered a good geochemical terrestrial analogue of Mars [2,3]. A dedicated geophysical characterization selected two drilling sites in the Peña de Hierro area due to the presence of water with a high ionic content [4].

Results: Two wells have been drilled in the selected area at depths of 620 (BH10) and 340 (BH11) meters respectively, with recovery of cores and generation of samples in anaerobic and steril conditions. A welth of complementary techniques (ICP-MS, XRD, ion and gas chromatography, immunological and biochemical analysis, fluorescence in situ hybridization, scanning electron microscopy, enrichment cultures using different substrates and electron acceptors, cloning and massive sequencing) have been used to analyze samples from different depths allowing to identify chemolithotrophy, using metal sulfides and H_2, as the key metabolisms operating in the subsurface of the Iberian Pyrite Belt.

As the groundwater enters in contact with the Volacnogenic-hosted Massive Sulfide system of the IPB, abiotic and biological processes are activated. Electron donors available for microbial metabolism include ferrous iron, metal sulfides and H_2. Identified electrobn acceptiors include nitrate, sulfate, ferric iron and CO_2. These compounds support a welth of different and complementary metabolisms. In contrast to cconventional Acid Rock Drainage (ARD) models, oxidants to drive the system are supplied by the rock matrix. Only mobilization of these sources by ground water is required to promote microbial metabolisms.

After drilling the wells were cased with PVC with holes at different depths and permanent sensors have been installed along the wells to characterize temporal and spatial variavility of the physicochemical parameters related to biological activity. Information from these sensors is being transmited by means of digital GSM modems in real time to the scientific community for its evaluation.

References:

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