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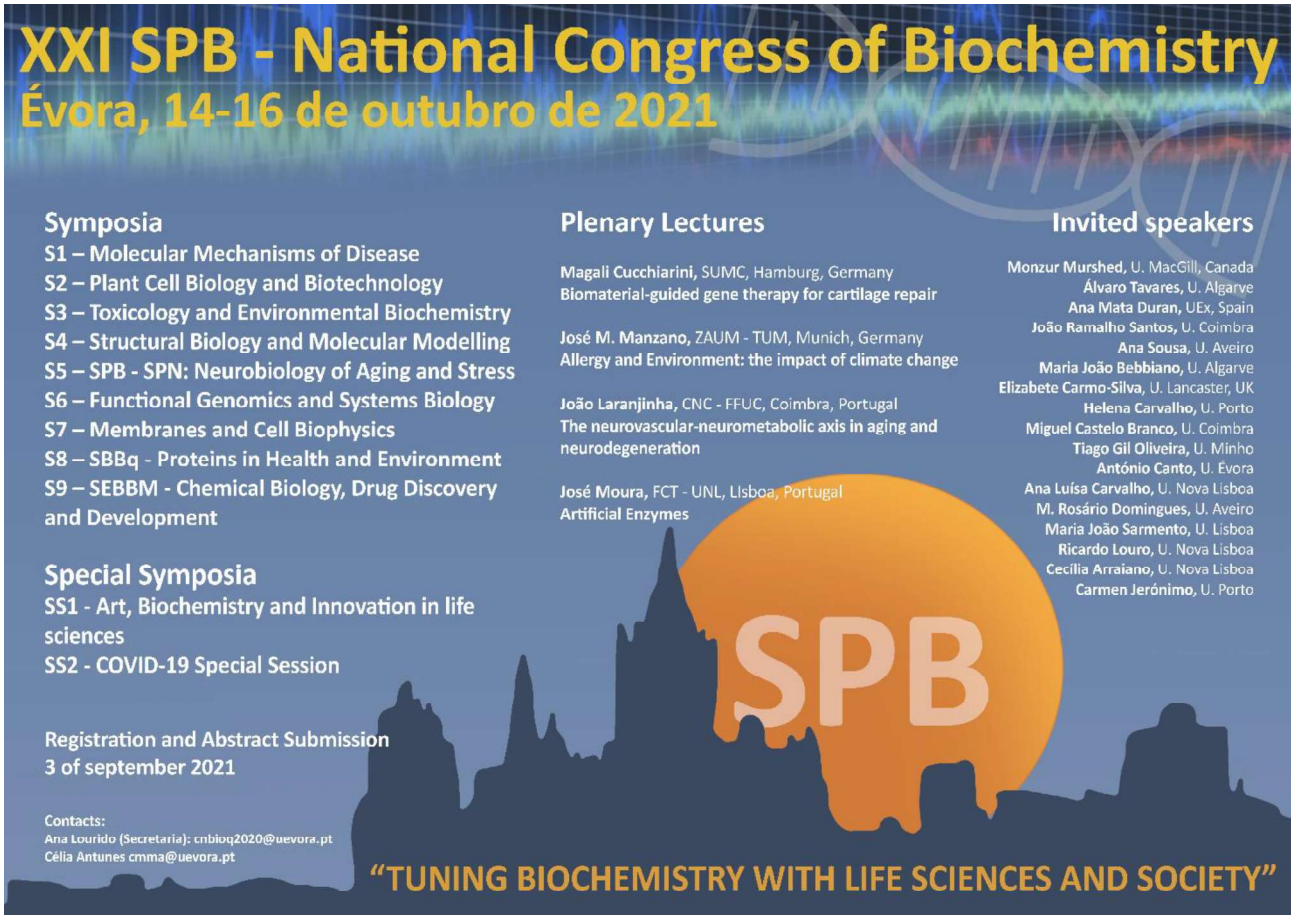

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FC67 - Microorganisms and Moonmilk in the non-ornated caves from the Vézère Valley (Dordogne, France)

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Background. Microorganisms inhabit all possible environments including hypogean environments. Cave are the best examples of a glimpse into the subsurface world and into human past through its art work. Microbes are often harmful for cultural assets (eg, paleolithic paintings), because they are related to constructive (mineral precipitation) and destructive (substrate dissolution) processes affecting different substrates (host-rock, speleothems, paintings, etc.). Moonmilk, a secondary speleothem is a problem that plagues this art. The environment is very distinct as they differ vastly from the exterior owing to it being divided by the soil and the epikarst. Caves are considered as extreme environments due to very little or complete absence of sunlight and limited interaction with the outside ecosystem. This determines the growth of microorganisms that can easily adapt to these extreme conditions playing an important role in the development of biotransformations inside the caves, namely biomineralization and probably in the formation of moonmilk and leading to potential degradation of cave art. Moonmilk is identified by its distinctive crystalline fibre, referred to as Needle Fibre Calcite (NFC).

Methods. Moonmilk formation is not completely understood being attributed to abiotic processes and / or mediated by biotic processes. This study deals with the identification of the microorganisms sampled in three non-ornated caves (named Leye, Pillier and Racine) in the Vézère Valley (Dordogne, France). Leye is considered as a "laboratory cave", because it is very similar to Lascaux, located in the same region but without any cave art, mimicking the environmental conditions and making it an ideal cave to carry out multidisciplinary studies where sampling is allowed. The other two caves (Pillier and Racine) are also important because they show the same moonmilk presence and enable to check the variability of these bioinduced minerals. These two caves have not been submitted to any kind of study yet.

Results. *In situ* DinoLite Microscopy confirmed the existence of microorganisms and needles. *In vitro* culture showed the presence of bacteria, fungi and yeast. High Throughput Sequencing (HTS) was used to explore, compare and characterise the microbial communities present in the cave. Scanning Electron Microscopy helped us discriminating the different types of needles along with microbial deposits present in the caves. SEM micrographs show the presence of various needles: monocrystalline, polycrystalline and serrated, which occur due to biomineralisation. Bacterial communities are mainly composed by *Proteobacteria, Actinobacteria* and *Firmicutes.* Phylums like *Nitrospirae, Tenericutes, Spirochaetes* and *Verrucromicrobia* are also present in the caves.

Conclusions. Taking into account these data, the next step is to perform some simulation assays to better understand the microbial involvement for the growth of moonmilk.

Keywords: Moonmilk, Needle Fibre Calcite, prehistoric caves, Vézère Vallée, HTS, SEM imagery, conservation