

## HIGH VALUE COMPOUNDS FROM CYANOBACTERIA CONFERRING THERAPEUTIC PROPERTIES TO EUGANEAN THERMAL MUDS

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*Cyanobacteria, high value compounds, lipids, pigments, exopolysaccharides*

The Euganean Thermal District is the biggest and ancient thermal SPA in Europe and represents a reference area for pelotherapy, with 130 structures and more than 3 million patients/tourists every year. The first testimonies about the use of biothermal clays in this district date back to VII and VI centuries b.C and acquired great importance during the Roman times. The therapeutic effectiveness of Euganean thermal muds has been patented in 2013 (EP1571203) and attributed to the anti-inflammatory compounds released by cyanobacteria growing on the surface of the virgin clay during the so-called maturation process. This is a complex procedure occurring in artificial tanks in a period of 2 months and relying on the direct chemical and physical interactions between virgin clay and thermal water as well as on the growth of cyanobacteria biofilms over the mud surface. This confers to the mature mud a typical viscosity and the enrichment in therapeutic anti-oxidant and anti-inflammatory compounds, such as pigments, lipids and polysaccharides produced and released by the biogelea.

Some species of endemic cyanobacteria have been studied for their ability to produce active biomolecules conferring anti-inflammatory and immunostimulating properties to the mature thermal mud. Among them, *Phormidium* sp. ETS-05 is one of the most widespread and typical species colonizing thermal muds of the Euganean SPAs and has been studied for the production of some classes of lipids composing the thylakoid membranes. These lipids are galactosyldiacylglycerols and have been shown to have a wide range of specific biologic activities, including anti-inflammatory properties<sup>1</sup>. Recently, another endemic species, *Cyanobacterium aponinum* ETS-03, isolated from Euganean thermal muds has been studied for its ability to produce and release polysaccharides (RPS) characterized to have immunostimulating effects<sup>2,3</sup>. Currently we are analyzing, during the mud maturation process, the biodiversity of species (NGS) composing the microorganism biofilms, the amount of high value compound, such as pigments and polysaccharides and the antioxidant activity of the mud, in order to define the variation of mud properties and to identify other species potentially contributing to its final therapeutic properties.

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2. Gudmundsdottir, A. B. *et al.* Exopolysaccharides from *Cyanobacterium aponinum* from the Blue Lagoon in Iceland increase IL-10 secretion by human dendritic cells and their ability to reduce the IL-17+RORγt+/IL-10+FoxP3+ ratio in CD4+ T cells. *Immunol. Lett.* **163**, 157–162 (2015).

3. Gris, B., Sforza, E., Morosinotto, T., Bertucco, A. & La Rocca, N. Influence of light and temperature on growth and high-value molecules productivity from *Cyanobacterium aponinum*. *J. Appl. Phycol.* doi:10.1007/s10811-017-1133-3 (2017)