AGAINST THE TREND: INSIGHTS INTO LIPOPOLYSACCHARIDE STRUCTURE AND OUTER MEMBRANE DYNAMICS IN COLD-ADAPTED PSEUDOMONAS ISOLATED FROM ENIGMA LAKE, ANTARTICA

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Pseudomonas is one of the most versatile genus able to adapt to extreme environmental conditions [1]. Therefore, *Pseudomonas* is an ideal research model for studying how environmental factors affect the chemical and physical properties of the cell envelope in order to maintain proper membrane integrity even in the most extreme habitats [2]. Numerous studies have shown that the biosynthesis of lipopolysaccharide (LPS), a key component of the outer membrane in Gram-negative bacteria, can be altered to ensure the preservation and optimal functioning of the membrane [3-5]. LPS properties in fact are strictly related to its chemical structure, which typically comprises a glycolipid anchor (lipid A), a core oligosaccharide (OS), and an O-antigen polysaccharide chain [3].
This communication [6] presents a study on the LPS structure of the cold-adapted *Pseudomonas* strain ESM#7, isolated from Enigma Lake in Antarctica's Northern foothills, a lake characterized by unique conditions including strong alkalinity, oxygen oversaturation, and near-zero temperatures. To study how the very low temperature affects the LPS membrane properties, LPS was isolated from this bacterium grown at 0.4 °C (*in situ* temperature of collected Enigma Lake water) and compared with the one isolated from the same bacterium grown at 20 °C. The chemical structure of both LPSs was investigated by chemical analyses, 1D and 2D NMR and MALDI TOF MS experiments that showed key structural differences in the lipid A region. This structural study was then complemented by morphological analysis of the LPS assemblies in water by Cryo-EM and SAXS which together with molecular coarse-grained MD simulations provided insights into the viscoelastic properties of the membrane and the role of the lipid A component in membrane stability.

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