**Università degli Studi di Napoli Federico II**

**PhD in Biotechnology - 40th cycle**

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# Structural elucidation of archaeal exopolysaccharides and identification of candidate enzymes involved in glycans modification

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The extremophilic traits of archaea make them promising candidates for diverse biotechnological applications, including sustainable biofuel production, biochemical synthesis, and nanotechnology, contributing to a circular bioeconomy[1,2,3]. However, critical aspects of their cellular and molecular biology remain poorly understood, limiting their full biotechnological potential[4]. One particularly important aspect is archaeal biofilm, which holds transformative applications across multiple industries, including infrastructure, food, and pharmaceutical[5,6]. The biofilm matrix is primarily composed of proteins, nucleic acids, and exopolysaccharides (PS), with PS playing a crucial role in the stability and development of the biofilm[7]. While previous studies have characterized the monosaccharide composition of archaeal PS[7], the detailed glycan linkages, including stereospecificity and regiospecificity, remain largely unexplored, hindering their biotechnological exploitation. For that reason, this PhD project aims to address this knowledge gap by employing glycoside hydrolases (GHs) to analyse glycan linkages in archaeal PS, complemented by physicochemical methods for detailed structural characterization. Available GHs will be utilized to systematically degrade PS into oligosaccharide fragments, which will then be analysed using High-Performance Liquid Chromatography (HPLC), to elucidate their structure and glycan linkages. The feasibility of this approach has been previously demonstrated in our laboratory[8,9]. However, given the potential limitations of existing GHs in recognizing all sugar residues and glycosidic bonds in archaeal PS, this project will also focus on identifying and characterizing novel enzymes for biofilm hydrolysis, thus expanding the available enzymatic toolkit for PS analysis.

## References


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