

Dissection of sulfoglycolysis pathways in nature

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Sulfoquinovose (SQ or 6-deoxy-6-sulfoglucose) is a sulfonated sugar present within plant sulfolipids (SQ-diglyceride SQDG and its metabolites) found embedded in the thylakoid membranes of photosynthetic plants and lower organisms such as cyanobacteria. SQ locked up in SQDG is a major source of biosulfur on earth and constitutes an important arm of the biogeochemical sulphur cycle with its estimated production amounting to 10 billion tonnes annually [1]. In Nature, dedicated SQDG degradation pathways exist that enable certain microorganisms to utilize this sulfoglucose as energy molecule, which were found to be analogous to the classical glycolytic Embden-Meyerhof-Parnas (EMP) and Entner-Duodoroff (ED) pathways [2-3], however the structural and biochemical characterization of core enzymes involved in these pathways is lacking. Here we present, structural studies of sulfoglycolysis enzymes, in complex with their proposed intermediates, as well as the kinetic studies to shed light on their mechanisms, the determinants of sulfo-sugar specificity and their selectivity over glycolysis intermediates [4-7]. The sulfonate recognition sequences and motifs thus identified will inform our search for sulfoglycolysis pathways in different environmental niches.

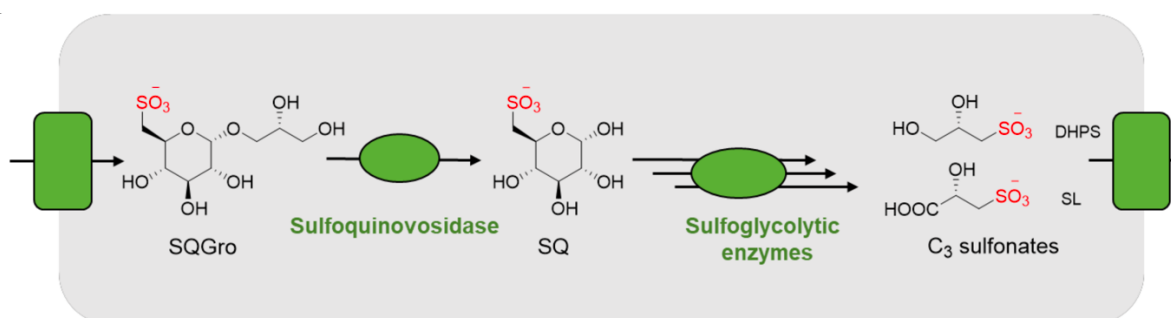


Figure 1. Schematic summary of sulfoglycolytic pathways prevalent in Nature.

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