J.H. Yopp: THE ROLE OF SULFUR IN OSMOREGULATION AND SALINITY TOLERANCE IN CYANOBACTERIA, ALGAE, AND PLANTS

Organosulfur compounds are involved in osmoregulation and salinity tolerance in some cyanobacteria and photosynthetic eukaryotes.

Glycinebetaine, the osmolyte of the halotolerant cyanobacterium, *Aphanothece halophytica*, requires the sulfonium compound, S-adenosyl-methionine (SAM) for its synthesis. Glutamate is the nitrogen source, SAM is the methyl-carbon and serine the carbon "backbone" source of this unique osmolyte. Inhibitor studies suggest that photorespiration interacts with sulfur metabolism to control betaine synthesis in cyanobacteria. The limiting factor for SAM synthesis is formate from photorespiration. SAM is, in turn, the methyl donor for betaine synthesis from serine. The nitrogen component of serine is from glutamate (Fig. I-26). Betaine synthesis is hypothesized to be regulated via potassium.

The biosynthesis of dimethyl-B-propiothetin (DMPT, which is the same as beta-dimethyl sulfoniopropionate - see Fig I-1), and diacylsulfoquinovosylglycerol have been elucidated as have their roles in osmoregulation and salinity tolerance. The relation between these sulfolipids and the sulfur cycle was discussed.

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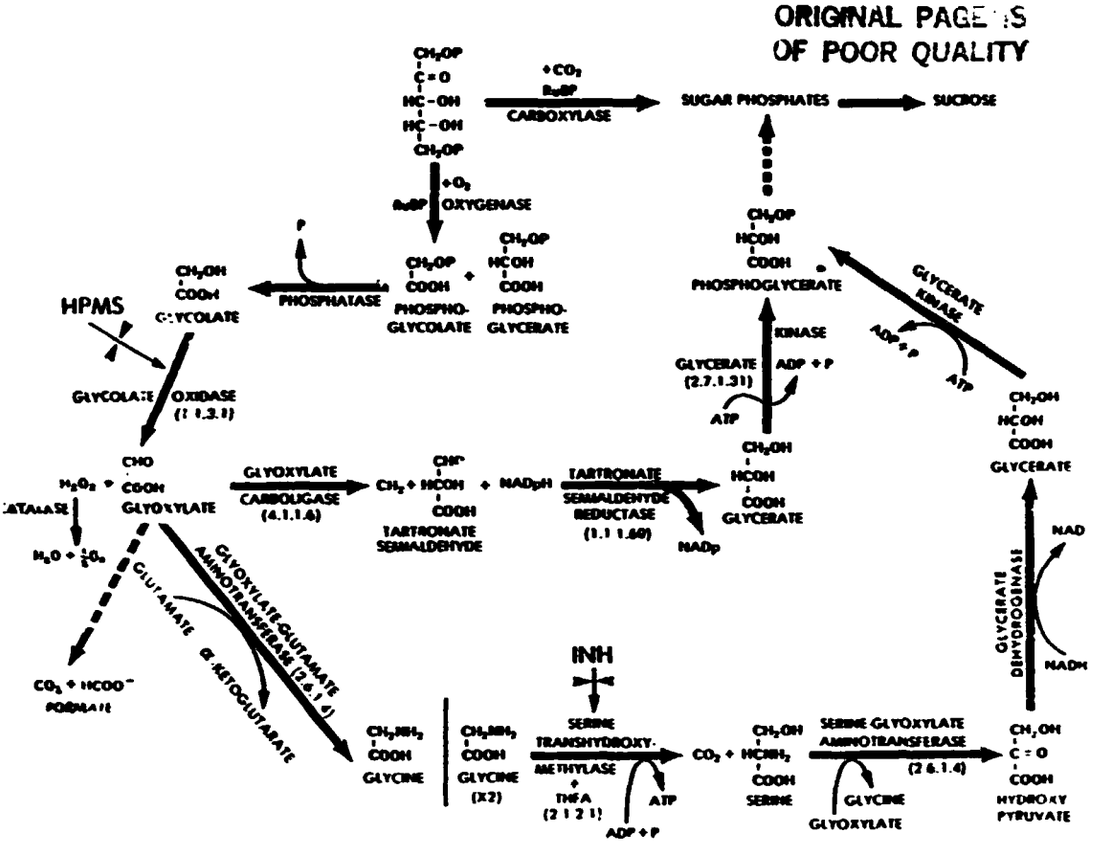

Figure I-25. Photorespiratory pathways in cyanobacteria.

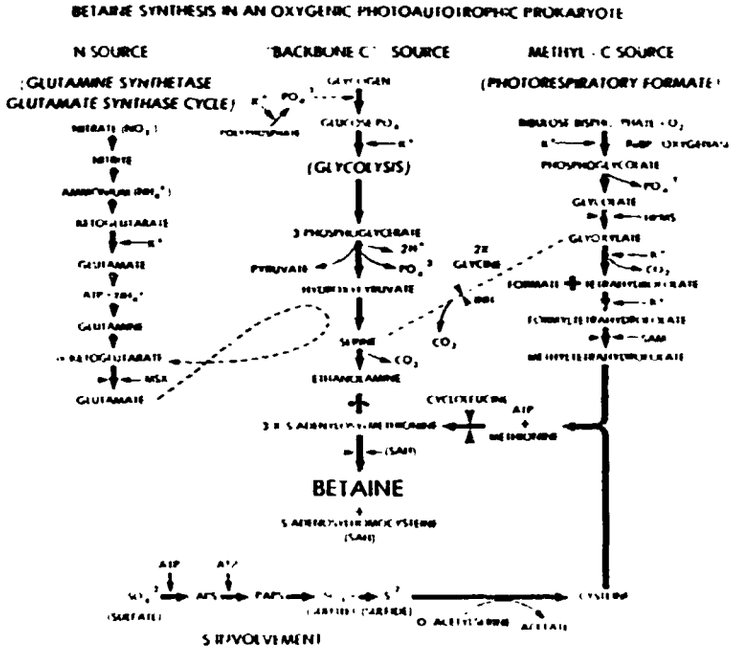

Figure I-26. Role of photorespiration, nitrogen metabolism, and sulfur metabolism in betaine synthesis by the cyanobacterium *Aphanothece halophytica*.

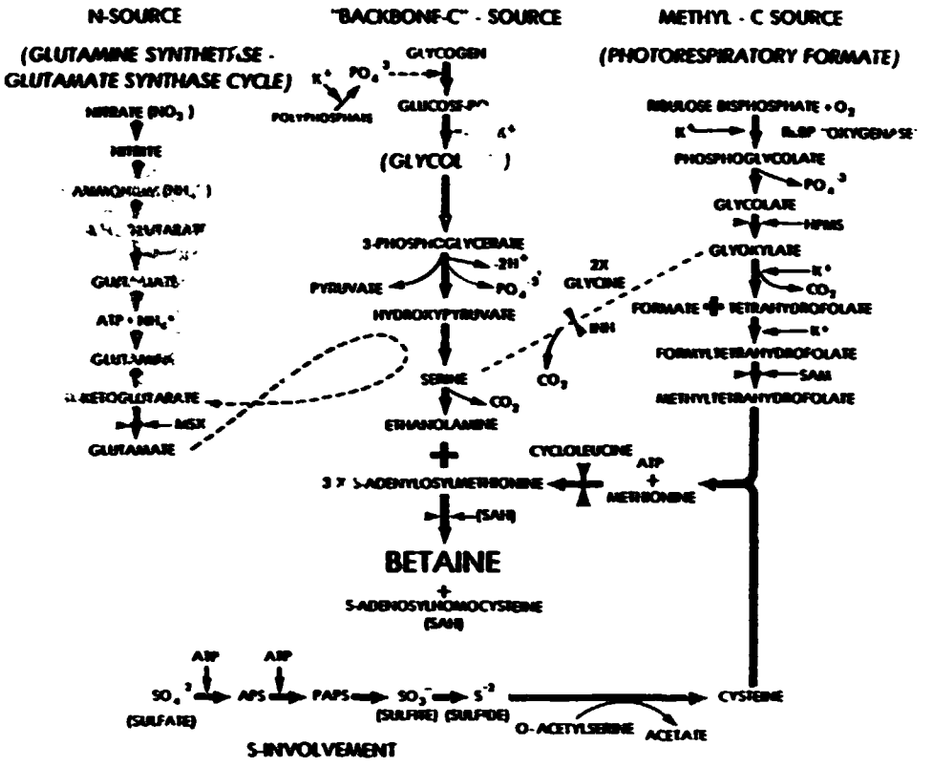

Figure I-27. Betaine synthesis in an oxygenic photoautotrophic prokaryote.

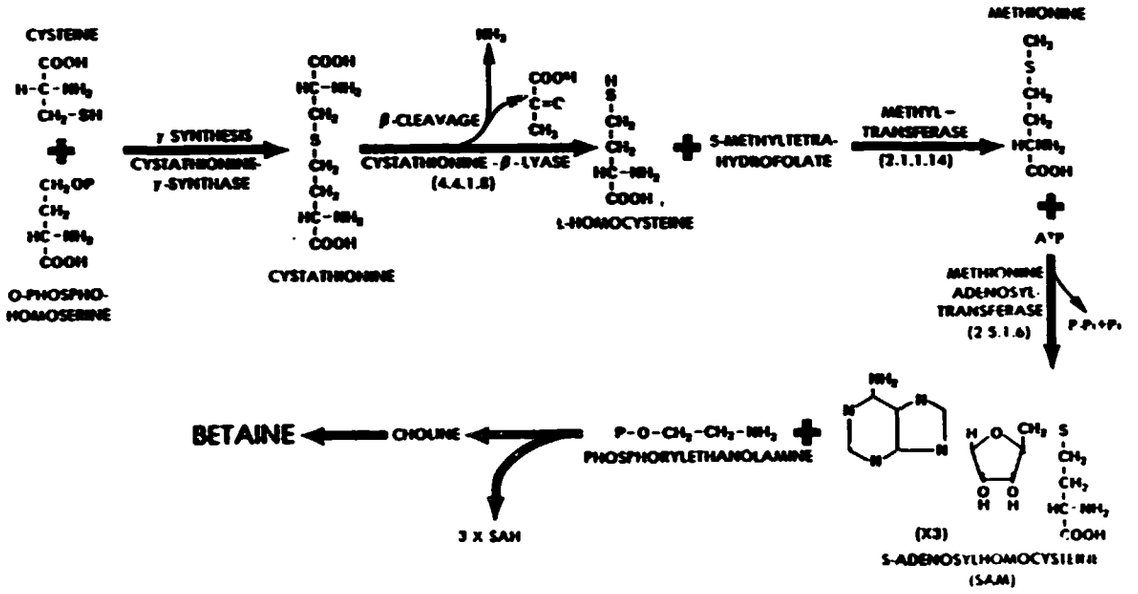

Figure I-28. Formation of the methyl donor of betaine - SAM.