Incorporating the Reductive Glycine Pathway to enhance the metabolic efficiency of the methanotroph Methylobacterium extorquens AM1

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While known for its one-carbon (C1) substrate (e.g. formate and methanol) utilization capabilities, the methylotrophic microbial strain Methylobacterium extorquens AM1 exhibits a comparatively slow growth rate, reducing the competitiveness of the strain as a conventional industrial platform. With the metabolic inefficiency of the Serine Cycle and the Ethylmalonyl-CoA Pathway (EMCP) specified as the known contributors to this problem, this study attempts to both restructure and add various metabolic pathways to achieve enhanced metabolic efficiency of the strain. By diverting the EMCP carbon flux into gluconeogenesis, solving the consequent lack of glycine via the recently recognized Reductive Glycine Pathway (RGP) and providing required reductive power through modifying the Serine Cycle, a metabolically efficient , EMCP-independent Methylobacterium extorquens AM1 strain is proposed.