

Engineering non-mevalonate pathway in *Methylorubrum extorquens* and increase the lycopene production through C1 substrate

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Formate, which can be synthesized from CO₂ or CO, is soluble C1 substrate so that it is more easier to use as microbial feedstock than C1 gas. In this study, we produced lycopene from formate using *M. extorquens* by engineering non-mevalonate pathway, also called MEP pathway, for effective lycopene production. First, LMZ01 strain was constructed by deleting crtCD, genes for consuming lycopene, and used as a parental strain, showing improved lycopene production. Then, dxs, a rate-limiting step of MEP pathway, was overexpressed under lac, tac, and mxaF promoter, respectively. Expression level was shown to be strong in the order of mxaF, tac, and lac promoter by expressing EGFP. Interestingly, while the mxaF promoter with strong expression level was ineffective, the tac promoter with moderate level showed 45% increase in lycopene production. This showed lycopene could be produced reasonably from formate and suitable expression level of MEP pathway is crucial.