High cell density culture of metabolically engineered *Escherichia coli* for the production of lycopene

Hyun Ok Bang, Sang Jun Lee, Sang Yup Lee
Department of Chemical and Biomolecular Engineering and BioProcess Engineering center, KAIST
Tel: +82-42-869-5970, FAX: +82-42-869-8800

Isoprenoids are naturally occurring pigments composed of polymerized isoprene units (C5) and synthesized by many plants, algae, and microorganisms. These pigments have many diverse biological functions, such as coloration, photo protection, and precursors for many hormones. Some isoprenoids exhibit significant anti-carcinogenic activities and play an important role in the prevention of chronic diseases and enhancing immune response. Lycopene is red-colored open-chain unsaturated carotenoid and also is an intermediate compound for many isoprenoid derivatives. Lycopene is the most efficient antioxidant that fights free radicals in the body, so nowadays this metabolite is spotlighting in pharmaceutical field. We have engineered Escherichia coli strains by pathway analysis followed by cloning three genes (crtE, crtB and crtI) from Erwinia uredovora, which are essential for lycopene biosynthesis, and constructed pLyc184 plasmid. In addition, the dxs gene involved in the biosynthesis of lycopene precursor (IPP), was cloned and coexpressed with the three essential genes. In order to enhance lycopene production, the DO-stat high cell density cultures of metabolically engineered E. coli strains were carried out.

Acknowledgement

This work was supported by the National Research Laboratory Program of the MOST, and by the Brain Korea 21 project.

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