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E.coli Cell Factory Engineering: A Review with White Biotechnology Perspective

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During the first half of the 20th century, organic chemistry developed methods to create many of modern industrial products mostly from petroleum. Petroleum-based synthesis of polymers and plastics replaced natural fibres, wood, and metals in many consumer items, buildings, furniture and etc. With growing concerns about oil's limited supplies and accompanying environmental load, chemical and biotechnology industries are now exploring the nature's rich repertoire for replacing the petroleum-based synthetics. A long tradition of industrial fermentation and biocatalysis are becoming a realistic tool for converting these traditional industries to biomaterial-based industries, thus creating **bio-based economy**. An entire branch of these activities are now designated as **"White Biotechnology"**, to differentiate itself from medical(Red) and Agro(Green)-biotechnology.

This review focuses on the ***E.coli* cell factory engineering**. My purpose of review is not to recommend the *E.coli* as an ideal industrial production host but to analyze the elemental genetic and physiological components when designing the microbial cell factory. *E.coli* is ideal in showing the potentials and the limits of cell factory engineering, because it is the best-studied microorganism. This review will analyze the physiological parameters such as growth-rate, maximum cell density, inherent metabolic rate and stationary phase phenomena in cell factory perspective. As artificial redesign or reprogramming of microbial cells is now in horizon, it would be worthwhile to check the basic design factors governing the factory behavior. Metabolic sustainability and physiological toughness are to be discussed with following key targets :

- Substrate transport mechanisms
- Acetate accumulation
- Metabolic potential in limited-growth conditions