Enhancing Beta Carotene Production in Yeast Cells

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Beta Carotene is an important organic compound with a bright orange color naturally produced in plants. It is hailed for its health benefits and antioxidant properties. In a previous study, researchers successfully genetically modified yeast cells (S. cerevisiae), introducing genes for 2 enzymes (CrtI & CrtYB) into the cells that led to the yeast cells producing beta carotene. However, many problems remain in obtaining a good yield of Beta Carotene through this method. The primary concern is that in eukaryotes such as yeast, carotene is synthesized from the starting source Mevalonic Acid, which is produced from Mevalonate. However, when a certain amount of Mevalonic acid is produced from Mevalonate, the structural domain of the enzyme (HMG-CoA reductase) responsible for synthesizing mevalonic acid degrades due to an inhibition loop. This leads to lesser Mevalonic acid, and hence lesser Beta carotene being produced. In my project, we introduced a gene for a truncated (shortened) gene for the enzyme (HMG-CoA reductase) into the yeast cells. The truncated version of the gene led to the structural part of the enzyme being absent. Due to this, the enzyme was unaffected by the mevalonic acid inhibition loop and could continue to function. A larger yield of Mevalonic acid was obtained and hence a larger yield of beta carotene was obtained due to this.

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