Engineered E. coli for Production of high-value Methylxanthines

THE UNIVERSITY OF ALABAMA | Research & Economic Development
Office for Innovation & Commercialization

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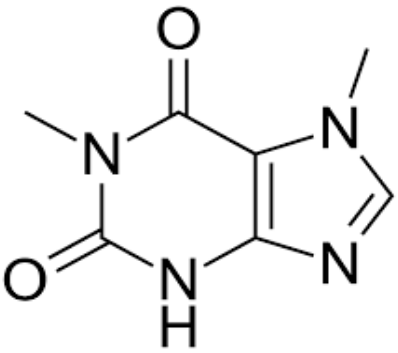
The Problem:

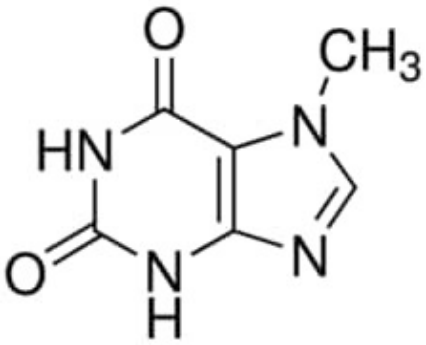
Both of paraxanthine and 7-methylxanthine are high-value biochemicals that are used in pharmaceuticals. Paraxanthine has potential treatment for Parkinson's diseases and 7-methylxanthine has shown health benefits for eyes, particularly in reducing progression of myopia. However, retail value of paraxanthine is $1,396 per gram and 7-methylxanthine is $453 per gram.

The Solution:

Engineered mutant enzymes and bacterial strains that are capable of converting caffeine, the most well-known methylxanthine, into the high-value methylxanthines paraxanthine and 7-methylxanthine. Two enzymes, NdmA and NdmD, are taken from the soil bacterium Pseudomonas putida CBB5, which is a natural caffeine-degrading bacterium. The NdmA enzyme, which normally produces theobromine from caffeine, is rationally engineered through specific mutations (producing enzyme NdmA4) to convert caffeine to paraxanthine.



Paraxanthine



7-methylxthanine

Benefits:

- Caffeine can be purchased in bulk for $0.045 per gram which is significantly less expensive than paraxanthine and 7-methylxanthine.
- Would allow for better access to medical treatments since the cost of production would be considerably lower.

INVENTORS

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Dr. Summers received PhD from the University of Iowa in 2011. His research interests include working to metabolically engineer bacteria and yeast cells to produce chemicals, fuels, and pharmaceuticals.

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