



# Biosynthetic Pathway to 1,4-Butanediol and other C4-C5 Chemicals (20130128, Dr. Kechun Zhang)

## Shortcut Pathway to Produce C4-C5 Renewable Chemicals

To reduce the costs of making valuable C4-C5 renewable chemicals, a biosynthetic pathway has been developed to generate C4-C5 chemicals, such as succinate, amino acids and 1,4-butanediol. This new pathway from sugars involves only five fermentation steps, as compared to the current pathway, which requires 23 steps. The new process uses engineered microbes and a simple pathway that produces less contaminating byproducts and higher yields (50% higher theoretical yield). This new approach makes the production of cost-effective renewable bioplastics, polyesters and spandex a possibility.

## Current Fermentation Pathways for Bioplastics

Current processes to create polymer-based products, including plastics, polyesters and spandex, use petroleum based feedstocks that are nonrenewable and often environmentally harmful. Major commodity chemical intermediates, such as 1,4-butanediol (BDO), are generated in very large quantities; 2.5 million tons of BDO are used per year alone. However, in the last several years, companies have turned towards generating bio-based BDO and other chemical intermediates through the fermentation of sugars. The current fermentation route to BDO and related molecules involve pathways that are costly, inefficient and involve multiple different steps. The current fermentation route to BDO involves 23 enzymatic steps, which results in loss of valuable carbon feedstock at each step, and a reduction in efficiency. To reduce manufacturing costs and unnecessary carbon loss, more efficient pathways are needed to make bio-based C4-C5 chemicals.

## BENEFITS AND FEATURES OF BIOSYNTHETIC PATHWAY:

- Less byproducts and a higher chemical yield than current synthesis routes
- Cheaper manufacturing with 50% higher theoretical yield
- Versatile pathway can be used to make multiple chemicals including succinic acid, amino acids and 1, 4-butanediol

**Fulfillment Details** Licensee will receive rights to practice the intellectual property (patent application) for the purposes of developing and manufacturing a commercial product.

**Phase of Development** Proof of Concept

## Researchers

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