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Glucose Assimilation Rate Determines the Partition of Flux at Pyruvate between Lactic Acid and Ethanol in Saccharomyces cerevisiae

Background/Objective

Engineered *Saccharomyces cerevisiae* expressing a lactic acid dehydrogenase can metabolize pyruvate into lactic acid. However, three indigenous pyruvate decarboxylase (PDC) isozymes usually drive the yeast to produce more ethanol than lactic acid. Unexpectedly, yeasts engineered to consume non-native sugars yield predominantly lactic acid rather than ethanol even while the native PDC isozymes remain functional. This study aims to gain a greater understanding of the mechanisms determining the partition of flux at pyruvate between lactic acid and ethanol.

Approach

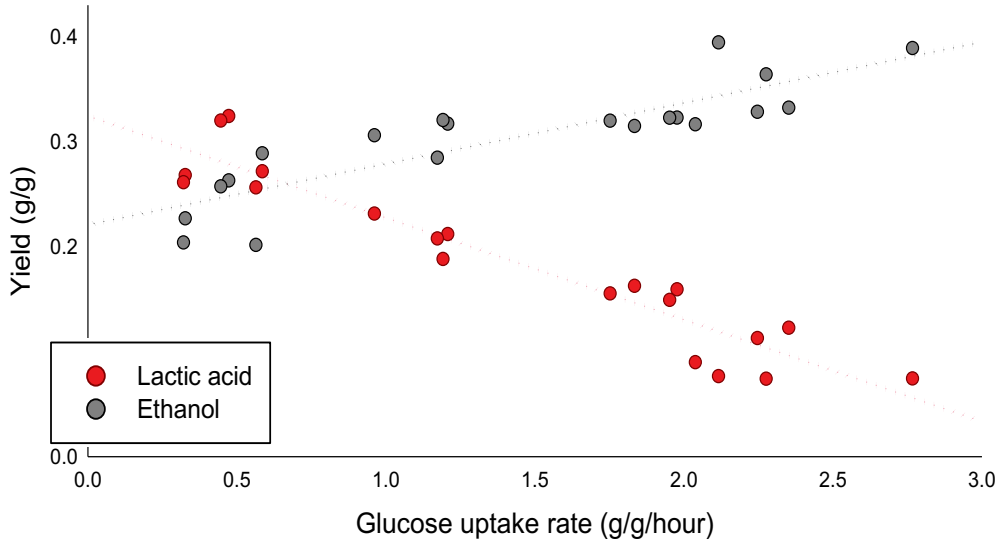
We investigated the contributions of glycolytic flux and glucose sensing on lactic acid and ethanol yields. We varied glycolytic flux by expressing hexokinases under a titratable promoter and probed the effects of glucose sensing by deleting *SNF3* and *RGT2,* two genes encoding membrane glucose sensors.

Results

The glucose assimilation rate directly impacted lactic acid and ethanol yields in the engineered yeast. Glucose sensing did not directly impact the yields of either product.

Significance

These results aid researchers to produce non-ethanol products using engineered yeasts.



Glucose uptake rate directs yields of lactic acid (red) and ethanol (grey).

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