*BRC Science Highlight*
*January 2019*

# pH Selectively Regulates Citric Acid and Lipid Production in *Yarrowia lipolytica* W29 During Nitrogen-limited Growth on Glucose

## Background/objective

The yeast *Yarrowia lipolytica* naturally produces lipids and citric acid, which have potential commercial value. Understanding how cultivation conditions govern the production of these compounds is critical to optimizing production. Here, we describe how pH selectivity drives the flow of carbon into either citric acid or lipids.

## Approach

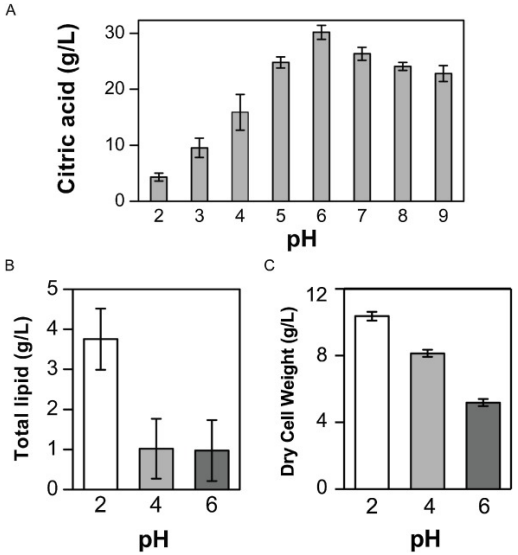
- *Y. lipolytica* W29 was cultivated under N-limited conditions over a pH gradient while monitoring lipid content, citric acid production, and culture density.
- RNAseq data and thermodynamic calculations were employed to propose mechanistic underpinnings of observed growth patterns.

## Results

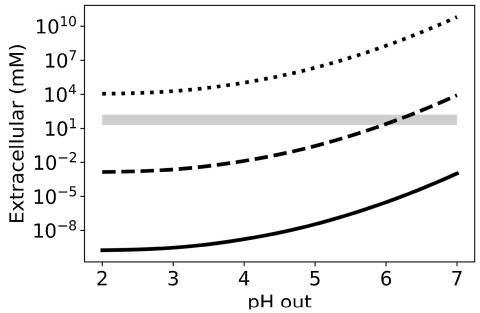
- Citric acid production increased with pH up to a maximum of pH 6 while total lipids and culture density were maximized at pH 2.
- This trade-off was tentatively attributed to enhanced citric acid transporter expression at high pH rather than any shift in expression of lipid synthesis genes.

## Significance

- Researchers can use these results to optimize culture conditions for production of lipids and citric acid in *Y. lipolytica* W29.
- The mechanistic underpinnings proposed may provide a framework for controlling the engineered production of other bioproducts in this and other yeast strains.




**Citric acid production in *Y. lipolytica* W29 was maximized at a circum-neutral pH (A), while total lipids (B) and culture density (C) were maximized at lower pH**




**pH of the growth medium affects the energetics of citrate secretion**

*Zhang S., et al. 2018. "pH selectively regulates citric acid and lipid production in Yarrowia lipolytica W29 during nitrogen-limited growth on glucose." **Journal of Biotechnology.** **290**: 10-15. doi:10.1016/j.jbiotec.2018.10.012*

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