Minor Isozymes Tailor Yeast Metabolism to Carbon Availability

Background/objective
Isozymes are enzymes that differ in sequence but catalyze the same chemical reaction. The evolutionary significance of the subset of isozymes that are co-localized in the same cellular compartment has remained a persistent question. Here, researchers used computational analysis of gene expression data from *Saccharomyces cerevisiae* to gain new understanding of the function of such isozymes.

Approach
- Gene expression data for *S. cerevisiae* was computationally analyzed to identify environmental conditions under which isozyme expression diverged.
- Gene knockouts were compared under the identified environmental conditions.

Results
- The response of many isozymes diverged in response to carbon availability, indicating a role for such enzymes in optimizing control of carbon metabolism.
- Function was assigned to two minor central carbon metabolism enzymes: aconitase 2 (*ACO2*); and pyruvate kinase 2 (*PYK2*).

Significance
- This study improves our understanding of how regulation of yeast central carbon metabolism resolves environment-dependent trade-offs.
- Understanding how isozymes fine-tune central carbon metabolism in response to different carbon sources will inform future efforts to engineer enzymes, including for bioproducts applications.


Co-localized isozyme-catalyzed reactions are enriched in the central carbon metabolism of *S. cerevisiae*. Heavy black lines indicate these reactions on the metabolic map above.