

# Recent Metabolic Modeling Advanced by Leveraging Stoichiometry, Thermodynamics and Kinetics with Constraint and Machine Learning-based Methods

## Background

- Understanding the governing principles behind organisms' metabolism and growth underpins their effective deployment as bioproduction chassis or feedstocks.
- The ever-increasing generation of 'omics data has led to increasingly sophisticated quantitative tools to predict responses to external environmental factors and internal genotypic perturbations.

## Approach

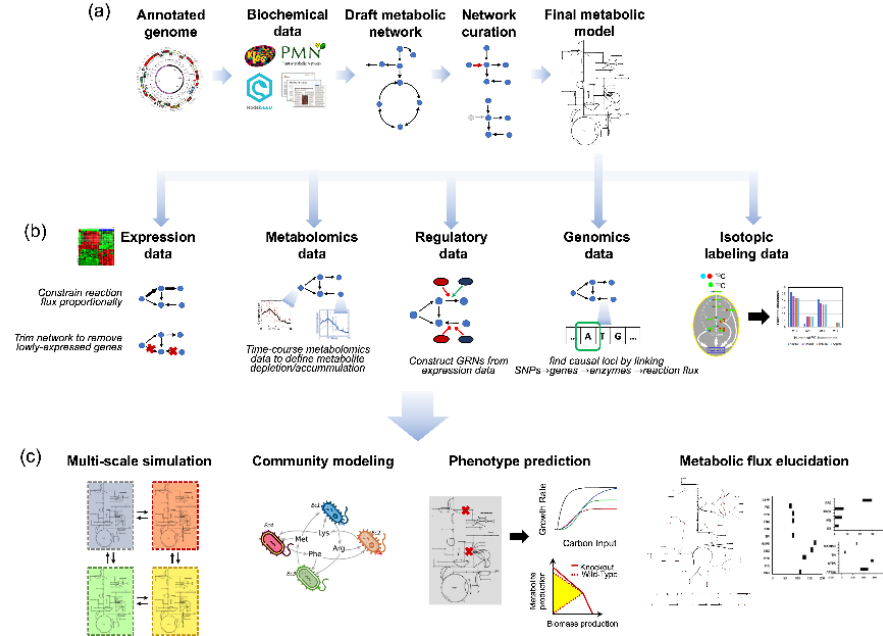
- This review examines the latest algorithmic advances integrating principles of stoichiometric, thermodynamic and kinetic methodology that are propelling metabolic modeling.
- It highlights the context of advances and describes each's pertinence based on problem type and data availability.

## Outcome

- This review covers recent approaches and imparts insight on promising areas for future advances.
- Extensive tables include all relevant algorithms, frameworks, and tools and summarize the types of tasks they perform, platform and licensing availability, example reference applications, and data requirements.

## Significance

- This review provides a comprehensive review of recent advances and has detailed information on more than 90 recent frameworks and software tools.



*Overview of constraint-based metabolic model construction, augmentation by incorporating large-scale experimental datasets, and select applications.*