Modeling Method for Increased Precision and Scope of Directly Measurable Fluxes at a Genome-Scale - DTU Orbit (24/12/2018)

Metabolic flux analysis (MFA) is considered to be the gold standard for determining the intracellular flux distribution of biological systems. The majority of work using MFA has been limited to core models of metabolism due to challenges in implementing genome-scale MFA and the undesirable trade-off between increased scope and decreased precision in flux estimations. This work presents a tunable workflow for expanding the scope of MFA to the genome-scale without trade-offs in flux precision. The genome-scale MFA model presented here, iDM2014, accounts for 537 net reactions, which includes the core pathways of traditional MFA models and also covers the additional pathways of purine, pyrimidine, isoprenoid, methionine, riboflavin, coenzyme A, and folate, as well as other biosynthetic pathways. When evaluating the iDM2014 using a set of measured intracellular intermediate and cofactor mass isotopomer distributions (MIDs),(1) it was found that a total of 232 net fluxes of central and peripheral metabolism could be resolved in the E. coli network. The increase in scope was shown to cover the full biosynthetic route to an expanded set of bioproduction pathways, which should facilitate applications such as the design of more complex bioprocessing strains and aid in identifying new antimicrobials. Importantly, it was found that there was no loss in precision of core fluxes when compared to a traditional core model, and additionally there was an overall increase in precision when considering all observable reactions.

General information
State: Published
Organisations: Novo Nordisk Foundation Center for Biosustainability, Network Reconstruction in Silico Biology, University of California, Vanderbilt University
Contributors: McCloskey, D., Young, J. D., Xu, S., Palsson, B., Feist, A.
Number of pages: 9
Pages: 3844-3852
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Analytical Chemistry
Volume: 88
Issue number: 7
ISSN (Print): 0003-2700
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 6.24
Web of Science (2017): Impact factor 6.042
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.08
Web of Science (2016): Impact factor 6.32
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 6
Web of Science (2015): Impact factor 5.886
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 5.79
Web of Science (2014): Impact factor 5.636
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 6.01
Web of Science (2013): Impact factor 5.825
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 5.8
Web of Science (2012): Impact factor 5.695
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 5.86
Web of Science (2011): Impact factor 5.856
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Impact factor 5.874
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Web of Science (2005): Indexed yes
Web of Science (2004): Indexed yes
Web of Science (2003): Indexed yes
Web of Science (2002): Indexed yes
Web of Science (2000): Indexed yes
Original language: English
DOIs:
10.1021/acs.analchem.5b04914
Source: FindIt
Source-ID: 2303107994
Research output: Research - peer-review › Journal article – Annual report year: 2016