

# Details of the kinetic model

**Table S1. Differential equations**

| Differential equation                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------|
| $\frac{d[X]}{dt} = v_{growth} - v_{D,X}$                                                                                  |
| $\frac{d[GLC^{ex}]}{dt} = v_{D,GLC^{food}} - v_{D,GLC^{ex}} - v_{Pis4,medium} - v_{Nonpts,medium}$                        |
| $\frac{d[GLC]}{dt} = v_{Nonpts} - v_{E,Glk} - v_{D,GLC}$                                                                  |
| $\frac{d[G6P]}{dt} = v_{Pis4} + v_{E,Glk} - v_{E,Pgi} - v_{E,G6pdh} - v_{D,G6P} - v_{BM,G6P}$                             |
| $\frac{d[F6P]}{dt} = v_{E,Pgi} + v_{E,TktB} + v_{E,Tal} + v_{E,Fbp} - v_{E,Pfk} - v_{D,F6P} - v_{BM,F6P}$                 |
| $\frac{d[FBP]}{dt} = v_{E,Pfk} - v_{E,Fba} - v_{E,Fbp} - v_{D,FBP}$                                                       |
| $\frac{d[GAP]}{dt} = 2v_{E,Fba} + v_{E,TktA} + v_{E,TktB} + v_{E,Eda} - v_{E,Tal} - v_{E,Gapdh} - v_{D,GAP} - v_{BM,GAP}$ |
| $\frac{d[PEP]}{dt} = v_{E,Gapdh} + v_{E,Pck} + v_{E,Pps} - v_{E,Pyk} - v_{Pis1} - v_{E,Ppc} - v_{D,PEP} - v_{BM,PEP}$     |
| $\frac{d[PYR]}{dt} = v_{E,Pyk} + v_{Pis1} + v_{E,Mez} + v_{E,Eda} - v_{E,Pdh} - v_{E,Pps} - v_{D,PYR} - v_{BM,PYR}$       |
| $\frac{d[AcCoA]}{dt} = v_{E,Pdh} + v_{E,Acs} - v_{E,Cs} - v_{E,Ms} - v_{E,Pta} - v_{D,AcCoA} - v_{BM,AcCoA}$              |
| $\frac{d[AcP]}{dt} = v_{E,Pta} - v_{E,Ack} - v_{D,AcP}$                                                                   |
| $\frac{d[ACE^{ex}]}{dt} = v_{E,Ack,medium} - v_{E,Acs,medium} - v_{D,ACE^{ex}}$                                           |
| $\frac{d[ICIT]}{dt} = v_{E,Cs} - v_{E,Icdh} - v_{E,Icl} - v_{D,ICIT}$                                                     |
| $\frac{d[\alpha KG]}{dt} = v_{E,Icdh} - v_{E,\alpha kgdh} - v_{D,\alpha KG} - v_{BM,\alpha KG}$                           |
| $\frac{d[SUC]}{dt} = v_{E,\alpha kgdh} + v_{E,Icl} - v_{E,Sdh} - v_{D,SUC} - v_{BM,SUC}$                                  |
| $\frac{d[FUM]}{dt} = v_{E,Sdh} - v_{E,Fum} - v_{D,FUM} - v_{BM,FUM}$                                                      |
| $\frac{d[MAL]}{dt} = v_{E,Fum} + v_{E,Ms} - v_{E,Mdh} - v_{E,Mez} - v_{D,MAL}$                                            |
| $\frac{d[OAA]}{dt} = v_{E,Mdh} + v_{E,Ppc} - v_{E,Pck} - v_{E,Cs} - v_{D,OAA} - v_{BM,OAA}$                               |
| $\frac{d[GOX]}{dt} = v_{E,Icl} - v_{E,Ms} - v_{D,GOX}$                                                                    |
| $\frac{d[6PGL]}{dt} = v_{E,G6pdh} - v_{E,Pgl} - v_{D,6PGL}$                                                               |
| $\frac{d[6PG]}{dt} = v_{E,Pgl} - v_{E,6Pgdh} - v_{E,Edd} - v_{D,6PG}$                                                     |
| $\frac{d[KDPG]}{dt} = v_{E,Edd} - v_{E,Eda} - v_{D,KDPG}$                                                                 |
| $\frac{d[R5P]}{dt} = v_{E,6Pgdh} - v_{E,Ru5p} - v_{E,R5pi} - v_{D,R5P}$                                                   |
| $\frac{d[R5P]}{dt} = v_{E,R5pi} - v_{E,TktA} - v_{D,R5P} - v_{BM,R5P}$                                                    |
| $\frac{d[X5P]}{dt} = v_{E,Ru5p} - v_{E,TktA} - v_{E,TktB} - v_{D,X5P}$                                                    |
| $\frac{d[S7P]}{dt} = v_{E,TktA} - v_{E,Tal} - v_{D,S7P}$                                                                  |
| $\frac{d[E4P]}{dt} = v_{E,Tal} - v_{E,TktB} - v_{D,E4P} - v_{BM,E4P}$                                                     |

$$\begin{aligned}
\frac{d[cAMP]}{dt} &= v_{E,Cyt} - v_{E,cAMP_{deg}} - v_{D,cAMP} \\
\frac{d[EIIA-P]}{dt} &= v_{Pis1} - v_{Pis4} \\
\frac{d[Glk]}{dt} &= v_{G,glk} - v_{D,Glk} \\
\frac{d[Pfk]}{dt} &= v_{G,pfkA} - v_{D,Pfk} \\
\frac{d[Fbp]}{dt} &= v_{G,fbp} - v_{D,Fbp} \\
\frac{d[Fba]}{dt} &= v_{G,fbaA} - v_{D,Fba} \\
\frac{d[Gapdh]}{dt} &= v_{G,gapA} - v_{D,Gapdh} \\
\frac{d[Pyk]}{dt} &= v_{G,pykF} - v_{D,Pyk} \\
\frac{d[Pps]}{dt} &= v_{G,ppsA} - v_{D,Pps} \\
\frac{d[Pdh]}{dt} &= v_{G,pdh} - v_{D,Pdh} \\
\frac{d[Acs]}{dt} &= v_{G,acs} - v_{D,Acs} \\
\frac{d[Cs]}{dt} &= v_{G,gluA} - v_{D,Cs} \\
\frac{d[Icdh]}{dt} &= v_{G,icdA} + v_{E,AceK-ph} - v_{E,AceK-ki} - v_{D,Icdh} \\
\frac{d[Icdh-P]}{dt} &= v_{E,AceK-ki} - v_{E,AceK-ph} - v_{D,Icdh-P} \\
\frac{d[\alpha kgdh]}{dt} &= v_{G,sucAB} - v_{D,\alpha kgdh} \\
\frac{d[Sdh]}{dt} &= v_{G,sdhCDAB} - v_{D,Sdh} \\
\frac{d[Fum]}{dt} &= v_{G,fumABC} - v_{D,Fum} \\
\frac{d[Mdh]}{dt} &= v_{G,mdh} - v_{D,Mdh} \\
\frac{d[Mez]}{dt} &= v_{G,maeB} - v_{D,Mez} \\
\frac{d[Pck]}{dt} &= v_{G,pckA} - v_{D,Pck} \\
\frac{d[Ppc]}{dt} &= v_{G,ppc} - v_{D,Ppc} \\
\frac{d[Icl]}{dt} &= v_{G,aceA} - v_{D,Icl} \\
\frac{d[Ms]}{dt} &= v_{G,aceB} - v_{D,Ms} \\
\frac{d[AceK]}{dt} &= v_{G,aceK} - v_{D,AceK}
\end{aligned}$$


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**Table S2. Rate equations**

| Rate equation                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| $v_{growth} = \mu[X]$                                                                                                                                                                                                                                                                                                                                                                                                                       | -         |
| $v_{Pis1} = k_{Pis1}[PEP][EIIA] - km_{Pis1}[PYR][EIIA-P]$                                                                                                                                                                                                                                                                                                                                                                                   | [1]       |
| $v_{Pis4} = \frac{v_{Pis4}^{max} [EIIA-P][GLC^{ex}]}{\left( K_{Pis\_EIIA} + [EIIA-P] \right) \left( K_{Pis\_GLC} + [GLC^{ex}] \right)}$                                                                                                                                                                                                                                                                                                     | [1]       |
| $v_{Pis4,medium} = v_{Pis4} \frac{[X]}{\rho}$                                                                                                                                                                                                                                                                                                                                                                                               | -         |
| $v_{Nonpts} = \frac{v_{Nonpts}^{max} [GLC^{ex}]}{K_{Nonpts\_S} + \left( 1 + \frac{[EIIA]}{K_{Nonpts\_I}} \right) [GLC^{ex}]}$                                                                                                                                                                                                                                                                                                               | [2]       |
| $v_{Nonpts,medium} = v_{Nonpts} \frac{[X]}{\rho}$                                                                                                                                                                                                                                                                                                                                                                                           | -         |
| $v_{E,Glk} = \frac{[Glk]k_{Glk\_cat} \left( \frac{[GLC]}{K_{Glk\_GLC\_m}} \right) \left( \frac{[ATP]}{K_{Glk\_ATP\_m} \left( 1 + \frac{[G6P]}{K_{Glk\_G6P\_i}} \right)} \right)}{1 + \frac{[GLC]}{K_{Glk\_GLC\_m}} + \frac{[ATP]}{K_{Glk\_ATP\_m} \left( 1 + \frac{[G6P]}{K_{Glk\_G6P\_i}} \right)} + \frac{[GLC][ATP]}{K_{Glk\_GLC\_m} K_{Glk\_ATP\_m} \left( 1 + \frac{[G6P]}{K_{Glk\_G6P\_i}} \right)} + \frac{[G6P]}{K_{Glk\_G6P\_i}}}$ | [3]       |
| $v_{E,Pgi} = \frac{v_{Pgi}^{max} \left( [G6P] - \frac{[F6P]}{K_{Pgi\_eq}} \right)}{K_{Pgi\_G6P} \left( 1 + \frac{[F6P]}{K_{Pgi\_F6P} \left( 1 + \frac{[6PG]}{K_{Pgi\_F6P\_6pginh}} \right)} + \frac{[6PG]}{K_{Pgi\_G6P\_6pginh}} \right) + [G6P]}$                                                                                                                                                                                          | [4]       |
| $v_{E,Pfk} = \frac{[Pfk]k_{Pfk\_cat} [ATP][F6P]}{\left( [ATP] + K_{Pfk\_ATP\_s} \left( 1 + \frac{[ADP]}{K_{Pfk\_ADP\_c}} \right) \right) \left( [F6P] + K_{Pfk\_F6P\_s} \cdot \frac{A}{B} \right) \left( 1 + \frac{L_{Pfk}}{\left( 1 + [F6P] \frac{B}{K_{Pfk\_F6P\_s} A} \right)^{n_{Pfk}}} \right)}$                                                                                                                                       | [4]       |
| $A = 1 + \frac{[PEP]}{K_{Pfk\_PEP}} + \frac{[ADP]}{K_{Pfk\_ADP\_b}} + \frac{[AMP]}{K_{Pfk\_AMP\_b}}$                                                                                                                                                                                                                                                                                                                                        |           |
| $B = 1 + \frac{[ADP]}{K_{Pfk\_ADP\_a}} + \frac{[AMP]}{K_{Pfk\_AMP\_a}}$                                                                                                                                                                                                                                                                                                                                                                     |           |
| $v_{E,Fbp} = \frac{[Fbp]k_{Fbp\_cat} \frac{[FBP]}{K_{Fbp\_FBP}} \left( 1 + \frac{[FBP]}{K_{Fbp\_FBP}} \right)^{n_{Fbp}-1}}{\left( 1 + \frac{[FBP]}{K_{Fbp\_FBP}} \right)^{n_{Fbp}} + \frac{L_{Fbp}}{\left( 1 + \frac{[PEP]}{K_{Fbp\_PEP}} \right)^{n_{Fbp}}}}$                                                                                                                                                                              | [1]       |
| $v_{E,Fba} = \frac{[Fba]k_{Fba\_cat} \left( [FBP] - \frac{[GAP]^2}{K_{Fba\_eq}} \right)}{K_{Fba\_FBP} + [FBP] + \frac{K_{Fba\_GAP}[GAP]}{K_{Fba\_eq}V_{Fba\_bf}} + \frac{K_{Fba\_DHAP}[GAP]}{K_{Fba\_eq}V_{Fba\_bf}} + \frac{[FBP][GAP]}{K_{Fba\_GAP\_inh}} + \frac{[GAP]^2}{K_{Fba\_eq}V_{Fba\_bf}}}$                                                                                                                                      | [4]       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| $v_{E,Gapdh} = \frac{[Gapdh]k_{Gapdh\_cat} \left( \frac{[GAP][NAD] - \frac{[PEP][NADH]}{K_{Gapdh\_eq}}}{K_{Gapdh\_cat}} \right)}{\left( K_{Gapdh\_GAP} \left( 1 + \frac{[PEP]}{K_{Gapdh\_PGP}} \right) + [GAP] \right) \left( K_{Gapdh\_NAD} \left( 1 + \frac{[NADH]}{K_{Gapdh\_NADH}} \right) + [NAD] \right)}$                                                                                                                                                     | [4] |
| $v_{E,Pyk} = \frac{[Pyk]k_{Pyk\_cat} [PEP] \left( \frac{[PEP]}{K_{Pyk\_PEP}} + 1 \right)^{n_{Pyk}-1} [ADP]}{K_{Pyk\_PEP} \left( L_{Pyk} \left( \frac{1 + \frac{[ATP]}{K_{Pyk\_ATP}}}{\frac{[FBP]}{K_{Pyk\_FBP}} + \frac{[AMP]}{K_{Pyk\_AMP}} + 1} \right)^{n_{Pyk}} + \left( \frac{[PEP]}{K_{Pyk\_PEP}} + 1 \right)^{n_{Pyk}} \right) ([ADP] + K_{Pyk\_ADP})}$                                                                                                       | [4] |
| $v_{E,Pps} = \frac{[Pps]k_{Pps\_cat} \frac{[PYR]}{K_{Pps\_PYR}} \left( 1 + \frac{[PYR]}{K_{Pps\_PYR}} \right)^{n_{Pps}-1}}{\left( 1 + \frac{[PYR]}{K_{Pps\_PYR}} \right)^{n_{Pps}} + L_{Pps} \left( 1 + \frac{[PEP]}{K_{Pps\_PEP}} \right)^{n_{Pps}}}$                                                                                                                                                                                                               | [1] |
| $v_{E,Pdh} = \frac{[Pdh]k_{Pdh\_cat} \left( \frac{1}{1 + K_{Pdh\_i} \frac{[NADH]}{[NAD]}} \right) \left( \frac{[PYR]}{K_{Pdh\_PYR\_m}} \right) \left( \frac{[NAD]}{K_{Pdh\_NAD\_m}} \right) \left( \frac{[CoA]}{K_{Pdh\_CoA\_m}} \right)}{\left( 1 + \frac{[PYR]}{K_{Pdh\_PYR\_m}} \right) \left( 1 + \frac{[NAD]}{K_{Pdh\_NAD\_m}} + \frac{[NADH]}{K_{Pdh\_NADH\_m}} \right) \left( 1 + \frac{[CoA]}{K_{Pdh\_CoA\_m}} + \frac{[AcCoA]}{K_{Pdh\_AcCoA\_m}} \right)}$ | [5] |
| $v_{E,Pta} = \frac{v_{Pta}^{max} \left( \frac{1}{K_{Pta\_AcCoA\_i} K_{Pta\_Pi\_m}} \right) \left( [AcCoA][P_i] - \frac{[AcP][CoA]}{K_{Pta\_eq}} \right)}{1 + \frac{[AcCoA]}{K_{Pta\_AcCoA\_i}} + \frac{[P_i]}{K_{Pta\_Pi\_i}} + \frac{[AcP]}{K_{Pta\_AcP\_i}} + \frac{[CoA]}{K_{Pta\_CoA\_i}} + \left( \frac{[AcCoA][P_i]}{K_{Pta\_AcCoA\_i} K_{Pta\_Pi\_m}} \right) + \left( \frac{[AcP][CoA]}{K_{Pta\_AcP\_m} K_{Pta\_CoA\_i}} \right)}$                           | [5] |
| $v_{E,Ack} = \frac{v_{Ack}^{max} \left( \frac{1}{K_{Ack\_ADP\_m} K_{Ack\_AcP\_m}} \right) \left( [AcP][ADP] - \frac{[ACE^{ex}][ATP]}{K_{Ack\_eq}} \right)}{\left( 1 + \frac{[AcP]}{K_{Ack\_AcP\_m}} + \frac{[ACE^{ex}]}{K_{Ack\_ACE\_m}} \right) \left( 1 + \frac{[ADP]}{K_{Ack\_ADP\_m}} + \frac{[ATP]}{K_{Ack\_ATP\_m}} \right)}$                                                                                                                                  | [5] |
| $v_{E,Ack,medium} = v_{E,Ack} \frac{[X]}{\rho}$                                                                                                                                                                                                                                                                                                                                                                                                                      | -   |
| $v_{E,Acs} = \frac{[Acs]k_{Acs\_cat} [ACE^{ex}]}{[ACE^{ex}] + K_{Acs\_ACE}}$                                                                                                                                                                                                                                                                                                                                                                                         | [1] |
| $v_{E,Acs,medium} = v_{E,Acs} \frac{[X]}{\rho}$                                                                                                                                                                                                                                                                                                                                                                                                                      | -   |
| $v_{E,Cs} = \frac{[Cs]k_{Cs\_cat} [OAA][AcCoA]}{\left( 1 + \frac{[\alpha KG]}{K_{Cs\_alphaKG}} \right) K_{Cs\_OAA\_AcCoA} K_{Cs\_AcCoA} + K_{Cs\_AcCoA} [OAA] + \left( 1 + \frac{[\alpha KG]}{K_{Cs\_alphaKG}} \right) K_{Cs\_OAA} [AcCoA] + [OAA][AcCoA]}$                                                                                                                                                                                                          | [1] |
| $v_{E,Icdh} = \frac{[Icdh]k_{Icdh\_cat} \frac{[ICIT]}{K_{Icdh\_ICIT}} \left( 1 + \frac{[ICIT]}{K_{Icdh\_ICIT}} \right)^{n_{Icdh}-1}}{\left( 1 + \frac{[ICIT]}{K_{Icdh\_ICIT}} \right)^{n_{Icdh}} + L_{Icdh} \left( 1 + \frac{[PEP]}{K_{Icdh\_PEP}} \right)^{n_{Icdh}}}$                                                                                                                                                                                              | [1] |

[6]

$$v_{E,\alpha kgdh} = \frac{[\alpha kgdh]k_{\alpha kgdh\_cat}[\alpha KG][CoA][NAD]}{\left( \begin{aligned} &K_{\alpha kgdh\_NAD\_m}[\alpha KG][CoA] + K_{\alpha kgdh\_CoA\_m}[\alpha KG][NAD] + K_{\alpha kgdh\_αKG\_m}[CoA][NAD] \\ &+ [\alpha KG][CoA][NAD] + \frac{K_{\alpha kgdh\_αKG\_m}K_{\alpha kgdh\_Z}[SUC][NADH]}{K_{\alpha kgdh\_SUC\_I}} + \frac{K_{\alpha kgdh\_NAD\_m}[\alpha KG][CoA][NADH]}{K_{\alpha kgdh\_NADH\_I}} \\ &+ \frac{K_{\alpha kgdh\_CoA\_m}[\alpha KG][NAD][SUC]}{K_{\alpha kgdh\_SUC\_I}} + \frac{K_{\alpha kgdh\_αKG\_m}K_{\alpha kgdh\_Z}[\alpha KG][SUC][NADH]}{K_{\alpha kgdh\_αKG\_I}K_{\alpha kgdh\_SUC\_I}} \end{aligned} \right)}$$

[6]

$$v_{Sdh1}^{\max} = [Sdh]k_{Sdh1\_cat}$$

$$v_{Sdh2}^{\max} = [Sdh]k_{Sdh2\_cat}$$

$$v_{E,Sdh} = \frac{v_{Sdh1}^{\max}v_{Sdh2}^{\max} \left( [SUC] - \frac{[FUM]}{K_{Sdh\_eq}} \right)}{K_{Sdh\_SUC\_m}v_{Sdh2}^{\max} + v_{Sdh2}^{\max}[SUC] + \frac{v_{Sdh1}^{\max}[FUM]}{K_{Sdh\_eq}}}$$

[6]

$$v_{Fum1}^{\max} = [Fum]k_{Fum1\_cat}$$

$$v_{Fum2}^{\max} = [Fum]k_{Fum2\_cat}$$

$$v_{E,Fum} = \frac{v_{Fum1}^{\max}v_{Fum2}^{\max} \left( [FUM] - \frac{[MAL]}{K_{Fum\_eq}} \right)}{K_{Fum\_FUM\_m}v_{Fum2}^{\max} + v_{Fum2}^{\max}[FUM] + \frac{v_{Fum1}^{\max}[MAL]}{K_{Fum\_eq}}}$$

[6]

$$v_{Mdh1}^{\max} = [Mdh]k_{Mdh1\_cat}$$

$$v_{Mdh2}^{\max} = [Mdh]k_{Mdh2\_cat}$$

$$v_{E,Mdh} = \frac{v_{Mdh1}^{\max}v_{Mdh2}^{\max} \left( [NAD][MAL] - \frac{[NADH][OAA]}{K_{Mdh\_eq}} \right)}{\left( \begin{aligned} &K_{Mdh\_NAD\_I}K_{Mdh\_MAL\_m}v_{Mdh2}^{\max} + K_{Mdh\_MAL\_m}v_{Mdh2}^{\max}[NAD] + K_{Mdh\_NAD\_m}v_{Mdh2}^{\max}[MAL] \\ &+ v_{Mdh2}^{\max}[NAD][MAL] + \frac{K_{Mdh\_OAA\_m}v_{Mdh1}^{\max}[NADH]}{K_{Mdh\_eq}} + \frac{K_{Mdh\_NADH\_m}v_{Mdh1}^{\max}[OAA]}{K_{Mdh\_eq}} \\ &+ \frac{v_{Mdh1}^{\max}[NADH][OAA]}{K_{Mdh\_eq}} + \frac{v_{Mdh1}^{\max}K_{Mdh\_OAA\_m}[NAD][NADH]}{K_{Mdh\_eq}K_{Mdh\_NAD\_I}} + \frac{v_{Mdh2}^{\max}K_{Mdh\_NAD\_m}[MAL][OAA]}{K_{Mdh\_OAA\_I}} \\ &+ \frac{v_{Mdh2}^{\max}[NAD][MAL][NADH]}{K_{Mdh\_NADH\_I}} + \frac{v_{Mdh1}^{\max}[MAL][NADH][OAA]}{K_{Mdh\_eq}K_{Mdh\_MAL\_I}} + \frac{v_{Mdh2}^{\max}[NAD][MAL][OAA]}{K_{Mdh\_OAA\_II}} \\ &+ \frac{v_{Mdh1}^{\max}[NAD][NADH][OAA]}{K_{Mdh\_NAD\_II}K_{Mdh\_eq}} + \frac{K_{Mdh\_NAD\_I}v_{Mdh2}^{\max}[NAD][MAL][NADH][OAA]}{K_{Mdh\_NAD\_II}K_{Mdh\_OAA\_m}K_{Mdh\_NADH\_I}} \end{aligned} \right)}$$

[1]

$$v_{E,Mez} = \frac{[Mez]k_{Mez\_cat} \frac{[MAL]}{K_{Mez\_MAL}} \left( 1 + \frac{[MAL]}{K_{Mez\_MAL}} \right)^{n_{Mez}-1}}{\left( 1 + \frac{[MAL]}{K_{Mez\_MAL}} \right)^{n_{Mez}} + L_{Mez} \left( 1 + \frac{[AcCoA]}{K_{Mez\_AcCoA}} + \frac{[cAMP]}{K_{Mez\_cAMP}} \right)^{n_{Mez}}}$$

[7]

$$v_{E,Pck} = \frac{[Pck]k_{Pck\_cat}[OAA] \frac{[ATP]}{[ADP]}}{\left( \begin{aligned} &K_{Pck\_OAA} \cdot \frac{[ATP]}{[ADP]} + [OAA] \cdot \frac{[ATP]}{[ADP]} + \frac{K_{Pck\_ATP\_i}K_{Pck\_OAA}}{K_{Pck\_ADP\_i}} + \frac{K_{Pck\_ATP\_i}K_{Pck\_OAA}}{K_{Pck\_PEP}K_{Pck\_ADP\_i}} \cdot [PEP] \\ &+ \frac{K_{Pck\_ATP\_i}K_{Pck\_OAA}}{K_{Pck\_PEP\_i}K_{Pck\_ATP\_I}} \cdot \frac{[ATP]}{[ADP]} \cdot [PEP] + \frac{K_{Pck\_ATP\_i}K_{Pck\_OAA}}{K_{Pck\_ADP\_i}K_{Pck\_OAA\_I}} \cdot [OAA] \end{aligned} \right)}$$

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$$v_{E, Ppc} = \frac{[Ppc]k_{Ppc\_cat} \frac{[PEP]}{K_{Ppc\_PEP}} \left(1 + \frac{[PEP]}{K_{Ppc\_PEP}}\right)^{n_{Ppc}-1}}{\left(1 + \frac{[PEP]}{K_{Ppc\_PEP}}\right)^{n_{Ppc}} + \frac{L_{Ppc}}{\left(1 + \frac{[FBP]}{K_{Ppc\_FBP}}\right)^{n_{Ppc}}}} \quad [1]$$


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$$v_{E, Icl} = \frac{[Icl]k_{Icl\_cat} \frac{[ICIT]}{K_{Icl\_ICIT}} \left(1 + \frac{[ICIT]}{K_{Icl\_ICIT}}\right)^{n_{Icl}-1}}{\left(1 + \frac{[ICIT]}{K_{Icl\_ICIT}}\right)^{n_{Icl}} + L_{Icl} \left(1 + \frac{[PEP]}{K_{Icl\_PEP}} + \frac{[GAP]}{K_{Icl\_3PG}} + \frac{[\alpha KG]}{K_{Icl\_αKG}}\right)^{n_{Icl}}}$$


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$$v_{E, Ms} = \frac{[Ms]k_{Ms\_cat} [GOX][AcCoA]}{K_{Ms\_GOX\_AcCoA} K_{Ms\_AcCoA} + K_{Ms\_AcCoA} [GOX] + K_{Ms\_GOX} [AcCoA] + [GOX][AcCoA]} \quad [1]$$


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$$v_{E, AceK\_ki} = \frac{[AceK]k_{AceK\_ki\_cat} \frac{[ICDH]}{K_{AceK\_ICDH}} \left(1 + \frac{[ICDH]}{K_{AceK\_ICDH}}\right)^{n_{AceK}-1}}{\left(1 + \frac{[ICDH]}{K_{AceK\_ICDH}}\right)^{n_{AceK}} + L_{AceK} \left(1 + \frac{[ICIT]}{K_{AceK\_ICIT}} + \frac{[GOX]}{K_{AceK\_GOX}} + \frac{[OAA]}{K_{AceK\_OAA}} + \frac{[\alpha KG]}{K_{AceK\_αKG}} + \frac{[PEP]}{K_{AceK\_PEP}} + \frac{[GAP]}{K_{AceK\_3PG}} + \frac{[PYR]}{K_{AceK\_PYR}}\right)^{n_{AceK}}}$$


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$$v_{E, AceK\_ph} = \frac{[AceK]k_{AceK\_ph\_cat} \frac{[ICDH-P]}{K_{AceK\_ICDH-P}} \left(1 + \frac{[ICDH-P]}{K_{AceK\_ICDH-P}}\right)^{n_{AceK}-1}}{\left(1 + \frac{[ICDH-P]}{K_{AceK\_ICDH-P}}\right)^{n_{AceK}} + \frac{L_{AceK}}{\left(1 + \frac{[OAA]}{K_{AceK\_OAA}} + \frac{[\alpha KG]}{K_{AceK\_αKG}} + \frac{[PEP]}{K_{AceK\_PEP}} + \frac{[GAP]}{K_{AceK\_3PG}} + \frac{[PYR]}{K_{AceK\_PYR}}\right)^{n_{AceK}}}}$$


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$$v_{E, G6pdh} = \frac{v_{G6pdh}^{\max} [G6P][NADP]}{([G6P] + K_{G6pdh\_G6P}) \left(1 + \frac{[NADPH]}{K_{G6pdh\_NADPH\_g6pinh}}\right) \left(K_{G6pdh\_NADP} \left(1 + \frac{[NADPH]}{K_{G6pdh\_NADPH\_nadpinh}}\right) + [NADP]\right)} \quad [4]$$


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$$v_{E, Pgl} = \frac{v_{Pgl}^{\max} \left([6PGL] - \frac{[6PG]}{K_{Pgl\_eq}}\right)}{\left(1 + \frac{[H^+]}{K_{Pgl\_hl}} + \frac{K_{Pgl\_h2}}{[H^+]}\right) \left(K_{Pgl\_6PGL\_m} + [6PGL] + \frac{K_{Pgl\_6PGL\_m}}{K_{Pgl\_6PG\_m}} [6PG]\right)} \quad [8]$$


---


$$v_{E, Edd} = \frac{v_{Edd}^{\max} Q_{Edd\_pH} \left([6PG] - \frac{[KDPG]}{K_{Edd\_eq}}\right)}{K_{Edd\_6PG\_m} + [6PG] + \frac{K_{Edd\_6PG\_m} [KDPG]}{K_{Edd\_KDPG\_m}}} \quad [8]$$


---


$$Q_{Edd\_pH} = \frac{1 + 2 \cdot 10^{(pH_{Edd\_m} - pK_{Edd})}}{1 + 10^{(pH - pK_{Edd})} + 10^{(2 \cdot pH_{Edd\_m} - pH - pK_{Edd})}}$$


---


$$v_{E, Eda} = \frac{v_{Eda}^{\max} Q_{Eda\_pH} \left([KDPG] - \frac{[GAP][PYR]}{K_{Eda\_eq}}\right)}{K_{Eda\_KDPG\_m} + [KDPG] + K_{Eda\_KDPG\_m} \left(\frac{[PYR]}{K_{Eda\_PYR\_m}} + \frac{[GAP]}{K_{Eda\_GAP\_m}} + \frac{[PYR][GAP]}{K_{Eda\_PYR\_m} K_{Eda\_GAP\_m}}\right)}$$


---


$$Q_{Eda\_pH} = \frac{1 + 2 \cdot 10^{(pH_{Eda\_m} - pK_{Eda})}}{1 + 10^{(pH - pK_{Eda})} + 10^{(2 \cdot pH_{Eda\_m} - pH - pK_{Eda})}}$$


---


$$v_{E, 6Pgdh} = \frac{v_{6Pgdh}^{\max} [6PG][NADP]}{([6PG] + K_{6Pgdh\_6PG}) \left([NADP] + K_{6Pgdh\_NADP} \left(1 + \frac{[NADPH]}{K_{6Pgdh\_NADPH\_inh}}\right) \left(1 + \frac{[ATP]}{K_{6Pgdh\_ATP\_inh}}\right)\right)} \quad [4]$$


---

|                                                                                                                                                                                                                                                                                                                                                                                     |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| $v_{E,R5pi} = v_{R5pi}^{\max} \left( [RU5P] - \frac{[R5P]}{K_{R5pi\_eq}} \right)$                                                                                                                                                                                                                                                                                                   | [4] |
| $v_{E,Ru5p} = v_{Ru5p}^{\max} \left( [RU5P] - \frac{[X5P]}{K_{Ru5p\_eq}} \right)$                                                                                                                                                                                                                                                                                                   | [4] |
| $v_{E,TktA} = v_{TktA}^{\max} \left( [R5P][X5P] - \frac{[S7P][GAP]}{K_{TktA\_eq}} \right)$                                                                                                                                                                                                                                                                                          | [4] |
| $v_{E,TktB} = v_{TktB}^{\max} \left( [X5P][E4P] - \frac{[F6P][GAP]}{K_{TktB\_eq}} \right)$                                                                                                                                                                                                                                                                                          | [4] |
| $v_{E,Tal} = v_{Tal}^{\max} \left( [GAP][S7P] - \frac{[E4P][F6P]}{K_{Tal\_eq}} \right)$                                                                                                                                                                                                                                                                                             | [4] |
| $v_{E,Cya} = \frac{v_{Cya}^{\max} [EIIA-P]}{[EIIA-P] + K_{Cya\_EIIA-P}}$                                                                                                                                                                                                                                                                                                            | [1] |
| $v_{E,cAMP_{deg}} = \frac{v_{cAMP_{deg}}^{\max} [cAMP]}{[cAMP] + K_{cAMP_{deg}\_cAMP}}$                                                                                                                                                                                                                                                                                             | [1] |
| $v_{G,glk} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{glk\_Cra}} \right) v_{glk\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{glk\_Cra}} v_{glk\_Cra\_bound} \right)$                                                                                                                                                                                                      | [1] |
| $v_{G,pfkA} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{pfkA\_Cra}} \right) v_{pfkA\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{pfkA\_Cra}} v_{pfkA\_Cra\_bound} \right)$                                                                                                                                                                                                 | [1] |
| $v_{G,fbp} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{fbp\_Cra}} \right) v_{fbp\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{fbp\_Cra}} v_{fbp\_Cra\_bound} \right)$                                                                                                                                                                                                      | [1] |
| $v_{G,fbmA} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{fbmA\_Cra}} \right) v_{fbmA\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{fbmA\_Cra}} v_{fbmA\_Cra\_bound} \right. \right. \\ \left. \left. + \left( 1 - \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{fbmA\_Crp}} \right) v_{fbmA\_Crp\_unbound} + \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{fbmA\_Crp}} v_{fbmA\_Crp\_bound} \right)$ | [1] |
| $v_{G,gapA} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{gapA\_Cra}} \right) v_{gapA\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{gapA\_Cra}} v_{gapA\_Cra\_bound} \right. \right. \\ \left. \left. + \left( 1 - \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{gapA\_Crp}} \right) v_{gapA\_Crp\_unbound} + \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{gapA\_Crp}} v_{gapA\_Crp\_bound} \right)$ | [1] |
| $v_{G,pykF} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{pykF\_Cra}} \right) v_{pykF\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{pykF\_Cra}} v_{pykF\_Cra\_bound} \right)$                                                                                                                                                                                                 | [1] |
| $v_{G,ppsA} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{ppsA\_Cra}} \right) v_{ppsA\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{ppsA\_Cra}} v_{ppsA\_Cra\_bound} \right)$                                                                                                                                                                                                 | [1] |
| $v_{G,pdh} = \mu k_{expr} \left( \left( 1 - \frac{[PdhR]}{[PdhR] + K_{pdh\_PdhR}} \right) v_{pdh\_PdhR\_unbound} + \frac{[PdhR]}{[PdhR] + K_{pdh\_PdhR}} v_{pdh\_PdhR\_bound} \right)$                                                                                                                                                                                              | [1] |
| $v_{G,acs} = \mu k_{expr} \left( \left( 1 - \frac{[Crp-cAMP]^{n_{acs}}}{[Crp-cAMP]^{n_{acs}} + K_{acs\_Crp}^{n_{acs}}} \right) v_{acs\_Crp\_unbound} + \frac{[Crp-cAMP]^{n_{acs}}}{[Crp-cAMP]^{n_{acs}} + K_{acs\_Crp}^{n_{acs}}} v_{acs\_Crp\_bound} \right)$                                                                                                                      | [1] |
| $v_{G,gltA} = \mu k_{expr} \left( \left( 1 - \frac{[Crp-cAMP]^{n_{gltA}}}{[Crp-cAMP]^{n_{gltA}} + K_{gltA\_Crp}^{n_{gltA}}} \right) v_{gltA\_Crp\_unbound} + \frac{[Crp-cAMP]^{n_{gltA}}}{[Crp-cAMP]^{n_{gltA}} + K_{gltA\_Crp}^{n_{gltA}}} v_{gltA\_Crp\_bound} \right)$                                                                                                           | [1] |
| $v_{G,icdA} = \mu k_{expr} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{icdA\_Cra}} \right) v_{icdA\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{icdA\_Cra}} v_{icdA\_Cra\_bound} \right)$                                                                                                                                                                                                 | [1] |
| $v_{G,sucAB} = \mu k_{expr} \left( \left( 1 - \frac{[Crp-cAMP]^{n_{sucAB}}}{[Crp-cAMP]^{n_{sucAB}} + K_{sucAB\_Crp}^{n_{sucAB}}} \right) v_{sucAB\_Crp\_unbound} \right. \right. \\ \left. \left. + \frac{[Crp-cAMP]^{n_{sucAB}}}{[Crp-cAMP]^{n_{sucAB}} + K_{sucAB\_Crp}^{n_{sucAB}}} v_{sucAB\_Crp\_bound} \right)$                                                               | [1] |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| $v_{G, sdhCDAB} = \mu k_{\text{expr}} \left( \left( 1 - \frac{[Crp-cAMP]^{n_{sdhCDAB}}}{[Crp-cAMP]^{n_{sdhCDAB}} + K_{sdhCDAB\_Crp}^{n_{sdhCDAB}}} \right) v_{sdhCDAB\_Crp\_unbound} + \frac{[Crp-cAMP]^{n_{sdhCDAB}}}{[Crp-cAMP]^{n_{sdhCDAB}} + K_{sdhCDAB\_Crp}^{n_{sdhCDAB}}} v_{sdhCDAB\_Crp\_bound} \right)$                                                                                                                                                                                                                                                                                                                                                                                                                                                            | [1] |
| $v_{G, fumABC} = \mu k_{\text{expr}} \left( \left( 1 - \frac{[Crp-cAMP]^{n_{fumABC}}}{[Crp-cAMP]^{n_{fumABC}} + K_{fumABC\_Crp}^{n_{fumABC}}} \right) v_{fumABC\_Crp\_unbound} + \frac{[Crp-cAMP]^{n_{fumABC}}}{[Crp-cAMP]^{n_{fumABC}} + K_{fumABC\_Crp}^{n_{fumABC}}} v_{fumABC\_Crp\_bound} \right)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | [1] |
| $v_{G, mdh} = \mu k_{\text{expr}} \left( \left( 1 - \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{mdh\_Crp}} \right) v_{mdh\_Crp\_unbound} + \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{mdh\_Crp}} v_{mdh\_Crp\_bound} \right)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | [1] |
| $SS_{Mez} = \alpha_{GLC} SS_{Mez}^{GLC} + \alpha_{ACE} SS_{Mez}^{ACE}$ $v_{G, mekB} = (\mu + k_{\text{degr}}) SS_{Mez}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | [1] |
| $v_{G, pckA} = \mu k_{\text{expr}} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{pckA\_Cra}} \right) v_{pckA\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{pckA\_Cra}} v_{pckA\_Cra\_bound} \right)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | [1] |
| $SS_{Ppc} = \alpha_{GLC} SS_{Ppc}^{GLC} + \alpha_{ACE} SS_{Ppc}^{ACE}$ $v_{G, ppc} = (\mu + k_{\text{degr}}) SS_{Ppc}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [1] |
| $v_{G, aceA} = \mu k_{\text{expr}} \left( \left( 1 - \frac{[Cra]}{[Cra] + K_{aceBAK\_Cra}} \right) v_{aceBAK\_Cra\_unbound} + \frac{[Cra]}{[Cra] + K_{aceBAK\_Cra}} v_{aceBAK\_Cra\_bound} + \left( 1 - \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{aceBAK\_Crp}} \right) v_{aceBAK\_Crp\_unbound} + \frac{[Crp-cAMP]}{[Crp-cAMP] + K_{aceBAK\_Crp}} v_{aceBAK\_Crp\_bound} + \left[ 1 - \frac{[aceBAK\_DNA]}{K_{aceBAK\_DNA}} \left( 1 + \frac{1}{L_{aceBAK}} \left( \frac{[GOX]}{K_{aceBAK\_GOX}} \right) \left( 1 + \frac{[GOX]}{K_{aceBAK\_GOX}} \right) + \frac{[aceBAK\_DNA]}{K_{aceBAK\_DNA}} \right) + \frac{[PYR]}{K_{aceBAK\_PYR}} + \frac{[aceBAK\_DNA]}{K_{aceBAK\_DNA}} \frac{[PYR]}{K_{aceBAK\_PYR\_prime}} \right] \right) k_{aceBAK\_cat\_IclR} [IclR_{total}] \right)$ | [1] |
| $v_{G, aceB} = Factor_{aceB} \cdot v_{G, aceA}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | [1] |
| $v_{G, aceK} = Factor_{aceK} \cdot v_{G, aceA}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | [1] |
| $v_{D, X} = D[X]$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -   |
| $v_{D, GLC^{feed}} = D[GLC^{feed}]$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -   |
| $v_{D, GLC^{ex}} = D[GLC^{ex}]$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -   |
| $v_{D, GLC} = \mu[GLC]$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -   |
| $v_{D, G6P} = \mu[G6P]$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -   |
| $v_{D, F6P} = \mu[F6P]$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -   |
| $v_{D, FBP} = \mu[FBP]$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -   |

|                                                    |     |
|----------------------------------------------------|-----|
| $v_{D,GAP} = \mu[GAP]$                             | -   |
| $v_{D,PEP} = \mu[PEP]$                             | -   |
| $v_{D,PYR} = \mu[PYR]$                             | -   |
| $v_{D,AcCoA} = \mu[AcCoA]$                         | -   |
| $v_{D,AcP} = \mu[AcP]$                             | -   |
| $v_{D,ACE^{\alpha}} = D[ACE^{ex}]$                 | -   |
| $v_{D,ICIT} = \mu[ICIT]$                           | -   |
| $v_{D,\alpha KG} = \mu[\alpha KG]$                 | -   |
| $v_{D,SUC} = \mu[SUC]$                             | -   |
| $v_{D,FUM} = \mu[FUM]$                             | -   |
| $v_{D,MAL} = \mu[MAL]$                             | -   |
| $v_{D,OAA} = \mu[OAA]$                             | -   |
| $v_{D,GOX} = \mu[GOX]$                             | -   |
| $v_{D,6PGL} = \mu[6PGL]$                           | -   |
| $v_{D,6PG} = \mu[6PG]$                             | -   |
| $v_{D,KDPG} = \mu[KDPG]$                           | -   |
| $v_{D,RUSP} = \mu[RUSP]$                           | -   |
| $v_{D,R5P} = \mu[R5P]$                             | -   |
| $v_{D,X5P} = \mu[X5P]$                             | -   |
| $v_{D,S7P} = \mu[S7P]$                             | -   |
| $v_{D,E4P} = \mu[E4P]$                             | -   |
| $v_{D,cAMP} = \mu[cAMP]$                           | -   |
| $v_{D,Glk} = (\mu + k_{deg})[Glk]$                 | [1] |
| $v_{D,Pfk} = (\mu + k_{deg})[Pfk]$                 | [1] |
| $v_{D,Fbp} = (\mu + k_{deg})[Fbp]$                 | [1] |
| $v_{D,Fba} = (\mu + k_{deg})[Fba]$                 | [1] |
| $v_{D,Gapdh} = (\mu + k_{deg})[Gapdh]$             | [1] |
| $v_{D,Pyk} = (\mu + k_{deg})[Pyk]$                 | [1] |
| $v_{D,Pps} = (\mu + k_{deg})[Pps]$                 | [1] |
| $v_{D,Pdh} = (\mu + k_{deg})[Pdh]$                 | [1] |
| $v_{D,Acs} = (\mu + k_{deg})[Acs]$                 | [1] |
| $v_{D,Cs} = (\mu + k_{deg})[Cs]$                   | [1] |
| $v_{D,Icdh} = (\mu + k_{deg})[Icdh]$               | [1] |
| $v_{D,Icdh-P} = (\mu + k_{deg})[Icdh-P]$           | [1] |
| $v_{D,\alpha kgdh} = (\mu + k_{deg})[\alpha kgdh]$ | [1] |
| $v_{D,Sdh} = (\mu + k_{deg})[Sdh]$                 | [1] |
| $v_{D,Fum} = (\mu + k_{deg})[Fum]$                 | [1] |
| $v_{D,Mdh} = (\mu + k_{deg})[Mdh]$                 | [1] |
| $v_{D,Mez} = (\mu + k_{deg})[Mez]$                 | [1] |
| $v_{D,Pck} = (\mu + k_{deg})[Pck]$                 | [1] |
| $v_{D,Ppc} = (\mu + k_{deg})[Ppc]$                 | [1] |
| $v_{D,Icl} = (\mu + k_{deg})[Icl]$                 | [1] |
| $v_{D,Ms} = (\mu + k_{deg})[Ms]$                   | [1] |
| $v_{D,AceK} = (\mu + k_{deg})[AceK]$               | [1] |

|                                                                                              |                      |
|----------------------------------------------------------------------------------------------|----------------------|
| $v_{BM,G6P} = (\alpha_{GLC} k_{BM\_GLC\_G6P} + \alpha_{ACE} k_{BM\_ACE\_G6P}) [G6P]$         | [1]                  |
| $v_{BM,F6P} = (\alpha_{GLC} k_{BM\_GLC\_F6P} + \alpha_{ACE} k_{BM\_ACE\_F6P}) [F6P]$         | [1]                  |
| $v_{BM,GAP} = (\alpha_{GLC} k_{BM\_GLC\_GAP} + \alpha_{ACE} k_{BM\_ACE\_GAP}) [GAP]$         | [1]                  |
| $v_{BM,PEP} = (\alpha_{GLC} k_{BM\_GLC\_PEP} + \alpha_{ACE} k_{BM\_ACE\_PEP}) [PEP]$         | [1]                  |
| $v_{BM,PYR} = (\alpha_{GLC} k_{BM\_GLC\_PYR} + \alpha_{ACE} k_{BM\_ACE\_PYR}) [PYR]$         | [1]                  |
| $v_{BM,AcCoA} = (\alpha_{GLC} k_{BM\_GLC\_AcCoA} + \alpha_{ACE} k_{BM\_ACE\_AcCoA}) [AcCoA]$ | [1]                  |
| $v_{BM,\alpha KG} = (\alpha_{GLC} k_{BM\_GLC\_αKG} + \alpha_{ACE} k_{BM\_ACE\_αKG}) [αKG]$   | [1]                  |
| $v_{BM,SUC} = (\alpha_{GLC} k_{BM\_GLC\_SUC} + \alpha_{ACE} k_{BM\_ACE\_SUC}) [SUC]$         | [1]                  |
| $v_{BM,FUM} = (\alpha_{GLC} k_{BM\_GLC\_FUM} + \alpha_{ACE} k_{BM\_ACE\_FUM}) [FUM]$         | [1]                  |
| $v_{BM,OAA} = (\alpha_{GLC} k_{BM\_GLC\_OAA} + \alpha_{ACE} k_{BM\_ACE\_OAA}) [OAA]$         | [1]                  |
| $v_{BM,R5P} = (\alpha_{GLC} k_{BM\_GLC\_R5P} + \alpha_{ACE} k_{BM\_ACE\_R5P}) [R5P]$         | Derived based on [1] |
| $v_{BM,E4P} = (\alpha_{GLC} k_{BM\_GLC\_E4P} + \alpha_{ACE} k_{BM\_ACE\_E4P}) [E4P]$         | Derived based on [1] |

**Table S3. Ancillary variables and their equations.**

| Equation                                                                                                                                                                              | Unit               | Reference              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------|
| $\alpha_{GLC} = \frac{[GLC^{ex}]}{[GLC^{ex}] + K_{Pis\_GLC}}$                                                                                                                         | -                  | [1]                    |
| $\alpha_{ACE} = \frac{[ACE^{ex}]}{[ACE^{ex}] + K_{Acs\_ACE}} (1 - \alpha_{GLC})$                                                                                                      | -                  | [1]                    |
| $[H^+] = 10^{-pH}$                                                                                                                                                                    | M                  | -                      |
| $[EIIA] = [EIIA_{total}] - [EIIA-P]$                                                                                                                                                  | mM                 | -                      |
| $[Crp-cAMP] = \frac{[Crp_{total}][cAMP]^{n_{Crp-cAMP}}}{[cAMP]^{n_{Crp-cAMP}} + K_{Crp-cAMP}^{n_{Crp-cAMP}}}$                                                                         | mM                 | Derived based on [1]   |
| $[Crp] = [Crp_{total}] - [Crp-cAMP]$                                                                                                                                                  | mM                 | -                      |
| $[Cra-FBP] = \frac{[Cra_{total}][FBP]^{n_{Cra-FBP}}}{[FBP]^{n_{Cra-FBP}} + K_{Cra-FBP}^{n_{Cra-FBP}}}$                                                                                | mM                 | Derived based on [1]   |
| $[Cra] = [Cra_{total}] - [Cra-FBP]$                                                                                                                                                   | mM                 | -                      |
| $[PdhR-PYR] = \frac{[PdhR_{total}][PYR]^{n_{PdhR-PYR}}}{[PYR]^{n_{PdhR-PYR}} + K_{PdhR-PYR}^{n_{PdhR-PYR}}}$                                                                          | mM                 | Derived based on [1]   |
| $[PdhR] = [PdhR_{total}] - [PdhR-PYR]$                                                                                                                                                | mM                 | -                      |
| $OP_{NADH} = (v_{E,Gapdh} + v_{E,Pdh} + v_{E,\alpha kgdh} + v_{E,Mdh}) \times (P/O)$                                                                                                  | mM h <sup>-1</sup> | [9]                    |
| $OP_{FADH_2} = v_{E,Sdh} \times (P/O)'$                                                                                                                                               | mM h <sup>-1</sup> | [9]                    |
| $v_{ATP} = OP_{NADH} + OP_{FADH_2} - v_{E,Glk} - v_{E,Pfk} + v_{E,Gapdh} + v_{E,Pyk} - v_{E,Pps} + v_{E,Ack} - v_{E,Acs} + v_{E,\alpha kgdh} - v_{E,Pck} - v_{E,AceK-ki} - v_{E,Cyu}$ | mM h <sup>-1</sup> | Developed based on [9] |
| $\mu = k_{ATP} v_{ATP}$                                                                                                                                                               | h <sup>-1</sup>    | Assumed                |

**Table S4. Model variables (Class I: Measured, Class II: Estimated by reference, ClassIII: Assumed by this paper, ‘-’: Fixed, i.e. not optimized).**

| Name              | Description                       | Initial value | Unit                                                  | Class | Reference | Optimized value (used in simulation) |
|-------------------|-----------------------------------|---------------|-------------------------------------------------------|-------|-----------|--------------------------------------|
| X                 | Biomass                           | 0.012         | $\text{g}_{\text{DW}} \text{L}_{\text{Culture}}^{-1}$ | -     | [10]      | 0.012                                |
| GLC <sup>ex</sup> | External glucose                  | 22.5          | mM                                                    | -     | [10]      | 22.5                                 |
| GLC               | Internal glucose                  | 3.48          | mM                                                    | III   | Assumed   | 2.85                                 |
| G6P               | Glucose-6-phosphate               | 3.48          | mM                                                    | I     | [4]       | 3.48                                 |
| F6P               | Fructose-6-phosphate              | 0.6           | mM                                                    | I     | [4]       | 0.57                                 |
| FBP               | Fructose-1,6-bisphosphate         | 15            | mM                                                    | I     | [11]      | 15.03                                |
| GAP               | Glyceraldehyde-3-phosphate        | 0.218         | mM                                                    | I     | [4]       | 0.218                                |
| PEP               | Phosphoenol pyruvate              | 0.18          | mM                                                    | I     | [11]      | 0.40                                 |
| PYR               | Pyruvate                          | 2.67          | mM                                                    | I     | [4]       | 1.77                                 |
| AcCoA             | Acetyl-CoA                        | 0.61          | mM                                                    | I     | [11]      | 0.612                                |
| AcP               | Acetyl phosphate                  | 1.1           | mM                                                    | I     | [11]      | 1.10                                 |
| ACE <sup>ex</sup> | External acetate                  | 0             | mM                                                    | -     | [10]      | 0                                    |
| ICIT              | Isocitrate                        | 0.17          | mM                                                    | I     | [12]      | 0.11                                 |
| $\alpha$ KG       | $\alpha$ -Ketoglutarate           | 0.44          | mM                                                    | I     | [11]      | 0.44                                 |
| SUC               | Succinate                         | 0.57          | mM                                                    | I     | [11]      | 0.57                                 |
| FUM               | Fumarate                          | 0.12          | mM                                                    | I     | [11]      | 0.12                                 |
| MAL               | Malate                            | 1.7           | mM                                                    | I     | [11]      | 1.43                                 |
| OAA               | Oxaloacetate                      | 0.68          | mM                                                    | I     | [12]      | 0.65                                 |
| GOX               | Glyoxylate                        | 0.10          | mM                                                    | II    | [13]      | 0.08                                 |
| 6PGL              | 6-Phosphogluconolactone           | 1             | mM                                                    | III   | Assumed   | 1.61                                 |
| 6PG               | 6-Phosphogluconate                | 3.8           | mM                                                    | I     | [11]      | 3.46                                 |
| KDPG              | 2-Keto-3-deoxy-6-phosphogluconate | 1             | mM                                                    | III   | Assumed   | 1.04                                 |
| RU5P              | Ribulose-5-phosphate              | 0.111         | mM                                                    | II    | [4]       | 0.16                                 |
| R5P               | Ribose-5-phosphate                | 0.398         | mM                                                    | II    | [4]       | 0.398                                |
| X5P               | Xylulose-5-phosphate              | 0.138         | mM                                                    | II    | [4]       | 0.188                                |
| S7P               | Sedoheptulose-7-phosphate         | 0.276         | mM                                                    | II    | [4]       | 0.066                                |

|        |                                             |          |    |     |         |          |
|--------|---------------------------------------------|----------|----|-----|---------|----------|
| E4P    | Erythrose-4-phosphate                       | 0.098    | mM | II  | [4]     | 0.097    |
| cAMP   | Cyclic AMP                                  | 0.035    | mM | I   | [11]    | 0.019    |
| EIIA-P | Phosphorylated Pts protein EIIA             | 0.0731   | mM | II  | [13]    | 0.014    |
| Glk    | Glucokinase                                 | 1.42e-03 | mM | III | Assumed | 3.0e-03  |
| Pfk    | Phosphofructokinase                         | 1.42e-03 | mM | I   | [14]    | 1.4e-03  |
| Fbp    | Fructose-1,6-bisphosphatase                 | 2.55e-04 | mM | I   | [15]    | 2.97e-04 |
| Fba    | Fructose-1,6-bisphosphate aldolase class II | 0.0309   | mM | I   | [16]    | 0.023    |
| Gapdh  | Glyceraldehyde 3-phosphate dehydrogenase    | 0.0356   | mM | I   | [17]    | 0.040    |
| Pyk    | Pyruvate kinase I                           | 2.75e-03 | mM | I   | [18]    | 2.88e-03 |
| Pps    | Phosphoenolpyruvate synthase                | 3.86e-03 | mM | I   | [19]    | 3.86e-03 |
| Pdh    | Pyruvate dehydrogenase                      | 3.32e-04 | mM | I   | [20]    | 5.30e-04 |
| Acs    | Acetyl coenzyme A synthetase                | 2.84e-04 | mM | II  | [1]     | 1.68e-04 |
| Cs     | Citrate synthase                            | 3.68e-03 | mM | I   | [21]    | 2.78e-03 |
| Icdh   | Isocitrate dehydrogenase                    | 0.119    | mM | I   | [22]    | 0.172    |
| Icdh-P | phosphorylated isocitrate dehydrogenase     | 0.119    | mM | I   | [22]    | 0.119    |
| αkgdh  | α-Keto-D-gluconate dehydrogenase            | 1.76e-03 | mM | I   | [23]    | 2.6e-03  |
| Sdh    | Succinate dehydrogenase                     | 0.0508   | mM | I   | [24]    | 0.059    |
| Fum    | Fumarase                                    | 2.10e-03 | mM | I   | [25]    | 2.1e-03  |
| Mdh    | Malate dehydrogenase                        | 0.0144   | mM | I   | [26]    | 7.3e-03  |
| Mez    | Malic enzyme                                | 1.87e-04 | mM | I   | [27]    | 1.87e-04 |
| Pck    | Phosphoenolpyruvate carboxykinase           | 1.08e-03 | mM | I   | [28]    | 6.7e-04  |
| Ppc    | Phosphoenolpyruvate carboxylase             | 1.89e-06 | mM | I   | [29]    | 3.42e-06 |
| Icl    | Isocitrate Lyase                            | 0.0120   | mM | I   | [30]    | 0.012    |
| Ms     | Malate synthase                             | 3.61e-03 | mM | I   | [31]    | 3.62e-03 |
| AceK   | Isocitrate dehydrogenase phosphatase/kinase | 3.61e-05 | mM | I   | [31]    | 2.86e-05 |

**Table S5. Constant components (Class I: Measured, Class II: Estimated by reference, ClassIII: Assumed by this paper, ‘-’: Fixed, i.e. not optimized).**

| Name                  | Description                                                | Value                                               | Unit | Class | Reference |
|-----------------------|------------------------------------------------------------|-----------------------------------------------------|------|-------|-----------|
| GLC <sup>feed</sup>   | Glucose concentration in feeding medium                    | 0 for batch culture and 22.2 for continuous culture | mM   | -     | [10]      |
| ATP                   | Adenosine-5-triphosphate                                   | 9.6                                                 | mM   | -     | [11]      |
| ADP                   | Adenosine-5-diphosphate                                    | 0.56                                                | mM   | -     | [11]      |
| AMP                   | Adenosine-5-monophosphate                                  | 0.28                                                | mM   | -     | [11]      |
| NAD                   | Nicotinamide adenine dinucleotide                          | 2.6                                                 | mM   | -     | [11]      |
| NADH                  | Nicotinamide adenine dinucleotide reduced                  | 0.083                                               | mM   | -     | [11]      |
| NADP                  | Dihydronicotinamide adenine dinucleotide phosphate         | 2.1e-03                                             | mM   | -     | [11]      |
| NADPH                 | Dihydronicotinamide adenine dinucleotide phosphate reduced | 0.12                                                | mM   | -     | [11]      |
| CoA                   | Coenzyme A                                                 | 1.4                                                 | mM   | -     | [11]      |
| P <sub>i</sub>        | Inorganic phosphate                                        | 10                                                  | mM   | -     | [32]      |
| EIIA <sub>total</sub> | Total concentration of EIIA                                | 0.0769                                              | mM   | -     | [33]      |
| Crp <sub>total</sub>  | Total concentration of Crp                                 | 0.0115                                              | mM   | -     | [34]      |
| Cra <sub>total</sub>  | Total concentration of Cra                                 | 3.00e-04                                            | mM   | -     | [13]      |
| PdhR <sub>total</sub> | Total concentration of PdhR                                | 6.66e-05                                            | mM   | -     | [35]      |
| IcIR <sub>total</sub> | Total concentration of IcIR                                | 8.30e-05                                            | mM   | -     | [13]      |
| pH                    | Intracellular pH                                           | 7.5                                                 | -    | -     | [8]       |
| aceBAK_DNA            | DNA concentration                                          | 5.15e-07                                            | mM   | -     | [36]      |

**Table S6. Kinetic parameters (Class I: Measured, Class II: Estimated by reference, ClassIII: Assumed by this paper, ‘-’: Fixed, i.e. not optimized).**

| Reaction involved | Parameter              | Value    | Unit                           | Class | Reference | Optimized value<br>(used in simulation) |
|-------------------|------------------------|----------|--------------------------------|-------|-----------|-----------------------------------------|
| $v_{P_{Ts1}}$     | $k_{P_{Ts1}}$          | 3.70e+04 | $\text{mM}^{-1} \text{h}^{-1}$ | II    | [1]       | 5.59e+04                                |
|                   | $km_{P_{Ts1}}$         | 1.48e+04 | $\text{mM}^{-1} \text{h}^{-1}$ | II    | [1]       | 2.77e+04                                |
| $v_{P_{Ts4}}$     | $v_{P_{Ts4}}^{\max}$   | 1.54e+04 | $\text{mM h}^{-1}$             | II    | [1]       | 3.94e+03                                |
|                   | $K_{P_{Ts\_EIIA}}$     | 0.240    | mM                             | II    | [1]       | 2.11e-03                                |
|                   | $K_{P_{Ts\_GLC}}$      | 6.67e-03 | mM                             | II    | [1]       | 4.89e-03                                |
| $v_{Nonpts}$      | $v_{Nonpts}^{\max}$    | 931      | $\text{mM h}^{-1}$             | II    | [2]       | 3.99e+03                                |
|                   | $K_{Nonpts\_S}$        | 0.846    | mM                             | II    | [2]       | 1.55                                    |
|                   | $K_{Nonpts\_I}$        | 5.64e-04 | mM                             | II    | [2]       | 0.01                                    |
| $v_{E\_Glc}$      | $k_{Glc\_cat}$         | 1.26e+06 | $\text{h}^{-1}$                | II    | [3]       | 2.01e+06                                |
|                   | $K_{Glc\_GLC\_m}$      | 0.22     | mM                             | I     | [37]      | 0.15                                    |
|                   | $K_{Glc\_ATP\_m}$      | 0.8      | mM                             | I     | [37]      | 0.71                                    |
|                   | $K_{Glc\_G6P\_i}$      | 15       | mM                             | I     | [37]      | 14.98                                   |
| $v_{E\_Pgi}$      | $v_{Pgi}^{\max}$       | 2.34e+06 | $\text{mM h}^{-1}$             | II    | [4]       | 3.56e+06                                |
|                   | $K_{Pgi\_eq}$          | 0.43     | -                              | I     | [38]      | 1.44                                    |
|                   | $K_{Pgi\_G6P}$         | 2.46     | mM                             | I     | [39]      | 2.46                                    |
|                   | $K_{Pgi\_F6P}$         | 0.2      | mM                             | I     | [40]      | 0.34                                    |
|                   | $K_{Pgi\_F6P\_6pginh}$ | 0.2      | mM                             | I     | [41]      | 0.19                                    |
|                   | $K_{Pgi\_G6P\_6pginh}$ | 0.2      | mM                             | I     | [41]      | 0.18                                    |
| $v_{E\_Pfk}$      | $k_{Pfk\_cat}$         | 4.67e+09 | $\text{h}^{-1}$                | II    | [4]       | 2.49e+10                                |
|                   | $K_{Pfk\_PEP}$         | 3.26     | mM                             | II    | [4]       | 1.73                                    |
|                   | $K_{Pfk\_ADP\_b}$      | 0.25     | mM                             | I     | [42]      | 0.26                                    |
|                   | $K_{Pfk\_AMP\_b}$      | 0.01     | mM                             | I     | [42]      | 0.03                                    |
|                   | $K_{Pfk\_ADP\_a}$      | 239      | mM                             | I     | [42]      | 276.95                                  |
|                   | $K_{Pfk\_AMP\_a}$      | 8.74     | mM                             | I     | [42]      | 10.05                                   |
|                   | $K_{Pfk\_ATP\_s}$      | 0.16     | mM                             | I     | [43]      | 0.16                                    |
|                   | $K_{Pfk\_ADP\_c}$      | 0.36     | mM                             | I     | [42]      | 0.45                                    |
|                   | $K_{Pfk\_F6P\_s}$      | 0.14     | mM                             | I     | [43]      | 0.02                                    |
|                   | $L_{Pfk}$              | 4e+06    | -                              | I     | [44]      | 1.77e+06                                |
| $v_{E\_Fbp}$      | $n_{Pfk}$              | 4        | -                              | -     | [44]      | 4                                       |
|                   | $k_{Fbp\_cat}$         | 8.17e+06 | $\text{h}^{-1}$                | II    | [1]       | 7.86e+06                                |
|                   | $K_{Fbp\_FBP}$         | 1.70e-03 | mM                             | II    | [1]       | 8.92e-03                                |
|                   | $K_{Fbp\_PEP}$         | 0.169    | mM                             | II    | [1]       | 0.49                                    |
|                   | $L_{Fbp}$              | 4.00e+06 | -                              | II    | [1]       | 4.41e+06                                |
| $v_{E\_Fba}$      | $n_{Fbp}$              | 4        | -                              | -     | [1]       | 4                                       |
|                   | $k_{Fba\_cat}$         | 2.03e+06 | $\text{h}^{-1}$                | II    | [4]       | 6.95e+06                                |
|                   | $K_{Fba\_eq}$          | 0.14     | mM                             | I     | [38]      | 0.37                                    |
|                   | $K_{Fba\_FBP}$         | 0.133    | mM                             | I     | [45]      | 0.084                                   |
|                   | $K_{Fba\_GAP}$         | 0.088    | mM                             | I     | [45]      | 0.154                                   |
|                   | $K_{Fba\_DHAP}$        | 0.088    | mM                             | I     | [45]      | 0.0884                                  |
|                   | $V_{Fba\_blf}$         | 2        | -                              | I     | [45]      | 1.54                                    |
| $v_{E\_Gapdh}$    | $K_{Fba\_GAP\_inh}$    | 0.6      | mM                             | I     | [45]      | 0.6                                     |
|                   | $k_{Gapdh\_cat}$       | 9.32e+07 | $\text{h}^{-1}$                | II    | [4]       | 5.04e+07                                |
|                   | $K_{Gapdh\_eq}$        | 0.63     | -                              | I     | [38]      | 0.30                                    |
|                   | $K_{Gapdh\_GAP}$       | 0.15     | mM                             | I     | [46]      | 0.15                                    |
|                   | $K_{Gapdh\_PGP}$       | 0.1      | mM                             | I     | [46]      | 0.13                                    |
|                   | $K_{Gapdh\_NAD}$       | 0.45     | mM                             | I     | [46]      | 0.45                                    |
| $v_{E\_Pyk}$      | $K_{Gapdh\_NADH}$      | 0.02     | mM                             | I     | [46]      | 0.02                                    |
|                   | $k_{Pyk\_cat}$         | 8.00e+04 | $\text{h}^{-1}$                | II    | [4]       | 8.16e+04                                |
|                   | $K_{Pyk\_PEP}$         | 0.31     | mM                             | I     | [47]      | 0.31                                    |
|                   | $K_{Pyk\_FBP}$         | 0.19     | mM                             | I     | [47]      | 0.25                                    |
|                   | $K_{Pyk\_AMP}$         | 0.2      | mM                             | II    | [4]       | 0.26                                    |

|                |                      |          |             |    |      |          |
|----------------|----------------------|----------|-------------|----|------|----------|
|                | $K_{Pyk\_ADP}$       | 0.26     | mM          | I  | [47] | 0.21     |
|                | $K_{Pyk\_ATP}$       | 22.5     | mM          | I  | [47] | 20.17    |
|                | $L_{Pyk}$            | 1e+03    | -           | I  | [47] | 997.10   |
|                | $n_{Pyk}$            | 4        | -           | -  | [47] | 4        |
| $V_{E\_Pps}$   | $k_{Pps\_cat}$       | 399      | $h^{-1}$    | II | [1]  | 2.49e+03 |
|                | $K_{Pps\_PYR}$       | 9.98e-04 | mM          | II | [1]  | 7.13e-04 |
|                | $K_{Pps\_PEP}$       | 5.64e-04 | mM          | II | [1]  | 2.16e-04 |
|                | $L_{Pps}$            | 1.00e-79 | -           | II | [1]  | 1.04e-79 |
|                | $n_{Pps}$            | 2        | -           | -  | [1]  | 2        |
| $V_{E\_Pdh}$   | $k_{Pdh\_cat}$       | 4.68e+07 | $h^{-1}$    | II | [5]  | 4.83e+07 |
|                | $K_{Pdh\_i}$         | 46.4     | -           | II | [5]  | 68.34    |
|                | $K_{Pdh\_PYR\_m}$    | 1        | mM          | I  | [48] | 1        |
|                | $K_{Pdh\_NAD\_m}$    | 0.4      | mM          | I  | [49] | 0.4      |
|                | $K_{Pdh\_NADH\_m}$   | 0.1      | mM          | II | [5]  | 0.05     |
|                | $K_{Pdh\_CoA\_m}$    | 0.014    | mM          | II | [5]  | 0.005    |
|                | $K_{Pdh\_AcCoA\_m}$  | 0.008    | mM          | I  | [50] | 0.008    |
|                | $V_{Pta}^{max}$      | 2.52e+03 | mM $h^{-1}$ | I  | [51] | 5.36e+03 |
| $V_{E\_Pta}$   | $K_{Pta\_eq}$        | 0.0281   | -           | I  | [52] | 0.028    |
|                | $K_{Pta\_AcCoA\_i}$  | 0.2      | mM          | II | [5]  | 0.2      |
|                | $K_{Pta\_CoA\_i}$    | 0.029    | mM          | II | [5]  | 0.08     |
|                | $K_{Pta\_Pi\_m}$     | 2.6      | mM          | II | [5]  | 0.69     |
|                | $K_{Pta\_Pi\_i}$     | 2.6      | mM          | II | [5]  | 2.11     |
|                | $K_{Pta\_AcP\_m}$    | 0.7      | mM          | II | [5]  | 0.23     |
|                | $K_{Pta\_AcP\_i}$    | 0.2      | mM          | II | [5]  | 0.32     |
|                | $V_{Ack}^{max}$      | 1.62e+05 | mM $h^{-1}$ | I  | [51] | 1.95e+05 |
| $V_{E\_Ack}$   | $K_{Ack\_eq}$        | 174.2    | -           | I  | [52] | 233.912  |
|                | $K_{Ack\_ADP\_m}$    | 0.5      | mM          | II | [5]  | 0.18     |
|                | $K_{Ack\_AcP\_m}$    | 0.16     | mM          | II | [5]  | 0.05     |
|                | $K_{Ack\_ACE\_m}$    | 7        | mM          | II | [5]  | 6.09     |
|                | $K_{Ack\_ATP\_m}$    | 0.07     | mM          | I  | [53] | 0.09     |
|                | $k_{Acs\_cat}$       | 8.81e+04 | $h^{-1}$    | II | [1]  | 1.29e+05 |
| $V_{E\_Acs}$   | $K_{Acs\_ACE}$       | 0.0167   | mM          | II | [1]  | 0.024    |
|                | $k_{Cs\_cat}$        | 2.79e+05 | $h^{-1}$    | II | [1]  | 5.43e+05 |
| $V_{E\_Cs}$    | $K_{Cs\_aKG}$        | 0.355    | mM          | II | [1]  | 0.19     |
|                | $K_{Cs\_OAA\_AcCoA}$ | 0.0164   | mM          | II | [1]  | 0.009    |
|                | $K_{Cs\_AcCoA}$      | 0.120    | mM          | II | [1]  | 0.03     |
|                | $K_{Cs\_OAA}$        | 0.0164   | mM          | II | [1]  | 0.018    |
|                | $k_{Icdh\_cat}$      | 1.14e+05 | $h^{-1}$    | II | [1]  | 8.58e+04 |
| $V_{E\_Icdh}$  | $K_{Icdh\_ICIT}$     | 9.02e-05 | mM          | II | [1]  | 2.01e-04 |
|                | $K_{Icdh\_PEP}$      | 0.188    | mM          | II | [1]  | 0.05     |
|                | $L_{Icdh}$           | 127      | -           | II | [1]  | 92.58    |
|                | $n_{Icdh}$           | 2        | -           | -  | [1]  | 2        |
|                | $k_{akgdh\_cat}$     | 2.59e+08 | $h^{-1}$    | II | [6]  | 7.02e+08 |
| $V_{E\_akgdh}$ | $K_{akgdh\_NAD\_m}$  | 0.07     | mM          | I  | [54] | 0.06     |
|                | $K_{akgdh\_CoA\_m}$  | 0.002    | mM          | I  | [54] | 0.003    |
|                | $K_{akgdh\_aKG\_m}$  | 1        | mM          | I  | [54] | 0.24     |
|                | $K_{akgdh\_Z}$       | 1.5      | mM          | II | [6]  | 4.17     |
|                | $K_{akgdh\_SUC\_I}$  | 1        | mM          | II | [6]  | 2.07     |
|                | $K_{akgdh\_NADH\_I}$ | 0.018    | mM          | I  | [54] | 0.018    |
|                | $K_{akgdh\_aKG\_I}$  | 0.75     | mM          | II | [6]  | 1        |
|                | $k_{Sdh1\_cat}$      | 3.72e+03 | $h^{-1}$    | II | [6]  | 1.96e+04 |
| $V_{E\_Sdh}$   | $k_{Sdh2\_cat}$      | 3.72e+03 | $h^{-1}$    | II | [6]  | 1.96e+04 |
|                | $K_{Sdh\_eq}$        | 10       | -           | II | [6]  | 29.66    |
|                | $K_{Sdh\_SUC\_m}$    | 0.22     | mM          | I  | [55] | 0.17     |
|                | $k_{Fum1\_cat}$      | 7.34e+05 | $h^{-1}$    | II | [6]  | 3.82e+05 |
| $V_{E\_Fum}$   | $k_{Fum2\_cat}$      | 7.34e+05 | $h^{-1}$    | II | [6]  | 3.82e+05 |
|                | $K_{Fum\_eq}$        | 10       | -           | II | [6]  | 12.87    |
|                | $K_{Fum\_FUM\_m}$    | 0.1      | mM          | II | [6]  | 0.09     |
|                | $k_{Mdh1\_cat}$      | 3.24e+05 | $h^{-1}$    | II | [6]  | 4.60e+05 |
| $V_{E\_Mdh}$   | $k_{Mdh2\_cat}$      | 3.24e+05 | $h^{-1}$    | II | [6]  | 4.60e+05 |
|                | $K_{Mdh\_eq}$        | 1        | -           | II | [6]  | 0.75     |
|                | $K_{Mdh\_NAD\_m}$    | 0.1      | mM          | I  | [56] | 0.05     |

|                 |                                  |          |                    |    |      |          |
|-----------------|----------------------------------|----------|--------------------|----|------|----------|
|                 | K <sub>Mdh_NAD_I</sub>           | 0.31     | mM                 | I  | [56] | 0.11     |
|                 | K <sub>Mdh_NAD_II</sub>          | 0.31     | mM                 | II | [6]  | 0.95     |
|                 | K <sub>Mdh_MAL_m</sub>           | 1.33     | mM                 | I  | [56] | 1.77     |
|                 | K <sub>Mdh_MAL_I</sub>           | 3.30     | mM                 | II | [6]  | 3.46     |
|                 | K <sub>Mdh_OAA_m</sub>           | 0.27     | mM                 | I  | [56] | 0.21     |
|                 | K <sub>Mdh_OAA_I</sub>           | 0.27     | mM                 | II | [6]  | 0.34     |
|                 | K <sub>Mdh_OAA_II</sub>          | 0.17     | mM                 | II | [6]  | 0.07     |
|                 | K <sub>Mdh_NADH_m</sub>          | 0.04     | mM                 | I  | [56] | 0.03     |
|                 | K <sub>Mdh_NADH_I</sub>          | 0.04     | mM                 | II | [6]  | 0.02     |
| $v_{E,Mez}$     | k <sub>Mez_cat</sub>             | 5.58e+05 | h <sup>-1</sup>    | II | [1]  | 3.68e+05 |
|                 | K <sub>Mez_MAL</sub>             | 3.50e-03 | mM                 | II | [1]  | 1.46e-03 |
|                 | K <sub>Mez_AcCoA</sub>           | 2.05     | mM                 | II | [1]  | 1.82     |
|                 | K <sub>Mez_cAMP</sub>            | 3.69     | mM                 | II | [1]  | 4.55     |
|                 | L <sub>Mez</sub>                 | 1.04e+05 | -                  | II | [1]  | 2.39e+05 |
|                 | n <sub>Mez</sub>                 | 1.33     | -                  | II | [1]  | 1.99     |
| $v_{E,Pck}$     | k <sub>Pck_cat</sub>             | 2.36e+06 | h <sup>-1</sup>    | II | [9]  | 3.44e+06 |
|                 | K <sub>Pck_OAA</sub>             | 0.67     | mM                 | I  | [57] | 0.58     |
|                 | K <sub>Pck_ATP_i</sub>           | 0.04     | mM                 | I  | [57] | 0.04     |
|                 | K <sub>Pck_ADG_i</sub>           | 0.04     | mM                 | II | [7]  | 0.02     |
|                 | K <sub>Pck_PEP</sub>             | 0.07     | mM                 | I  | [57] | 0.07     |
|                 | K <sub>Pck_PEP_i</sub>           | 0.06     | mM                 | I  | [57] | 0.06     |
|                 | K <sub>Pck_OAA_I</sub>           | 0.45     | mM                 | II | [7]  | 0.35     |
|                 | K <sub>Pck_ATP_I</sub>           | 0.04     | mM                 | I  | [57] | 0.04     |
| $v_{E,Ppc}$     | k <sub>Ppc_cat</sub>             | 5.31e+06 | h <sup>-1</sup>    | II | [1]  | 5.39e+06 |
|                 | K <sub>Ppc_PEP</sub>             | 0.0271   | mM                 | II | [1]  | 0.03     |
|                 | K <sub>Ppc_FBP</sub>             | 0.230    | mM                 | II | [1]  | 0.18     |
|                 | L <sub>Ppc</sub>                 | 5.2e+06  | -                  | II | [1]  | 5.65e+06 |
|                 | n <sub>Ppc</sub>                 | 3        | -                  | -  | [1]  | 3        |
| $v_{E,Icl}$     | k <sub>Icl_cat</sub>             | 1.76e+06 | h <sup>-1</sup>    | II | [1]  | 9.42e+05 |
|                 | K <sub>Icl_ICIT</sub>            | 0.0124   | mM                 | II | [1]  | 0.02     |
|                 | K <sub>Icl_PEP</sub>             | 0.0310   | mM                 | II | [1]  | 0.02     |
|                 | K <sub>Icl_3PG</sub>             | 0.406    | mM                 | II | [1]  | 0.52     |
|                 | K <sub>Icl_αKG</sub>             | 0.466    | mM                 | II | [1]  | 0.83     |
|                 | L <sub>Icl</sub>                 | 5.01e+04 | -                  | II | [1]  | 1.91e+05 |
|                 | n <sub>Icl</sub>                 | 4        | -                  | -  | [1]  | 4        |
| $v_{E,Ms}$      | k <sub>Ms_cat</sub>              | 1.04e+04 | h <sup>-1</sup>    | II | [1]  | 1.70e+04 |
|                 | K <sub>Ms_GOX_AcCoA</sub>        | 0.406    | mM                 | II | [1]  | 0.39     |
|                 | K <sub>Ms_AcCoA</sub>            | 0.426    | mM                 | II | [1]  | 0.46     |
|                 | K <sub>Ms_GOX</sub>              | 0.536    | mM                 | II | [1]  | 1.11     |
| $v_{E,AceK-ki}$ | k <sub>AceK_ki_cat</sub>         | 1.22e+16 | h <sup>-1</sup>    | II | [1]  | 5.27e+15 |
| $v_{E,AceK-ph}$ | k <sub>AceK_ph_cat</sub>         | 6.12e+12 | h <sup>-1</sup>    | II | [1]  | 1.82e+12 |
|                 | K <sub>AceK_ICDH</sub>           | 0.530    | mM                 | II | [1]  | 0.19     |
|                 | K <sub>AceK_ICDH-P</sub>         | 7.93     | mM                 | II | [1]  | 7.26     |
|                 | K <sub>AceK_ICIT</sub>           | 0.0773   | mM                 | II | [1]  | 0.09     |
|                 | K <sub>AceK_GOX</sub>            | 0.488    | mM                 | II | [1]  | 0.50     |
|                 | K <sub>AceK_OAA</sub>            | 0.0976   | mM                 | II | [1]  | 0.07     |
|                 | K <sub>AceK_αKG</sub>            | 0.463    | mM                 | II | [1]  | 0.42     |
|                 | K <sub>AceK_PEP</sub>            | 0.304    | mM                 | II | [1]  | 0.36     |
|                 | K <sub>AceK_3PG</sub>            | 0.886    | mM                 | II | [1]  | 0.42     |
|                 | K <sub>AceK_PYR</sub>            | 0.0214   | mM                 | II | [1]  | 0.03     |
|                 | L <sub>AceK</sub>                | 1.00e+08 | -                  | II | [1]  | 2.83e+08 |
|                 | n <sub>AceK</sub>                | 2        | -                  | -  | [1]  | 2        |
| $v_{E,G6pdh}$   | $v_{G6pdh}^{max}$                | 4.97e+03 | mM h <sup>-1</sup> | II | [4]  | 1.66e+04 |
|                 | K <sub>G6pdh_G6P</sub>           | 0.07     | mM                 | I  | [58] | 0.07     |
|                 | K <sub>G6pdh_NADPH_g6pinh</sub>  | 0.18     | mM                 | I  | [58] | 0.19     |
|                 | K <sub>G6pdh_NADP</sub>          | 0.015    | mM                 | I  | [58] | 0.004    |
|                 | K <sub>G6pdh_NADPH_nadpinh</sub> | 0.01     | mM                 | I  | [58] | 0.08     |
| $v_{E,Pgl}$     | $v_{Pgl}^{max}$                  | 4.5e+04  | mM h <sup>-1</sup> | II | [8]  | 2.28e+04 |
|                 | K <sub>Pgl_cq</sub>              | 42.8     | -                  | I  | [59] | 42.69    |
|                 | K <sub>Pgl_6PGL_m</sub>          | 0.023    | mM                 | I  | [37] | 0.023    |
|                 | K <sub>Pgl_6PG_m</sub>           | 10       | mM                 | I  | [37] | 10.01    |

|                   |                          |          |                                  |    |      |          |
|-------------------|--------------------------|----------|----------------------------------|----|------|----------|
|                   | $K_{Pgl\_h1}$            | 5.61e-03 | mM                               | I  | [60] | 0.004    |
|                   | $K_{Pgl\_h2}$            | 9.73e-06 | mM                               | I  | [60] | 9.70e-06 |
| $v_{E\_Edd}$      | $v_{Edd}^{max}$          | 300      | mM h <sup>-1</sup>               | II | [8]  | 515.41   |
|                   | $K_{Edd\_eq}$            | 1e+03    | -                                | I  | [61] | 1.01e+03 |
|                   | $K_{Edd\_6PG\_m}$        | 0.6      | mM                               | I  | [61] | 0.12     |
|                   | $K_{Edd\_KDPG\_m}$       | 1        | mM                               | II | [8]  | 2.02     |
|                   | $pH_{Edd\_m}$            | 6.4      | -                                | I  | [61] | 7.53     |
|                   | $pK_{Edd}$               | 10       | -                                | II | [8]  | 8.74     |
| $v_{E\_Eda}$      | $v_{Eda}^{max}$          | 300      | mM h <sup>-1</sup>               | II | [8]  | 667.33   |
|                   | $K_{Eda\_eq}$            | 0.5      | -                                | I  | [62] | 0.50     |
|                   | $K_{Eda\_PYR\_m}$        | 10       | mM                               | II | [8]  | 7.69     |
|                   | $K_{Eda\_KDPG\_m}$       | 0.35     | mM                               | I  | [62] | 0.15     |
|                   | $K_{Eda\_GAP\_m}$        | 1        | mM                               | II | [8]  | 1.18     |
|                   | $pH_{Eda\_m}$            | 7.5      | -                                | I  | [62] | 10.38    |
|                   | $pK_{Eda}$               | 10       | -                                | II | [8]  | 36.97    |
| $v_{E\_6Pgdh}$    | $v_{6Pgdh}^{max}$        | 5.84e+04 | mM h <sup>-1</sup>               | II | [4]  | 2.48e+05 |
|                   | $K_{6Pgdh\_6PG}$         | 0.1      | mM                               | I  | [63] | 0.10     |
|                   | $K_{6Pgdh\_NADP}$        | 0.028    | mM                               | I  | [63] | 0.02     |
|                   | $K_{6Pgdh\_NADPH\_inh}$  | 0.01     | mM                               | I  | [63] | 0.04     |
|                   | $K_{6Pgdh\_ATP\_inh}$    | 3        | mM                               | I  | [63] | 3.01     |
| $v_{E\_RSpi}$     | $v_{RSpi}^{max}$         | 1.74e+04 | h <sup>-1</sup>                  | II | [4]  | 3.21e+04 |
|                   | $K_{RSpi\_eq}$           | 4        | -                                | I  | [64] | 0.48     |
| $v_{E\_Ru5p}$     | $v_{Ru5p}^{max}$         | 2.42e+04 | h <sup>-1</sup>                  | II | [4]  | 1.27e+04 |
|                   | $K_{Ru5p\_eq}$           | 1.4      | -                                | I  | [64] | 1.41     |
| $v_{E\_TktA}$     | $v_{TktA}^{max}$         | 3.41e+04 | mM <sup>-1</sup> h <sup>-1</sup> | II | [4]  | 8.87e+03 |
|                   | $K_{TktA\_eq}$           | 1.2      | -                                | I  | [64] | 1.20     |
| $v_{E\_TktB}$     | $v_{TktB}^{max}$         | 3.12e+05 | mM <sup>-1</sup> h <sup>-1</sup> | II | [4]  | 3.79e+05 |
|                   | $K_{TktB\_eq}$           | 10       | -                                | I  | [64] | 9.97     |
| $v_{E\_Tal}$      | $v_{Tal}^{max}$          | 3.91e+04 | mM <sup>-1</sup> h <sup>-1</sup> | II | [4]  | 7.17e+04 |
|                   | $K_{Tal\_eq}$            | 1.05     | -                                | I  | [64] | 1.05     |
| $v_{E\_Cya}$      | $v_{Cya}^{max}$          | 28.9     | mM h <sup>-1</sup>               | II | [1]  | 9.45     |
|                   | $K_{Cya\_EIIA-P}$        | 0.0479   | mM                               | II | [1]  | 0.002    |
| $v_{E\_cAMPdegr}$ | $v_{cAMPdegr}^{max}$     | 2.03     | mM h <sup>-1</sup>               | II | [1]  | 9.21     |
|                   | $K_{cAMPdegr\_cAMP}$     | 0.0564   | mM                               | II | [1]  | 0.048    |
| $v_{G\_glk}$      | $K_{glk\_Cra}$           | 9.35e-06 | mM                               | II | [1]  | 1.22e-08 |
|                   | $v_{glk\_Cra\_unbound}$  | 0.0812   | mM h <sup>-1</sup>               | II | [1]  | 0.206    |
|                   | $v_{glk\_Cra\_bound}$    | 6.38e-04 | mM h <sup>-1</sup>               | II | [1]  | 0.002    |
| $v_{G\_pfkA}$     | $K_{pfkA\_Cra}$          | 9.35e-06 | mM                               | II | [1]  | 9.87e-09 |
|                   | $v_{pfkA\_Cra\_unbound}$ | 0.0812   | mM h <sup>-1</sup>               | II | [1]  | 0.05     |
|                   | $v_{pfkA\_Cra\_bound}$   | 6.38e-04 | mM h <sup>-1</sup>               | II | [1]  | 0.001    |
| $v_{G\_fbp}$      | $K_{fbp\_Cra}$           | 0.0175   | mM                               | II | [1]  | 3.75e-05 |
|                   | $v_{fbp\_Cra\_unbound}$  | 0        | mM h <sup>-1</sup>               | II | [1]  | 0        |
|                   | $v_{fbp\_Cra\_bound}$    | 1.07e-03 | mM h <sup>-1</sup>               | II | [1]  | 0.001    |
| $v_{G\_fbaA}$     | $K_{fbaA\_Cra}$          | 1.34     | mM                               | II | [1]  | 3.26e-03 |
|                   | $v_{fbaA\_Cra\_unbound}$ | 0.0310   | mM h <sup>-1</sup>               | II | [1]  | 0.025    |
|                   | $v_{fbaA\_Cra\_bound}$   | 0        | mM h <sup>-1</sup>               | II | [1]  | 0        |
|                   | $K_{fbaA\_Crp}$          | 0.286    | mM                               | II | [1]  | 0.009    |
|                   | $v_{fbaA\_Crp\_unbound}$ | 0        | mM h <sup>-1</sup>               | II | [1]  | 0        |
|                   | $v_{fbaA\_Crp\_bound}$   | 0.0239   | mM h <sup>-1</sup>               | II | [1]  | 0.016    |
| $v_{G\_gapA}$     | $K_{gapA\_Cra}$          | 1.34     | mM                               | II | [1]  | 0.02     |
|                   | $v_{gapA\_Cra\_unbound}$ | 0.0349   | mM h <sup>-1</sup>               | II | [1]  | 0.02     |
|                   | $v_{gapA\_Cra\_bound}$   | 0        | mM h <sup>-1</sup>               | II | [1]  | 0        |
|                   | $K_{gapA\_Crp}$          | 0.286    | mM                               | II | [1]  | 0.05     |
|                   | $v_{gapA\_Crp\_unbound}$ | 0        | mM h <sup>-1</sup>               | II | [1]  | 0        |
|                   | $v_{gapA\_Crp\_bound}$   | 0.0269   | mM h <sup>-1</sup>               | II | [1]  | 0.03     |
| $v_{G\_pykF}$     | $K_{pykF\_Cra}$          | 0.0341   | mM                               | II | [1]  | 7.26e-05 |
|                   | $v_{pykF\_Cra\_unbound}$ | 6.40e-03 | mM h <sup>-1</sup>               | II | [1]  | 0.011    |
|                   | $v_{pykF\_Cra\_bound}$   | 3.52e-05 | mM h <sup>-1</sup>               | II | [1]  | 4.30e-05 |
| $v_{G\_ppsA}$     | $K_{ppsA\_Cra}$          | 0.252    | mM                               | II | [1]  | 4.88e-04 |
|                   | $v_{ppsA\_Cra\_unbound}$ | 0        | mM h <sup>-1</sup>               | II | [1]  | 0        |
|                   | $v_{ppsA\_Cra\_bound}$   | 0.0798   | mM h <sup>-1</sup>               | II | [1]  | 0.053    |

|                 |                             |          |                    |     |         |           |
|-----------------|-----------------------------|----------|--------------------|-----|---------|-----------|
| $V_{G,pdh}$     | $K_{pdh\_PdhR}$             | 0.0652   | mM                 | II  | [1]     | 2.46e-05  |
|                 | $V_{pdh\_PdhR\_unbound}$    | 1.57e-03 | mM h <sup>-1</sup> | II  | [1]     | 0.001     |
|                 | $V_{pdh\_PdhR\_bound}$      | 5.70e-06 | mM h <sup>-1</sup> | II  | [1]     | 7.50e-06  |
| $V_{G,acs}$     | $K_{acs\_Crp}$              | 0.112    | mM                 | II  | [1]     | 1.36e-03  |
|                 | $V_{acs\_Crp\_unbound}$     | 0        | mM h <sup>-1</sup> | II  | [1]     | 0         |
|                 | $V_{acs\_Crp\_bound}$       | 1.13e-03 | mM h <sup>-1</sup> | II  | [1]     | 3.62e-04  |
|                 | $n_{acs}$                   | 2.31     | -                  | -   | [1]     | 2.31      |
| $V_{G,gltA}$    | $K_{gltA\_Crp}$             | 0.954    | mM                 | II  | [1]     | 0.056     |
|                 | $V_{gltA\_Crp\_unbound}$    | 0        | mM h <sup>-1</sup> | II  | [1]     | 0         |
|                 | $V_{gltA\_Crp\_bound}$      | 0.0275   | mM h <sup>-1</sup> | II  | [1]     | 0.03      |
|                 | $n_{gltA}$                  | 1.07     | -                  | -   | [1]     | 1.07      |
| $V_{G,icdA}$    | $K_{icdA\_Cra}$             | 0.0174   | mM                 | II  | [1]     | 2.92e-05  |
|                 | $V_{icdA\_Cra\_unbound}$    | 4.88e-03 | mM h <sup>-1</sup> | II  | [1]     | 0.01      |
|                 | $V_{icdA\_Cra\_bound}$      | 0.0377   | mM h <sup>-1</sup> | II  | [1]     | 0.02      |
| $V_{G,sucAB}$   | $K_{sucAB\_Crp}$            | 2.17     | mM                 | II  | [1]     | 0.31      |
|                 | $V_{sucAB\_Crp\_unbound}$   | 0        | mM h <sup>-1</sup> | II  | [1]     | 0         |
|                 | $V_{sucAB\_Crp\_bound}$     | 0.0271   | mM h <sup>-1</sup> | II  | [1]     | 0.02      |
|                 | $n_{sucAB}$                 | 0.74     | -                  | -   | [1]     | 0.74      |
| $V_{G,sdhCDAB}$ | $K_{sdhCDAB\_Crp}$          | 2.17     | mM                 | II  | [1]     | 0.086     |
|                 | $V_{sdhCDAB\_Crp\_unbound}$ | 0        | mM h <sup>-1</sup> | II  | [1]     | 0         |
|                 | $V_{sdhCDAB\_Crp\_bound}$   | 0.199    | mM h <sup>-1</sup> | II  | [1]     | 0.24      |
|                 | $n_{sdhCDAB}$               | 0.74     | -                  | -   | [1]     | 0.74      |
| $V_{G,fumABC}$  | $K_{fumABC\_Crp}$           | 2.17     | mM                 | II  | [1]     | 0.15      |
|                 | $V_{fumABC\_Crp\_unbound}$  | 0        | mM h <sup>-1</sup> | II  | [1]     | 0         |
|                 | $V_{fumABC\_Crp\_bound}$    | 0.0462   | mM h <sup>-1</sup> | II  | [1]     | 0.05      |
|                 | $n_{fumABC}$                | 0.74     | -                  | -   | [1]     | 0.74      |
| $V_{G,mdh}$     | $K_{mdh\_Crp}$              | 1.43     | mM                 | II  | [1]     | 0.21      |
|                 | $V_{mdh\_Crp\_unbound}$     | 0        | mM h <sup>-1</sup> | II  | [1]     | 0         |
|                 | $V_{mdh\_Crp\_bound}$       | 0.0816   | mM h <sup>-1</sup> | II  | [1]     | 0.10      |
| $V_{G,maeB}$    | $SS_{Mec}^{GLC}$            | 6.84e-03 | mM                 | II  | [1]     | 5.00e-03  |
|                 | $SS_{Mec}^{ACE}$            | 0.0233   | mM                 | II  | [1]     | 0.015     |
| $V_{G,pckA}$    | $K_{pckA\_Cra}$             | 0.0794   | mM                 | II  | [1]     | 1.52e-04  |
|                 | $V_{pckA\_Cra\_unbound}$    | 0        | mM h <sup>-1</sup> | II  | [1]     | 0         |
|                 | $V_{pckA\_Cra\_bound}$      | 0.0137   | mM h <sup>-1</sup> | II  | [1]     | 0.014     |
| $V_{G,ppc}$     | $SS_{Ppc}^{GLC}$            | 2.15e-03 | mM                 | II  | [1]     | 4.93e-03  |
|                 | $SS_{Ppc}^{ACE}$            | 6.04e-04 | mM                 | II  | [1]     | 1.47e-03  |
| $V_{G,aceA}$    | $K_{aceBAK\_Cra}$           | 0.0542   | mM                 | II  | [1]     | 5.4e-04   |
|                 | $V_{aceBAK\_Cra\_unbound}$  | 1.02e-04 | mM h <sup>-1</sup> | II  | [1]     | 1.76e-04  |
|                 | $V_{aceBAK\_Cra\_bound}$    | 0.107    | mM h <sup>-1</sup> | II  | [1]     | 0.05      |
|                 | $K_{aceBAK\_Crp}$           | 8.14     | mM                 | II  | [1]     | 0.53      |
|                 | $V_{aceBAK\_Crp\_unbound}$  | 1.72e-03 | mM h <sup>-1</sup> | II  | [1]     | 3.47e-03  |
|                 | $V_{aceBAK\_Crp\_bound}$    | 1.98e-05 | mM h <sup>-1</sup> | II  | [1]     | 2.18e-05  |
|                 | $K_{aceBAK\_DNA}$           | 1.13e-06 | mM                 | II  | [1]     | 9.51e-07  |
|                 | $K_{aceBAK\_PYR}$           | 0.506    | mM                 | II  | [1]     | 2.01      |
|                 | $K_{aceBAK\_PYRprime}$      | 1.70e-03 | mM                 | II  | [1]     | 2.723e-03 |
|                 | $K_{aceBAK\_GOX}$           | 2.75e-03 | mM                 | II  | [1]     | 2.246e-03 |
|                 | $k_{aceBAK\_cat\_IclR}$     | 3.35     | h <sup>-1</sup>    | II  | [1]     | 4.41      |
|                 | $L_{aceBAK}$                | 923      | -                  | II  | [1]     | 412.07    |
| $V_{G,aceB}$    | $Factor_{aceB}$             | 0.3      | -                  | II  | [1]     | 0.31      |
| $V_{G,aceK}$    | $Factor_{aceK}$             | 0.03     | -                  | II  | [1]     | 0.02      |
| $V_{G,\bullet}$ | $k_{expr}$                  | 5.56     | h                  | II  | [1]     | 7.26      |
| $V_{D,\bullet}$ | $k_{degr}$                  | 1.8      | h <sup>-1</sup>    | I   | [65]    | 0.33      |
| $V_{BM,G6P}$    | $k_{BM\_GLC\_G6P}$          | 554      | h <sup>-1</sup>    | II  | [1]     | 48.92     |
|                 | $k_{BM\_ACE\_G6P}$          | 274      | h <sup>-1</sup>    | II  | [1]     | 456.46    |
| $V_{BM,F6P}$    | $k_{BM\_GLC\_F6P}$          | 554      | h <sup>-1</sup>    | III | Assumed | 1.27e+03  |
|                 | $k_{BM\_ACE\_F6P}$          | 274      | h <sup>-1</sup>    | III | Assumed | 368.62    |
| $V_{BM,GAP}$    | $k_{BM\_GLC\_GAP}$          | 176      | h <sup>-1</sup>    | III | Assumed | 101.66    |
|                 | $k_{BM\_ACE\_GAP}$          | 238      | h <sup>-1</sup>    | III | Assumed | 420.74    |
| $V_{BM,PEP}$    | $k_{BM\_GLC\_PEP}$          | 1.52e+03 | h <sup>-1</sup>    | II  | [1]     | 957.04    |
|                 | $k_{BM\_ACE\_PEP}$          | 169      | h <sup>-1</sup>    | II  | [1]     | 253.05    |
| $V_{BM,PYR}$    | $k_{BM\_GLC\_PYR}$          | 1.99e+03 | h <sup>-1</sup>    | II  | [1]     | 850.96    |
|                 | $k_{BM\_ACE\_PYR}$          | 1.87e+04 | h <sup>-1</sup>    | II  | [1]     | 1.24e+04  |
| $V_{RM\_AcCoA}$ | $k_{BM\_GLC\_AcCoA}$        | 6.77e+03 | h <sup>-1</sup>    | II  | [1]     | 2.37e+03  |

|                    |                                           |                                      |                        |     |         |          |
|--------------------|-------------------------------------------|--------------------------------------|------------------------|-----|---------|----------|
|                    | $k_{BM\_ACE\_AcCoA}$                      | 389                                  | $h^{-1}$               | II  | [1]     | 763.07   |
| $v_{BM,\alpha KG}$ | $k_{BM\_GLC\_αKG}$                        | 3.52e+03                             | $h^{-1}$               | II  | [1]     | 3.00e+03 |
|                    | $k_{BM\_ACE\_αKG}$                        | 202                                  | $h^{-1}$               | II  | [1]     | 323.912  |
| $v_{BM,SUC}$       | $k_{BM\_GLC\_SUC}$                        | 3.52e+03                             | $h^{-1}$               | III | Assumed | 1.89e+03 |
|                    | $k_{BM\_ACE\_SUC}$                        | 202                                  | $h^{-1}$               | III | Assumed | 227.03   |
| $v_{BM,FUM}$       | $k_{BM\_GLC\_FUM}$                        | 3.52e+03                             | $h^{-1}$               | III | Assumed | 3.47e+03 |
|                    | $k_{BM\_ACE\_FUM}$                        | 202                                  | $h^{-1}$               | III | Assumed | 288.72   |
| $v_{BM,OAA}$       | $k_{BM\_GLC\_OAA}$                        | 2.30e+04                             | $h^{-1}$               | II  | [1]     | 2.31e+04 |
|                    | $k_{BM\_ACE\_OAA}$                        | 5.15e+03                             | $h^{-1}$               | II  | [1]     | 1.31e+04 |
| $v_{BM,RSP}$       | $k_{BM\_GLC\_RSP}$                        | 554                                  | $h^{-1}$               | III | Assumed | 307.97   |
|                    | $k_{BM\_ACE\_RSP}$                        | 274                                  | $h^{-1}$               | III | Assumed | 499.54   |
| $v_{BM,E4P}$       | $k_{BM\_GLC\_E4P}$                        | 554                                  | $h^{-1}$               | III | Assumed | 1.51e+03 |
|                    | $k_{BM\_ACE\_E4P}$                        | 274                                  | $h^{-1}$               | III | Assumed | 289.66   |
| Others             | $K_{Ctp-cAMP}$                            | 0.505                                | mM                     | II  | [1]     | 0.420    |
|                    | $n_{Ctp-cAMP}$                            | 1                                    | -                      | -   | [1]     | 1        |
|                    | $K_{Cra-FBP}$                             | 0.767                                | mM                     | II  | [1]     | 0.029    |
|                    | $n_{Cra-FBP}$                             | 2                                    | -                      | -   | [1]     | 2        |
|                    | $K_{PdhR-PYR}$                            | 0.0925                               | mM                     | II  | [1]     | 0.043    |
|                    | $n_{PdhR-PYR}$                            | 1                                    | -                      | -   | [1]     | 1        |
|                    | (P/O) (P/O ratio for NADH)                | 2.5                                  | -                      | I   | [2]     | 3.48     |
|                    | (P/O)' (P/O ratio for FADH <sub>2</sub> ) | 1.5                                  | -                      | I   | [2]     | 1.49     |
|                    | $k_{ATP}$                                 | 8.87e-06                             | $mM^{-1}$              | I   | [9]     | 1.32e-05 |
|                    | $\rho$ (Cell density)                     | 564                                  | $g_{DW} L_{Cell}^{-1}$ | -   | [4]     | 564      |
|                    | D (Dilution rate)                         | 0 for batch culture                  | $h^{-1}$               | -   | -       |          |
|                    |                                           | See main text for continuous culture |                        |     |         |          |

## References

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