

# R1-24

June 10, 2025

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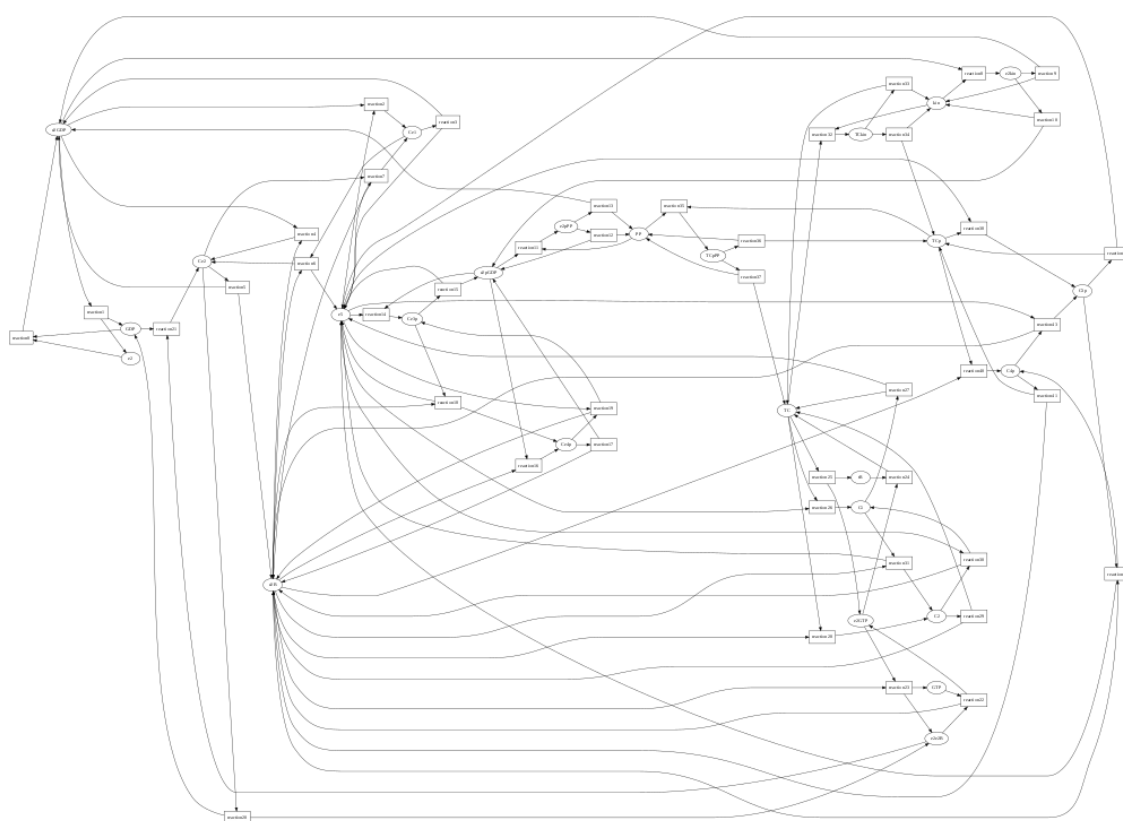
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```
[1]: e2 + GDP <=> e2GDP.  
e2GDP + e5 <=> Ce1.  
e2GDP + e2B <=> Ce2.  
Ce1 + e2B <=> Ce2 + e5.  
e2GDP + kin <=> e2kin.  
e2kin => e2pGDP + kin.  
e2pGDP + PP <=> e2pPP.  
e2pPP => e2GDP + PP.  
e2pGDP + e5 <=> Ce3p.  
e2pGDP + e2B <=> Ce4p.  
Ce3p + e2B <=> Ce4p + e5.  
Ce2 <=> e2e2B + GDP.  
e2e2B + GTP <=> e2GTP + e2B.  
tR + e2GTP <=> TC.  
TC+e5<=>C1.  
TC + e2B<=> C2.  
C2 + e5<=>C1 + e2B.  
TC + kin<=>TCkin.  
TCkin => TCp + kin.  
TCp + PP<=>TCpPP.  
TCpPP =>TC + PP.  
TCp + e5<=>C3p.  
TCp + e2B<=>C4p.  
C3p + e2B<=>C4p + e5.
```

[1]:

```
[2]: draw_reactions.
```



[2]:

[3]: `list_ode.`

$$\begin{aligned}
e2B_0 &= 0 \\
C3p_0 &= 0 \\
e5_0 &= 0 \\
C4p_0 &= 0 \\
TCp_0 &= 0 \\
TC_0 &= 0 \\
PP_0 &= 0 \\
TCpPP_0 &= 0 \\
kin_0 &= 0 \\
TCkin_0 &= 0 \\
C2_0 &= 0 \\
C1_0 &= 0 \\
tR_0 &= 0 \\
e2GTP_0 &= 0 \\
e2e2B_0 &= 0 \\
GTP_0 &= 0 \\
Ce2_0 &= 0 \\
GDP_0 &= 0 \\
Ce3p_0 &= 0 \\
Ce4p_0 &= 0 \\
e2pGDP_0 &= 0 \\
e2GDP_0 &= 0 \\
e2pPP_0 &= 0 \\
e2kin_0 &= 0 \\
Ce1_0 &= 0 \\
e2_0 &= 0 \\
\frac{de2B}{dt} &= C2 + C4p + Ce2 + Ce4p - C1 * e2B + C2 * e5 - C3p * e2B + C4p * e5 - Ce1 * e2B + Ce2 * e5 - C \\
\frac{dC3p}{dt} &= C4p * e5 - C3p - C3p * e2B + TCp * e5 \\
\frac{de5}{dt} &= C1 + C3p + Ce1 + Ce3p + C1 * e2B - C2 * e5 + C3p * e2B - C4p * e5 + Ce1 * e2B - Ce2 * e5 + C \\
\frac{dC4p}{dt} &= C3p * e2B - C4p - C4p * e5 + TCp * e2B \\
\frac{dTCp}{dt} &= C3p + C4p + TCkin + TCpPP - PP * TCp - TCp * e2B - TCp * e5 \\
\frac{dTC}{dt} &= C1 + C2 - TC + TCkin + TCpPP - TC * e2B - TC * e5 - TC * kin + e2GTP * tR \\
\frac{dPP}{dt} &= 2 * TCpPP + 2 * e2pPP - PP * TCp - PP * e2pGDP \\
\frac{dTCpPP}{dt} &= PP * TCp - 2 * TCpPP \\
\frac{dkin}{dt} &= 2 * TCkin + 2 * e2kin - TC * kin - 4 * e2GDP * kin \\
\frac{dTCkin}{dt} &= TC * kin - 2 * TCkin
\end{aligned}$$

[3]:

[ ]: