Shu-Han Wang

4. a)

ATP + D-fructose 6-phosphate ⟶ ADP + D-fructose 1,6-bisphosphate

↓ F6P

$$V(m)_j = \frac{\sum_{i \in \{x_i\}} W_i f_i(m)}{\sum_{j \in C_j} W_j f_j(m)}$$

$$r_1 = k_{cat} E_1 \left(\frac{F6P}{K_{F6P} + F6P}\right)\left(\frac{ATP}{K_{ATP} + ATP}\right)$$

$$\begin{cases} \hat{r}_1 = r_1 V_1 \\ V_1 = \dfrac{W_1 + W_2 f}{1 + W_1 + W_2 f} \\ f_1 = \dfrac{(\frac{x}{K_1})^n}{1 + (\frac{x}{K_1})^n} \end{cases}$$

[F6P] = 0.1 mM
[ATP] = 2.3 mM
[PFK(E_1)] = 0.12 μM
K_{F6P} = 0.11 mM
K_{ATP} = 0.42 mM
k_{cat} = 0.4 s^{-1}

1° $\Rightarrow r_1 = 0.4\,s^{-1} \times 0.12\,\mu M \times \left(\frac{0.1\,mM}{0.11\,mM + 0.1\,mM}\right)\cdot\left(\frac{2.3\,mM}{0.42\,mM + 2.3\,mM}\right)$

$= 0.0193\,\mu M/s = 69.58\,\mu M/hr$

2° [3'-5'-AMP] = 0, $f_1 = 0$, $\hat{r}_1 = 3.0003$

$\Rightarrow 3.0003 = 69.58 \frac{W_1}{1 + W_1}$, $\boxed{W_1 = 0.0451}$ #

3° [3'-5'-AMP] = 0.99 mM, $\hat{r}_1 = 68.653$ and $f_1 \doteq 1$ (assume)

$\Rightarrow 68.653 = 69.58 \times \frac{0.0451 + W_2}{1 + 0.0451 + W_2}$, $\boxed{W_2 = 14.01}$ #

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4. b)

Guess n and K

↑ order parameter ↑ binding constant

The estimation is $n = 2.488$

$K = 0.665$

⇒ Calculation shown in excel file.

4. c)

Plot shown in excel and jpg file. #

⇒ The estimated model fits the data pretty good.