Michaelis-Menten: Wichtige Formeln, konsistent

Ohne Hemmung: $E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$

$$\Rightarrow v = \frac{d[P]}{dt} = \frac{v_{max}[S]}{K_m + [S]}, \quad \text{mit } v_{max} = k_2[E]_0, \; K_m = \frac{k_{-1} + k_2}{k_1}$$

Kompetitive Hemmung: $E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$

und $E + I \underset{k_{-3}}{\overset{k_3}{\rightleftharpoons}} EI \Rightarrow$ Def. $K_{EI} = \frac{k_{-3}}{k_3}$

$$\Rightarrow v = \frac{d[P]}{dt} = \frac{v_{max}[S]}{K_m\left(1 + \frac{[I]}{K_{EI}}\right) + [S]} = \frac{v_{max}[S]}{K_m\alpha + [S]}, \quad \alpha = 1 + \frac{[I]}{K_{EI}}$$

Unkompetitive Hemmung: $E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$

und $ES + I \underset{k_{-4}}{\overset{k_4}{\rightleftharpoons}} ESI \Rightarrow$ Def. $K_{ESI} = \frac{k_{-4}}{k_4}$

$$\Rightarrow v = \frac{d[P]}{dt} = \frac{v_{max}[S]}{K_m + \beta[S]}, \quad \text{mit } \beta = 1 + \frac{[I]}{K_{ESI}}$$

Nicht-Komp. Hemmung: "Beide zusammen"

$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$

und $E + I \underset{k_{-3}}{\overset{k_3}{\rightleftharpoons}} EI \Rightarrow$ Def. $K_{EI} = \frac{k_{-3}}{k_3}$

und $ES + I \underset{k_{-4}}{\overset{k_4}{\rightleftharpoons}} ESI \Rightarrow$ Def. $K_{ESI} = \frac{k_{-4}}{k_4}$

$$\Rightarrow v = \frac{v_{max}[S]}{K_m\alpha + [S]\beta} \quad \text{mit } \alpha, \beta \text{ wie oben:}$$

$$\alpha = 1 + \frac{[I]}{K_{EI}}$$

$$\beta = 1 + \frac{[I]}{K_{ESI}}$$

der gleiche Inhibitor