Enzyme inhibition

The Michaelis-Menton rate of a reaction was given by

$$V = \frac{V_{max} \cdot s}{K_m + s}$$

We can rewrite this as
$$\frac{1}{V} = \frac{K_m + s}{V_{max} \cdot s} = \frac{K_m}{V_{max}} \cdot \frac{1}{s} + \frac{s}{s} \cdot \frac{1}{V_{max}}$$

The first term (of the last bit) goes to 0 close to the origin of the 1/V x 1/s plot, enabling the estimation of K_m.

Cooperativity

$$\mathrm{E} + \mathrm{S} \rightleftharpoons \mathrm{C}_1 \to E + \mathrm{P}$$
$$\mathrm{C}_1 + \mathrm{S} \rightleftharpoons \mathrm{C}_2 \to C_1 + \mathrm{P}$$
$$\mathrm{C}_2 + \mathrm{S} \rightleftharpoons \mathrm{C}_3 \to C_2 + \mathrm{P}$$

model

$$\mathrm{C}_{n-1} + \mathrm{S} \rightleftharpoons \mathrm{C}_n \to C_{n-1} + \mathrm{P}$$

By using the quasi-steady-state assumption, we get

$$V = \frac{dp}{dt} = \frac{V_{max} \cdot S^n}{K_m^n + S^n}$$

Hill's rate equation

For n large enough, V in Hill's equation becomes a sigmoidal curve

xpp

$$\frac{dc}{dt} = k_1(a_0 - c - 2d) - k_2 c - 2(k_3 c^2 k_4 d)$$
$$d' = k_3 c^2 - k_4 d$$

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#kinetics.ode
#simple enzyme model to fit some data
c'=k1*(a0-c-2d)*(b0-c-2*d)-k2*c-2*(k3*c*c-k4*d)
d'=k3*c*c-k4*d
init c=0, d=0
```