ENZYME INHIBITION

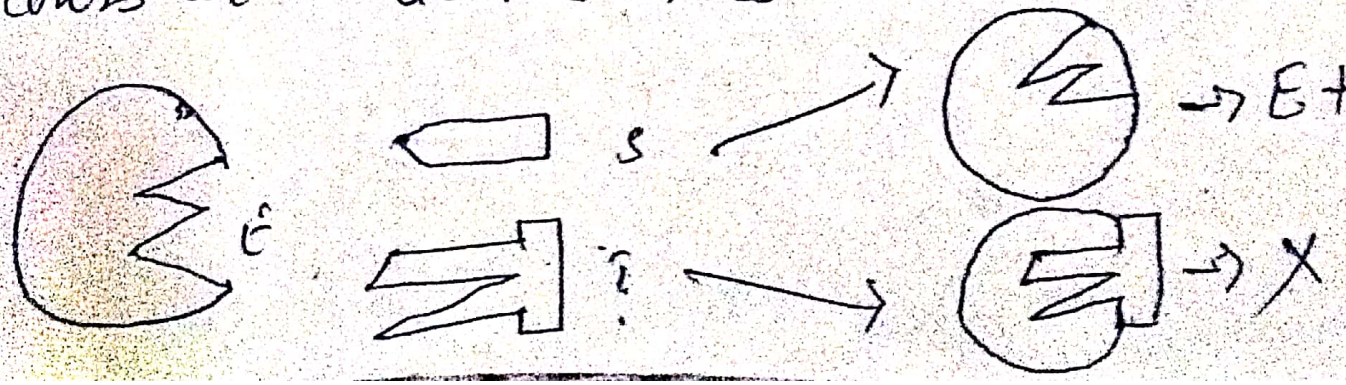
~~Inhibito~~. Introduction =>

Inhibitors are substances which tend to decrease the rate of an enzyme catalysed reaction although some act on a substrate or cofector such a process known as enzyme inhibition.

Types =>

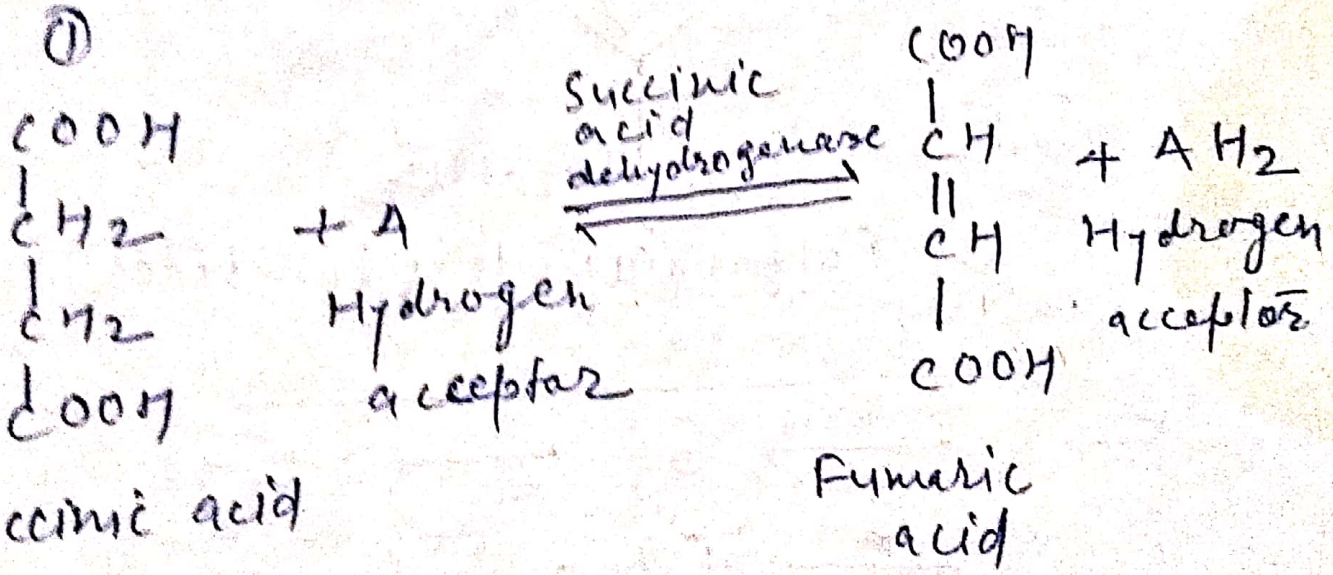
- Reversible
  - Uncompetitive
  - Competitive
  - Non competitive
  - Mixed inhibition
  - Partial inhibition
- Irreversible
  - Substrate inhibition.

Competitive inhibition => This type of inhibition occurs at the active sites.



the structure of inhibitor (I) closely resembles with that of the substrate (S) it may thus combine with the enzyme (E) forming an Enzyme - inhibitor (EI) complex rather than ES complex. The degree of inhibitors depend upon the relative concentration of the substrate and the inhibitor.

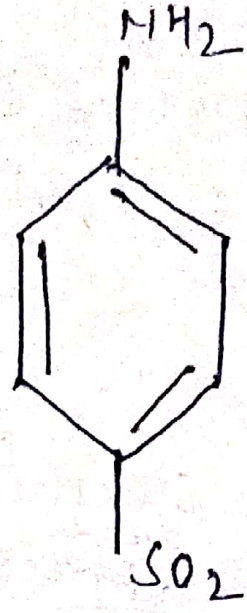
Ex ①



An enzyme succinic acid dehydrogenase catalyzer the conversion of succinic acid to fumeric acid

② Many microorganisms like bacteria synthesize the vitamin folic acid from Paraamino benzoic acid (PABA) sulfanilamide and other sulfa drugs are structural

analogus of PABA sulf drug act as enzyme inhibitor and occupy the active site of some bacterial enzymes catalyzing reaction



Sulfanilamide (Inhibitor)

$$E + S \longrightarrow ES \longrightarrow E + P$$

$$E + I \longrightarrow EI$$

The dissociation constant for the reaction between E and I is Ki where

$$K_m = \frac{[E][S]}{[ES]} \qquad K_i = \frac{[E][I]}{[EI]}$$

$$[E_0] = [E] + [ES] + [EI]$$

$$= [E] + \frac{[E][I]}{K_i} + [ES] \quad \text{— (1)}$$

$$[E_0] = \frac{[E]K_i + [E][I]}{K_i} + [ES]$$

$$= [E]\left(\frac{K_i + [I]}{K_i}\right) + [ES]$$

$$= [E]\left(\frac{K_i}{K_i} + \frac{[I]}{K_i}\right) + [ES]$$

$$[E_0] = [E]\left(1 + \frac{[I]}{K_i}\right) + [ES]$$

$$[E] = \frac{[E_0] - [ES]}{1 + \frac{[I]}{K_i}}$$

From M.M. eq.

$$K_m = \frac{[E][S]}{[ES]} \qquad K_m = \frac{\frac{[E_0] - [ES]}{1 + \frac{[I]}{K_i}} \times [S]}{[ES]}$$

$$K_m[ES] = \frac{([E_0] - [ES])[S]}{1 + \frac{[I]}{K_i}}$$

$$K_m[ES]\left(1 + \frac{[I]}{K_i}\right) = [E_0][S] - [ES][S]$$

$$[E_0][S] = K_m[ES]\left(1+\frac{[I]}{K_i}\right)+[ES][S]$$

$$[E_0][S] = [ES]\left[K_m\left(1+\frac{[I]}{K_i}\right)\right]+[S]$$

$$[ES] = \frac{[E_0][S]}{K_m\left(1+\frac{[I]}{K_i}\right)+[S]} \quad \text{---} \quad (4)$$

From the M.M. eq. $V_0 = K_2[ES]$ —

Substituting the value of ES - eq. (4) - (5)

$$V_0 = \frac{K_2[E_0][S]}{K_m\left(1+\frac{[I]}{K_i}\right)+[S]}$$

$$V_{max} = K_2[E_0]$$

$$V_0 = \frac{V_{max}[S]}{K_m\left(1+\frac{[I]}{K_i}\right)+[S]}$$

$$\left[K_m' = K_m \left(1 + \frac{[I]}{K_i}\right) \right]$$

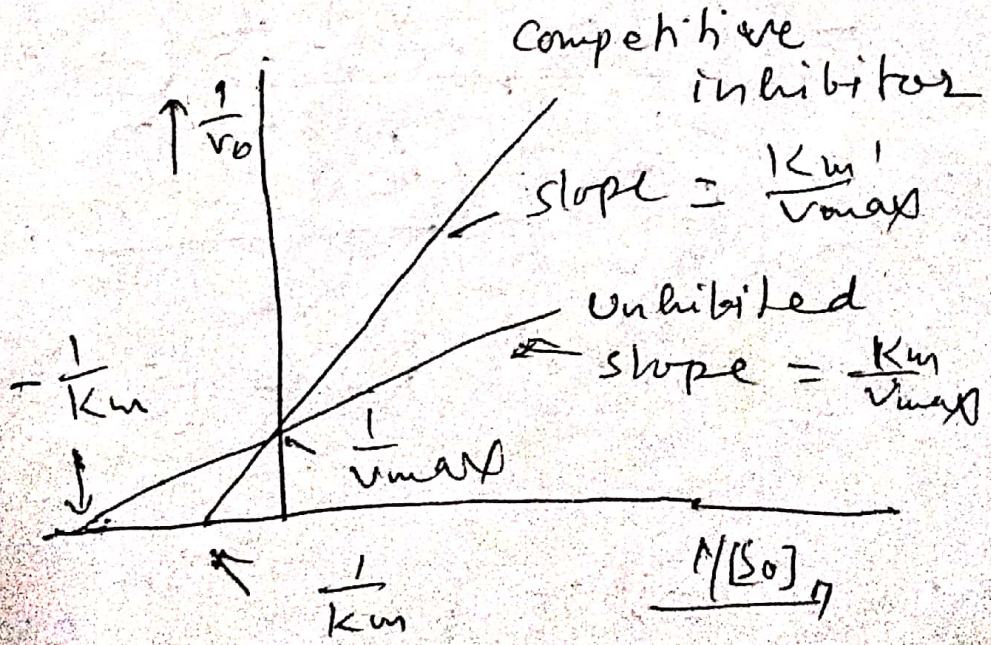
$$v_0 = \frac{V_{max}[S_0]}{K_m' + [S]}$$

$$\frac{1}{v_0} = \frac{K_m' + [S_0]}{V_{max}[S_0]}$$

$$\frac{1}{v_0} = \frac{K_m'}{V_{max}[S_0]} + \frac{[S_0]}{V_{max}[S_0]}$$

$$\frac{1}{v_0} = \frac{K_m'}{V_{max}} \times \frac{1}{[S_0]} + \frac{1}{V_{max}}$$

$$y = m \cdot x + c$$



~~K_m is~~