FOOD ENZYMES AND THEIR APPLICATIONS

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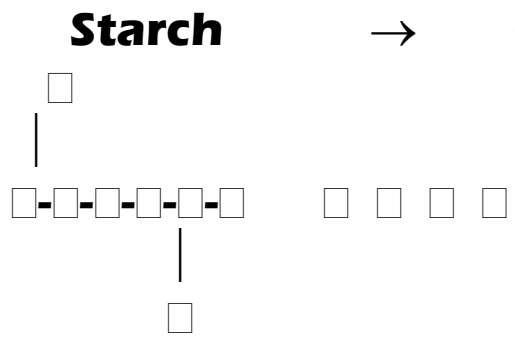
Food enzymes catalyzed reactions



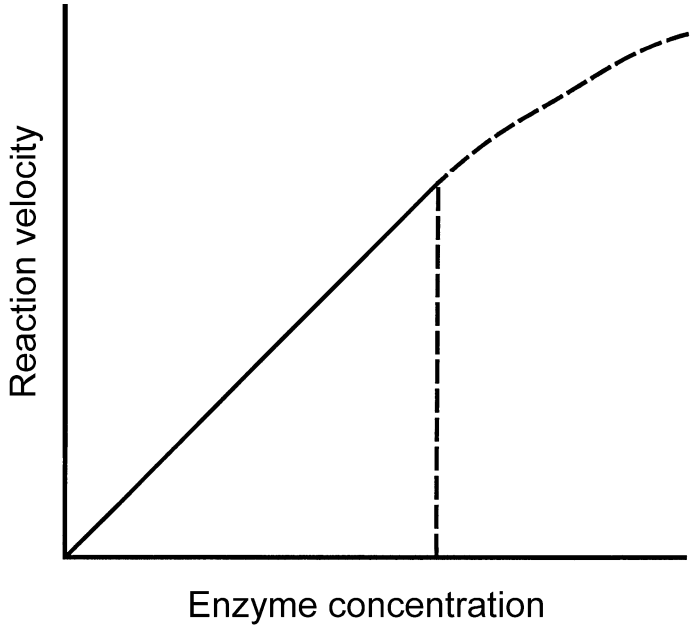
Factors affecting enzyme activity

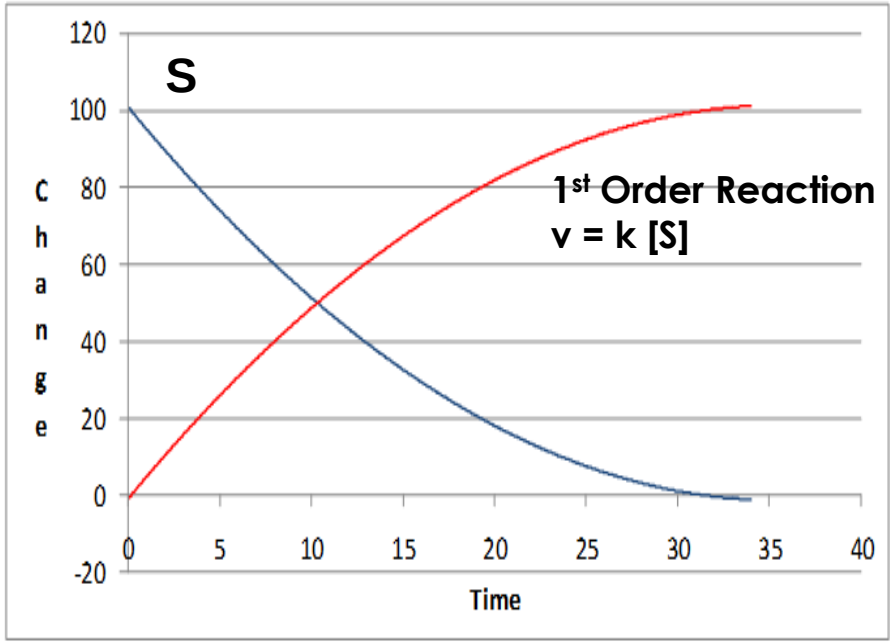
- Concentration of enzymes
- Concentration of Substrates
- Temperature
- pH
- Water Content
- Chemicals (inhibitors)

Factors affecting enzyme activity

1. Enzyme and substrate concentration

- When substrate concentration is kept constant the enzyme reaction is proportional to the amount of enzyme (i.e. doubling enzyme will double the speed of the reaction) up to a certain limit – ideal conc.

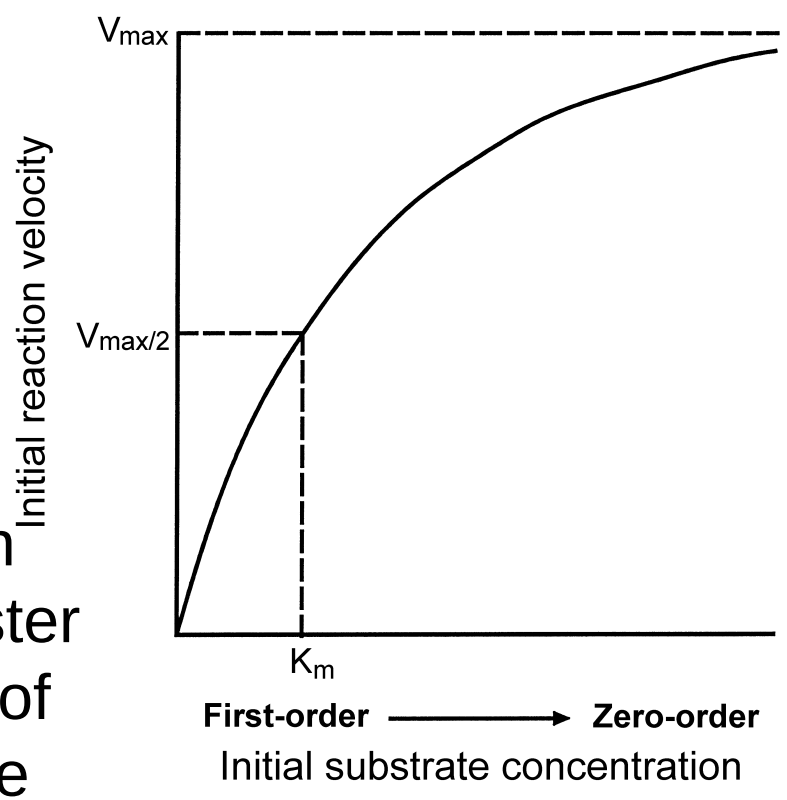




Factors affecting enzyme activity

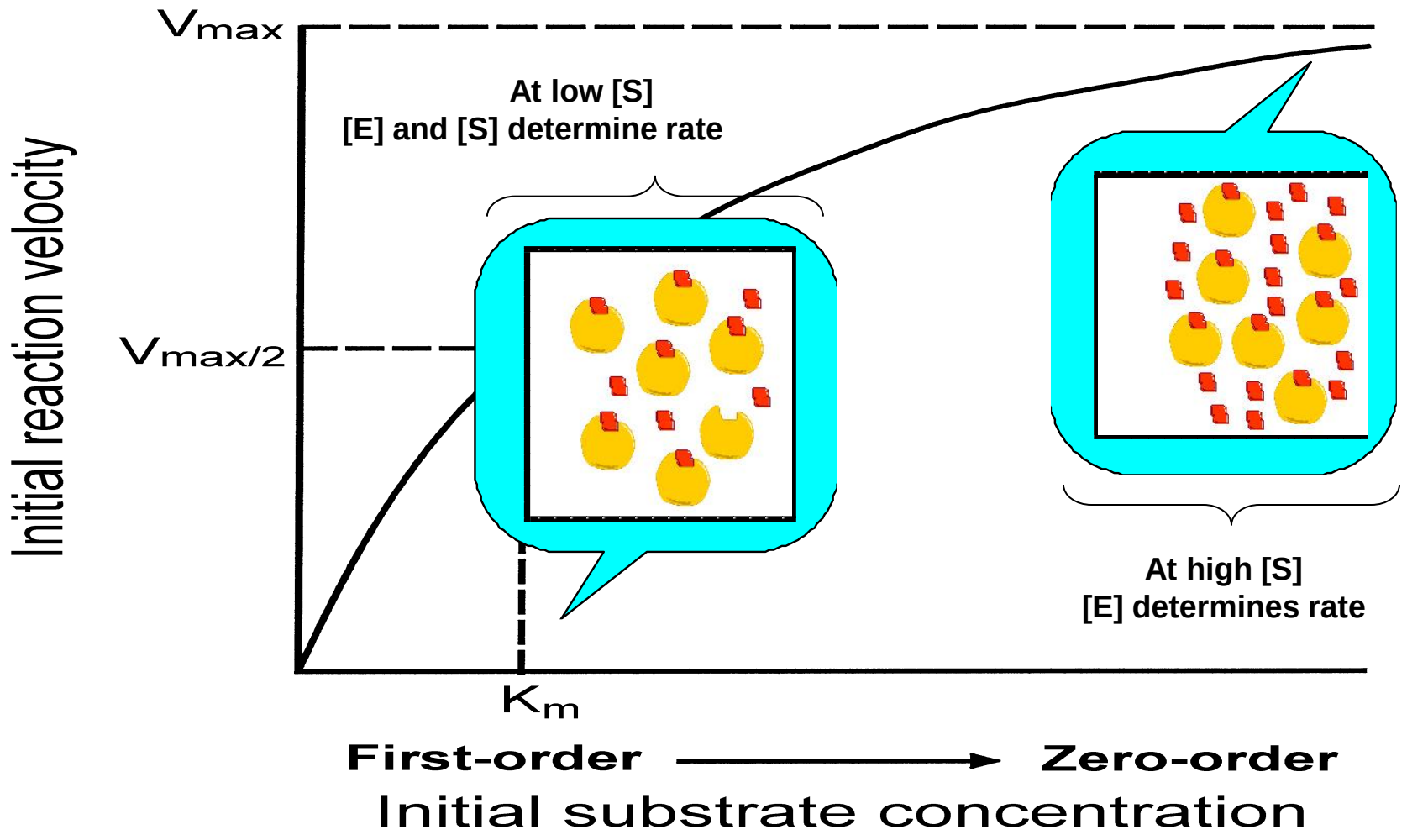
Enzyme Kinetics

- Increasing the substrate cor
  enzyme concentration leads
  reaction velocity, explained
  Enzyme-Substrate complex
- Activity of the enzyme and t



- $\mathbf{V_{max}}$ gives us the maximum velocity that the enzyme can produce – the higher the faster
- $\mathbf{K_m}$ (as ½ V_{max}) - the affinity of the enzyme for its substrate
- $\mathbf{V_{max}/K_m}$ = catalytic efficiency (higher number more efficient)

Factors affecting enzyme activity



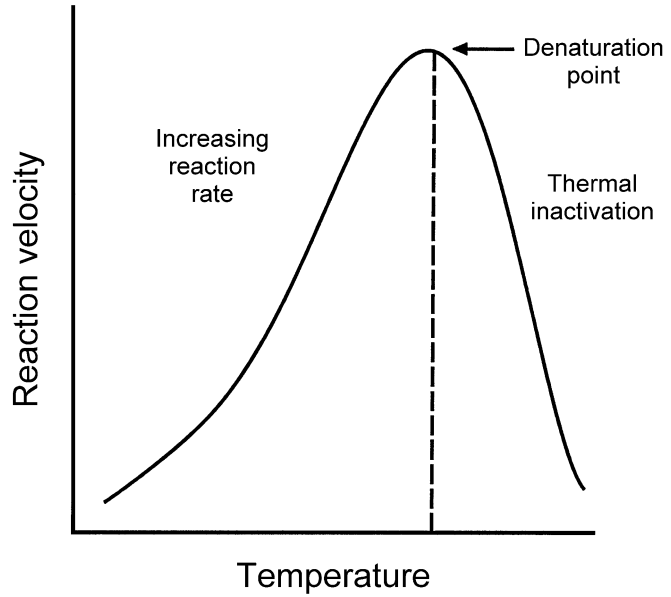
Factors affecting enzyme activity

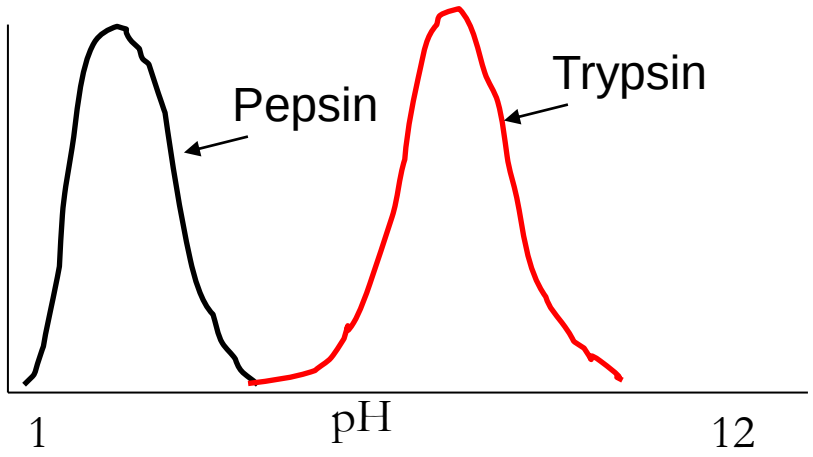
2. Temperature

- Activity increase with Temp.
- Different temperature optima
- Important to predict the type of thermal treatment need in processing to inactivate

3. pH

- Have narrow range of pH
- Extremes of pH can affect the enzyme by denaturing it or affecting charge at active site
- pH control with undesirable enzymes is important

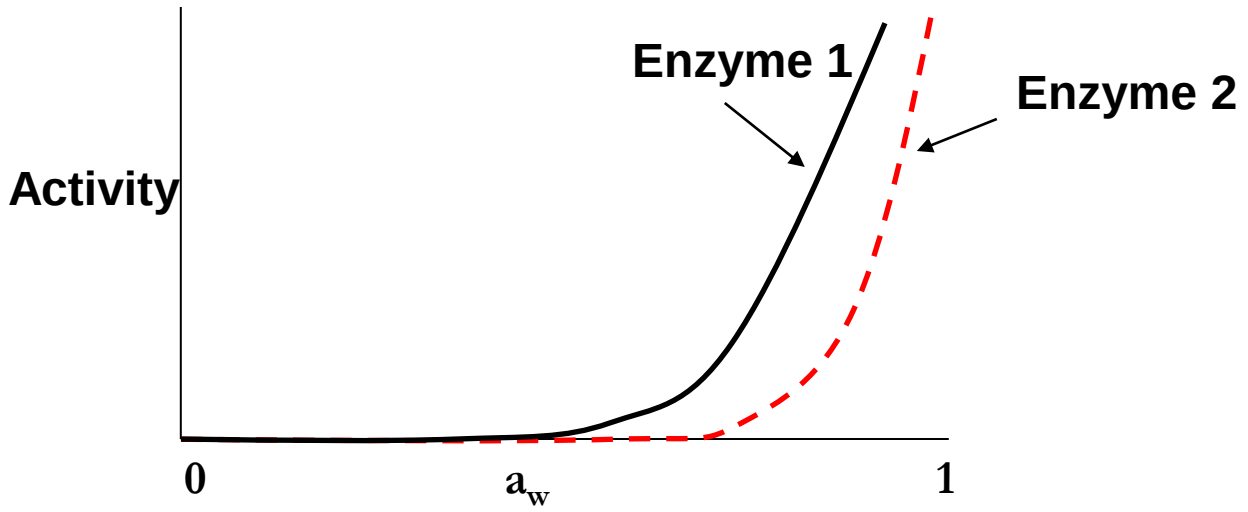




Factors affecting enzyme activity

4. Water activity

- Water can influence an enzyme in many ways
  - It can be critical for the enzyme reaction (e.g. hydrolysis)
  - It can be critical to solubilize the substrate and product
  - It can be critical for the flexibility of the enzyme structure
- Water activity can be varied in foods to slow down enzyme activity



Factors affecting enzyme activity

5. Inhibitors

- Chemical compounds that inhibit or slow down the activity
- These can be reversible or irreversible
  1. Competitive inhibitors
     - Compete with the substrate for the active site
     - Enzyme can only bind to either S or I at one time
  2. Non-competitive inhibitors
     - Bind to enzyme at another site than active site
     - Enzyme can bind to both S and I at the same time
  3. Un-competitive inhibitors
     - Can only bind to the E-S complex
     - Enzyme binds first to S and then can bind to I