Not alter the equilibrium Constant (Kc). ← Enzyme ⇒ Req. very minute quantity

- First time in 1926 · James Sumner Isolated & Crystallised enzyme Urease
- He postulate all enzyme are protien → This postulate/Hypothesis was widely accepted in 1930 ← When Scientist see Crystallised Pepsin, Trypsin & other digestive enzyme (found them in protien)

⇒ Protien that Catalyse (↑) rate of the Chemical rxn. are known as Enzymes. [DEPTH OF BIOLOGY]

Properties ⇒

Enzymes are Highly specific & effective protien molecule (except RNAs) that catalyse allMost all BioChemical reaction.

1. All enzyme are protien. except group of Catalytic RNA's.
2. M.W = ranges from 12,000 to 1 million. [DEPTH OF BIOLOGY]
3. Catalytic activity of enzyme is Mainly due to their own P., Sec., Tert & quat. struc. of protien. (Destroyed in case of denaturation).
4. Most of enzyme req. only aminoacid residue to show their effect whereas in some enzyme Cofactor is Needed.
5. Holoenzyme = Catalytically active enzyme
6. Enzyme activity regulated by some processes → phosphorylation → This process alter The struc. of Protien found in the enzyme ← [DEPTH OF BIOLOGY]

Nomenclature & IUB classification

Enzyme → adding the suffix ase

Urea Hydrolysis = Urease

DNA polymerisation = DNA polymerase.

Digestive enzyme = Pepsin. , Bacteria Cell Lysis = Lysozyme

⇒ Some enzyme Has Multiple Name -

⇒ 2 diff. Enzyme or ase with same name

To avoid Such Uncertinties

- Enzyme are classified (on the basis of type of rxn they Catalyse) Accord. to IUB (International Union of Biochemistry).

↓

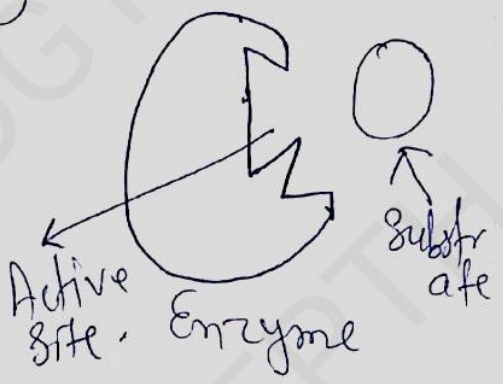
Enzyme are classified into 6 Major classes. Each with Sub classes.

Based on the type of rxn Catalysed.

1. Oxidoreductase → Transfer of e-
2. Transferase → Group transfer rxns.
3. Hydrolases → Hydrolysis rxn.
4. Lyases → Addition of Groups to double Bond.
5. Isomerases → Transfer of Group within Molecule to yield Isomeric form
6. Ligases → formation of C-C / C-S / C-O by condensation rxn

Enzyme (continue).

- Each enzyme is given a systematic name
- Specific 4 part Classification Number.



for eg ⇒ E. C. 1.1.1.1.

- 1 → Oxidoreductase
- 1 → Alcohol
- 1 → NAD+
- 1 → Dehydrogenase.

Sub-Class	Name
EC 1	Oxidoreductase.
EC 1.1	Acting on CH-OH group of donors.
EC 1.2	Acting on aldehyde group of donors.
EC 1.3	Acting on CH-CH group of donor.
EC 1.4	CH-NH_2
EC 1.5	CH-NH
EC 1.6	NADPH
EC 1.7	Nitrogenous comp.
EC 1.8	Sulphur Group
EC 1.9	Haeme Group.
EC 1.10	Diphenol subst. as donor.

LECTURE - 2

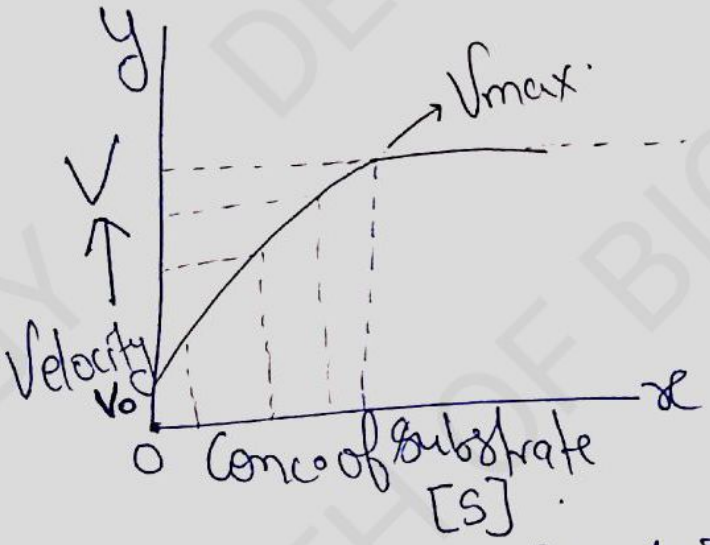
ENZYMES

Michaelis Plot ⇒

Michalis Menten Equation ⇒

Gives the relationship b/w the Velocity of rxn & the conc. of substrate.

⇒ [Velocity ∝ [S] (molar conc. of substrate)]



⇒ If substrate conc. 0 at Initial stage then Velocity is also 0.

[Initial Velocity = V_0]

↓

Rate of rxn. start.

[V_{max} = Below Max. Velocity]

$$\left[V_0 = \frac{V_{max} \times [S]}{K_m + [S]}\right]$$

V_0 → Initial Velocity

K_m → Michalis menten Const.

V_{max} → Max. Velocity.

[S] → Conc. of substrate.

After V_{max} the Graph become straight (constant).

⇓

In this condition If we (↑)se substrate conc. Nothing will Happen bcz. at V_0 stage R.O.R is Const.

Reverse the equation $\Rightarrow \left[V_0 = \frac{V_{max} \times [S]}{K_m + [S]}\right]$

$$\frac{1}{V_0} = \frac{K_m + [S]}{V_{max} \times [S]}$$

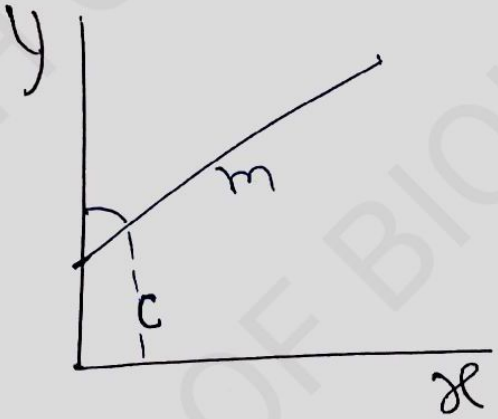
$$\frac{1}{V_0} = \frac{K_m}{V_{max} \times [S]} + \frac{[S]}{V_{max} \times [S]}$$

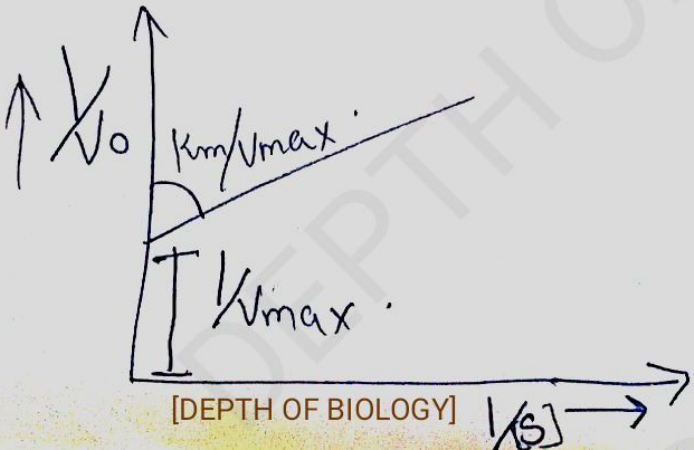
$$\frac{1}{V_0} = \frac{K_m}{V_{max} \times [S]} + \frac{1}{V_{max}}$$

$$\frac{1}{V_0} = \frac{K_m}{V_{max}} \times \frac{1}{[S]} + \frac{1}{V_{max}}$$

Compare this equation with $\Rightarrow [y = mx + c]$.

$\left[y = \frac{1}{V_0}\right]$, $\left[m = \frac{K_m}{V_{max}}\right]$, $\left[x = \frac{1}{[S]}\right]$, $\left[C = \frac{1}{V_{max}}\right]$





Line Weaver Burke Plot ⇒ Double reciprocal plot

$$\frac{1}{V_0} = \frac{K_m}{V_{max}} \times \frac{1}{[S]} + \frac{1}{V_m}$$

If $\left(\frac{1}{V_0} = 0\right)$

$$0 = \frac{K_m}{V_{max}} \times \frac{1}{[S]} + \frac{1}{V_m}$$

$$\frac{-1}{V_{max}} = \frac{K_m}{V_{max}} \times \frac{1}{[S]}$$

$$\left(\frac{-1}{K_m} = \frac{1}{[S]}\right)$$

[NEA → ~~Penalty~~ Tyrosine, Arginine
EAA → Phenyalanine, Leucine, Isoleucine]

[DEPTH OF BIOLOGY]

ENZYME INHIBITORS

PPT

LECTURE - 3

LECTURE - 4

ALLOSTERIC

Allosteric Enzyme Regulation ⇒

- The enzyme that change their conformation on binding with the effector are termed as Allosteric enzyme.

Biological Activity of An Allosteric enzyme get affect when an effector molecule bind to the allosteric site. & altering the confirmation of its Quarternary structure. [altering their Biological activity & Conformation]

Classes of Allosteric Enzyme ⇒

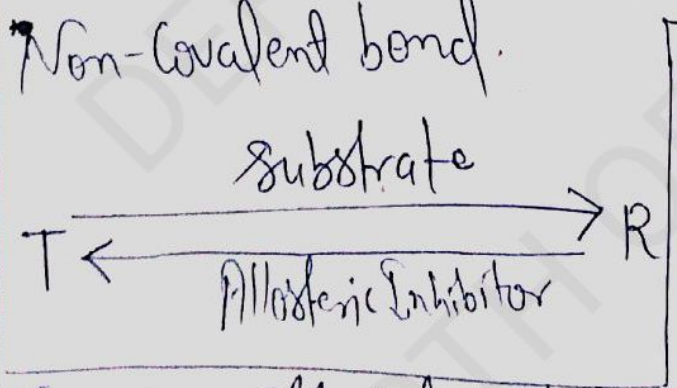
→ K-Class of Allosteric Enzymes = Vmax Same Km after.

— V-Class of Allosteric Enzymes. = Km Const. Vmax. After.

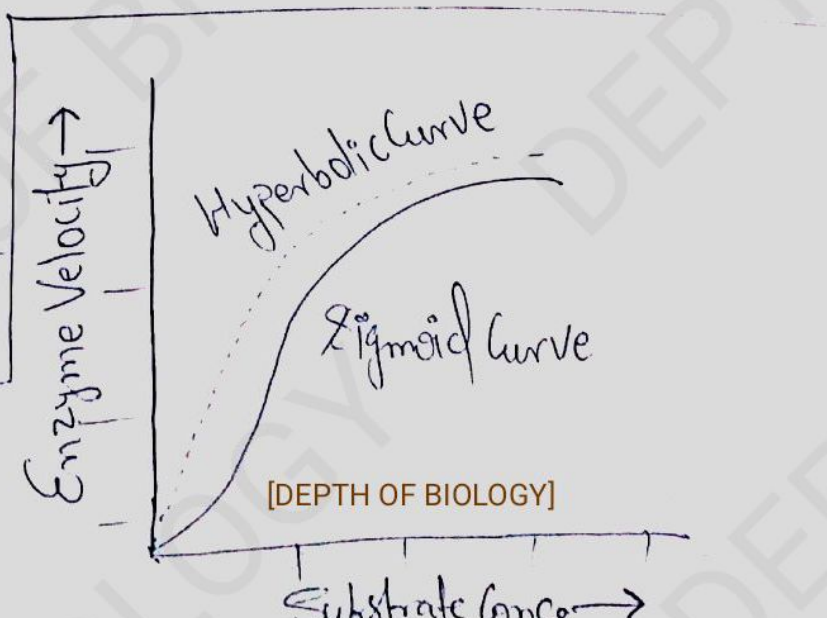
Confirmational Change in Allosteric Enzyme ⇒

↓

Takes place due to Binding of effector Molecule at allosteric site with Non-Covalent bond.



Graph = Effect of Substrate Conc. on Allosteric Enzyme.



LECTURE - 5 ENZYMES

Therapeutic & Diagnostic Application of Enzyme

① Diagnostic Uses. ② Therapeutic Use ③ Lab Uses.
④ Industrial.

⇒ Plasma functional ⇒ or Plasma Specific

Conc. ↑ More in Plasma. → Clotting factor functional in plasma

- This group is not Useful in the diagnostic uses of enzyme.

- Plasma functional enzyme ⇒ Lipoprotein Lipase (negligible in cell)

⇒ Plasma Non-functional Group ⇒

CONC. OF THIS GROUP OF ENZYME IS LOW IN PLASMA

THEY ARE NON-FUNCTIONAL IN PLASMA

- They are Fnt in Cell in Low Conc. (But Higher then Plasma)
- But whenever there is Proliferation, Necrosis, Neoplasm or damage to the Cell ⇒ Concn. of this enzyme ↑ses & they Leaked Out in the Plasma. & Now these enzyme are used for Diagnosis of Various DZ.

DIAGNOSTIC USES OF ENZYMES 👇👇

① Liver dz. ⟶

These are Imp. enzyme ← for diagnosis of Liver dz.
- AST (SGOT)
- ALT (SGPT) ➡️ MORE SPECIFIC FOR LIVER DISEASE
- ALP
- 5'NT
- GGT
- LDH 4,5

[AST & ALT ratio if < 1] ⇓ Liver Dz. (>2) Alcohlic Liver Dz.

[DEPTH OF BIOLOGY]

Indicate

ALP ⇒ obstructive Liver dz.
5'NT ⇒
GGT ⇒

→ If ALP (↑)se 2-3 times (Viral Hepatitis).

② Heart / Cardiac Markers

(enzyme) CPK-MB ⇒ Myocardial Infraction.

LDH-1 ⇒ specific for ♡

Mb. →
Troponin →
PAPP-A →

[DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

③ Pancreatic Dz. →

Amylase → But Non-specific.

Lipase → More specific.

④ Bone dz. ⇒

— ALP → Imp. In diagnosis of Bone dz.

— Calcitonin

[DEPTH OF BIOLOGY]

Therapetic Use of enzyme ⇒

A S P A R ginase → RTPA = Used in Myocardial Infraction

→ α1 Antitrypsin = Emphysema.

→ Papain = Antiinflammatory.

Asparginase → Use in Acute Leukemia

Streptokinase → Clot lysis → Used in Myocardial Infraction.

⇒ Streptodornase = Dnase.

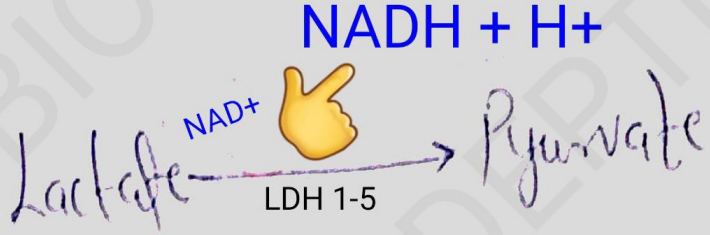
& Pancreatin = Used in dig. disorder

→ Urokinase → Clot lysis.

ISOENZYMES 👇👇

Diff. forms of same enzyme catalysing the same rxn.

eg ⇒ LDH_1
LDH_2
LDH_3
LDH_4
LDH_5



Properties ⇒

① Electrophoratic Mobility.

LDH_1 → fastest Moving Component

LDH_5 → slow Moving Component.

eg → CK 1, 2, 3
→ ALP

So all are seprated by Electrophoratic Mobility

② Stability to Heat → [DEPTH OF BIOLOGY]

α2HL → Liver.

③ Various Inhibitors →

④ Cofactors → Isocitrate Dehydrogenase → Req. NAD as a Cofactor

Mitochondrial Variant

While Cytosolic Variant → Req. NADP as a Coenzyme

5. Antibodies → Diff. Isoenzyme sensitive to diff. antibodies

6. Tissue of origin →

7. Km value & affinity.

Examples ⇒

1. Lactate Dehydrogenase (LDH) → LDH_1 to LDH_5

Isoenzyme	Subunit Constitution	Principle Tissue of origin.	Electrophile mobility
LDH_1	H_4	Heart, RBC	Fastest
LDH_2	H_3M	Heart, RBC	Faster
LDH_3	H_2M_2	Brain, kidney.	Fast.
LDH_4	HM_3	Liver.	Slow
LDH_5	M_4	Liver	Slowest.

2. Isoenzyme of CPK ⇒

Phosphocreatine $\xleftarrow[ADP+Pi]{CPK}$ $\xrightarrow{ATP}$ Creatine.

Isoenzyme	Subunit	Tissue in origin
CPK_1	BB	Brain
CPK_2	MB	♡
CPK_3	MM	Skeletal Muscle.

LECTURE - 6
ENZYMES

(Continue in my page)

② Coenzyme ⇒ Small organic Molecules, (Transporting the chemical group from one enzyme to another).

eg ⇒ Thiamine, Riboflavin, folic acid, PLP

Methyl group carried by

Holoenzyme = Apoenzyme (Protien part) + Coenzyme. (Non-protien part).

[DEPTH OF BIOLOGY]

* Vitamin play a Vital role in Various Metabolic Human body rxn. & are also used as Coenzyme.

① Thiamine / Vit. B_1 → Sulphur Contain.
→ H_2O soluble

Biochemical function ⇒ T.P.P without participation in transketolase & Pyruvic decarboxylase as a coenzyme.

② Riboflavin ⇒ Vit B_2 (Micronutrient) → absorbed easily.

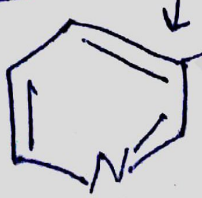
→ Biochemical function ⇒ Ability of Riboflavin undergo Oxid./red. rxn. it functions as co-enzyme,

Riboflavin Colour —red.→ dissapear

regain Colour on oxid.

Coenzyme function of the Nicotinamide nucleotides ⇐ B.F ⇐ ③ Nicotinamide ⇒ Amide of $CONH_2$ Vit. B3.

is for enzyme dehydrogenase. This enzyme catalyse various oxid. & red. rxn.



④ # Syllabus से Continue ⇒ Structure & Biochemical function.

Vitamin B6 ⇒ Part of Vit B complex (H2O soluble in Nature)

Biochemical function ⇒ THESE ESSENTIAL METABOLISM REACTION OF AMINO ACID ARE CATALYSED BY PLP.

⑤ Lipoic Acid ⇒ Exist in form of two Enatiomers.

Biochemical function ⇒ L↑A Is a Cofactor of the Complexes of Multienzymes α-Ketoglutaric dehydrogenase & Pyruvic dehydrogenase

⑥ Biotin (B7) ⇒ It is B-Complex Vitamin. Known as Vit. B7. (H2O soluble)

Coenzyme in fatty acid & leucine Metabolism.

⑦ Folic Acid ⇒ / Folacin. (Vit. B9)

⑧ Vit. B12 ⇒ Cobalamin (H2O soluble).

[Biochemical function = Coenzyme form of folic acid can be obtained after it undergo reduction].

BIOCHEMICAL FUNCTION ⇒ It play Vital role in the Proper functioning of Brain, Also affect synth & regulation of DNA.