DIAGNOSTIC ENZYMOLOGY

Objectives:

1. To know the diagnostic significance of plasma enzymes.

2. To study the factors determining plasma enzyme activity.

3. To define the steady state plasma enzyme activity.

4. To study the factors changing the steady state plasma activity.

5. To discuss the factors should be taken into consideration upon selecting a plasma enzyme test.

What are non-functional plasma enzymes

And their clinical significance ?

A large number of enzymes are released from cells during normal cell turn over. These enzymes almost always function intracellularily , and have no physiological role in the plasma (*non-functional enzymes*).

An elevated plasma activity of these enzymes may indicate cell or membrane damage, organelle damage, or cell death. Therefore, measurement of their plasma activity may be of valuable diagnostic significance.

DIAGNOSTIC ENZYMOLOGY **is a branch of medicine involving the use of enzymes in the diagnosis and management of diseases.**

What are the advantages of diagnostic plasma enzymes ?

1. Diagnosis of the disease.

2. Assessment of disease severity.

3. Following the progress of the disease.

4. Predicting the disease outcome.

What are the factors determining plasma enzyme activity?

1. **Rate of enzyme entry into plasma.**
2. **Rate of enzyme removal from plasma.**
3. **Volume of enzyme distribution in ECF.**
4. **Presence of factors in the plasma that may affect the assay method.**

What is steady state plasma enzyme activity ?

Normally, plasma enzyme activity represent

A STEADY STATE

where: **The rate of enzyme entry into plasma**

equal

The rate of enzyme removal from plasma

Changes in plasma enzyme activity are *NEARLY ALWAYS* due to:

An increased rate of enzyme entry into the plasma.

Such increases could be due to :

1. **Enzyme induction.**
2. **Increased rate of cell turn over.**
3. **Enzyme leakage from cells.**
4. **Duct obstruction.**

Enzyme induction

An increase in enzyme production by cells.

Example:

γ-glutamyl transferase **is induced by:**

1. **Drugs: phenobarbitone, rifampicin.**
2. **Chronic alcohol consumption.**

Increased rate of cell turn over

An increase in the No. of enzyme producing cells.

Examples:

1. ***Alkaline phosphatase*** **is increased in osteoblastic bone tumours**
2. **Acid phosphatase is increased in osteolytic bone tumours**
3. ***Amylase*** **is increased in pancreatic tumours**

Enzyme leakage from cells

Enzyme leakage into the plasma as a result of cell damage.

Examples:

1. *ALT* and *AST* are released into the circulation as a result of hepatocellular damage.

2. *Amylase* is released into the circulation as a result of pancreatic damage in acute pancreatitis.

Duct obstruction

This causes enzymes that are normally present in exocrine secretion to be regurgitated back into the circulation.

Example:

***Amylase* enzyme is regurgitated back into the circulation in cases of pancreatic duct obstruction.**

What are the factors should be taken into consideration upon selecting a plasma enzyme test ?

1. Sensitivity . The ability to detect minute tissue damage.

2. Specificity. The ability to identify which tissue has been damaged.

3. Time course of enzyme elevation. The enzyme should rises early in the course of the disease and should remain high for appreciable period of time.

4. Technical factors. The assay method is preferred to be accurate, precise, inexpensive and easy to perform.