Isoenzymes

Recent studies have shown that some of the enzymes exits in many physically distinct forms and all the forms of a single enzyme can catalyse the same reaction. The only differences noted in the different forms of a single enzyme are that of electrophoretic mobility and possibly of the quaternary structure of the enzyme protein. Such forms of a single enzyme, having same catalytic activity are knwon as **isoenzymes.** Isoenzymes have been reported for several enzymes, such as several dehydrogenases, transaminases, proteolytic enzymes and phosphatises. Also the presence of isoenzymes has been reported in many animal species such as mammals, amphibians, birds and insects. Changes in the isoenzyme levels have been reported in certain pathological disorders.

According to international union of Biochemists (I.U.B.) the term **isoenzyme** has been described as the multiple forms of an enzyme occuring within a single species. Some 100 enzymes at present are known to exit in such multiple forms. It is an established practice to **distinguish** the various components of isoenzymes by numbering them according to their electrophoretic mobilites. According to I.U.B. system, the numbering of the isoenzymes is done in decreasing order of their negative charge, however, numbering is regarded as a temporary expedient until more is known about the chemical difference existing between isoenzymes. Isoenzymes are separated from fresh materials by electrophoresis and ion exchange chromatography. The multiple forms of the enzymes have been attributed to the combination of different types of subunits. The examples of various isoenzymes are as follows:

In clinical biochemistry till date most of the work has been done on the following isoenzymes :

(a) lactic dehydrogenase (LDH),

(b) alkaline phosphatase (ALP) and

(c) creatine kinase i.e. creatine phosphokinase (CK or CPK)

Examples of isoenzymes are :
1. lactic dehydrogenase **(LDH)**
2. alkaline phosphatas **(ALP)**
3. creatline phosphokinase (creatine kinas), **CPK or CK**
4. acid phosphatase, **(ACP)**
5. amylase
6. malate dehydrogenase,
7. cholinesterase,
8. hexokinase,
9. phosphoglucomutase,
10. pyruvate kinase, etc.

Today, nearly 100 enzymes have been detected to exist as 'isoenzymes'. Starch gel gives a clear electrophoretic separation than any other media. The vertical form is recommended. Other media include cellulose acetate, agar gel, etc.