DIAGNOSTIC SIGNIFICANCE OF DIFFERENT URINARY ENZYMES IN SOME CHRONIC RENAL DISEASES

ESSAY

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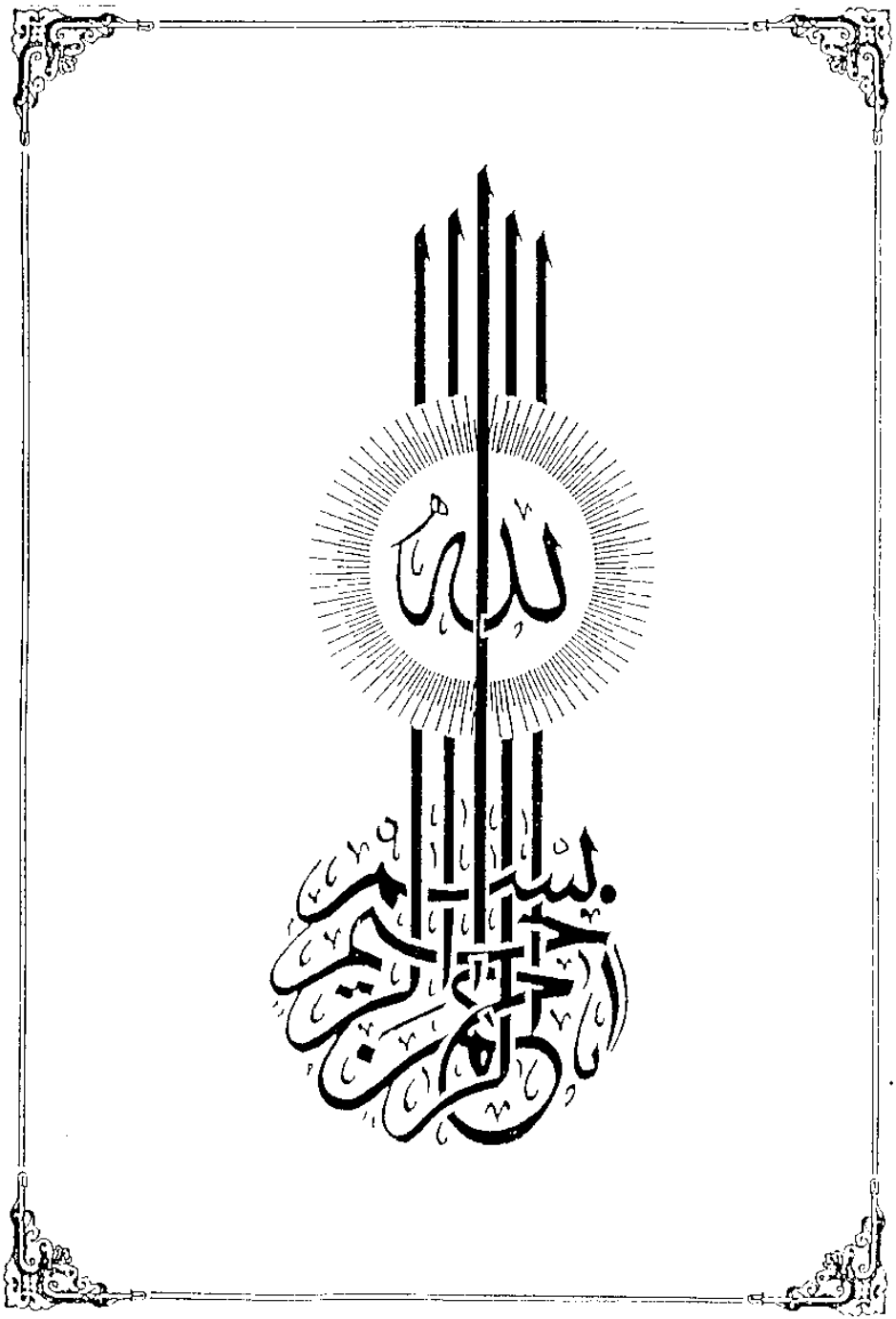

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INTRODUCTION AND

AIM OF THE STUDY

INTRODUCTION

Serum creatinine is the widely accepted routine parameter to assess renal function. However, the relationship of this analyte with GFR. is hyperbolic and thus GFR. may decrease by about 50% without detectable change in serum creatinine. It is also well-known that a better and more precise method is isotopic clearance technique however, it is expensive, time- consuming and not always avialable. Therefore, developing non- invasive practical methods will be valuable in early detection of kidney diseases (Vanderlinde 1981).

A number of invasive and non- invasive methods have been developed over the past decade to detect the state of renal function. One of the non- invasive tests is the measurement of urinary enzymes excretion in some chronic renal diseases such as, chronic pyelonephritis, chronic glomerulonephritis and nephrolithiasis Urinary enzymes include N-acetyl B-D- glucosaminidase (NAG), Alkaline phosphatase (ALP), lactate dehydrogenase (LDH), Beta glucuronidase (B-glu), dipeptidyl aminopeptidase IV (DAP IV) and lysozyme (muramidase) are used to detect the renal diseases in early stage (Palmieri et al., 1984).

AIM OF THE STUDY

The aim of this study is to put a flash of light on using urinary enzymes in the diagnosis of different renal diseases. Also differential diagnosis of renal infections can be done by determination of Bglu, LDH and B microglobulin. Determination of urinary enzymes activity can be used in follow up of renal diseases. Efficiency of treatment, relapse and remission also can be diagnosed by urinary enzymes (Francois et al., 1983).

I

SIGNIFICANCE OF URINARY ENZYMES IN RENAL DISEASES

ENZYMES

Enzymes are biological material with catalytic properties i.e they increase the rate of chemical reactions in cells and vitro that otherwise proceed very slowly (Thomas, 1980). They are compounds with molecular weights usually between 13,000 500,000 daltons. The study of these molecules and the changes in enzymes activity that occur in body fluid over time has become a valuable diagnostic tool for elucidation of various disease entities and for testing organ functions (Baron et al., 1975).

Different tissues or cell types do not contain the same amount or type of enzymes. The hundereds of different enzymes in each cell are attached to the cell wall and membrane and are also found in the cytoplasm, the nucleus and many other specialized subcellular organelle (e.g mitochondria and lysosomes). After the determination of one or several enzymes in plasma a pattern of results is obtain, that is indicative of the tissue or cell type from which the enzyme or enzymes have been derived. The enzymes act on one or more substrates and in many instances require a coenzyme or other cofactors for activity. It is apparent that in the metabolizing cell, they are often part of the

complicated interrelated system e.g the product of one reaction becomes the substrate of the next and so on. (Baron et al., 1975).

Few enzymes are found in plasma or other extracellular fluids where they seem to perform a physiological function, but most enzymees catalyze reactions inside cells or in the lumen of various organs (Boyer, 1970).

All enzymes are proteins i.e they are compounds of high molecular weight, they contain carbon, hydrogen, nitrogen and sulfer that are similar in amounts to other proteins. Hydrolysis with strong acid yeilds a mixture of amino acids and small peptides (Hohanad and Cooper, 1972).

Properties of the enzyme to be useful in diagnosis of renal diseases:

The enzyme should be present in high concentration in kidney parenchyma but absent or in substantially lesser concentration in the lower urinary tract.

The molecular weight of the enzyme should be sufficiently large so that the enzyme derived from organs other than the kidney and circulating in the blood do not appear in the urine even when glomerular permeability is increased.

Contributions to urinary enzyme activity from bacteria and urinary sediment should be minimal.

Enzymatic activity should be stable for several days at refrigerator or freezer temperature.

Inhibitors or activators of the enzyme should be absent from the urine or if present should be consistently and reproducibly removable by dialysis.

The determination should be both accurate and rapid. (Harvey et al., 1973).

Origin of urinary enzymes:

A. Under normal conditions:

Enzymatic activities of urine may originate from the following sources

1. Serum:

Few urinary enzymes derive from the serum and enter urine by glomerular filteration. Enzymes exceeding a molecular weight of 70,000 daltons are not excreted in urine. Renal excretion of serum enzymatic activities occurs in a few instances only e.g. pepsinogen, amylase and lipase.

2. Kidneys:

Renal tubular cells are rich in enzymes, with normal cellular turnover, cells desquamate and disintegrate in urine, and thus their enzymes appear in urine.

3. Glandular secretions of the urogenital tract:

Among the genital glands, only prostatic fluid (acid phosphatase) has been shown to contribute significantly to enzymatic activity of urine (Mattenheimer 1971).

B. Under pathologic conditions:

1. Kidneys:

Increased urinary leakage of the enzymes occur as a result of diseased glomeruli e.g. nephrotic syndrome. The enzymuria here is dependent on the enzyme molecular weight and the degree of proteinuria (Crockson, 1961).

When tubular cells disintegrate or when tubular permeability is disturbed. Acute tubular or parenchymal damage will result in release of renal enzymes into the urine. Examples are acute glomerulonephritis, acute pyelonephritis and acute tubular necrosis (Wacker et al., 1964).

2. Tumours in the urogenital tract:

Tumour cells usually contain many highly active enzymes. Tumours of the kidney, bladder and genitals often cause increased activity in certain urinary enzymes.

3. Infilterate and exudate cells:

Inflammatory processes of the kidney and urinary tract are accompanied by movement of cells that have a high enzyme content (Leucocytes and lymphocytes).

4. Erythrocytes:

Bleeding in urogenital system where red cells are haemolyzed and liberate their enzymes in urine.

5. Bacteria:

Bacterial infections of the kidney and other parts of the urogenital system are often accompanied by the appearance of bacteria in urine. These bacterial enzymes (e.g catalase) may enter urine (**Wacker et al., 1964**).

6. Drug abuse causes toxic nephropathy which causes hyperenzymuria like antibiotics, analgesics, and lithium (**Garvey et al., 1982**).

(NAG)

N-ACETYL

B-D GLUCOSAMINIDASE