

## Enzymes in the Urine

*Hermann Mattenheimer, M.D.\**

It has been known for over 100 years that digestive enzymes or their precursors are excreted in urine. In the beginning of this century Wohlgemut realized the diagnostic value of amylase measurements in urine in acute pancreatitis.<sup>101</sup> During the past three decades the presence of cell enzymes in urine was reported, and today more than 30 enzymes have been identified, among them oxidoreductases, transferases, hydrolases, and lyases.<sup>74</sup> The interest in quantitative enzyme determinations developed more recently, when it became evident that the activities of certain enzymes in urine increase in diseases of the kidney and the urinary tract. The enzymes which were most extensively studied in human urine are lactate dehydrogenase (LDH), alkaline phosphatase (AP), leucine aminopeptidase (LAP), and  $\beta$ -glucuronidase.

---

Abbreviations and classification numbers of enzymes: aldolase = ALD (4.1.2.13); alkaline phosphatase = AP (3.1.3.1); carbonic anhydrase = CA (4.2.1.1); glutamate dehydrogenase = GLDH (1.4.1.2); glutamate oxaloacetate transaminase = aspartate aminotransferase = GOT (2.6.1.1); glutamate pyruvate transaminase = alanine aminotransferase = GPT (2.6.1.2); glucose-6-phosphate dehydrogenase = G-6-PDH (1.1.1.49); 3-hydroxybutyrate dehydrogenase = HBDH (1.1.1.30); isocitrate dehydrogenase = JCHD (1.1.1.42); leucinaminopeptidase = LAP (3.4.1.2); lysozyme = muramidase (3.2.1.17); lactate dehydrogenase = LDH (1.1.1.28); LDH<sub>i</sub> = heart type, LDH<sub>s</sub> = muscle type;  $\alpha$ -amylase (3.2.1.1);  $\beta$ -glucuronidase (3.2.1.31).

Definition of the international enzyme unit: U = millimoles substrate converted per minute; mU = 1/1000 U.

Nomenclature of the kidney:

Cortex: glomeruli, proximal and distal convoluted tubules, medullary rays. OMZ = outer zone of the medulla: straight parts of proximal and distal tubules, loops of Henle and collecting ducts

IMZ = inner zone of the medulla: loops of Henle and collecting ducts

Papilla: mainly collecting ducts, some loops of Henle

From the Renal and Nutrition Section, Department of Medicine, and the Department of Biochemistry, Rush Presbyterian-St. Luke's Medical Center.

\*Professor of Biochemistry, Rush Presbyterian-St. Luke's Medical Center; research career development awardee (5-K3-GM 15524), U.S. Public Health Service

Supported by a grant (No. HE 03912) from the U.S. Public Health Service and by a contract (No. DADA 17-68-C-8019) from the Surgeon General's Office, U.S. Army Research and Development Command.