

NEWLY DISCOVERED ENZYMES AND CASCADES FOR THE DETERMINATION OF AMINO ACIDS

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The high stereo- and substrate specificities of enzymes have been utilized for micro-determination of amino acids. With the successful practical use of oxidoreductases such as the NAD⁺-dependent L-Phe dehydrogenase for phenylketonuria among more than 5,400,000 of neonates in Japan [1], many enzymes with higher substrate specificities have been screened and discovered from Nature [2].

In this report, successful screening and uses of selective enzymes for micro-determination of amino acids will be discussed. Focuses on amino acid oxidases that are renewing the common sense of classical biochemistry will be described: L-Thr dehydrogenase [3], L-Trp dehydrogenase [4], L-Lys e-oxidase [5], L-Trp oxidase [6,7], L-Arg oxidase [8], Gly oxidase, Taurine oxygenase [9], etc, all of which show high selectivity.

In addition, novel enzymatic assays with the systematic use of cascades of known enzymes, including assays based on a pyrophosphate detection system using pyrophosphate dikinase for L-Met, L-Cit, L-Arg [10] and a variety of L-amino acids with amino-acyl-tRNA synthetase (AARS) [1,11] will be discussed. The X-ray crystallographic structures of some of the enzymes and the protein engineering are often necessary to use them practically. Together with the use of microbial determination of amino acids with lactic acid bacterium transformed with marker enzymes [12], most of the amino acids can be determined by the enzymatic methods (Table 1). The success and the potential for amino acid determination in biological samples will be shown.

Table 1. Amino acid determination by various enzymes and enzyme system

	Previous study	Our study				Previous study	Our study		
		Oxido-reductase	AARS assay	Bio-assay			Oxido-reductase	AARS assay	Bio-assay
Ala	•		•		Met	•	•		
Cys			•		Asn				
Asp			•		Pro		•	•	
Glu	•			•	Gln				
Phe		•	•		Arg	•		•	
Gly	•		•		Ser		•		
His	•		•	•	Thr	•			
Ile			•	•	Val		•	•	
Lys	•	•	•		Trp	•	•		
Leu	•			•	Tyr	•			

References

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