3050 Spruce Street
Saint Louis, Missouri 63103 USA
Telephone 800-325-5832 • (314) 771-5765
Fax (314) 286-7828
email: techserv@sial.com
sigma-aldrich.com

ProductInformation

L-Glutamic Dehydrogenase
from bovine liver

Product Number **G 2626**
Storage Temperature 2-8 C

Product Description

Enzyme Commission (EC) Number: 1.4.1.3
CAS Number: 9029-12-3

L-glutamic dehydrogenase is a pyridine nucelotide enzyme which catalyzes the reversible oxidative deamination of L-glutamate to α-keto-glutarate and ammonia.[1] This reaction, while considered the forward reaction, actually is not favored. The equilibrium actually is in favor of the reverse reaction to form glutamate. Mammalian forms of this enzyme, including this bovine form, can use either NADP(H) or NAD(H) as coenzymes.

L-glutamic dehydrogenase plays a unique role in mammalian metabolism. The reverse reaction catalyzed by this enzyme is the only pathway by which ammonia can be become bound to the α-carbon atom of an α-carboxylic acid and thus, is the only source of *de novo* amino acid synthesis in mammalian species.[1] This bovine enzyme is characterized by three sets of properties:

1) it has a reversible concentration-dependent association, producing higher molecular weight forms,
2) it forms tight enzyme-reduced coenzyme-substrate ternary complexes whose rates of dissociation modulate the steady-state reaction rates, and
3) it has a wide variety of effects from the binding of any of a number of nucleotide modifiers.

Since all three of this features affect one another, the resulting activity is much more complex than that of other pyridine nucleotide dehydrogenases. At protein concentrations below 0.1 mg/ml, the enzyme exists completely in the hexamer form. As the protein concentration is raised near 3 mg/ml, the hexamers associate to form a larger complex with a tripled molecular weight. At even higher concentrations, the molecular weight continues to increase and linear aggregates form and lengthen. In addition to L-glutamate, this enzyme can catalyze the reversible oxidative deamination of L-α-amino monocarboxylic acids. The substrate K_M values, however, are much higher (30 - 100 mM). This enzyme is also subject to allosteric regulation by nucleotides such as ADP and GTP, as well as by its own coenzymes, substrates, and reaction products. Competitive inhibitors of L-glutamate include isophthalate, m-iodobenzoate, and 5-bromofuroate, as well as glutarate and D-glutamate.[1]

The smallest active structure of L-glutamic dehydrogenase, GLDH, is a hexamer of an approximate molecular weight of 310-350 kDa (Each subunit is approximately 55.4 kDa). The Stoke's radius for the L-glutamic dehydrogenase hexamer is 7.22 nm.[2] K_M values (mM) are listed below:[3,4,5]

L-glutamate	1.8×10^{-3}
α-ketoglutarate	7.0×10^{-4}
ammonium ion	3.2×10^{-3}
NAD	7.0×10^{-4}
NADH	2.4×10^{-5}
NADP	4.7×10^{-5}
NADPH	2.5×10^{-5}

Precautions and Disclaimer

For Laboratory Use Only. Not for drug, household or other uses.

Preparation Instructions

This product is supplied as a solution in 10 mM phosphate buffer, pH 7.0, containing 50% glycerol. This solution is then diluted to 0.3 - 0.6 units/ml using triethanolamine buffer, pH 7.3, for use in enzymatic assays.

References

1. Fisher, H. F., Methods in Enzymology, **113**, 16 (1985).
2. J. Chromatography, **152**, 21 (1978).
3. Enzyme Handbook, **6**, Schomburg, D., et al., Springer-Verlag (Berlin Heidelberg, Germany: 1993), EC 1.4.1.3, p. 3.
4. Smith, E. L., et al., in The Enzymes, 3rd ed., **XI A**, Boyer, P. D., ed., Academic Press (New York, NY: 1975), p. 361.
5. Frieden, C., J. Biol. Chem., **234**, 2891 (1959).

CMH/RXR 8/03