Certificate of Analysis

Manganese Peroxidase, Versatile (MnP)

EC=1.11.1.13; Mn(II):H2O2 oxidoreductases/diarylpropane:O2,H2O2 oxidoreductases

Catalog No	CAS No	Molecular Formula	Molecular Weight	Storage
MBS653779				-20°C

Lot No	Control No	Revision No	Revised By	Approved By
L19100259	C19100259			

Versatile peroxidase (VP) from Bjerkandera adusta is a structural hybrid between lignin (LiP) and manganese (MnP) peroxidase. This hybrid combines the catalytic properties of the two above peroxidases, being able to oxidize typical LiP and MnP substrates. The catalytic mechanism is that of classical peroxidases, where the substrate oxidation is carried out by a two-electron multistep reaction at the expense of hydrogen peroxide. Elucidation of the structures of intermediates in this process is crucial for understanding the mechanism of substrate oxidation. In this work, the reaction of H(2)O(2) with the enzyme in the absence of substrate has been investigated with electron paramagnetic resonance (EPR) spectroscopy. The results reveal an EPR signal with partially resolved hyperfine structure typical of an organic radical. The yield of this radical is approximately 30%. Progressive microwave power saturation measurements indicate that the radical is weakly coupled to a paramagnetic metal ion, suggesting an amino acid radical in moderate distance from the ferryl heme. A tryptophan radical was identified as a protein-based radical formed during the catalytic mechanism of VP from Bjerkandera adusta through X-band and high-field EPR measurements at 94 GHz, aided by computer simulations for both frequency bands. A close analysis of the theoretical model of the VP from Bjerkandera sp. shows the presence of a tryptophan residue near to the heme prosthetic group, which is solvent-exposed as in the case of LiP and other VPs. The catalytic role of this residue in a long-range electron-transfer pathway is discussed.

Versatile peroxidase (syn. hybrid peroxidase, manganese-lignin peroxidase) is a new ligninolytic enzyme, combining catalytic properties of manganese peroxidase (oxidation of Mn(II)), lignin peroxidase (Mn-independent oxidation of non-phenolic aromatic compounds) and plant peroxidase (oxidation of hydro-quinones and substituted phenols). The manganese peroxidase component catalyzes the oxidation of Mn(II) to Mn(III) by H2O2. The highly reactive Mn(III) is stabilized via chelation in the presence of dicarboxylic acid.

2 Mn(II) + 2 H+ + H2O2 → 2 Mn(III) + 2 H2O

The lignin peroxidase component catalyzes the oxidation of non-phenolic aromatic rings into aryl cation radicals by H2O2. Aryl cation radicals are unstable and undergo various subsequent reactions. A typical example is the oxidation of veratryl alcohol (3,4-dimethoxybenzyl alcohol) into veratryl aldehyde (3,4-dimethoxybenzyl aldehyde) via the intermediary formation of veratryl cation and benzyl radicals.

Veratryl alcohol + H2O2 → Veratraldehyde + 2 H2O

Source:
Bjerkandera adusta

Nomenclature:
Mn(II):H2O2 oxidoreductases/diarylpropane:O2,H2O2 oxidoreductases

Activity:
100u/ml

Unit Definition:
One unit is defined as the amount of enzyme that oxidizes 1umole of Mn(II) per minute at pH 4.5 and 25°C.

Reaction Conditions:
Optimal reaction with Mn(II) at pH 4.5, with veratryl alcohol at pH 3.0, Temperature range 15-50°C.

Possible Substrates:
Mn(II), Veratryl alcohol

Purity:
Enzymes are produced by fermentation of highly selective fungi and are partly purified.

Form:
Supplied as a brown-colored amorphous lyophilized powder. No stabilizing proteins added.

Solubility:
Water

Storage and Stability:
Lyophilized and reconstituted products are stable for 6 months after receipt at -20°C. Reconstitute with sterile ddH2O. Aliquot to avoid repeated freezing and thawing. Store at -20°C. For maximum recovery of product, centrifuge the original vial after thawing and prior to removing the cap.

Important Note:
This product as supplied is intended for research use only, not for use in human, therapeutic or diagnostic applications

Toxicity and Hazards:
All products should be handled by qualified personnel only, trained in laboratory procedures.

1. Department of Chemistry, University of Siena, via Aldo Moro, 53100 Siena, Italy 2. J Biol Chem, Vol. 274, Issue 15, 10324-10330, April 9, 1999 3. Karimi et al. (2009) Color remediation of chemimechanical pulping effluent using combination of enzymatic treatment and Fenton reaction. Desalination **249**(2):870. 4. Schachschal et al. (2011) Encapsulation of enzymes in microgels by polymerization/cross-linking in aqueous droplets. Colloid and Polymer Science **289**:693.