

Fluoride-dependent conversion of organic compounds mediated by manganese peroxidases in the absence of Mn(2+) ions.

Ye L, Spiteller D, Ullrich R, Boland W, Nüske J, Diekert G (2010) Fluoride-dependent conversion of organic compounds mediated by manganese peroxidases in the absence of Mn(2+) ions. *Biochemistry* 49(34), 7264-7271. [PubMed](#)

ILRS Authors

[Lidan Ye](#)

Projects

Studies on the microbial halogen cycle: reactions of fungal peroxidases and bacterial reductive dehalogenases

[Details](#)

Abstract

Manganese peroxidase generally mediates the oxidation of Mn(2+) to Mn(3+) with H₂O₂ as an oxidant. Several manganese peroxidases purified from different lignin-degrading fungi were found to mediate a fluoride-dependent conversion of organic substrates such as monochlorodimedone or 2,6-dimethoxyphenol in the absence of manganese ions. Using the manganese peroxidase MnP-1 from *Bjerkandera adusta* strain Ud1, these fluoride-dependent reactions were studied with respect to different substrates converted, reaction products, and kinetic properties to shed some light on the reaction mechanism of manganese peroxidase. The analysis of the reaction products formed from monochlorodimedone and 2,6-dimethoxyphenol showed that the substrates were oxidized rather than fluorinated. The addition of fluoride to MnP-1 resulted in altered absorption spectra, indicating a coordinative binding of fluoride or HF to the heme iron; the fluoride:heme stoichiometry was determined to be 1:1 and the K(D) value to be approximately 2.5 mM at pH 3.4. The high K(D) value indicates weak binding of fluoride to the heme. Fluoride appeared to act as a partially competitive inhibitor with respect to hydrogen peroxide for binding to the heme as the sixth ligand. From the findings, a putative model for the fluoride-dependent reaction was developed. The data were interpreted to indicate that changes of the reaction center of manganese peroxidase as, for example, caused by fluoride binding may lead to the oxidation of organic compounds in the absence of manganese by opening a long-range electron transfer pathway.

Identifier

doi: 10.1021/bi100831w PMID: 20666406

