The Reactivity of Vanadium Bromoperoxidase in the Biosynthesis of Halogenated Marine Natural Products

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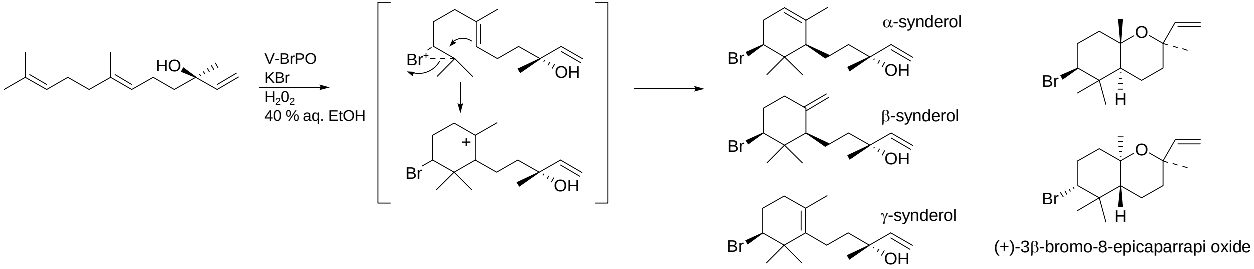
The biogenesis of cyclic halogenated terpene marine natural products has attracted sustained interest in part because terpenes are the biogenic precursors of many bioactive metabolites. Vanadium bromoperoxidase isolated from marine red algae (species of *Laurencia, Plocamium, Corallina*) catalyzes the bromination of the sesquiterpene (*E*)-(+)-nerolidol producing α-, β-, and γ-snyderol and (+)-3β-bromo-8-epicaparrapi oxide. α-Snyderol, β-snyderol, and (+)-3β-bromo-8-epicaparrapi oxide are natural products isolated from *Laurencia obtusa* and each have also been isolated from other species of marine red algae. γ-Snyderol is a proposed intermediate in other bicyclo natural products. Single diastereomers of β-snyderol, γ-snyderol, and mixed diastereomers of (+)-3β-bromo-8-epicaparrapi oxide are produced in the enzyme reaction, whereas two diastereomers of these compounds are formed in the synthesis with 2,4,4,6-tetrabromocyclohexa-2,5-dienone.



V-BrPO likely functions by catalyzing the two-electron oxidation of bromide ion by hydrogen peroxide producing a bromonium ion or equivalent in the active site that brominates one face of the terminal olefin of nerolidol. These results establish the role of V-BrPO in the asymmetric bromination and cyclization of a terpene, producing marine natural products isolated from red algae.

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