Chapter 16

L-AMINO ACID OXIDASE ENZYMES

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16.1 SUMMARY

L-amino acid oxidases (LAAOs) catalyze the oxidative deamination of an L-amino acid to produce the corresponding α-keto acid. In the process, hydrogen peroxide (H₂O₂) and ammonia are generated. Snake venoms are a rich source of LAAOs. The enzyme is a flavoprotein with two identical subunits, and MW ranging from 110 kDa to 140 kDa. LAAOs from different snake venoms are highly similar in terms of their amino acid sequence, and hence they may possess similar three-dimensional structures. X-ray diffraction studies have indicated that each subunit of these enzymes consists of three well-defined domains: the FAD-binding domain, the substrate-binding domain, and a helical domain that provides access to the active site of the enzyme. The roles of snake venom LAAOs (SV-LAAOs) are not yet completely understood. However, a cytotoxic action, caused mainly as a result of H₂O₂ generated by the oxidative action of the enzyme, may contribute to hemorrhagic and necrotic effects of the venom. In addition, H₂O₂ can trigger inflammation and also result in blood clots. Recent studies have revealed that SV-LAAOs exhibit several interesting pharmacological activities with potential therapeutic applications. The pharmacological effects are mainly mediated by the H₂O₂ generated, and the binding of the enzyme to the target cells appears to play an important role in its cytotoxicity. Effects include platelet aggregation induction, platelet aggregation inhibition, and antibacterial, antiproliferative, antiparasitic, and antiviral (HIV) activities. Although the practicality of therapeutic applications of this enzyme is yet to be fully demonstrated, its potential usefulness as a molecular probe for investigating cellular processes and the utilization of its cytotoxic action against certain cells should not be underestimated.