ENZYMATIC PROPERTIES OF A NOVEL CYP152 FATTY ACID DECARBOXYLASE

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Bacterial P450s in CYP152 family are attractive to industries and various applications. They can convert a fatty acid to a terminal alkene which can be used as a building block for productions of lubricant, surfactant, and biofuel in a single step under mild conditions. We have identified and overexpressed a new CYP152 from *Salinicoccus alkaliphilus* ($P450_{SA}$). $P450_{SA}$ is a heme-dependent enzyme and a homolog of CYP152L1 from *Jeotgalicoccus* sp. 8456, an extensively investigated fatty acid decarboxylation. In this study, we measured a melting temperature and thermostability of the purified $P450_{SA}$. $P450_{SA}$ can catalyze decarboxylation *via* a hydrogen peroxide shunt pathway (peroxygenase activity) and redox partner system (monooxygenase activity) with various chain lengths of fatty acids as substrates. $P450_{SA}$ can use fatty acids of 10-18 carbon atoms to generate terminal alkenes. Decarboxylation activity is greater when using hydrogen peroxide than that of redox partner systems. Remarkably, $P450_{SA}$ demonstrated higher decarboxylation activity compared to CYP152L1 when using long-chain fatty acids such as hexadecenoic acid (16 carbon atoms) as substrates in the presence of solvent such as ethanol (10%(v/v)). We have also solved a crystal structure of $P450_{SA}$ in complex with arachidic acid (20 carbon atoms). The information is useful for guiding the engineering of $P450_{SA}$ to enhance activity and stability in the future to overcome challenges related to real applications.