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Fatty Acid Photodecarboxylases: mechanism, substrate specificity and use in biocatalysis and biotransformation

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PURPOSE OF THE ABSTRACT

Fatty acid photodecarboxylase (FAP, EC 4.1.1.106) is a natural photoenzyme converting fatty acids into hydrocarbons that we originally isolated from the green microalgae Chlorella variabilis (1). FAP activity has been shown to be conserved in a variety of algae and is thought to play a role in photosynthetic membranes (2). Being members of the glucose-methanol-choline (GMC) oxidoreductase family, FAPs harbor a flavin adenine dinucleotide (FAD) as their chromophore. The structure and photocycle of Chlorella variabilis FAP (CvFAP) have been characterized in detail (3). CvFAP has also been shown to be an interfacial enzyme that prefers fatty acids present at organized lipid-water interfaces such as liposomes and microemulsions (4). We also recently showed that CvFAP is highly active on shorter fatty acids than previously thought and provided spectroscopic evidence for an autocatalytic effect on octanoic acid (5). CvFAP appears to represent an attractive light-focused and redox-neutral medium for the production of not only n-alkanes and n-alkenes, but also other specialty chemicals such as enantiomerically pure alpha-amino and alpha-hydroxy carboxylic acids, secondary fatty alcohols and aliphatic amines and esters. In this talk, I will present our structural, mechanistic and enzymology studies on CvFAP. Some of the potential applications of CvFAP in biocatalytic or biotransformation processes that have been explored by several groups since its discovery will also be reviewed.

FIGURES

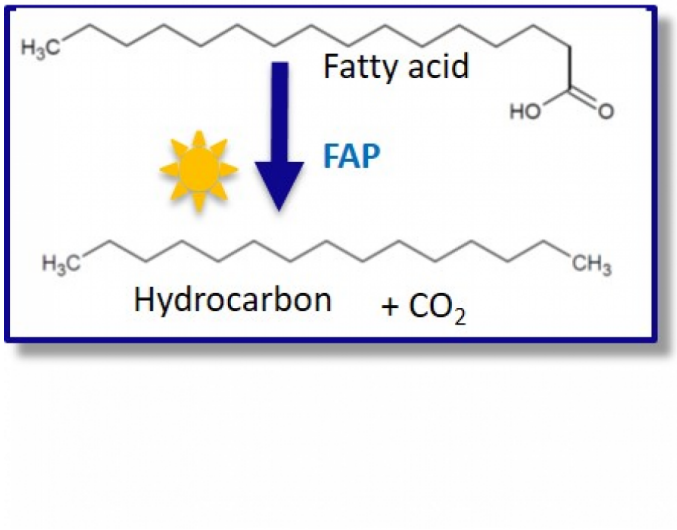

FIGURE 1

Figure 1

Reaction catalyzed by Fatty Acid Photodecarbxylase

FIGURE 2

KEYWORDS

Hydrocarbons | Fatty acids | Photoenzymes | Decarboxylation

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