DISSECTING POLYUNSATURATED FATTY ACID SYNTHASES FOR PRODUCT PROFILE CONTROL

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Polyunsaturated fatty acids (PUFAs) such as docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA), and arachidonic acid (ARA) are essential fatty acids for humans and are ingested from fish oils. Because of increasing demand, however, fermentative processes using microalgae, yeasts, and fungi have been developed to produce DHA, EPA, and ARA, respectively. PUFAs are biosynthesized by either desaturases/elongases from oleic acid or PUFA synthases from acetyl units. PUFA synthases are composed of three to four subunits and each create a specific PUFA without undesirable byproducts even though the multiple catalytic domains in each huge subunit are very similar. In this study, we carefully dissected these PUFA synthases by in vivo and in vitro experiments and elucidated how the enzymes control PUFA profiles (Figure 1) [1]. Moreover, for the first time, we converted a practical microalgal DHA synthase into an EPA synthase based on the obtained results [2].

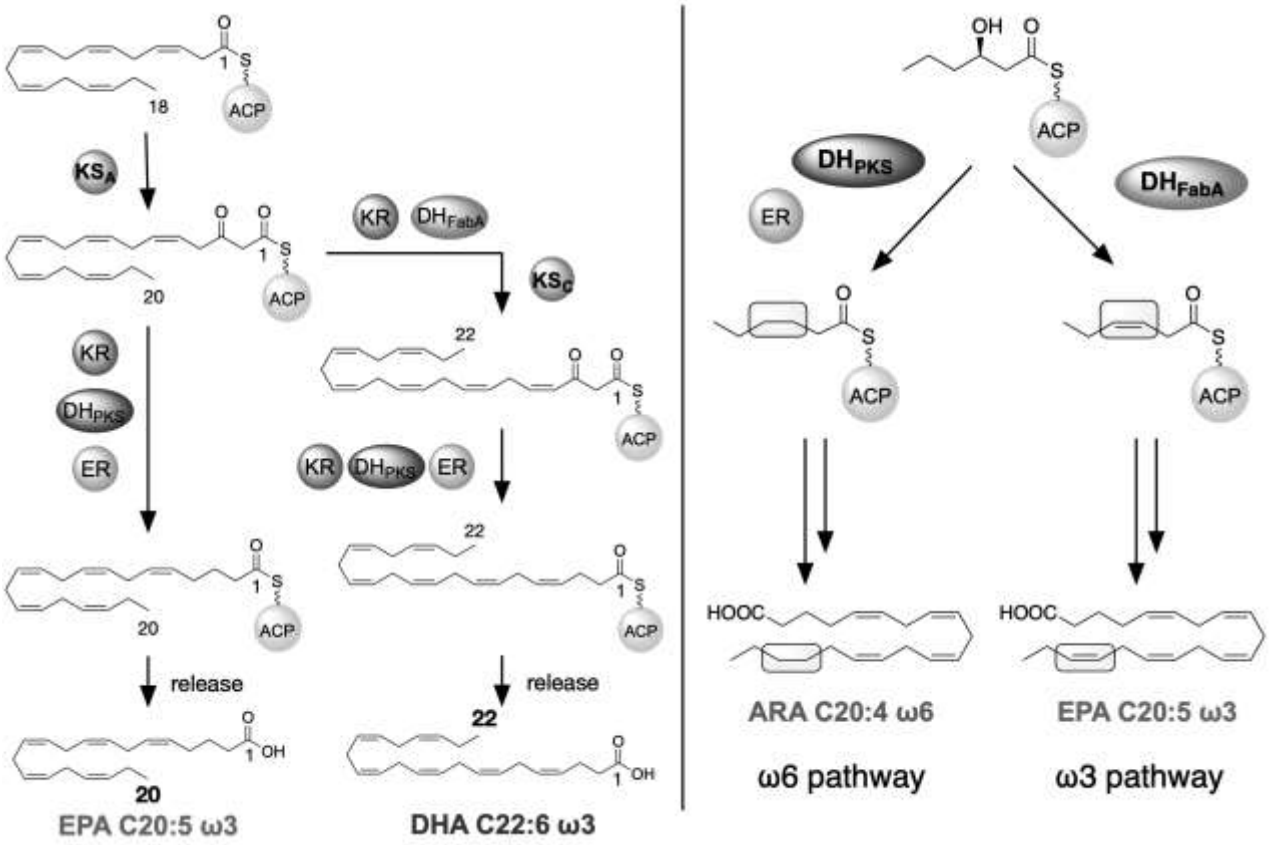

Figure 1 Control mechanism for carbon chain length (left) and first cis double bond formation (right) in PUFA synthases.

References
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