

Generation of ribozymes that catalyze fatty acid biosynthesis and toward RNA-based life

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【 Outline of survey 】

All modern living cells have membranes, and the activities of life were maintained within the membranes. Even in the RNA world, the most plausible hypothesis of the origin of life, fatty acids or similar materials could most likely form membranes and compartmentalize various RNA molecules that played critical roles in catalyzing biochemical reactions. Thus, fatty acids are believed to be one of the key components that have led the RNA world to life. This project attempts to artificially evolve four kinds of ribozymes (RNA catalysts) capable of carrying out the respective steps of fatty acid biosynthesis. Our ultimate goal is to aim at performing the biosynthetic steps of fatty acids in continuous manner by the catalytic system consisting of multi-ribozymes.

【 Expected results 】

We expect that this project will elicit the catalytic abilities which RNA molecules intrinsically have, and demonstrate multi-functions of ribozymes as catalysts. Our successful achievement of this project will provide not only the first demonstration of a complicated biosynthesis of biological molecules but also a large step toward the creation of RNA-based life.

【 References by the principal researcher 】

S. Tsukiji, S. Pattnaik, H. Suga* " Reduction of an aldehyde by a NADH/Zn²⁺-dependent redox active ribozyme ", *J. Am. Chem. Soc.* **2004** *126*, 5044-5055.

S. Tsukiji, S. Pattnaik, H. Suga* " An alcohol dehydrogenase ribozyme ", *Nature Struct. Biol.* **2003** *10*, 713-717.

【 Term of project 】 F Y 2004 - 2008

【 Budget allocation 】 86,200,000 yen

【 Homepage address 】 http://www.chembio.t.u-tokyo.ac.jp/chembio/lab_30.html