

【Grant-in-Aid for Scientific Research(S)】

Integrated Science and Innovative Science (New multidisciplinary fields)



Title of Project : Design and construction of new systems for regulating human cell fate

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Research Area : Chemical Biology

Keyword : RNA, protein, synthetic biology

【Purpose and Background of the Research】

Numerous numbers of DNA, RNA and protein molecules have been investigated at molecular level, starting from late 20th century till now. Moreover, the relationships between their intermolecular interactions and the functions have been revealed at atomic level on the basis of their 3D structures.

The accumulation of the data can be utilized as new tools for solving medical, food and energy problems in future. Along this line of thoughts, we would like to develop a new field in synthetic biology to contribute to medical engineering and other relevant fields by employing newly designed RNP (RNA-protein complex) containing naturally occurring tertiary interactions.

【Research Methods】

Two projects will be performed during the term of period.

Theme 1): Development of new RNP switches, which can be turned-on or -off in the presence of a marker protein expressed in cancer cells, for regulating human cell fate.

Theme 2): Multifunctional RNP will be constructed for detecting human cancer cells specifically and sensitively. After the establishment of the system, it will be employed to regulate signal transduction cascades connected to the cell surface receptors.

【Expected Research Achievements and Scientific Significance】

Establishment of new methods for detecting and determining human cell fate will be expected.

The methods developed in the projects will be applicable not only for human cell but also for any other living organisms, because the materials used in the system are RNA and protein that are produced in any cell.

In addition, the RNP engineering employed in the projects can be applicable in a broad range of biological, medical and nanobiological studies.

【Publications Relevant to the Project】

- Ohno H, Kobayashi T, Kabata R, Endo K, Iwasa T, Yoshimura SH, Takeyasu K, Inoue T, Saito H. Synthetic RNA-protein complex shaped like an equilateral triangle. Nature Nanotechnology, 6, 116-20. (2011)
- Saito H, Fujita Y, Kashida S, Hayashi K, Inoue T. Synthetic human cell fate regulation by protein-driven RNA switches. Nature Communications, 2,160- (2011)
- Hirohide Saito, Yoshihiko Fujita, Karin Hayashi, Rie Furushima, and Tan Inoue Synthetic Translational Regulation by an L7Ae-Kink-turn RNP Switch. Nature Chemical Biology, 6,71-78 (2010)

【Term of Project】 FY2011-2014

【Budget Allocation】 85,300 Thousand Yen

【Homepage Address and Other Contact Information】

<http://kuchem.kyoto-u.ac.jp/seika/index.html>