【Integrated Science and Innovative Science（New multidisciplinary fields）】

Fathoming the evolution of gene regulation through an 'arms race' between transposons and Argonautes

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【Outline of survey】

Transposable elements (TEs) are powerful mutagenic agents responsible for generating variation in the host genome. As TEs can be overtly deleterious, a variety of different mechanisms have evolved to keep their activities in check. Recent evidence has linked RNA silencing with inhibition of expression and transposition of TEs. RNA silencing is an evolutionarily conserved mechanism in which small RNAs trigger various forms of sequence specific gene silencing by guiding Argonautes to target RNAs via base-pairing. It is becoming increasingly clear that the "arms race" between TEs and hosts leads to positive selection for cellular defense mechanisms, part of which are co-opted for evolving new regulatory circuits, thus enabling the integration and networking of complex suites of gene activity. Using a combination of biochemistry and genetics, we will seek to fill gaps in our understanding of the biochemical events that transpire in this "arms race", which has the potential to create diversification of gene expression in hosts.

【Expected results】

In the coming years, results from this project would provide clear links between TE silencing by RNA silencing pathways and regulation of the expression of specific cellular genes. Recent studies have shown that RNA silencing is implicated in human disease such as fragile X syndrome. Thus our studies would also provide links between RNA silencing and human disease.

【References by the principal investigator】

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【Term of project】 FY2008-2012	【Budget allocation】 **164,100,000 yen** (direct cost)

【Homepage address】 http://web.sc.itc.keio.ac.jp/dmb/sindex.html