



Title of Project : Nascent-chain biology

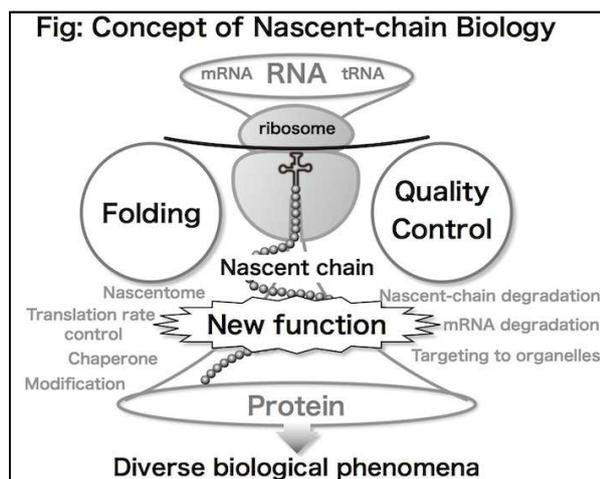
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【Purpose of the Research Project】

Life depends on correct gene expressions. Proteins do not instantaneously finish the synthesis and folding into functioning products, but experience the nascent peptidyl-tRNAs, defined as "nascent chains", during the translation. So far, nascent chains are regarded as transient intermediates during the protein synthesis. However, recent advances have revealed that nascent chains are directly involved in a variety of cellular processes including self-maturation and the quality control system of protein and mRNA. In addition, the dysfunction of the maturation and the quality control system could perturb cellular homeostasis, often leading to human diseases.

The concept of nascent chains join the protein and RNA researchers to generate a new field called "Nascent-chain biology". Our project aims to understand the roles of the "nascent chains" in the gene expression and cellular homeostasis.



【Content of the Research Project】

[1: Nascent chain folding, modification and targeting]

- How do several chaperones cooperate or have distinct roles on nascent chain protein folding?
- How are disulfide bonds incorporated into the nascent chains?
- How are nascent chains inserted into organelle membranes?

[2: Translation speed control of nascent chains]

- What are the molecular mechanisms that cause the translation arrests or elongation speed controls?
- Are translation arrest sequences widespread in general?
- What are the physiological relevance of translation rate control?

[3: Quality control of nascent chains]

- What is the role of nascent chains in the mRNA quality control?
- What are the mechanisms by which nascent chains fold or are degraded?

[New approaches to investigate nascent chains]

- tRNA, mRNA ribosome profiling.
- Eukaryotic reconstituted cell-free translation system.

【Expected Research Achievements and Scientific Significance】

Since all proteins experience the nascent chains during the synthesis, the nascent chains are involved in a variety of biological phenomena. Understanding the nascent chains will contribute to elucidate the molecular mechanism of human diseases associated with the nascent chains.

【Key Words】

Nascent chain: Genetic information coded in DNA sequences is translated into the amino acid sequences of proteins in the ribosomes. During the translation process the ribosomes synthesize the proteins as the forms of peptidyl-tRNAs, which we call "nascent chains".

【Term of Project】 FY2014-2018

【Budget Allocation】 1,221,800 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.pharm.tohoku.ac.jp/nascentbiology>