FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Highly effective chemical probes and novel analyzing methods for visualization of intracellular nucleic acid behavior related to genetic disorder	
Name: Akimitsu OKAMOTO	**Institution**: The University of Tokyo

1. Background of research

All cells of our bodies have the same genome DNA, but they express different RNA and proteins depending on their roles. We require the effective chemical devices to monitor the transcription-controlling chemical reactions on DNA and the behavior of expressed RNA in cells. This is a key technology for elucidation of the mechanism of cell aging and carcinogenesis.

2. Research objectives

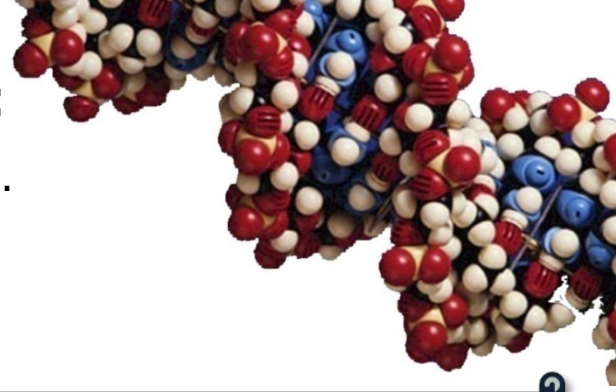
We develop the chemical devices to color only the specific DNA methylation regions and expressed RNA strands relating to genomic disorder and elucidate when, where and how they work in the cell. In addition, we search new chemistry for disease diagnosis using fluorescence colors.

3. Research characteristics (incl. originality and creativity)

We employ a multidisciplinary approach involving organic synthesis, photophysical chemistry, state-of-the-art spectroscopy, and biological assays to attain new approaches to the extremely high signal-to-noise detection of DNA methylation and RNA expression.

4. Anticipated effects and future applications of research

The results will be useful for analyses of the diseases arising from genetic disorder and applicable to cellular RNA diagnosis. They will make it possible to diagnose the disorder from a few cell samples of patients.



To strengthen DNA-RNA visualization technology:

We require new chemistries to observe, monitor, diagnose...

- Specific RNA working in a single cell
- DNA chemical modification for expression control

From "New Chemical Knowledge" to "Frontier Medicine for Healthy Life"

1 Observe DNA modification

Visualization of DNA (hydroxy)methylation using probe design and new chemical reactions

2 Monitor moving RNA

Live cell RNA imaging using probe design and new optical technologies

3 Analyze structuring RNA

RNA folding analysis using the structure-specific binding of designed probes

4 Diagnose working RNA

Simultaneous diagnosis of RNA in a cell using multicolor probes