

Visualization of Biological Functions Using Split-Reporter Reconstitution Technology

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A current focus of biological research is to quantify and image cellular processes in living subjects. To detect such cellular processes, genetically-encoded reporters have been extensively used. The most common reporters are firefly luciferase, *renilla* luciferase, green fluorescent protein (GFP) and its variants with various spectral properties. Herein, novel design of split GFP and split luciferase will be described; the principle is based on reconstitution of the split-reporter fragments when they are brought sufficiently close together [1, 2]. To demonstrate the usefulness of the split-GFP reporters, we have applied the reporters for imaging dynamics of endogenous mRNA in single living cells [3]. We demonstrated that mitochondrial mRNA is concentrated particularly on mtDNA and its movement is restricted in the mitochondria. We have used a split-luciferase reporter for noninvasive imaging of Smad1-Smad4 and Smad2-Smad4 interactions in living *Xenopus* embryo. The interactions between Smads show specific patterns of bioluminescence in early developing stages of the embryo. The split-reporter reconstitution technology is widely applicable for visualization of complex cellular processes in living cells and animals.

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