Development of riboswitch-based sensor devices for quantification of intracellular concentration of a flavonoid scaffold, naringenin

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Detection and measurement of intracellular metabolites can improve chemical production from microbial cells by facilitating screening or selection process in evolutionary engineering. Artificial riboswitches have been proved to modulate expression of genes in response to their cognate ligands. Development cycle of novel riboswitch, however, is time-consuming since it involves characterization of individual aptamer and requires tuning of dose-response curve. Here, we developed riboswitch-based sensor devices for naringenin, a scaffold molecule of diverse flavonoids, through an abridged process. Various evolutionary pathways were designed to enrich riboswitches with different quantitative behaviors from the pool of candidate constructs which incorporate artificial RNA aptamers. Evolved riboswitches exhibited naringenin-dependent increase of sGFP expression enabling quantification of intracellular level. We expect that these new riboswitches could be applied to diverse applications in metabolic engineering and investigation of flavonoid metabolism.