

Customized regulatory RNAs for controlling gene expression

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Recently the emerging synthetic biology constructs genetic circuits assembled from genetic elements to empower cells to carry out preprogrammed biological functions. To date genetic circuits have been built using transcriptional regulators to show oscillation, toggle switch, and band detection. The demand on constructing complex genetic networks to create synthetic organisms is increasing. As the scale of genetic circuits gets more sophisticated, more genetic elements are required to interconnect each element. However, the small number of available genetic regulators limits the scale and diversity of genetic circuits. In nature, small regulatory RNAs play an important role in complex genetic regulations and diversify sophisticated genetic regulations in a cell. Likewise, small regulatory RNAs are expected to provide a new mode of genetic regulation, thereby expanding genetic circuits composed of DNA and proteins developed in synthetic biology. Here we show customized small regulatory RNAs acting as a genetic regulator and can provide alternate mode of regulation. The possibility of customizing small regulatory RNAs opens a new mode of regulation in synthetic biology, and is expected to facilitate the development of a precisely regulated synthetic organism.