

RAPID system: A new emerging technology for the ribosomal synthesis of non-standard peptides and its application to drug discovery

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We have invented a highly flexible tool for tRNA acylation based on an artificial ribozyme, referred to as flexizyme. This novel tool enables us to charge virtually any desired amino and hydroxy acids onto any arbitrarily chosen tRNAs, and thus the genetic code can be completely reprogrammed. Using this tool, we are able to synthesize non-standard peptides containing various non-proteinogenic (non-natural) amino acids using the combination of the flexizyme system a reconstituted cell-free translation system, enabling us to reprogram the genetic code. Genetic code reprogramming involves the reassignment of codons from proteinogenic amino acids to non-proteinogenic ones via multiple sense suppressions. Thus, this methodology enables us to simultaneously incorporate multiple non-proteinogenic amino acids into peptides, which represents a major advantage over the previous non-sense suppression methodology. I shall present its technology development and application toward the synthesis of non-standard peptides for drug discovery.