

Cell-free synthetic biology for portable protein synthesis and nucleic acid detection

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Cell-free in vitro transcription and/or translation system enables rapid and convenient expression of RNAs or proteins. In this talk, a portable biomolecular-manufacturing platform based on the cell-free in vitro transcription and translation system will be described in the first place. This flexible system is based on reaction pellets composed of freeze-dried, cell-free transcription and translation machinery. The same concept of using freeze-dried cell-free expression platform is also employed to build programmable molecular diagnostics. In combination with toehold switches, a femtomolar or lower level of viral sample is identified in a simple, and field-ready workflow based on in vitro translation as a protein expression basis. Meanwhile, our group developed an in vitro transcription-based nucleic acid recognition method for sequence specific detection. The detection mechanisms and performance indexes will be discussed during the talk. Overall, the given cell-free in vitro transcription and/or translation demonstrate how cell-free synthetic biology can be used to develop future molecular and cellular devices for therapeutics and molecular diagnostic tools.