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# Reengineering Cell-Free Protein Synthesis as a Biosensor: Biosensing with Transcription, Translation, and Protein-folding

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## Highlights

- Cell-free Protein Synthesis-based biosensors are quick, portable, and robust
- CFPS systems biosense at transcription, translation, and protein folding levels
- CFPS-based biosensors are effective in sewage, blood, and urine

**ABSTRACT:** Biosensors hijack and reengineer biological systems for highly specific detection of diverse molecules. However, many traditional biosensor devices have slow response times and high operating costs and require specialized training and immobile lab equipment. In an effort to address these limitations, researchers have begun using cell-free protein synthesis (CFPS) systems as biosensors. CFPS-based systems provide the advantages of speed, portability, and robustness at a relatively low cost. Here, we review CFPS-based biosensors according to the three fundamental stages of CFPS: transcription, translation, and protein folding.

**Keywords:** Cell-free Protein Synthesis, Biosensor, *in vitro* protein synthesis, protein biosensor, TX-TL, CFPS

## Introduction

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