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## CRISPR/dCas9-mediated biosensor for detection of tick-borne diseases

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### Highlights

- An improved molecular diagnostics tool that utilizes CRISPR/dCas9-mediated biosensor
- It couples a nuclease inactivated Cas9 (dCas9) and single microring resonator biosensor for detection of pathogenic DNA and RNA
- Achieved single molecule sensitivity for the detection of ST (0.54 aM) and SFTS (0.63 aM)
- CRISPR/dCas9-mediated biosensor was able to clearly distinguish between scrub typhus (ST) and severe fever with thrombocytopenia syndrome (SFTS) in serum samples within 20 min.

### Abstract

Rapid and highly sensitive detection of biomolecules is greatly needed for pathogen diagnosis in clinical samples, but the method needs to be significantly improved in terms of sensitivity and specificity for actual use in clinical settings. Here, we report the development of an improved molecular diagnostics tool that utilizes CRISPR/dCas9-mediated biosensor that couples a nuclease inactivated Cas9 (dCas9) and single microring resonator biosensor, enables label-free and real-time detection of pathogenic DNA and RNA. We addressed the clinical utility of this CRISPR/dCas9-mediated biosensor in tick-borne illnesses including scrub typhus (ST) and severe fever with thrombocytopenia syndrome (SFTS), whose clinical presentations are too similar to be easily differentiated. By using CRISPR/dCas9-mediated biosensor, we achieved single molecule sensitivity for the detection of ST (0.54 aM) and SFTS (0.63 aM); this detection

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