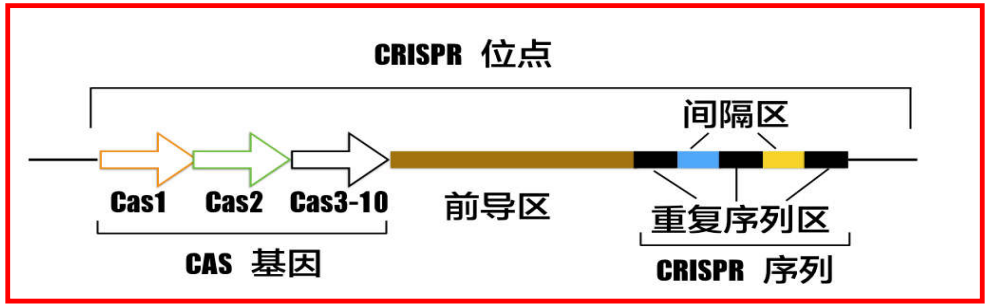
Literature Report

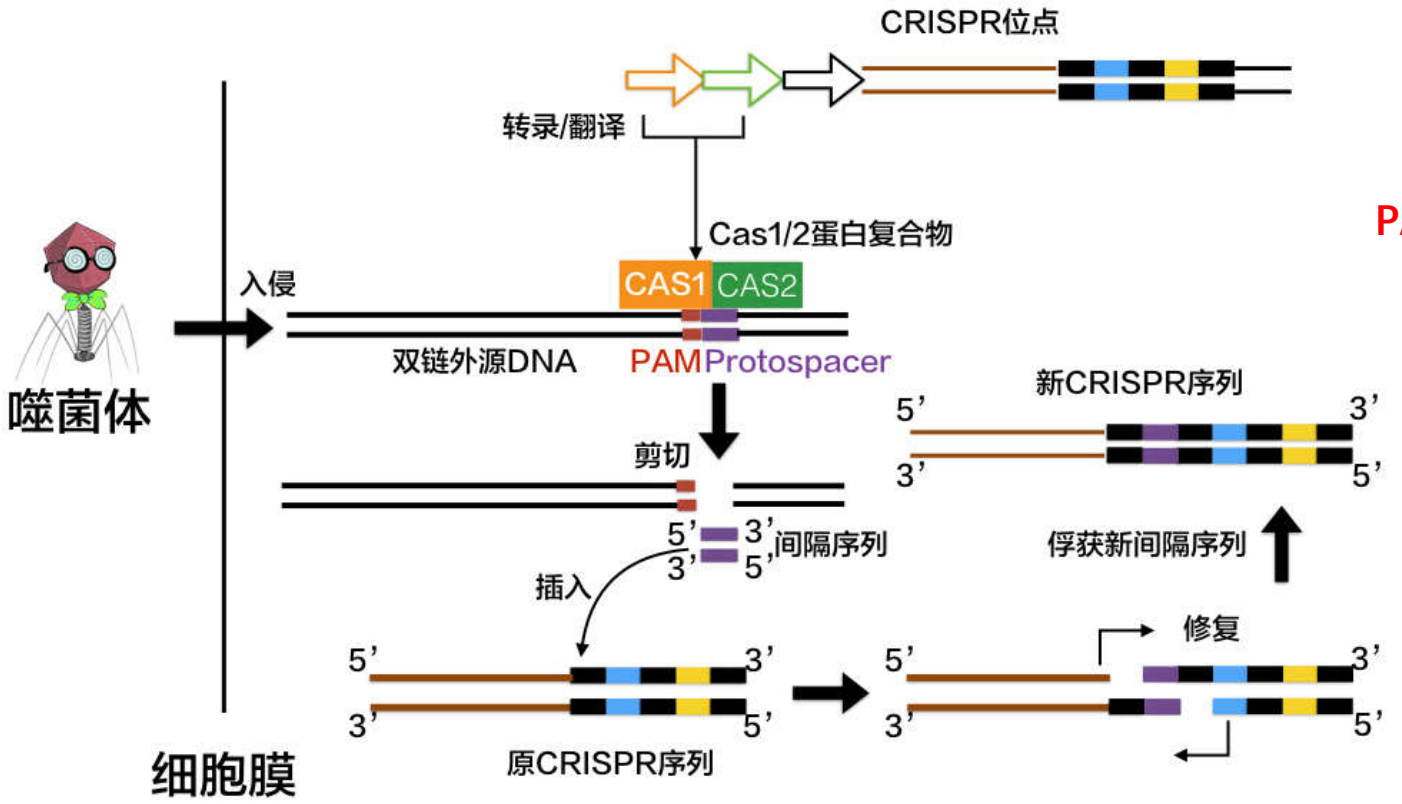
Reporter: Chunyu Yan

Date: 2021-01-14

CRISPR/Cas



第一阶段：外源DNA俘获

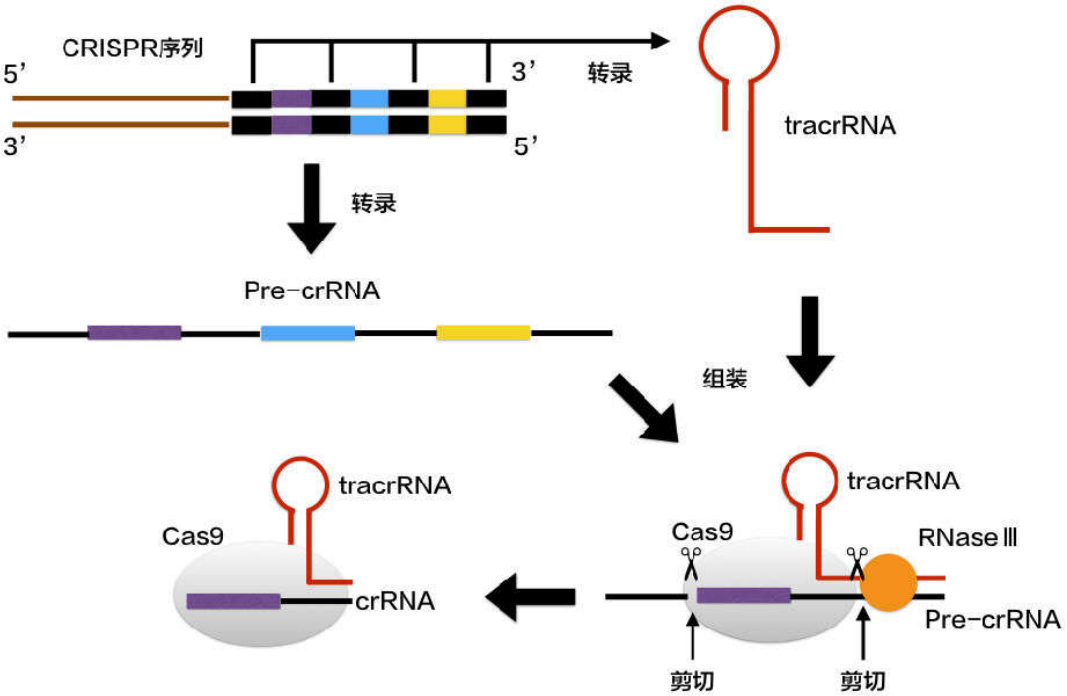


PAM位点：NGG

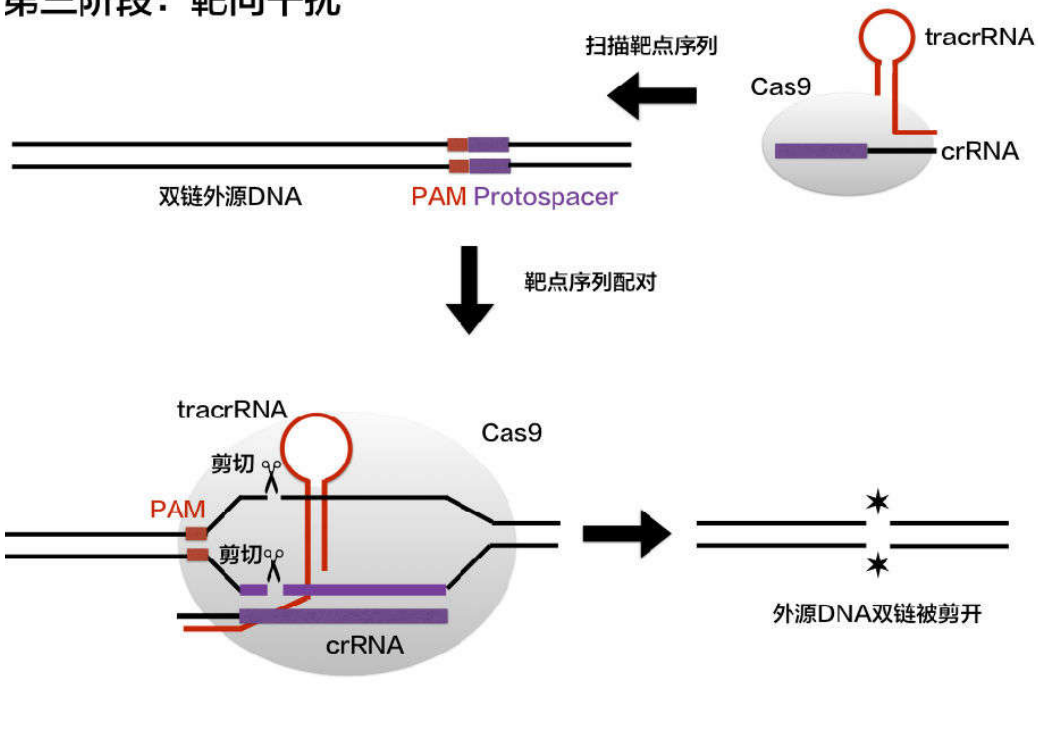
A G C T/U

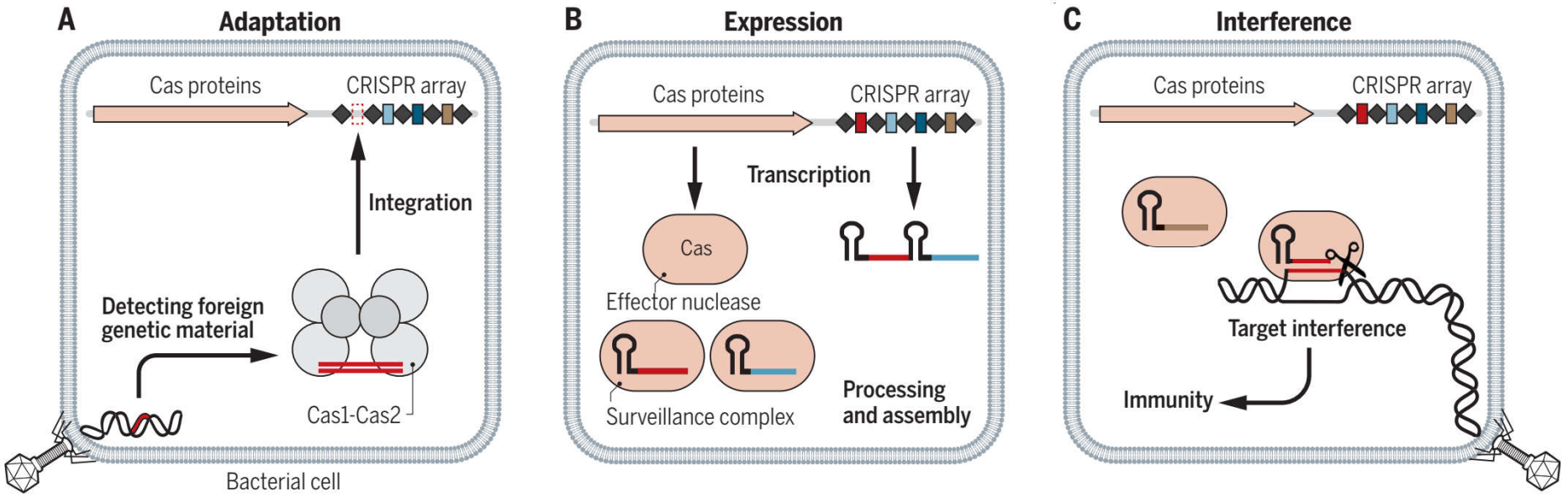
CRISPR/Cas

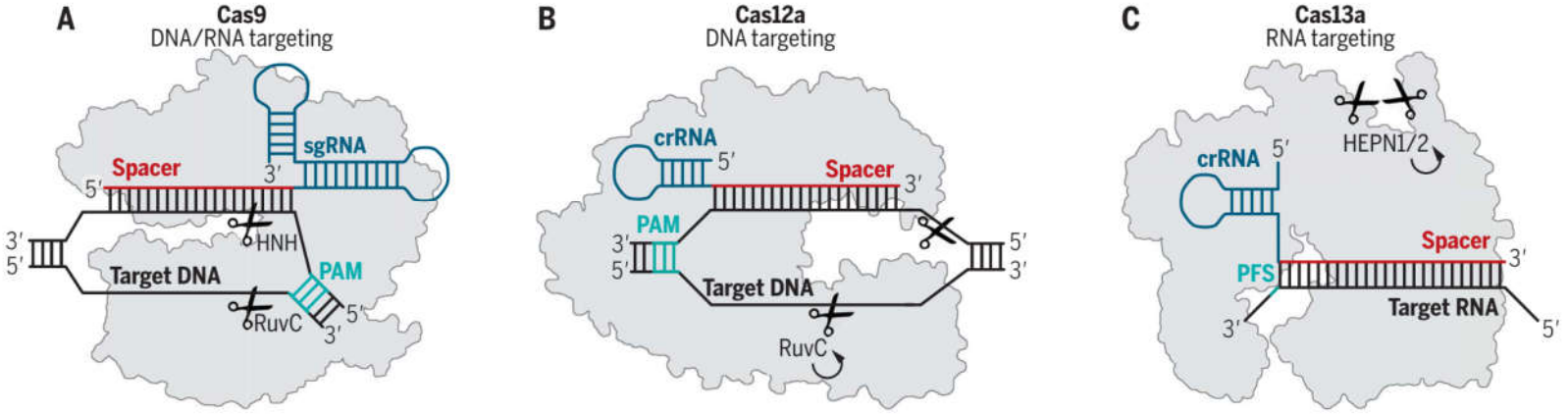
第二阶段：crRNA合成



第三阶段：靶向干扰







Science 361, 866–869 (2018)

SHERLOCK：CRISPR-Cas13a/C2C2

张锋教授团队推出新一代新冠病毒CRISPR检测技术，让即时检测更便捷！

2020-05-07 19:31

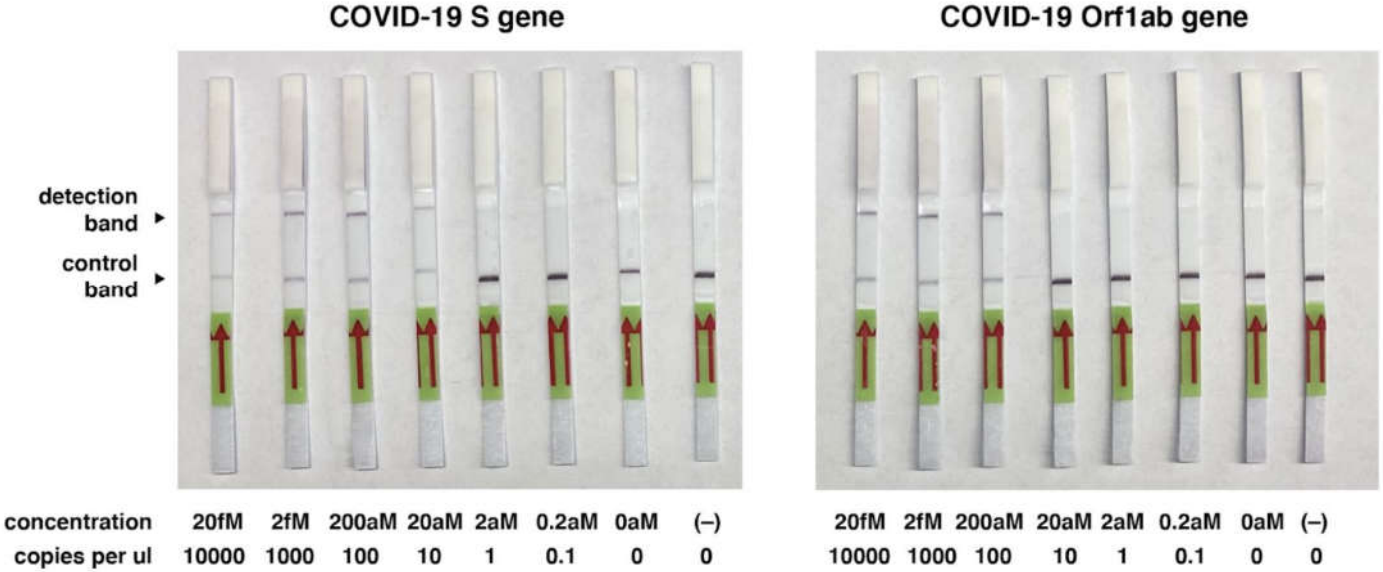
药明康德内容团队编辑

Broad研究所的著名学者张锋教授和他在Broad研究所，麻省理工学院（MIT）麦戈文脑科学研究所（McGovern Institute for Brain Research）的合作伙伴一起，公布了他们开发的新一代新冠病毒CRISPR检测技术的实验流程。今年2月，张锋教授和他的合作伙伴曾经开发出一项基于CRISPR的新冠病毒检测技术，不需要复杂的设备，三步检测仅需约1个小时，就能检查出新冠病毒RNA的存在。

CRISPR TECHNOLOGY

Nucleic acid detection with CRISPR-Cas13a/C2c2

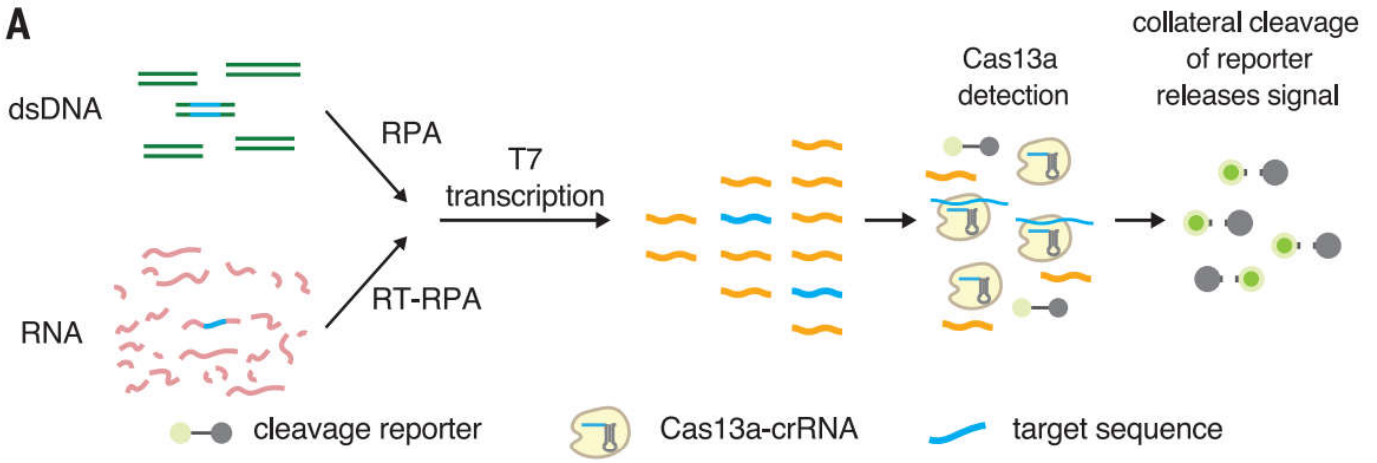
Jonathan S. Gootenberg,[1,2,3,4,5*] Omar O. Abudayyeh,[1,2,3,4,6*] Jeong Wook Lee,[7] Patrick Essletzbichler,[1,2,3,4] Aaron J. Dy,[1,4,8] Julia Joung,[1,2,3,4] Vanessa Verdine,[1,2,3,4] Nina Donghia,[7] Nichole M. Daringer,[8] Catherine A. Freije,[1,9] Cameron Myhrvold,[1,9] Roby P. Bhattacharyya,[1] Jonathan Livny,[1] Aviv Regev,[1,10] Eugene V. Koonin,[11] Deborah T. Hung,[1] Pardis C. Sabeti,[1,9,12,13] James J. Collins,[1,4,6,7,8†] Feng Zhang[1,2,3,4†]

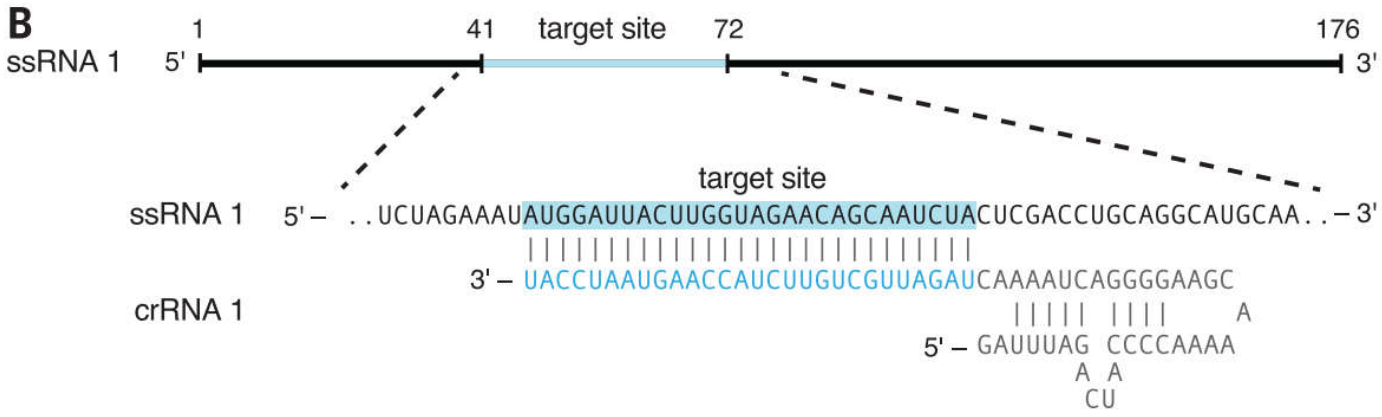


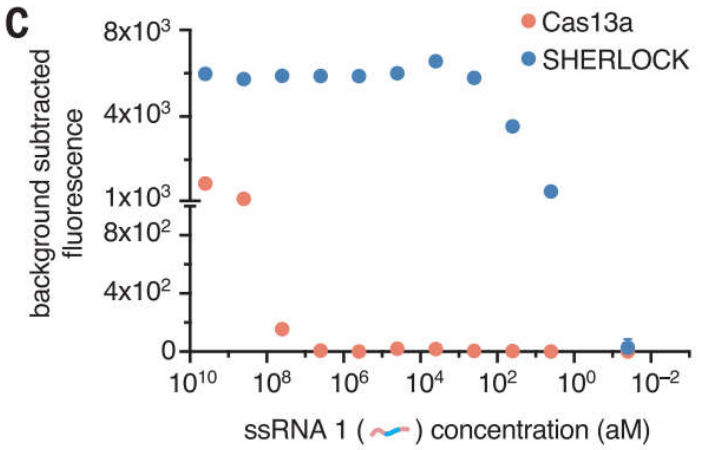
Science 356, 438–442 (2017)

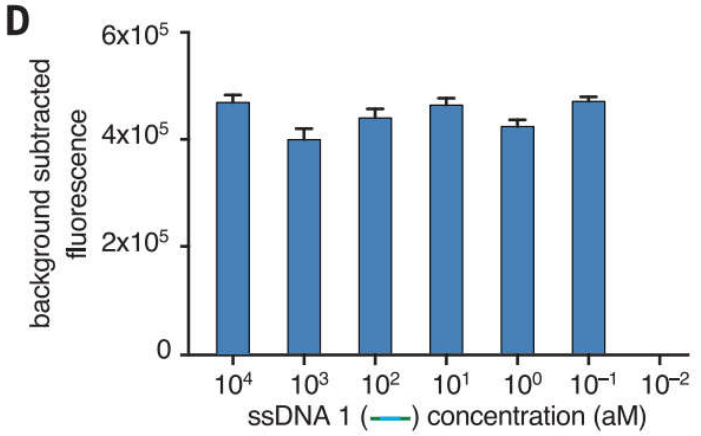
Nature Protocols. 2019,14(10):2986-3012.

Principle

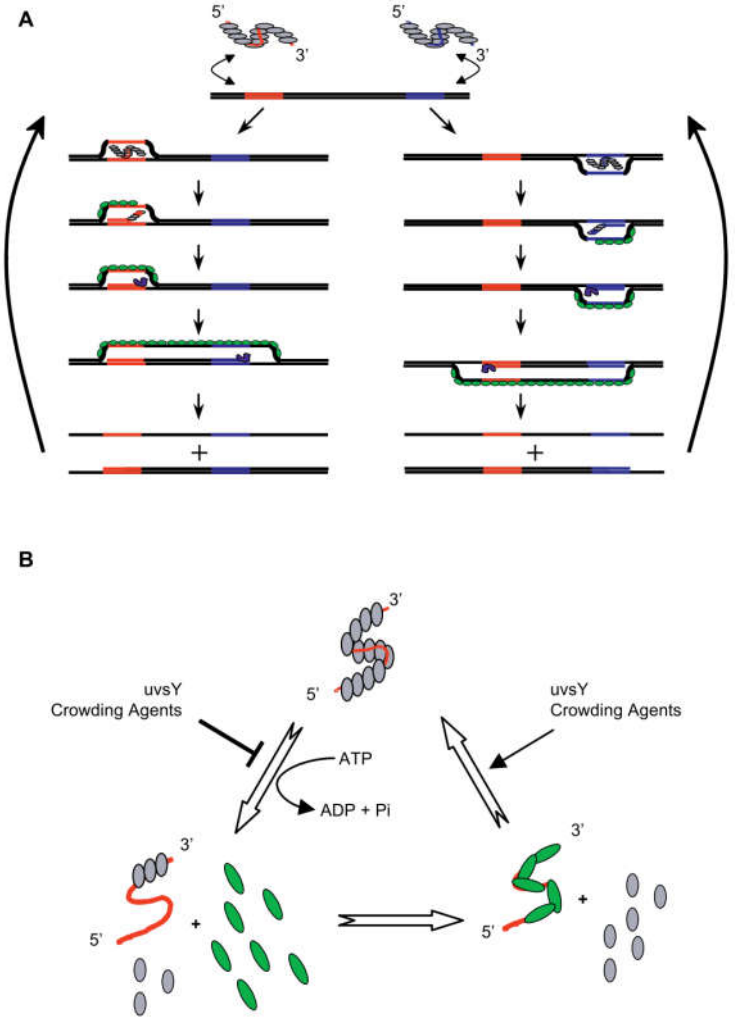

A
dsDNA
RNA
RPA
RT-RPA
T7
transcription
Cas13a
detection
collateral cleavage
of reporter
releases signal
cleavage reporter
Cas13a-crRNA
target sequence

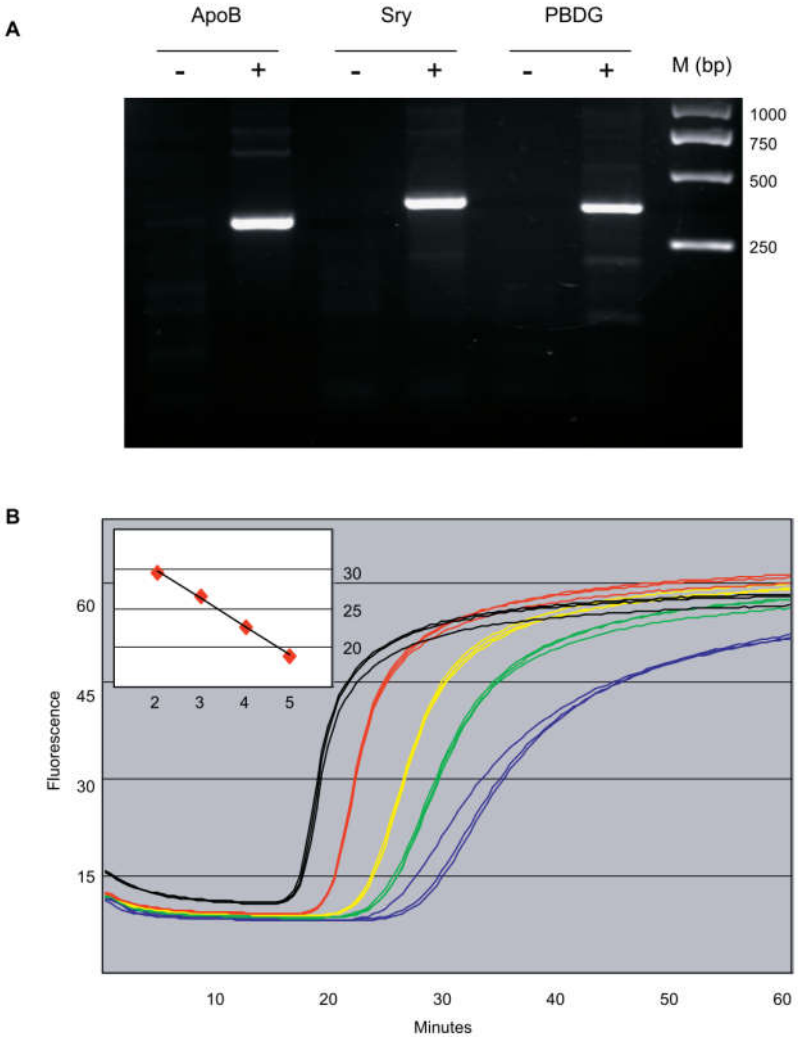

B
ssRNA 1
5'
1
41
target site
72
176
3'
target site
ssRNA 1
5' – . . UCUAGAAAUAUGGAUUACUUGGUAGAACAGCAAUCUACUCGACCUGCAGGCAUGCAA . . – 3'
3' – UACCUAAUGAACCAUCUUGUCGUUAGAUCAAAAUCAGGGGAAGC
crRNA 1
5' – GAUUUAG CCCCAAAA
A A
CU
A


C
Cas13a
SHERLOCK
background subtracted
fluorescence
8x10³
4x10³
1x10³
8x10²
4x10²
0
10¹⁰
10⁸
10⁶
10⁴
10²
10⁰
10⁻²
ssRNA 1 ( ) concentration (aM)


D
background subtracted
fluorescence
6x10⁵
4x10⁵
2x10⁵
0
10⁴
10³
10²
10¹
10⁰
10⁻¹
10⁻²
ssDNA 1 ( ) concentration (aM)

RPA——重组酶聚合酶扩增技术





RPA

反应温度：37℃

引物：一对/2条

PCR

反应温度：95℃-57℃-72℃

引物：一对/2条

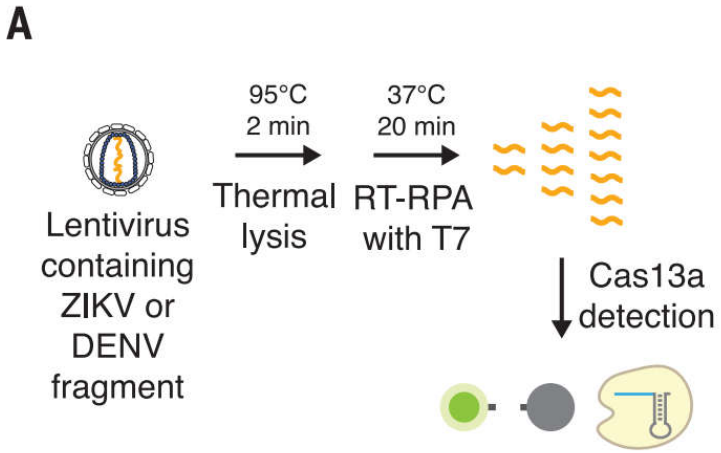
LAMP

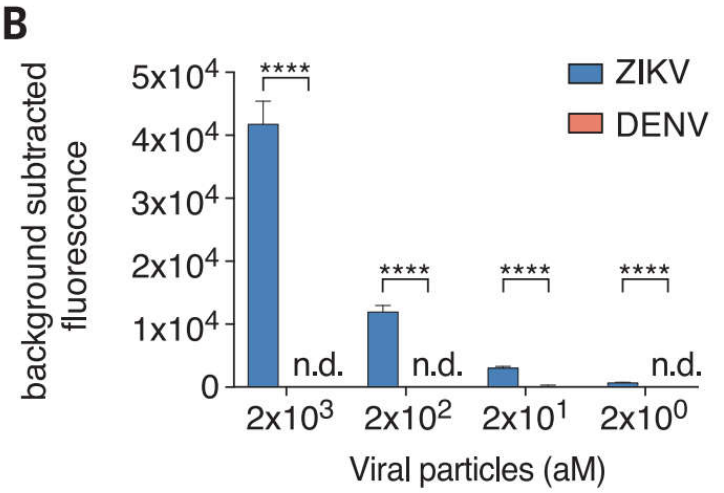
反应温度：65℃

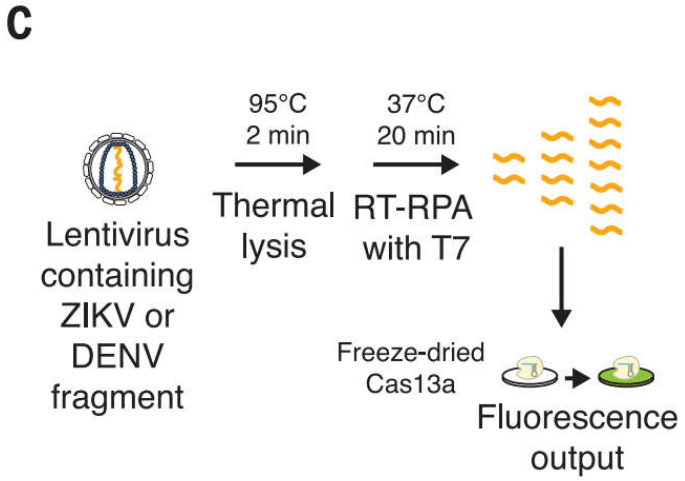
引物：四对/6条

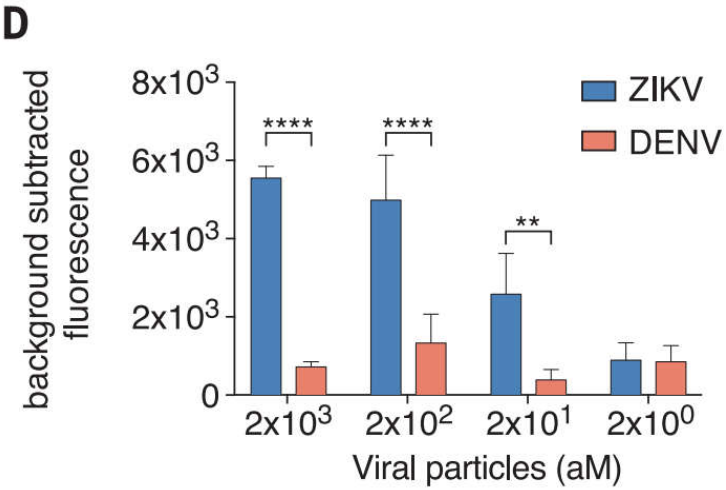
PLoS Biol 4(7): e204. 2006

Result and Discussion



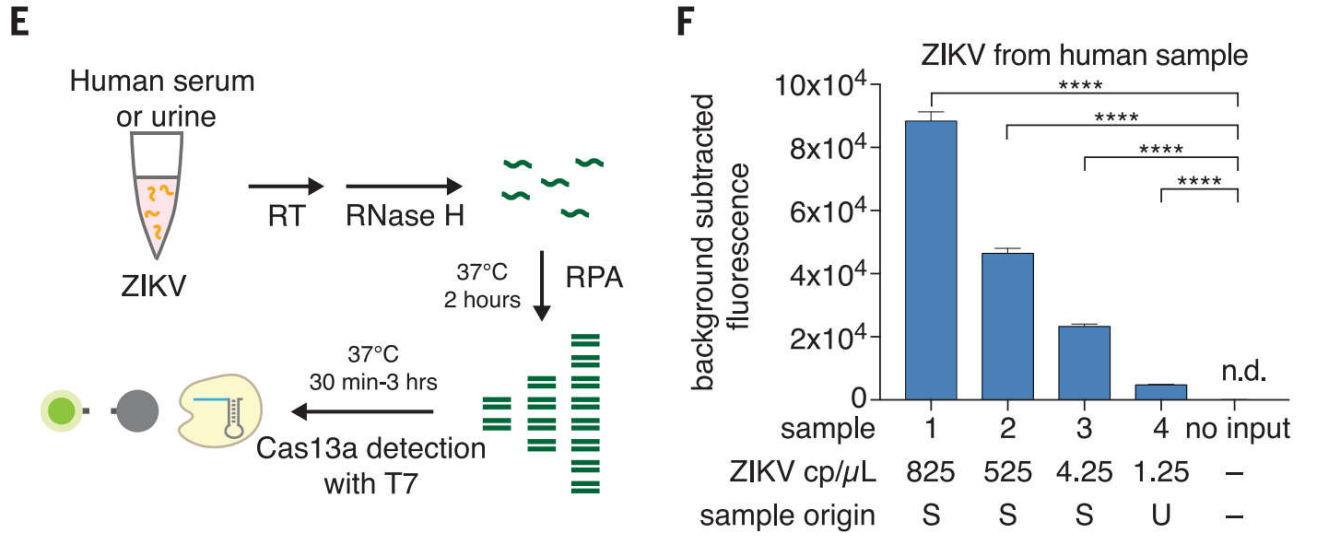


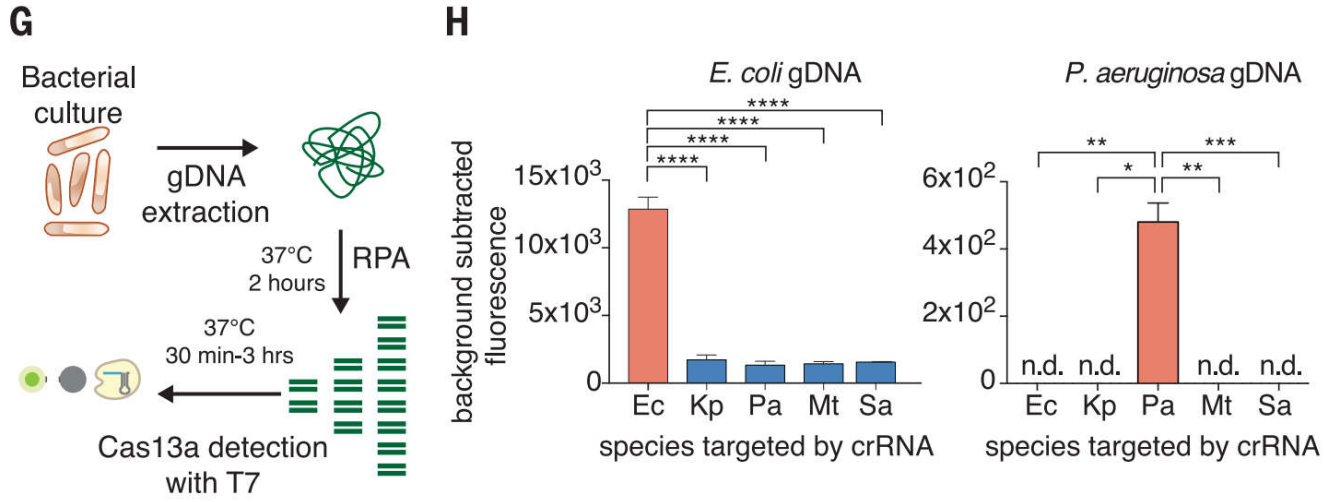




Science 356, 438–442 (2017)

Result and Discussion





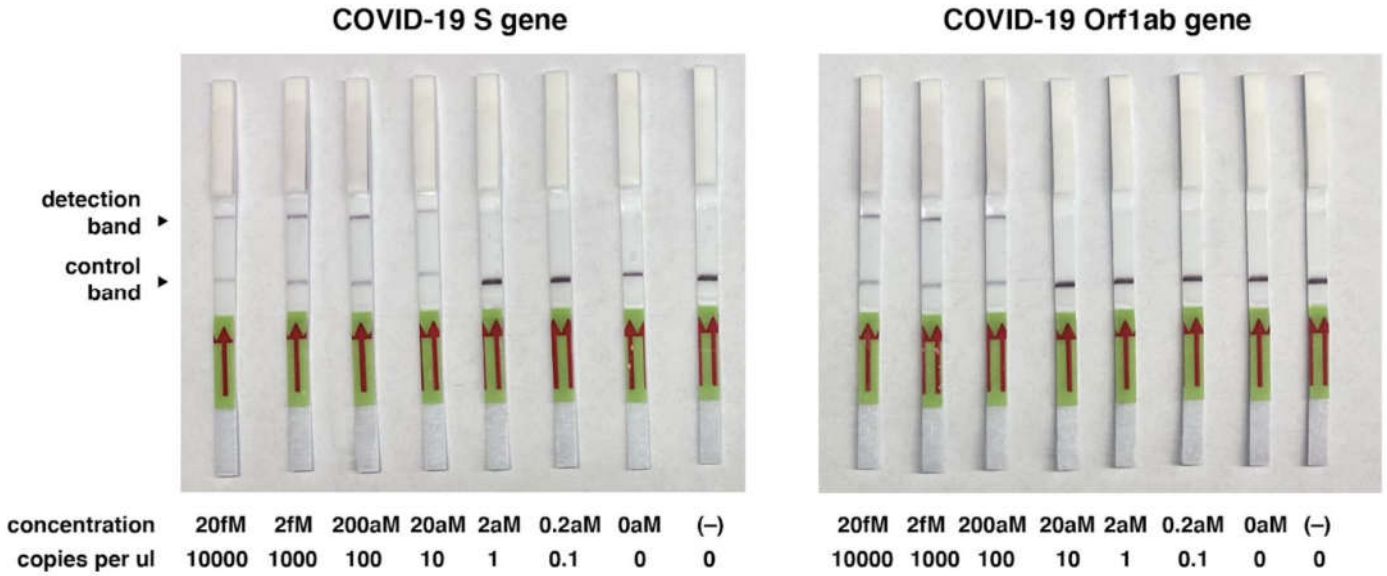
Science 356, 438–442 (2017)

Result and Discussion

A protocol for detection of COVID-19 using CRISPR diagnostics

(v.20200321)

Feng Zhang[1,2,3,4,5], Omar O. Abudayyeh[3], Jonathan S. Gootenberg[3]



Nature Protocols. 2019,14(10):2986-3012.

Perspective

逆天了！戴上口罩就能测新冠 还能随处识别病毒

2020-05-16 05:42

来源：加西周末（westcanadaweekly）

科技扭转疫情!

这个发明创造来自一个由 **哈佛大学和麻省理工学院**科学家组成的团队。这个科学家团队由合成生物学专家、麻省理工学院教授柯林斯(James J. Collins)创建。柯林斯被认为是合成生物学的先驱人物，曾在2003年获得麦克阿瑟奖。

BUSINESS INSIDER

Harvard and MIT researchers are developing a face mask that lights up when it detects the coronavirus

insider@insider.com (Aria Bendix)
May 13, 2020

Inspiration

Resource

Cell

Rapid, Low-Cost Detection of Zika Virus Using Programmable Biomolecular Components

Authors

Keith Pardee, Alexander A. Green, Melissa K. Takahashi, ..., David H. O'Connor, Lee Gehrke, James J. Collins

Correspondence

jimjc@mit.edu

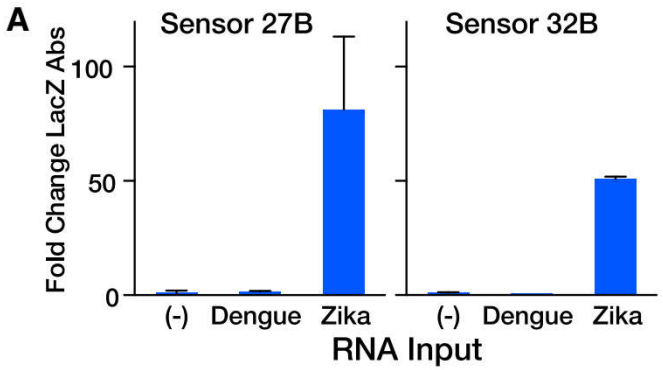
In Brief

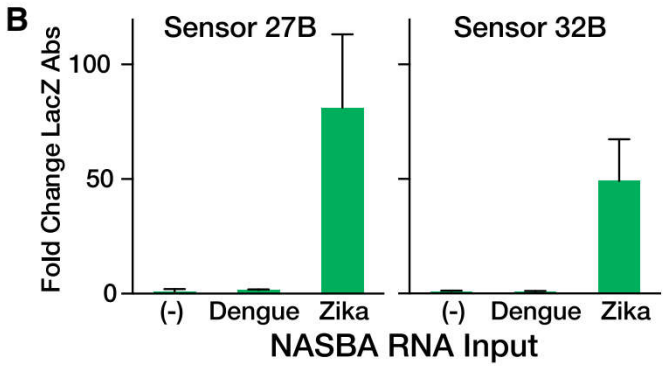
A diagnostic platform utilizing biomolecular sensors and CRISPR-based technology allows rapid, specific, and low-cost detection of the Zika virus at clinically relevant concentrations.

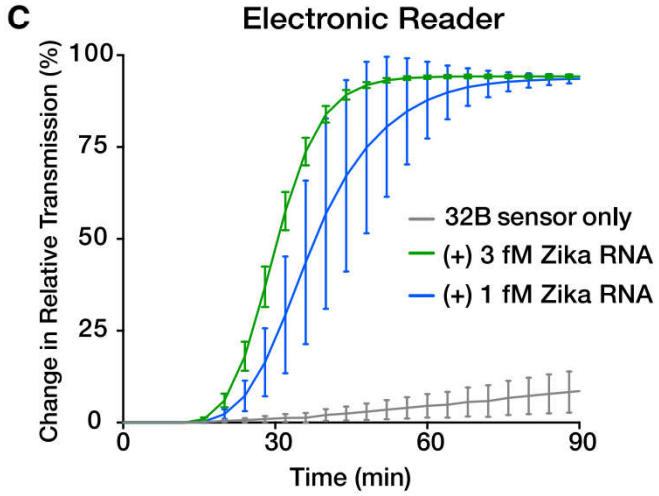
Highlights

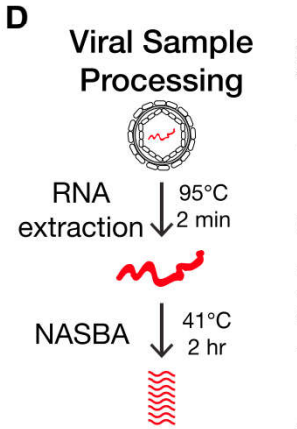
- A portable, low-cost diagnostic platform for the detection of Zika virus
- Discrimination of viral strains at single-base resolution using a CRISPR-based tool
- Low femtomolar detection of Zika virus from infected monkey plasma
- Programmable sensor development workflow for rapid responses to global epidemics

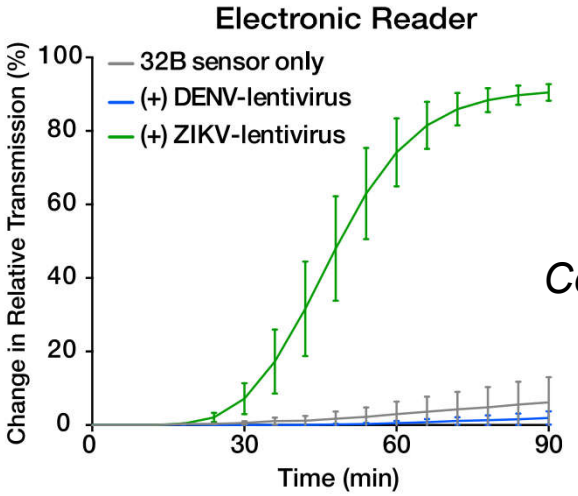
Result and Discussion





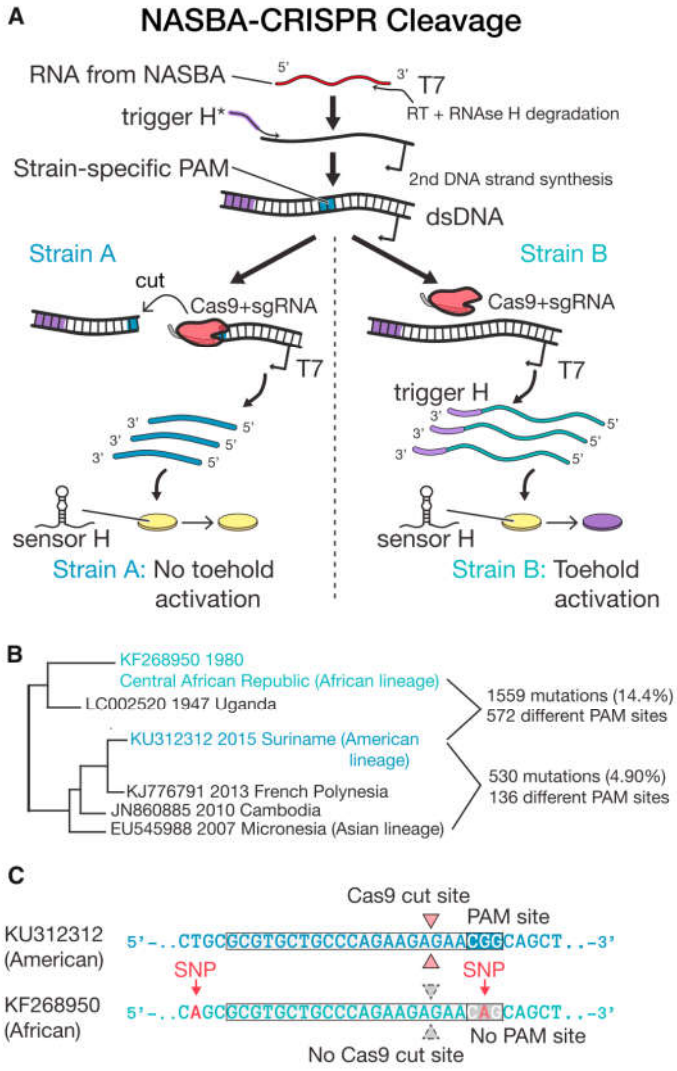


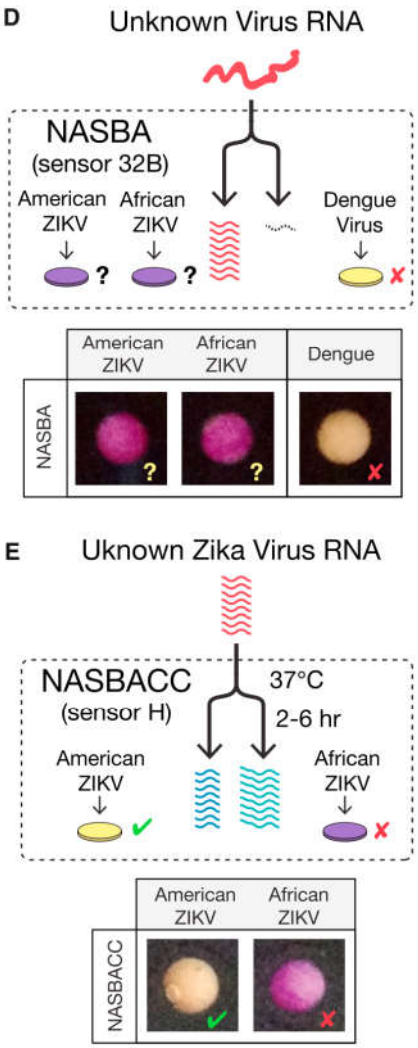


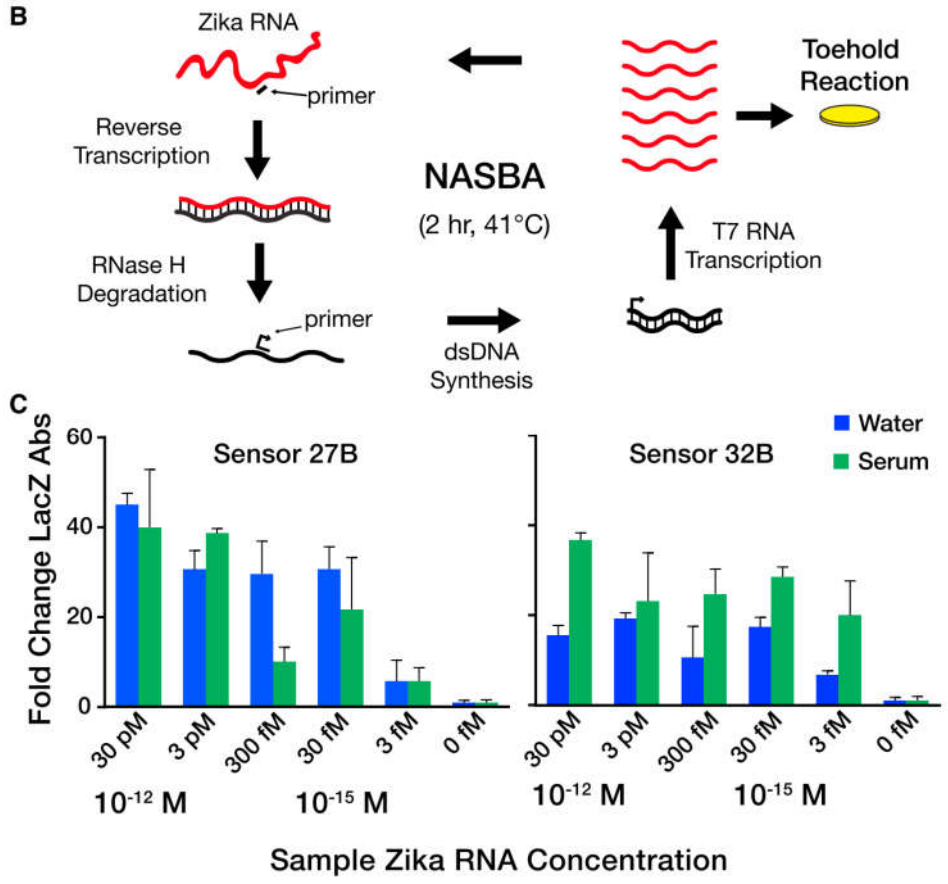


Cell 165, 1255–1266, 2016

Principle







Cell 165, 1255–1266, 2016