SAND2022-15080C

Novel Detection Of Epitopes Specific For Crispr Gene-editing Components

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Sandia National Labs

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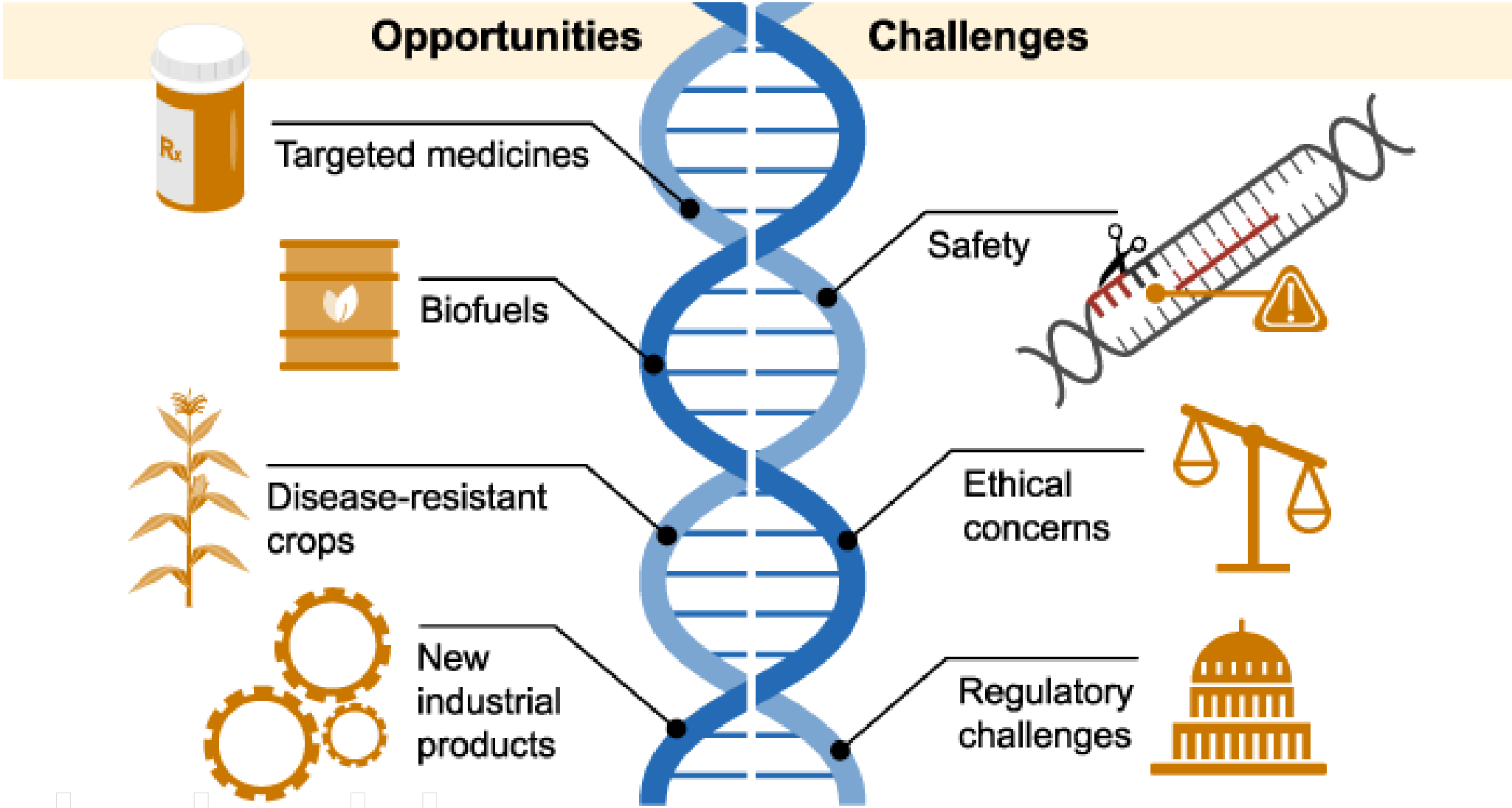
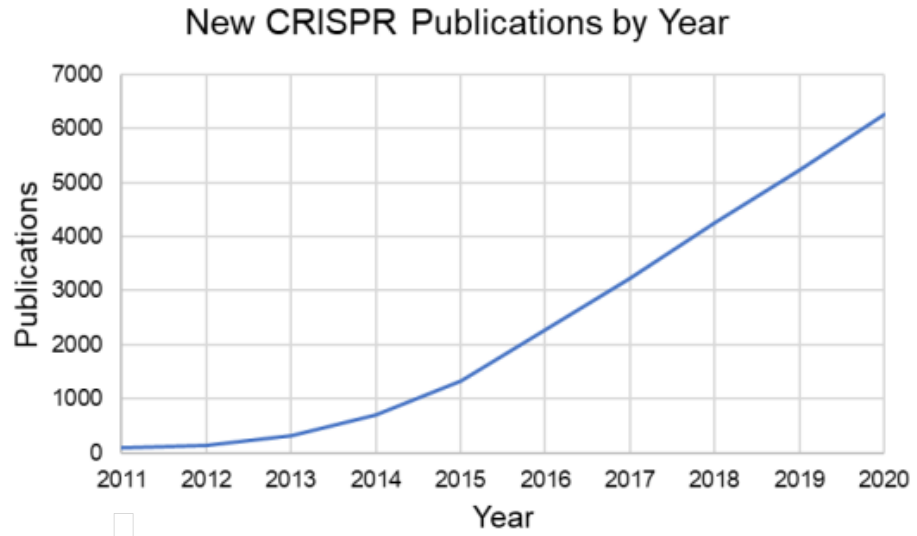
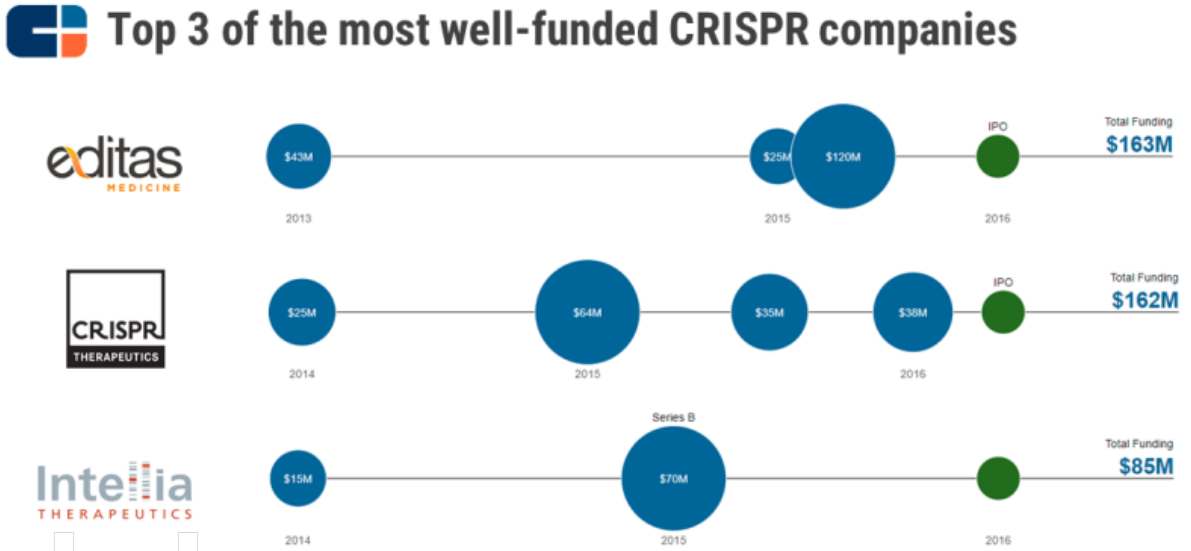
CRISPR Dual-use Concerns



Speed of Research Outpacing Safety/Surveillance



PubMed pubmed.ncbi.nlm.nih.gov

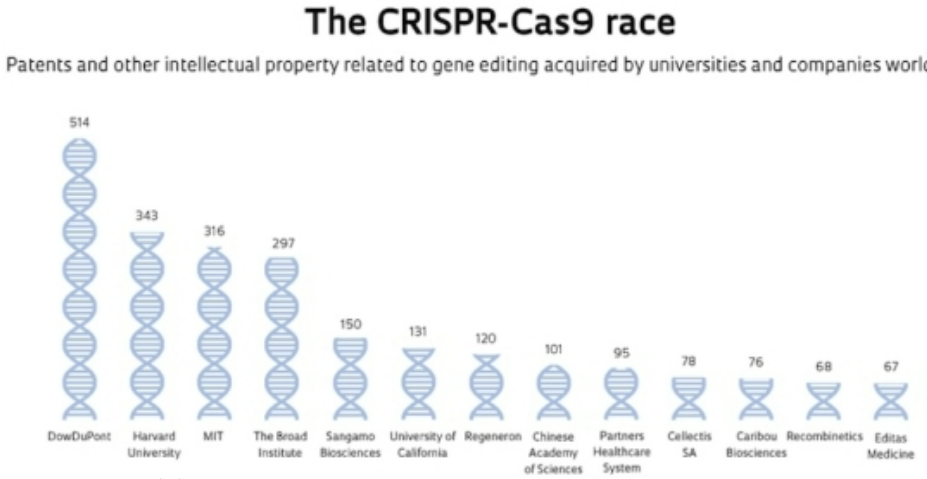


CB Insights cbinsights.com

Four U.S. CRISPR Trials Editing Human DNA to Research New Treatments

Breaking down how the gene editing technology is being used, for the first time in the United States, to treat patients with severe medical conditions

Smithsonian Magazine smithsonianmag.com



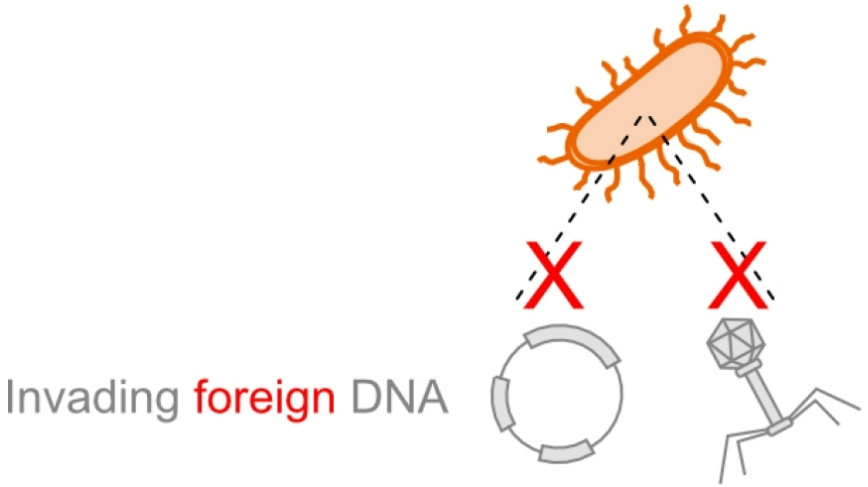
Labiotech labiotech.eu

'CRISPR babies'
He Jiankui

VOX vox.com

Bacterial CRISPR has been Coopted for Gene-editing

Natural bacterial CRISPR
Protects against foreign DNA



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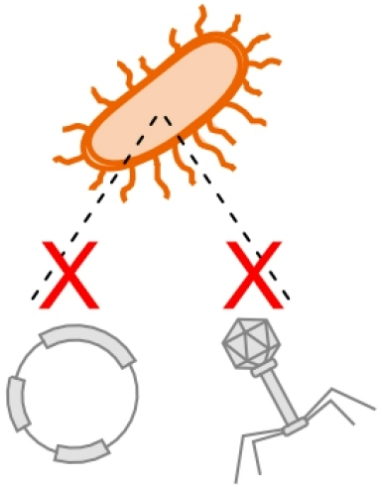
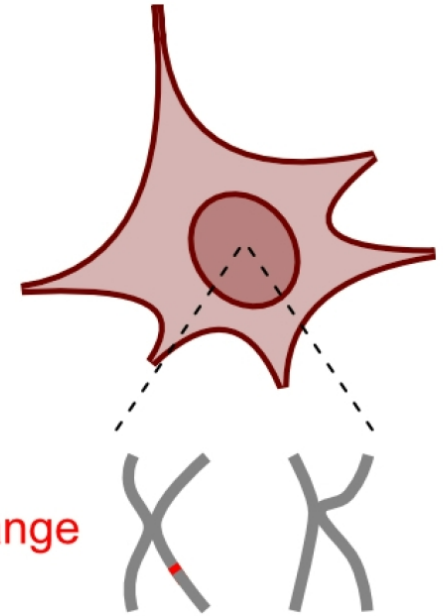


Invading foreign DNA

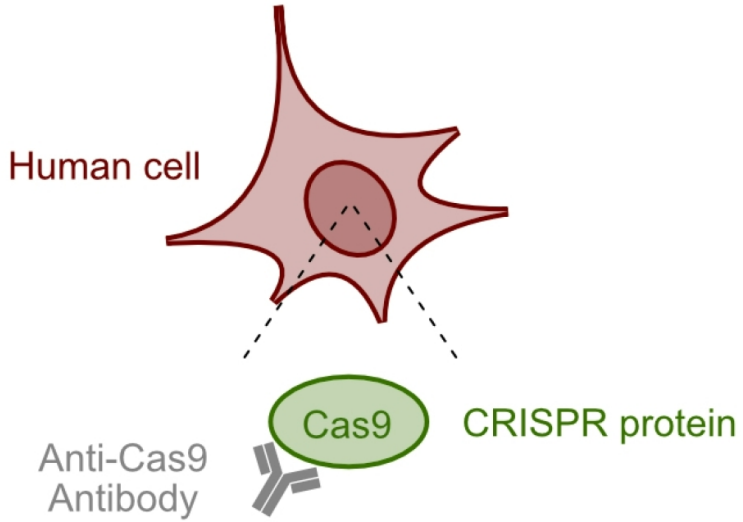
Engineered gene-editing CRISPR
Alter genomic DNA sequence



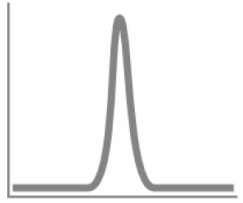
DNA sequence change

Current Detection Limitations

Scenario 1:
Human gene-editor exposure



True signal
gene-editor CRISPR



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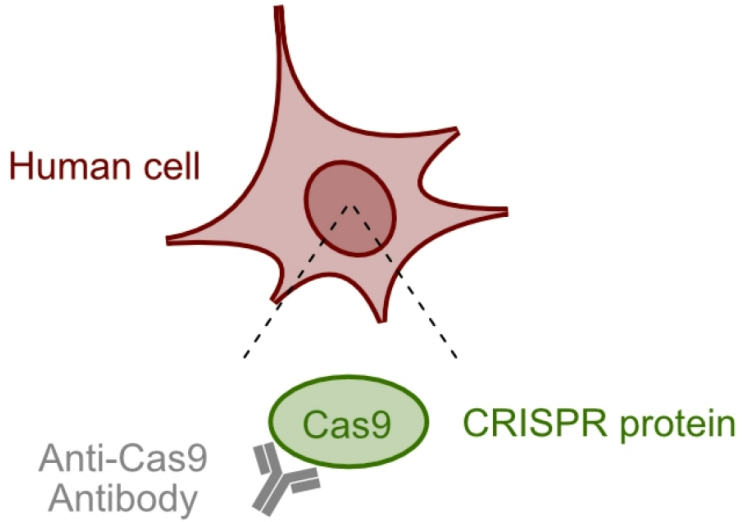
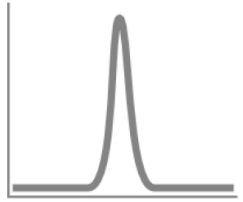
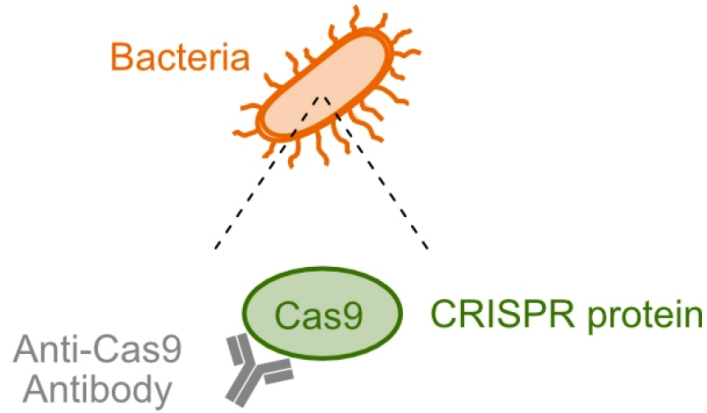


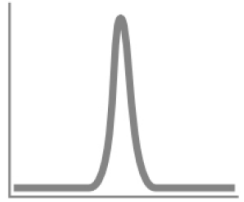
True signal
gene-editor CRISPR



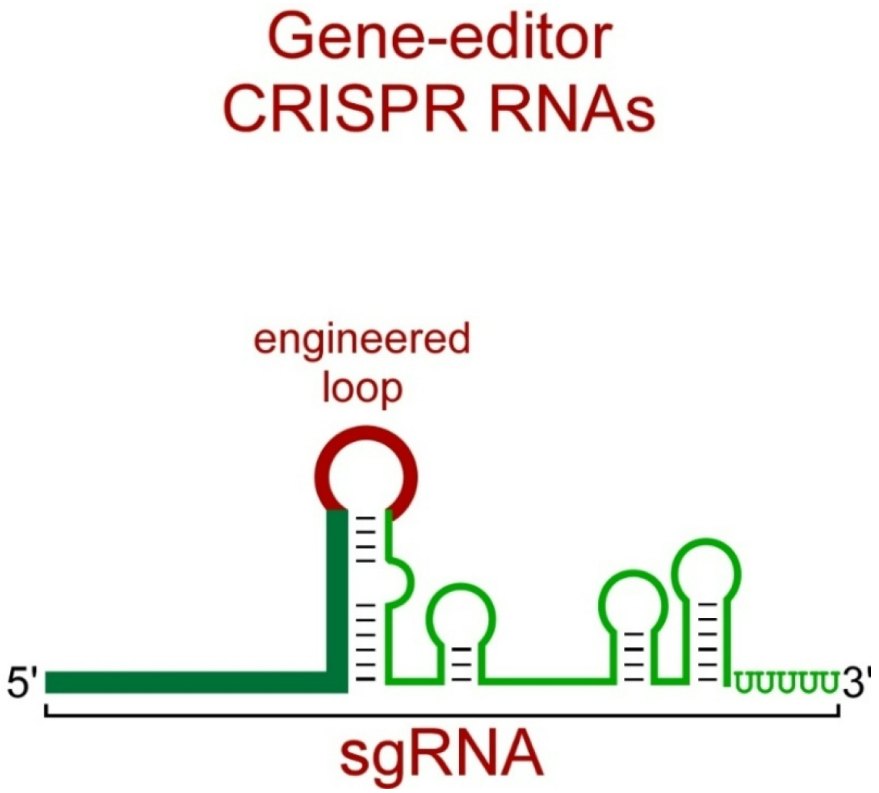
Scenario 2:
Common human pathogen infection



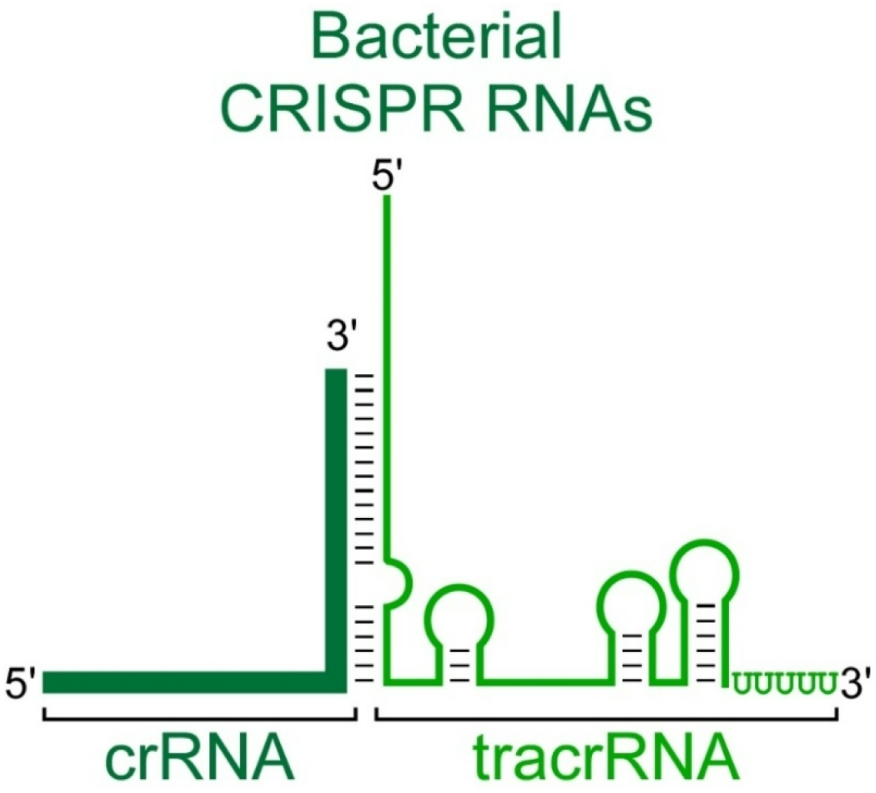
False signal
bacterial CRISPR



CRISPR RNA as a Moiety for Gene-editor Exposure

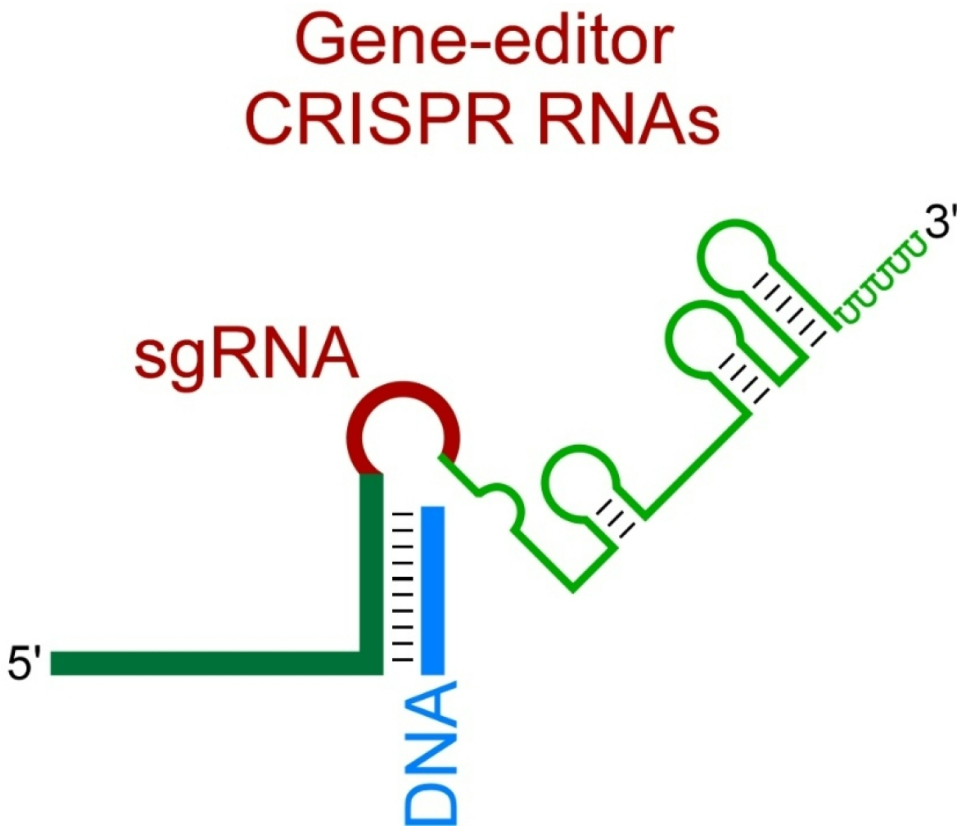


1 RNA molecule

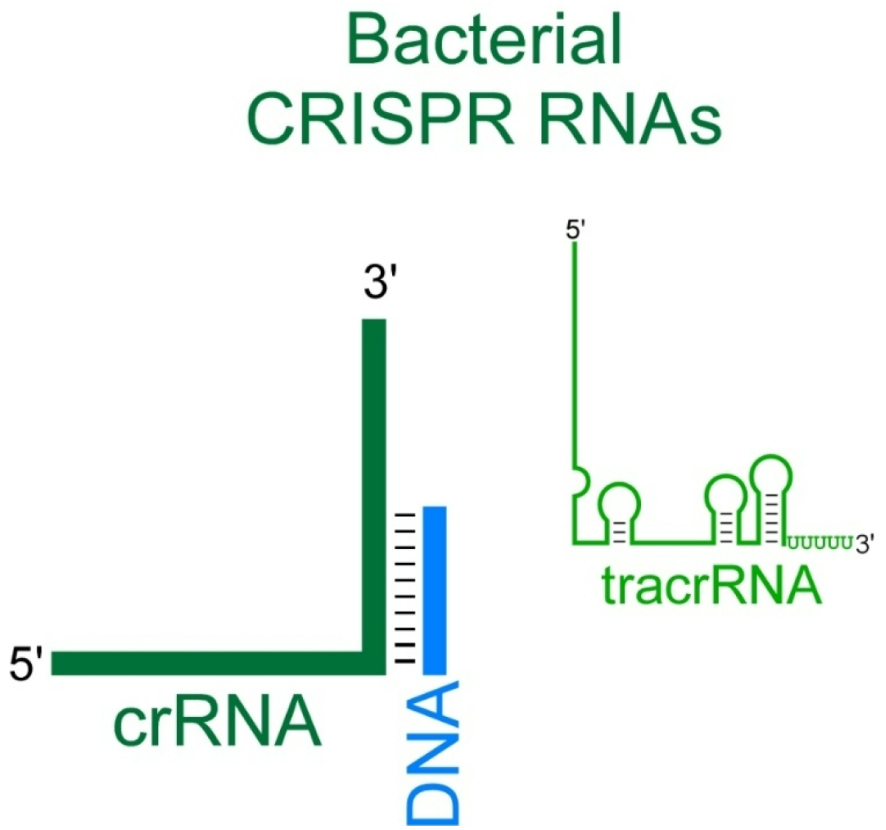


2 RNA molecules

DNA Displacement of RNA Structure



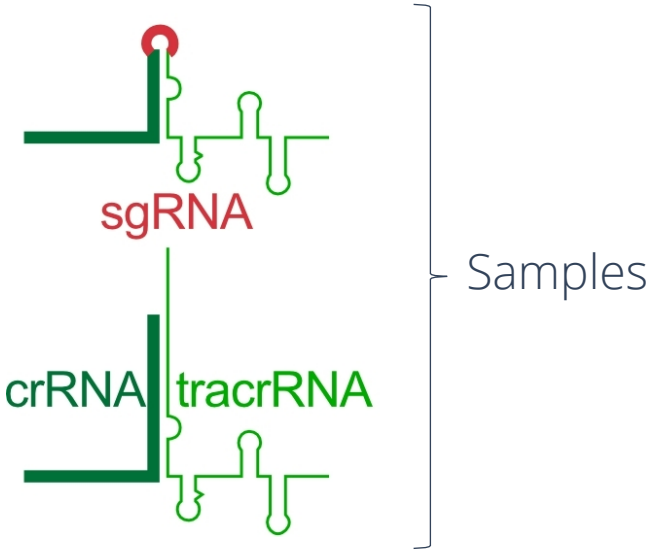
Unfold single RNA



Displace and loss of second RNA

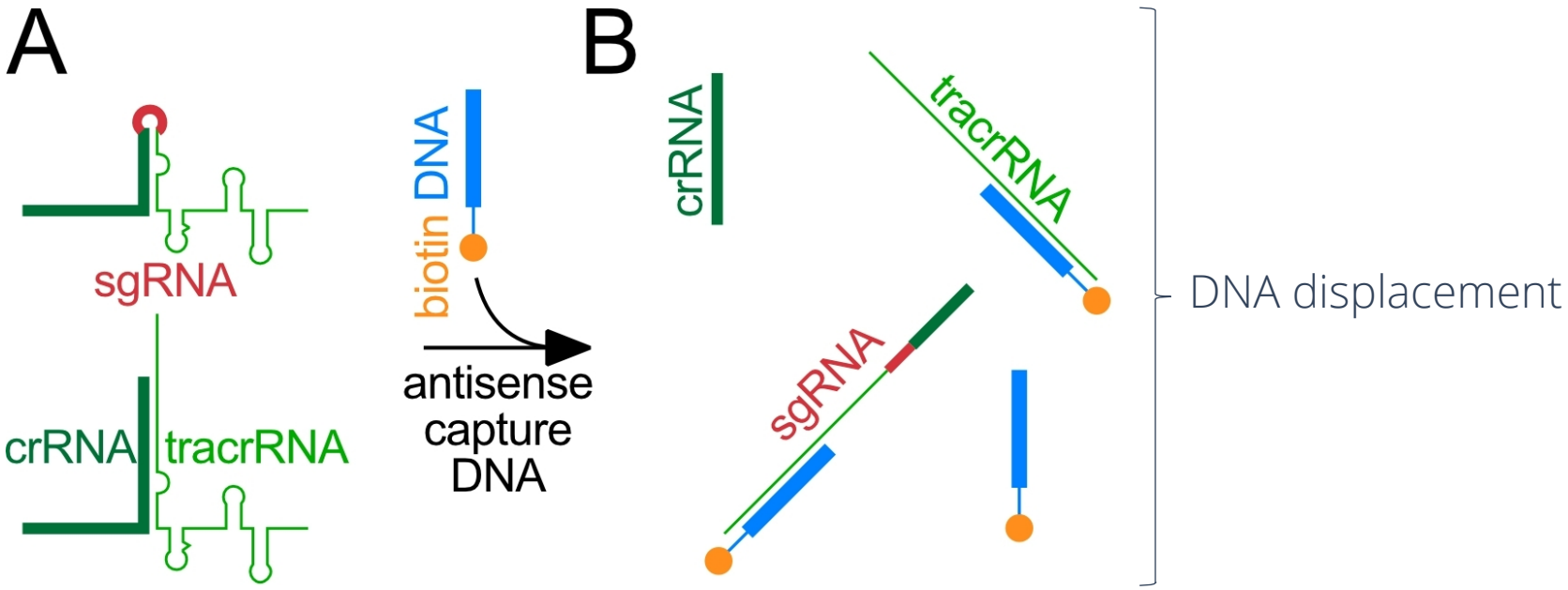
Engineered Gene-editor CRISPR Detection Assay

A

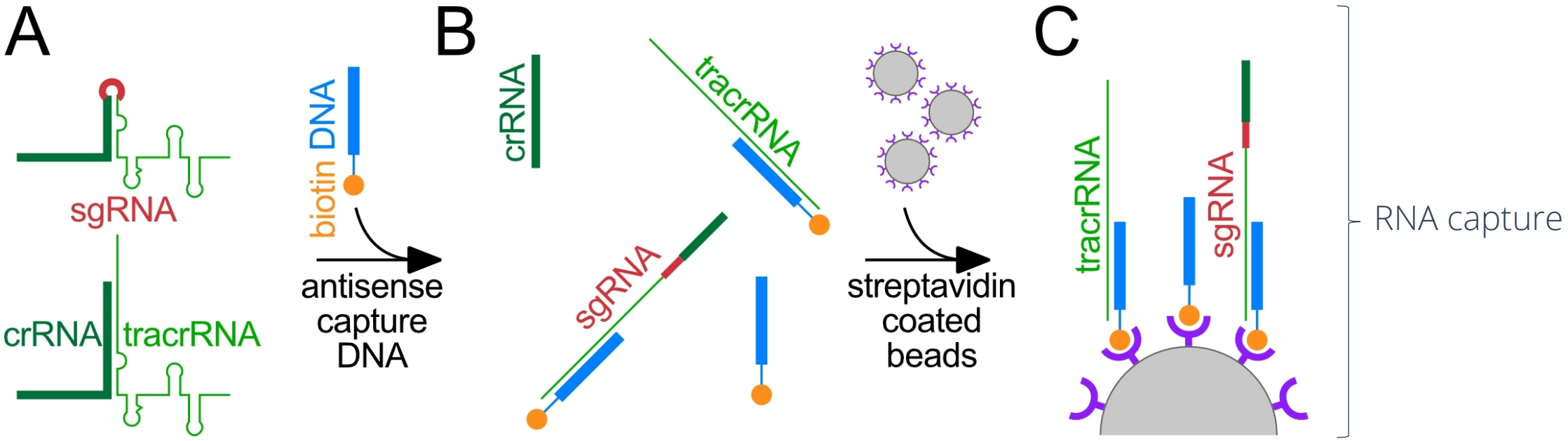


Samples

Engineered Gene-editor CRISPR Detection Assay

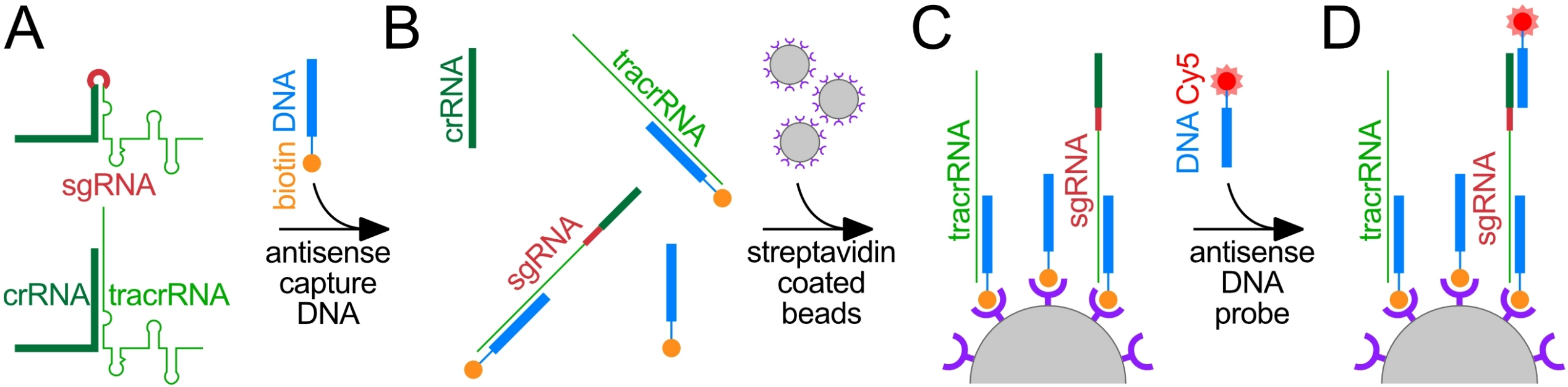


Engineered Gene-editor CRISPR Detection Assay



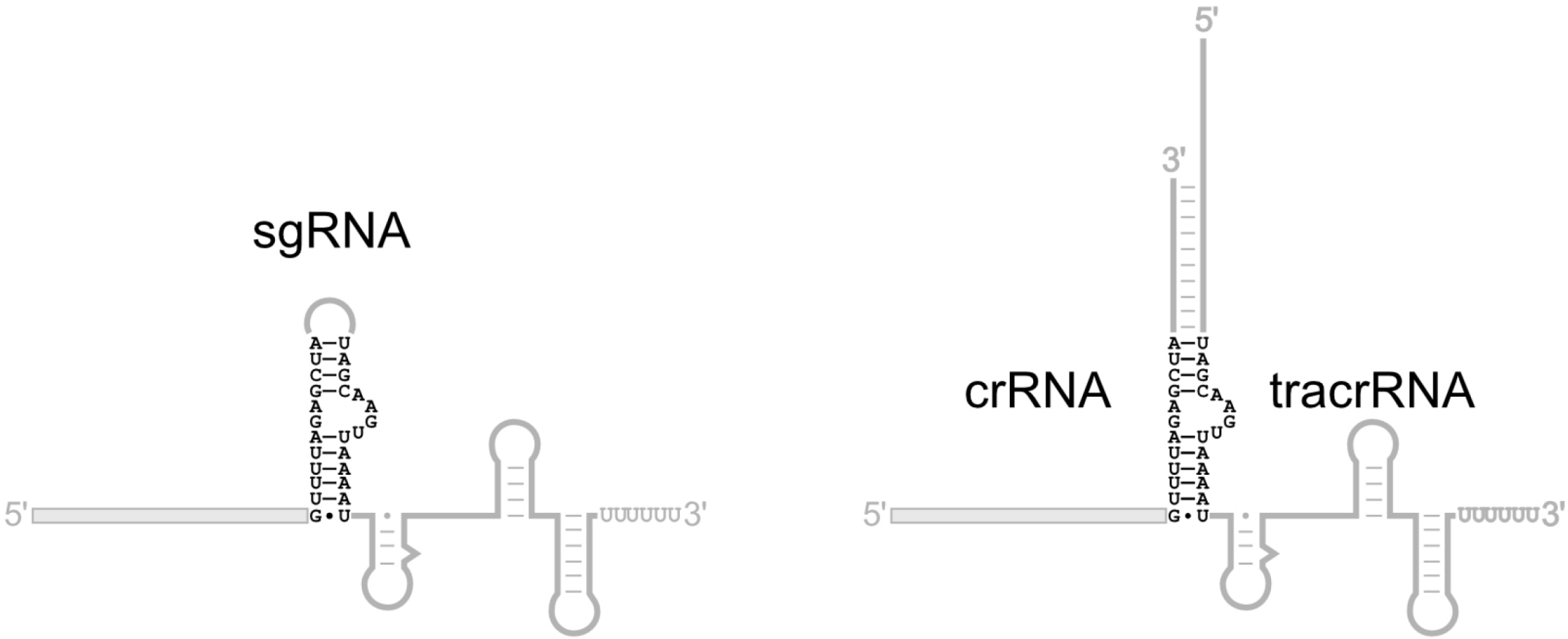
*crRNA is displaced and lost

Engineered Gene-editor CRISPR Detection Assay

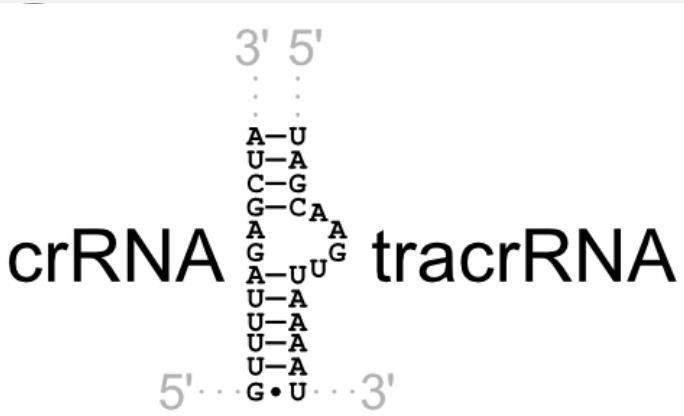


Specific detection of sgRNA

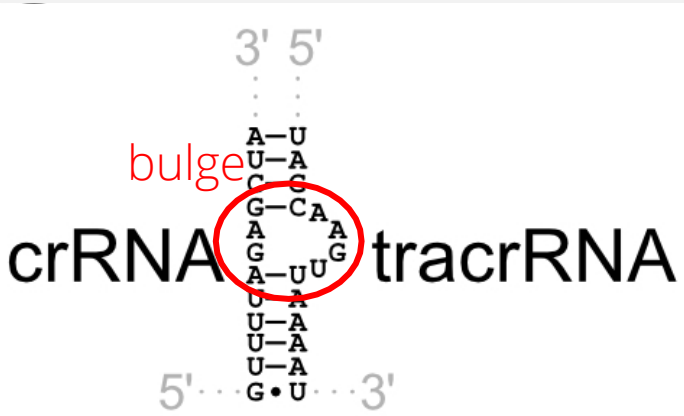
Internal Bulge in Central Stem



Internal Bulge in Central Stem



Internal Bulge in Central Stem



Internal Bulge in Central Stem

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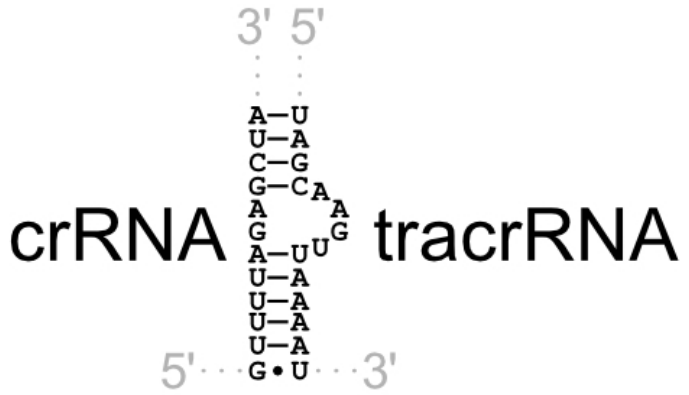
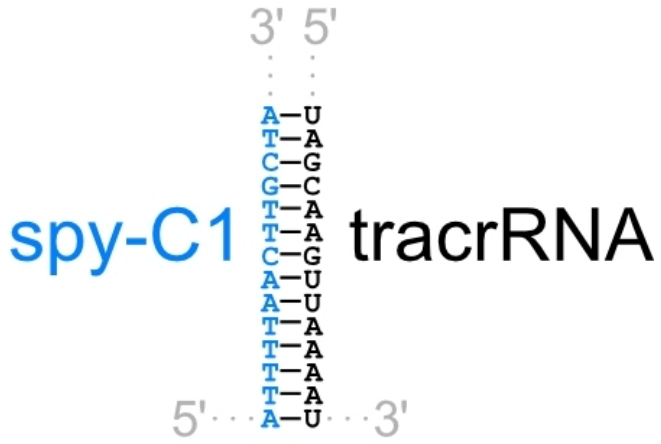
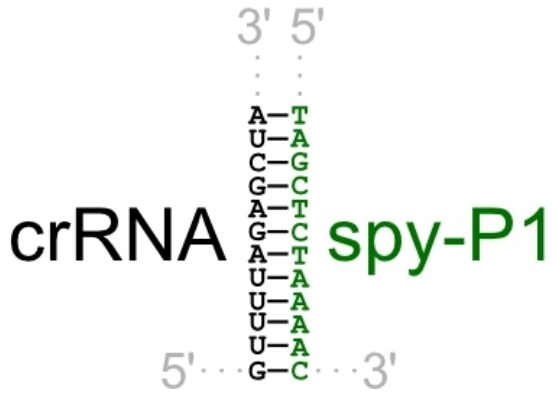
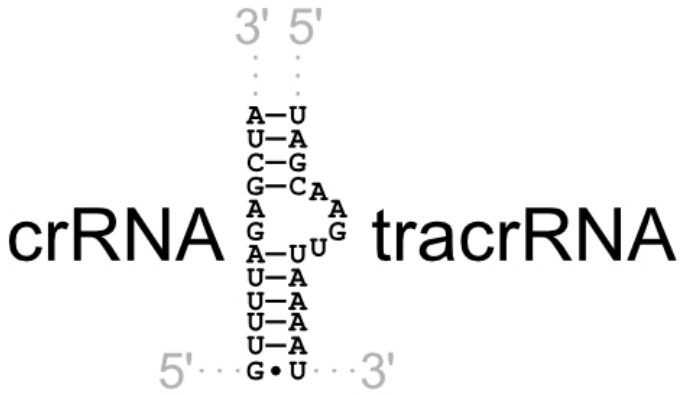
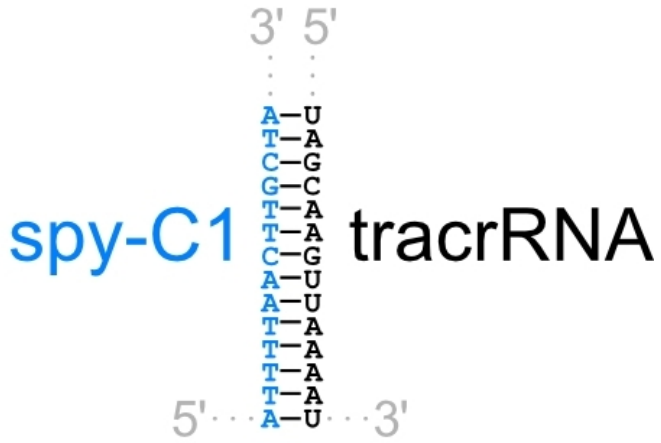


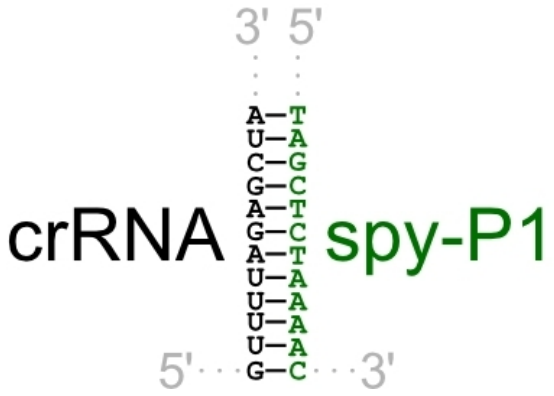


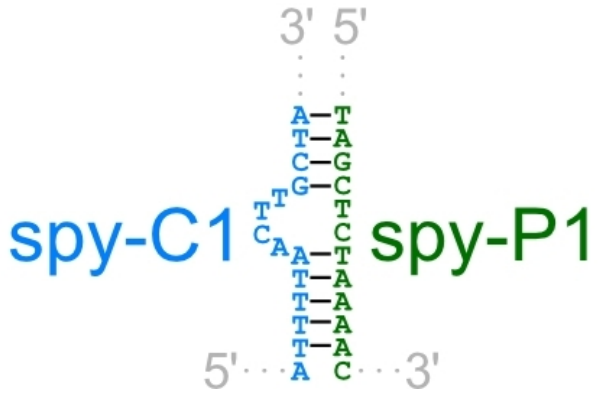


Internal Bulge in Central Stem









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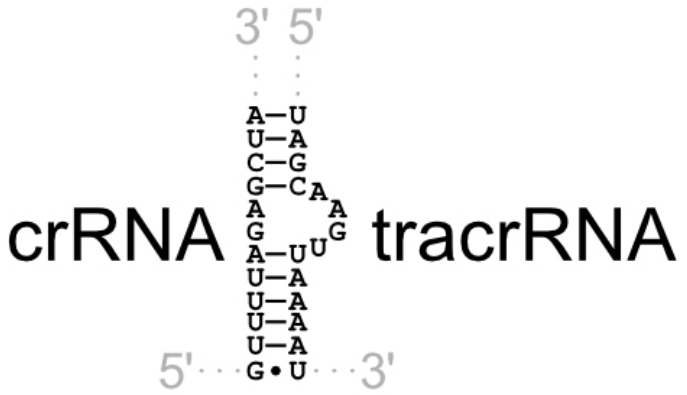
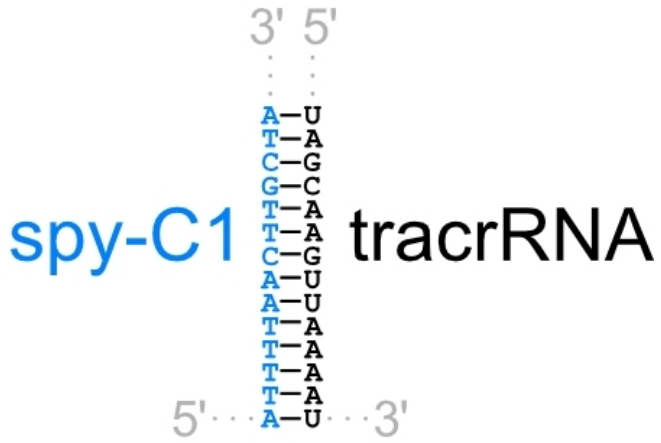
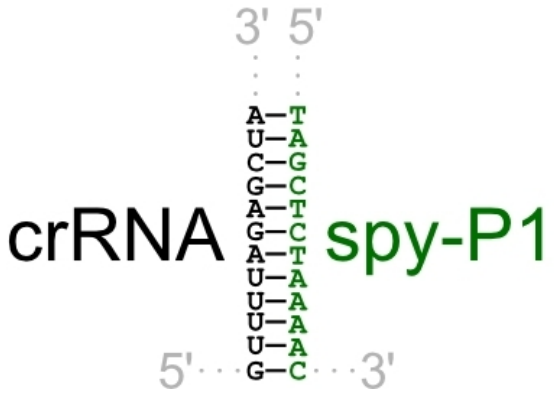
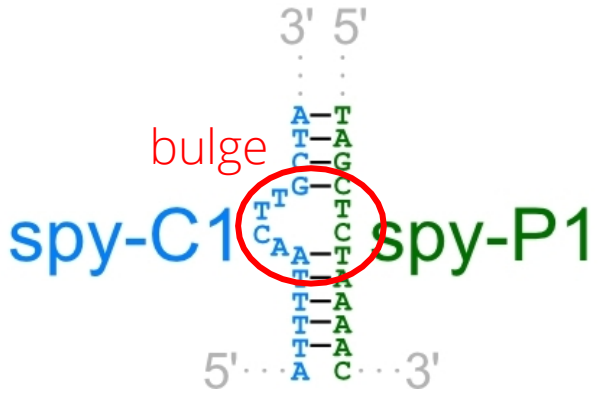
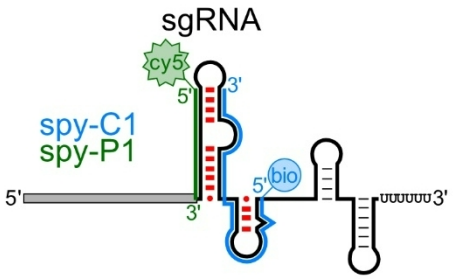


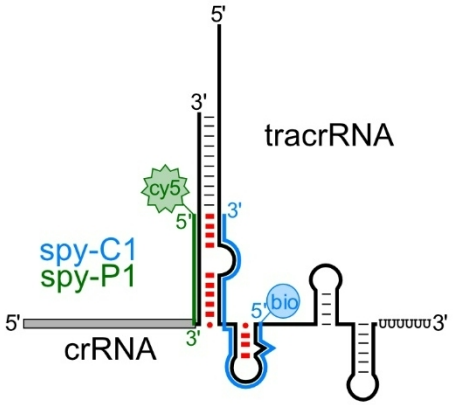


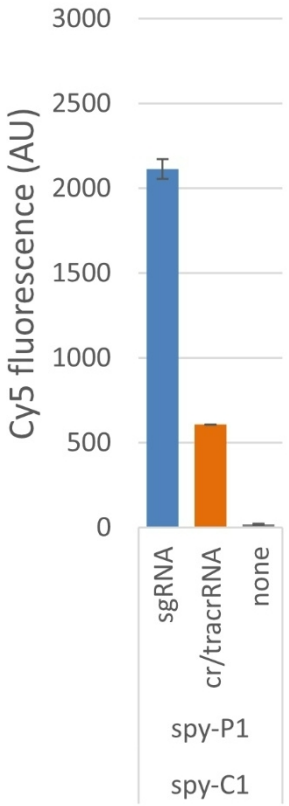




Specific detection of the ***S. pyogenes*** sgRNA







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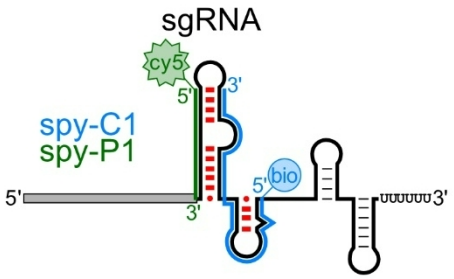

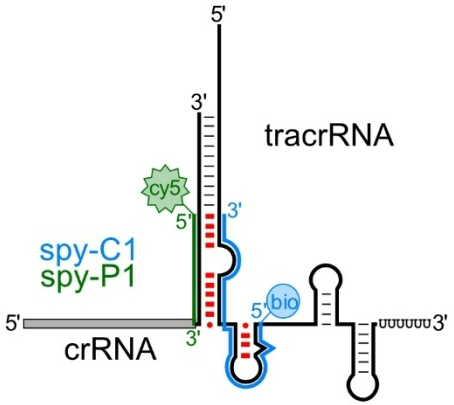

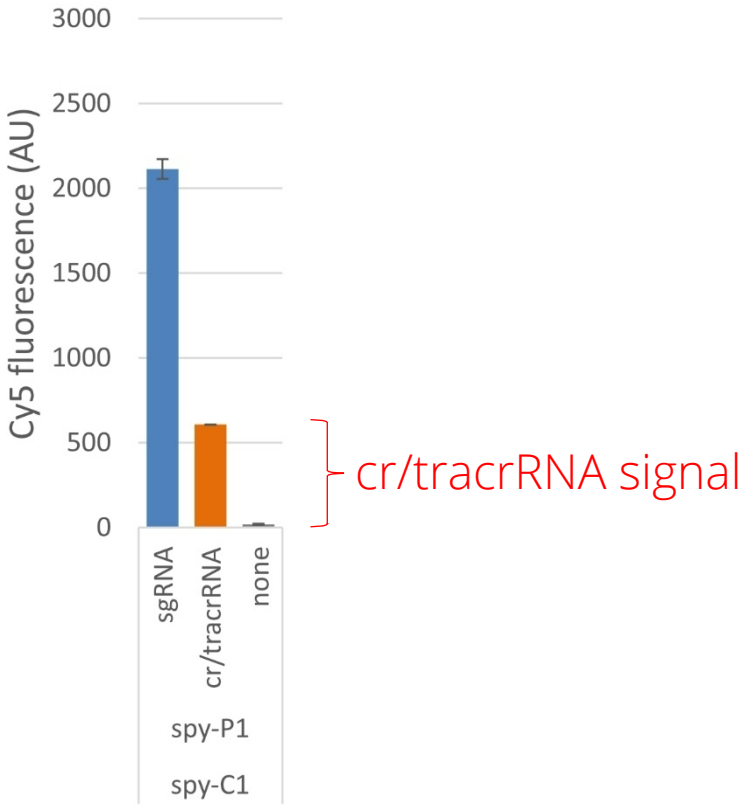

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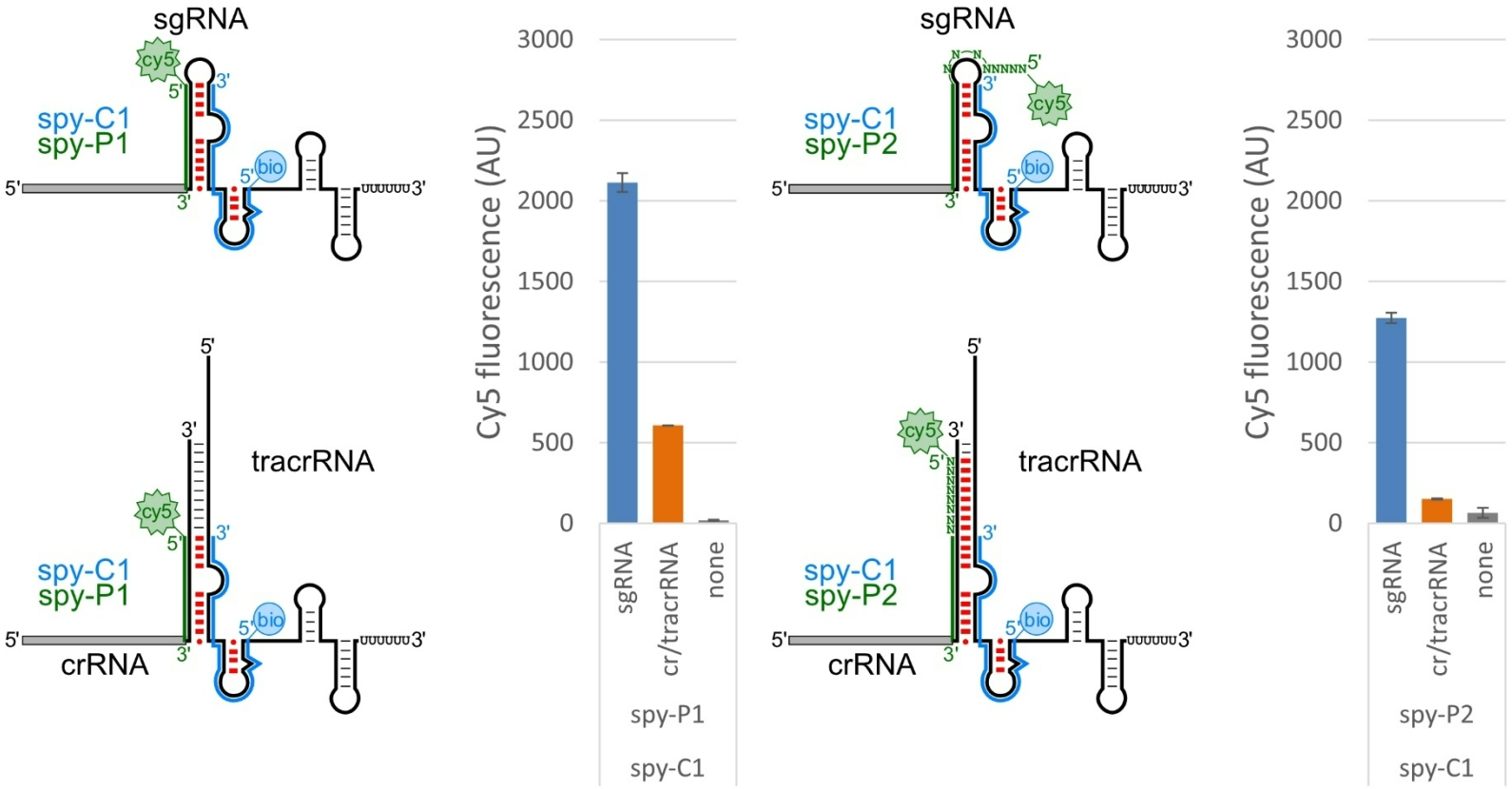

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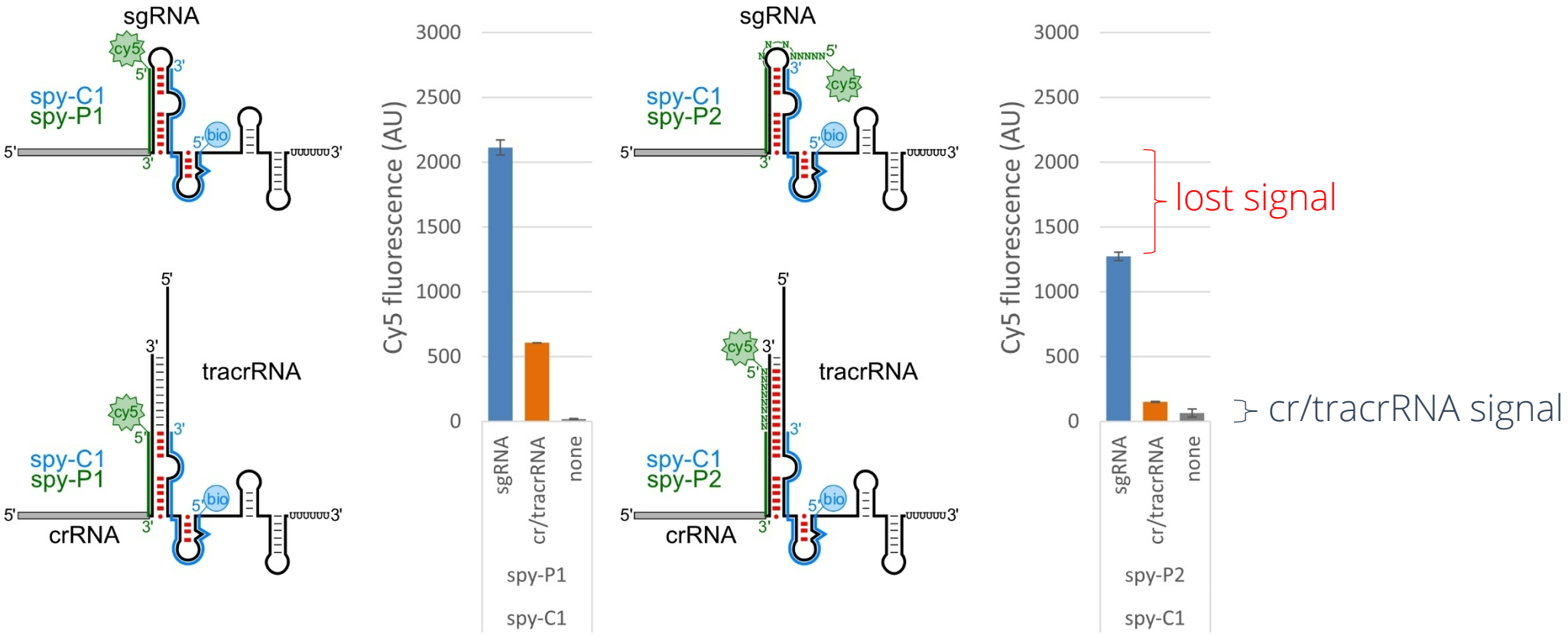

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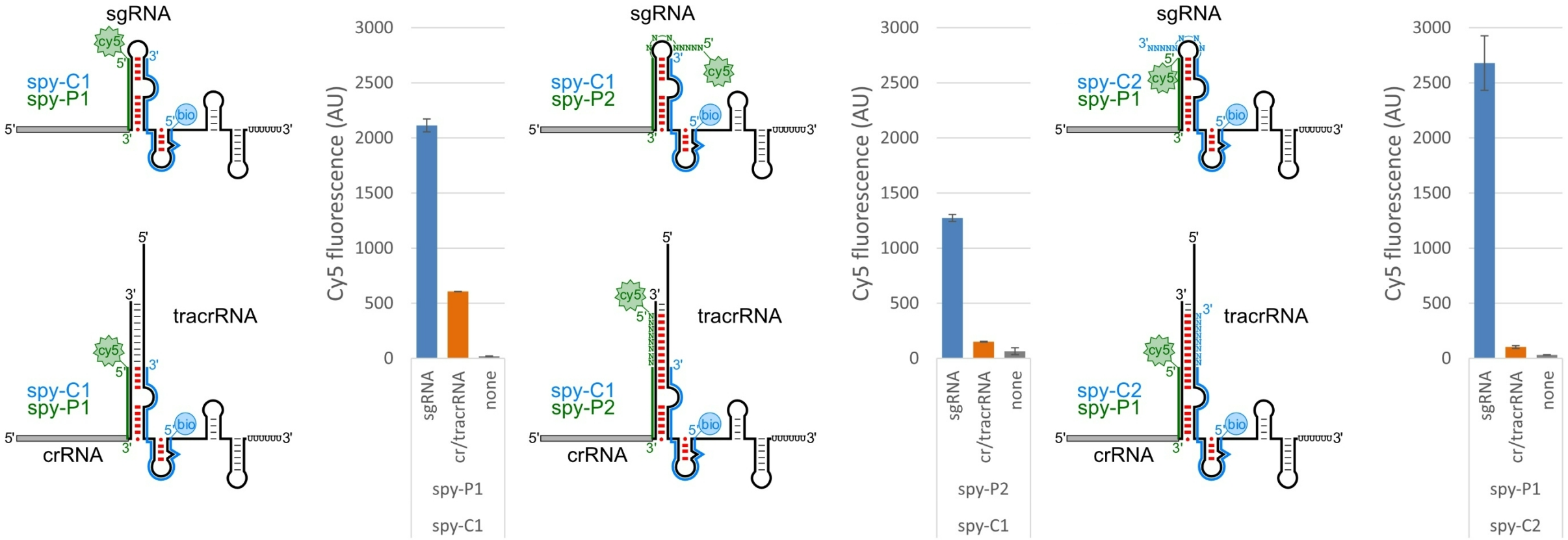

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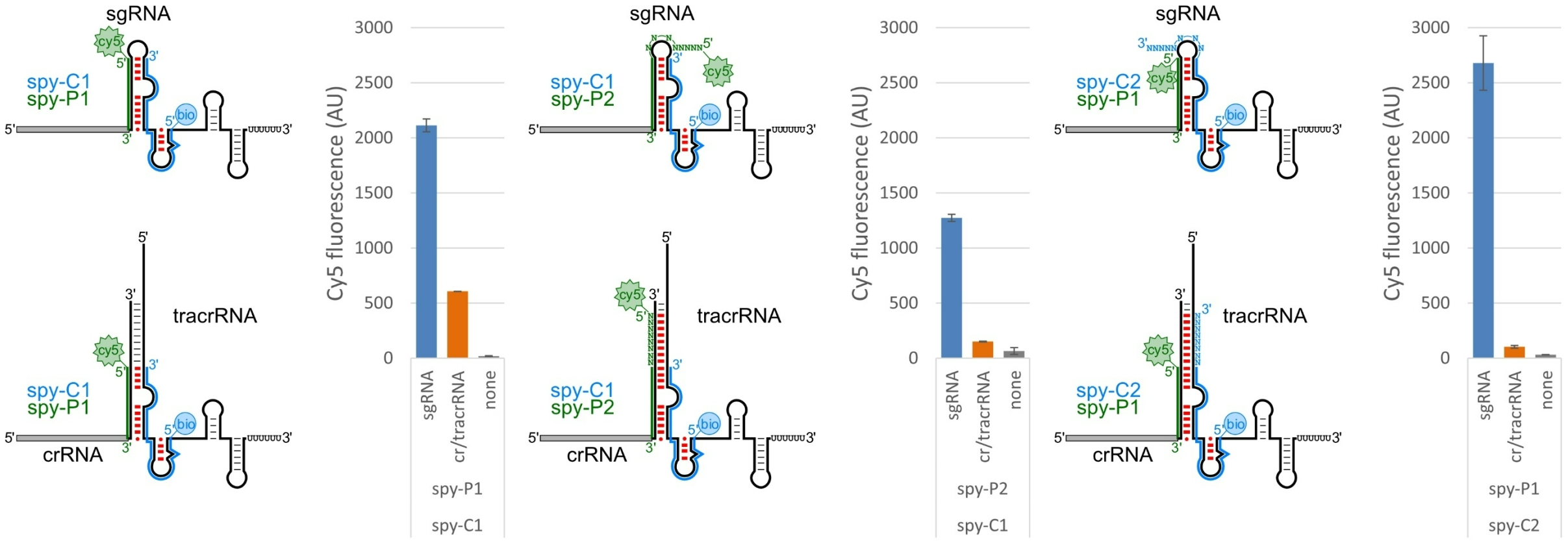
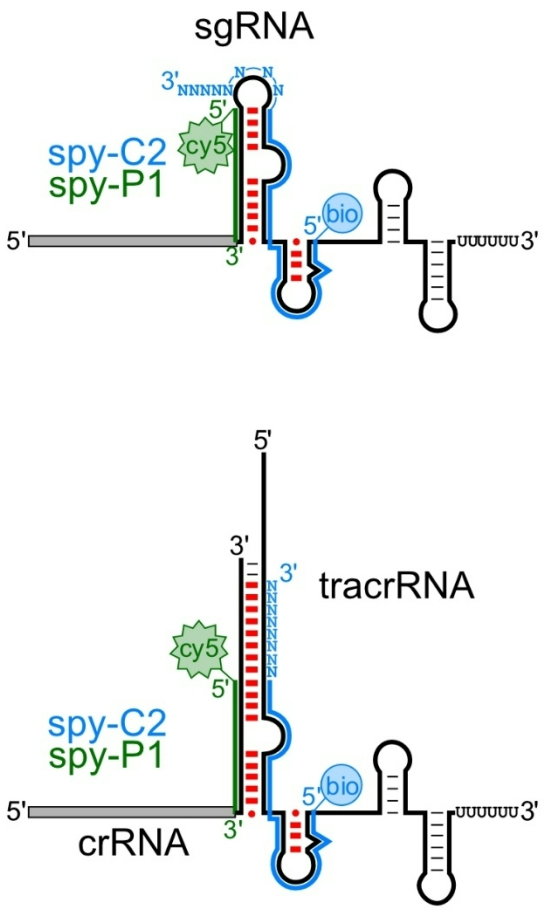
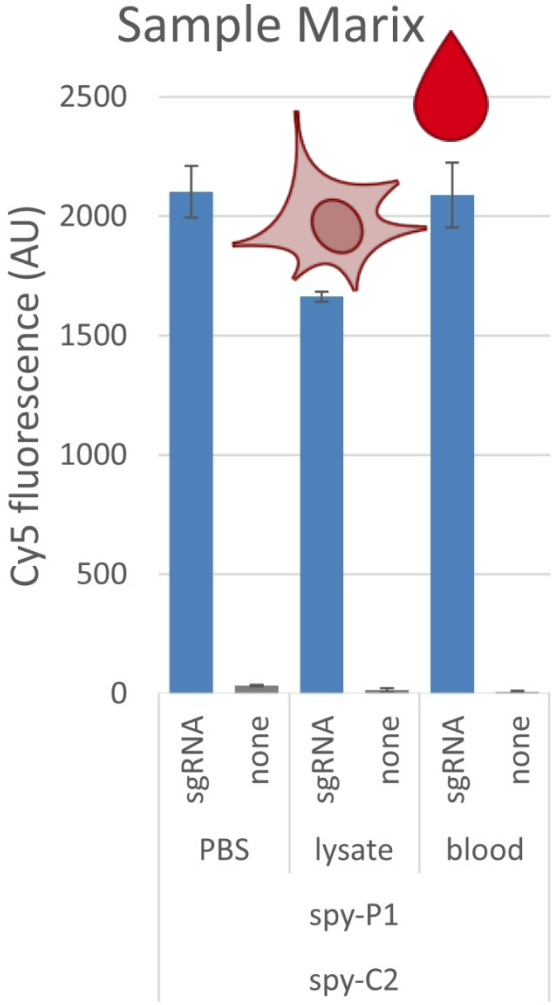
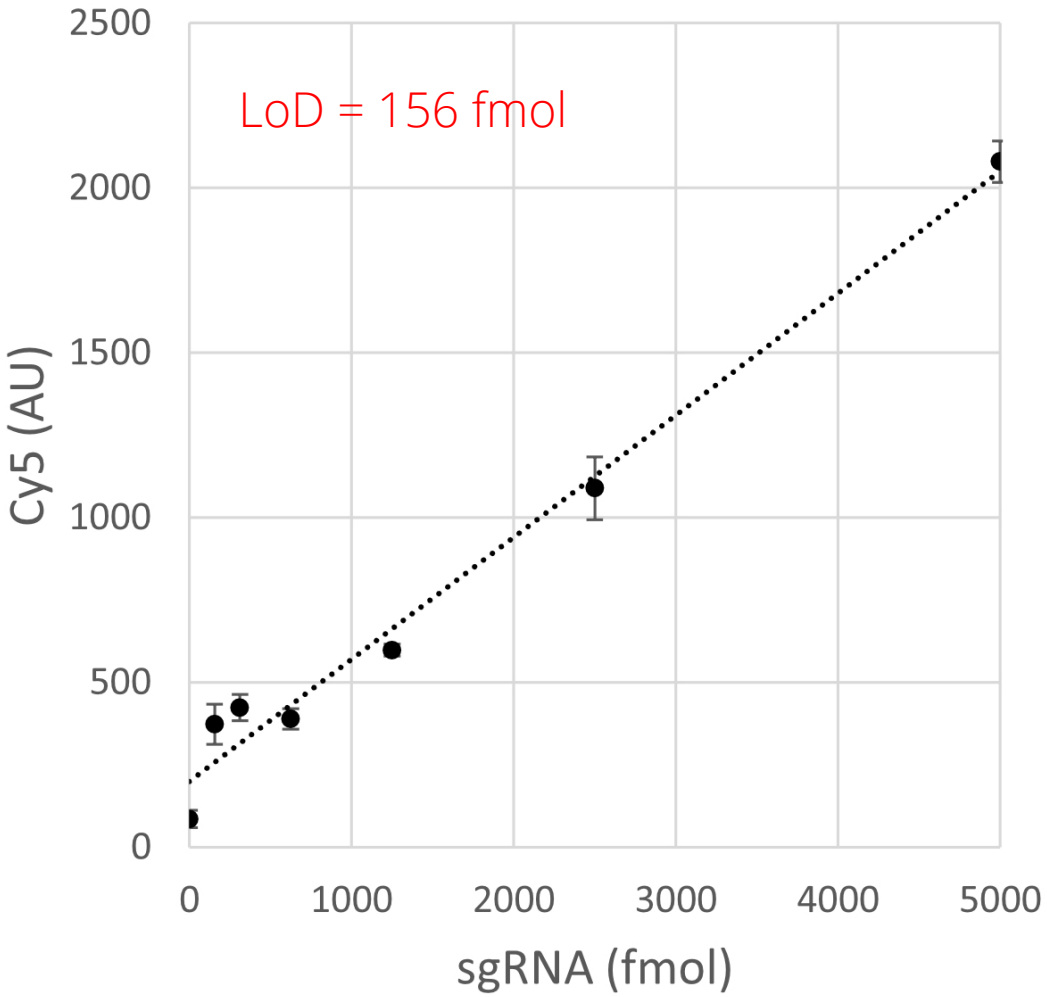


Detection in Complex Samples

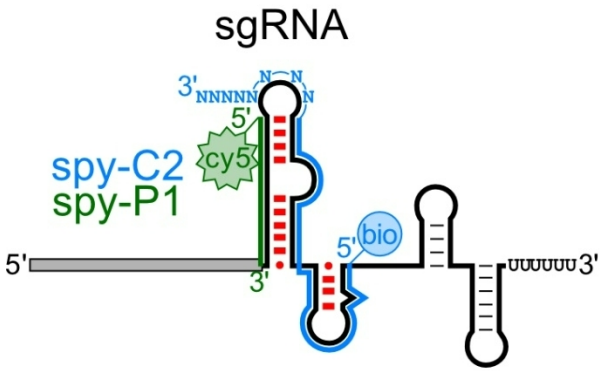


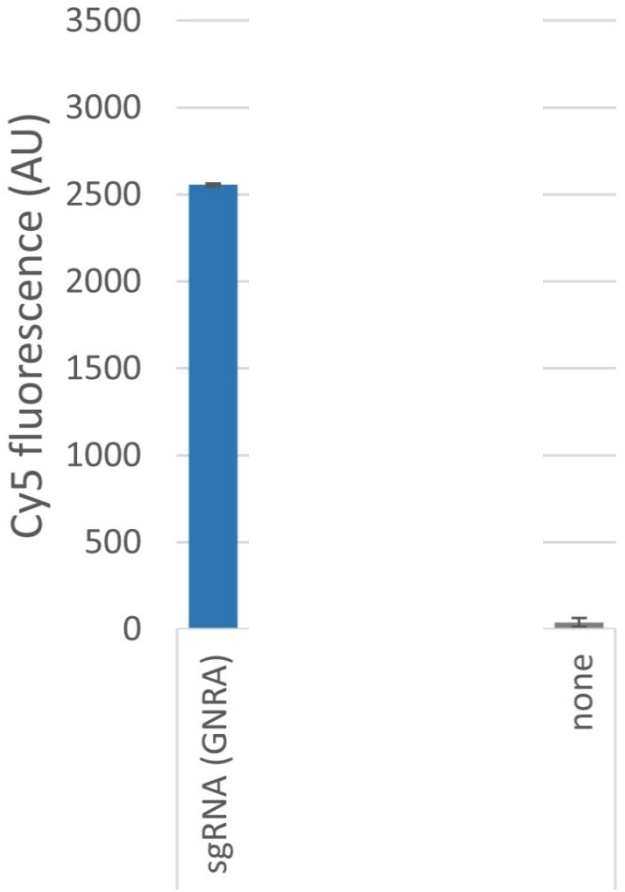


Limit of Detection



Detection Unaffected by Tetraloop and Spacer





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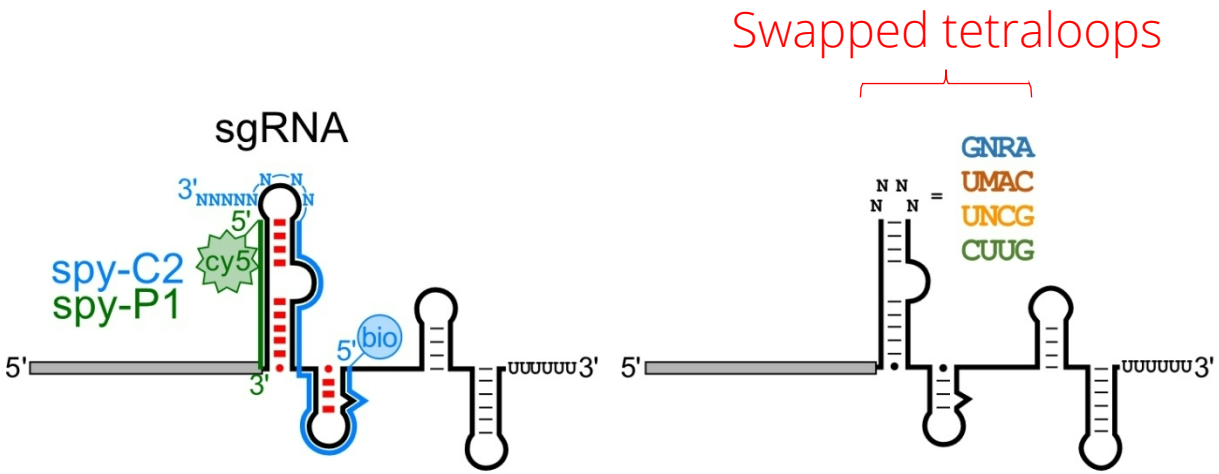
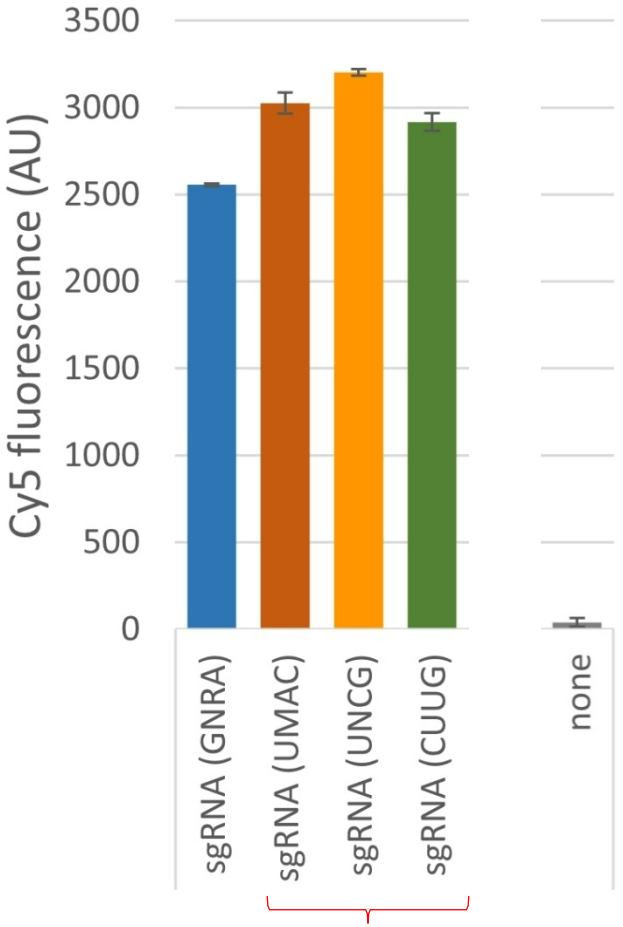
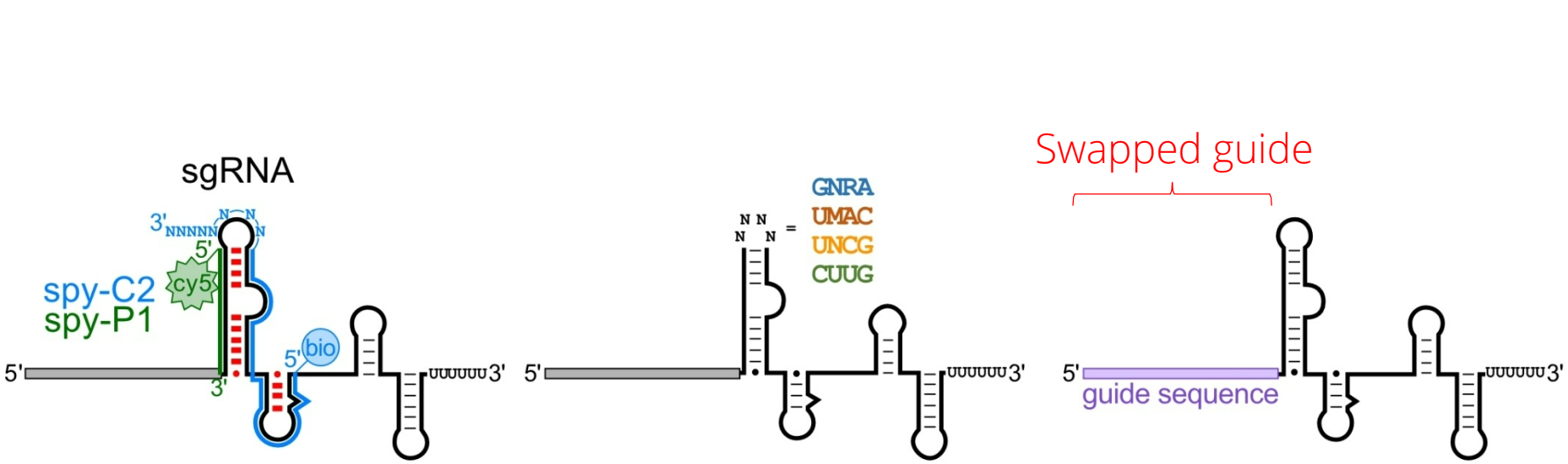
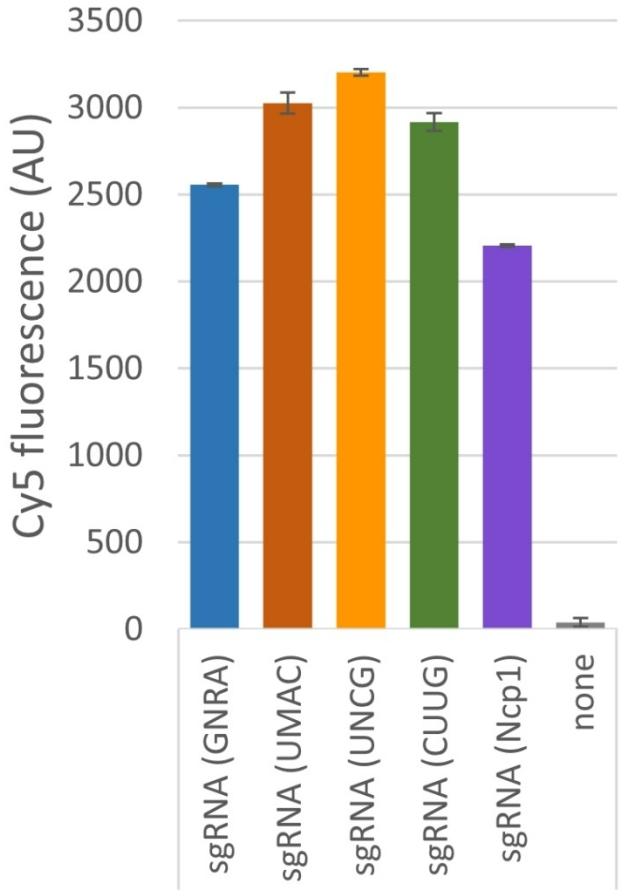


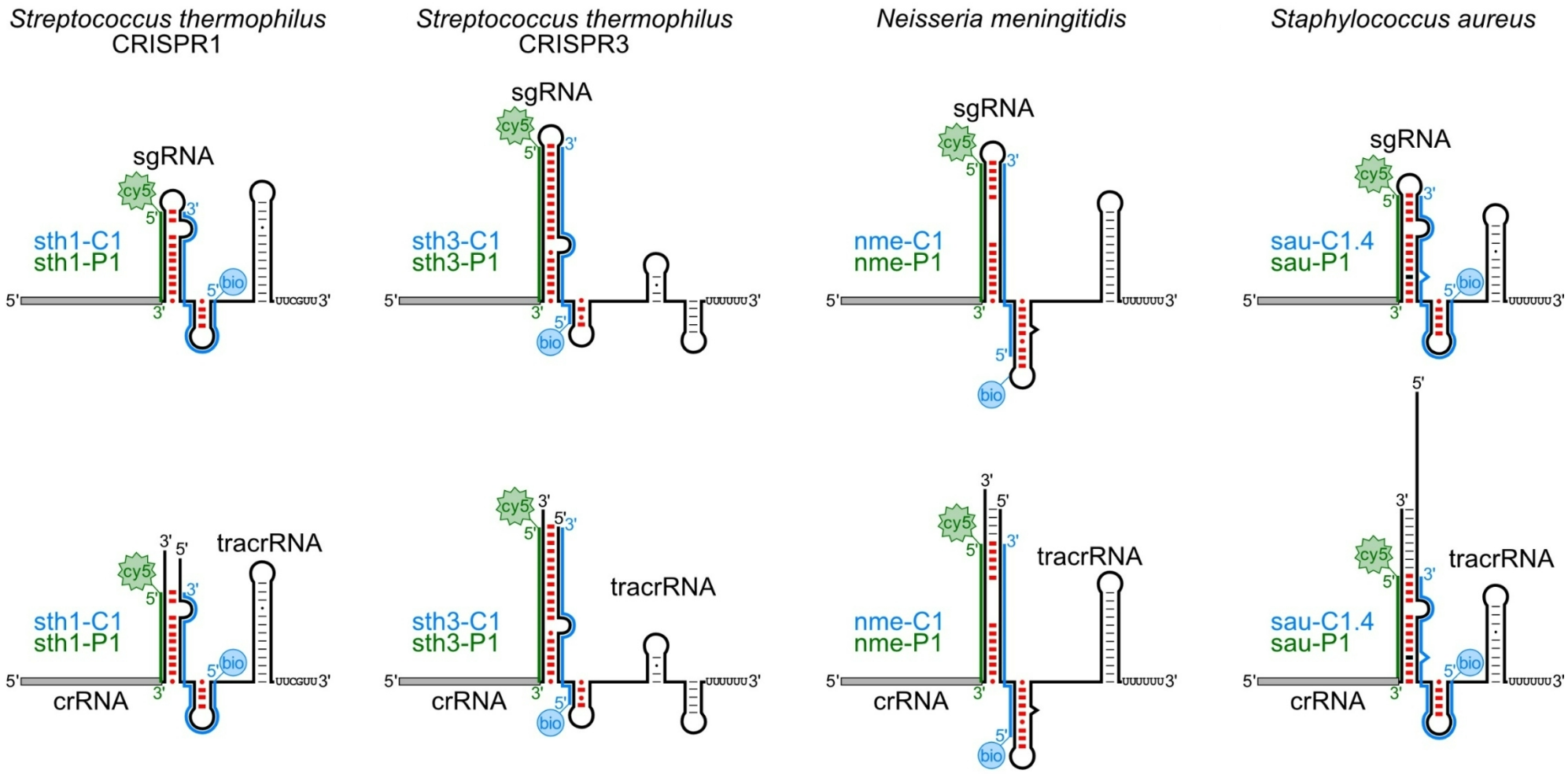


Detection Unaffected by Tetraloop and Spacer



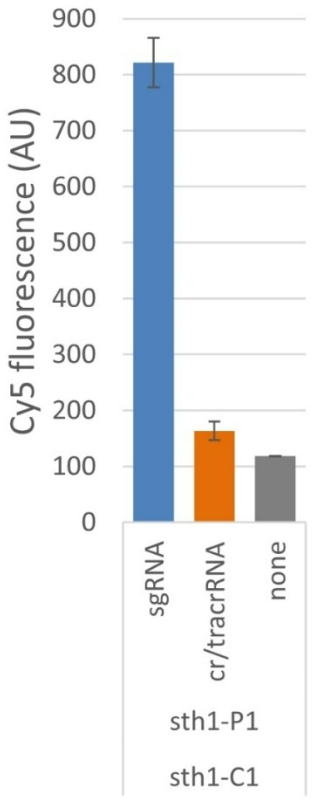


Specific Detection of sgRNAs from Other Species

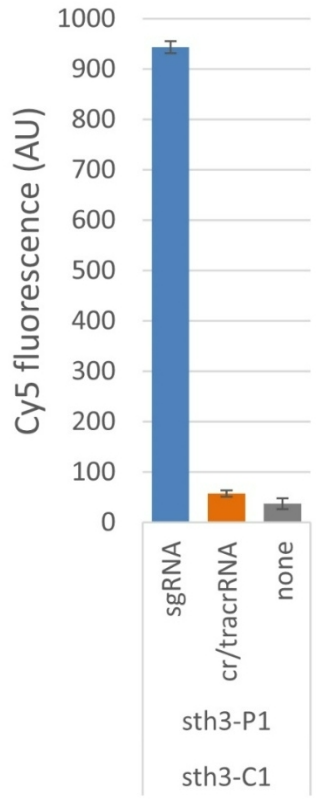


Specific Detection of sgRNAs from Other Species

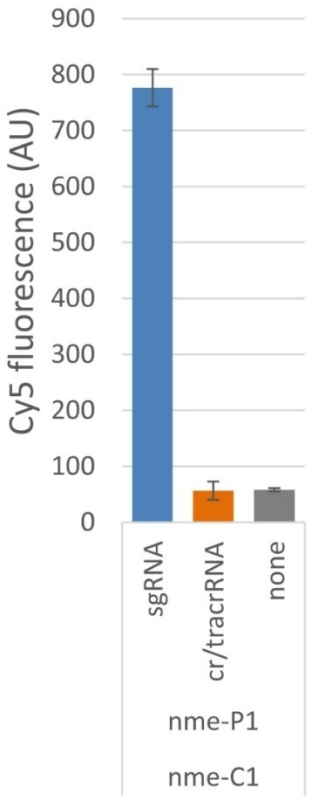
Streptococcus thermophilus CRISPR1



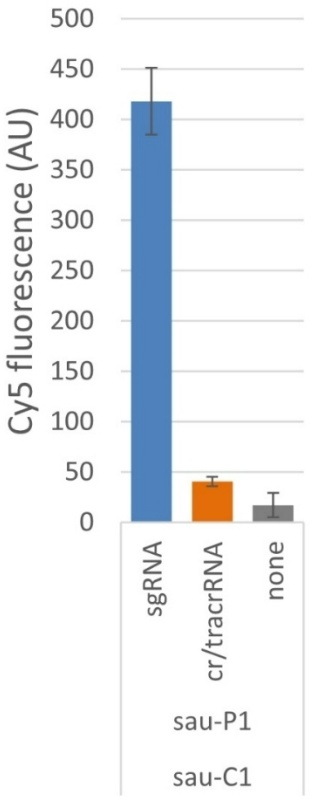
Streptococcus thermophilus CRISPR3



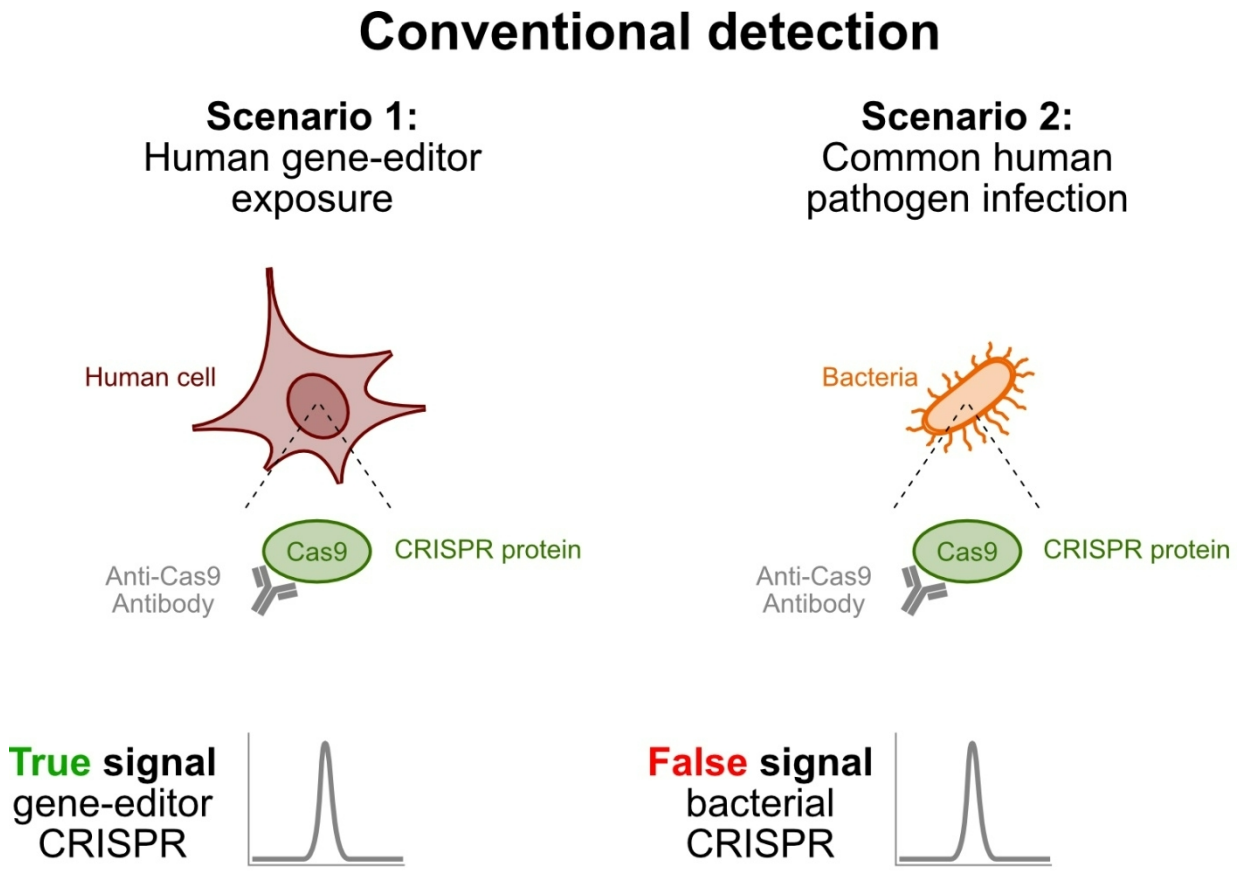
Neisseria meningitidis



Staphylococcus aureus



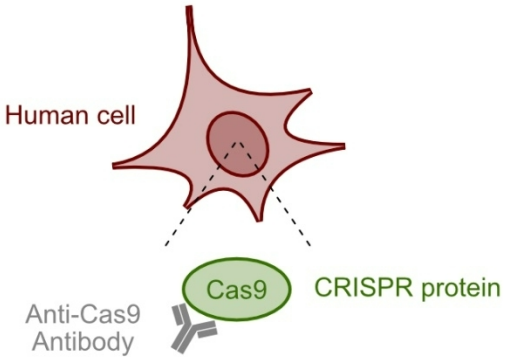
Specific CRISPR Gene-editor Detection



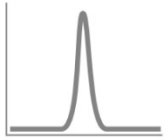
Specific CRISPR Gene-editor Detection

Conventional detection

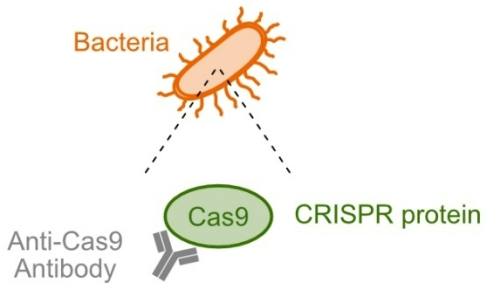
Scenario 1:
Human gene-editor exposure



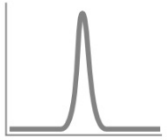
True signal
gene-editor CRISPR



Scenario 2:
Common human pathogen infection

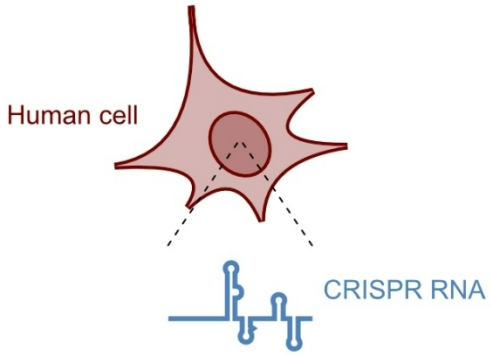


False signal
bacterial CRISPR

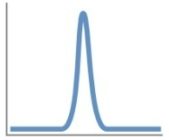


DNA displacement assay

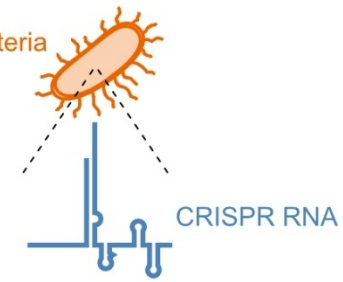
Scenario 1:
Human gene-editor exposure



True signal
gene-editor CRISPR



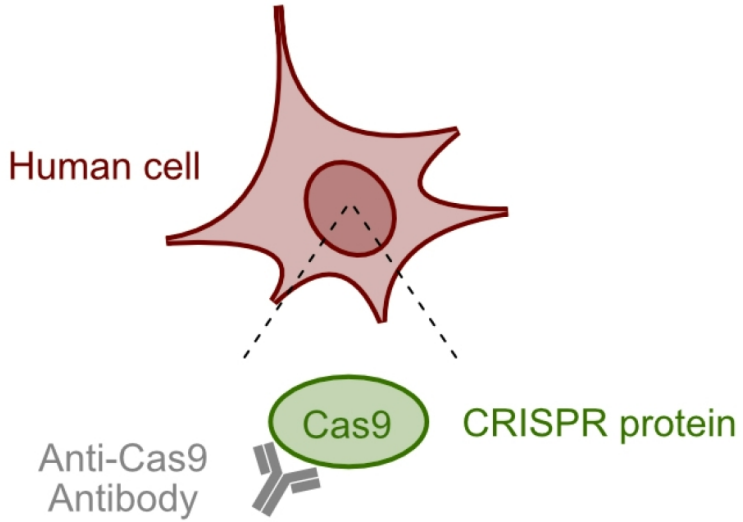
Scenario 2:
Common human pathogen infection



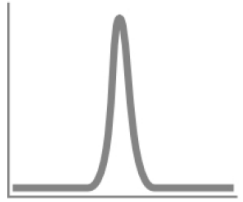
False signal
bacterial CRISPR

Current Detection Limitations

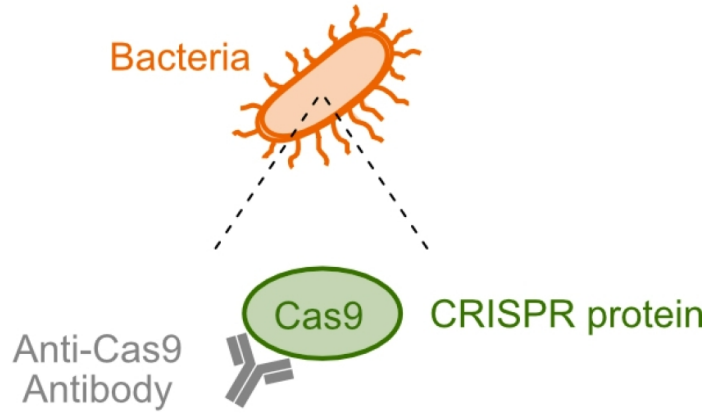
Scenario 1:
Human gene-editor exposure



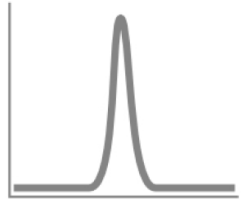
True signal
gene-editor CRISPR



Scenario 2:
Common human pathogen infection

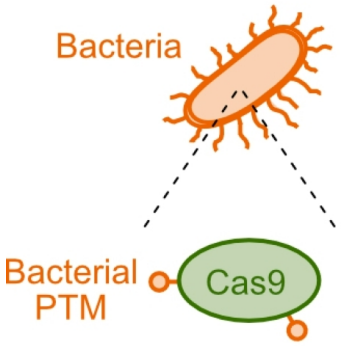


False signal
bacterial CRISPR

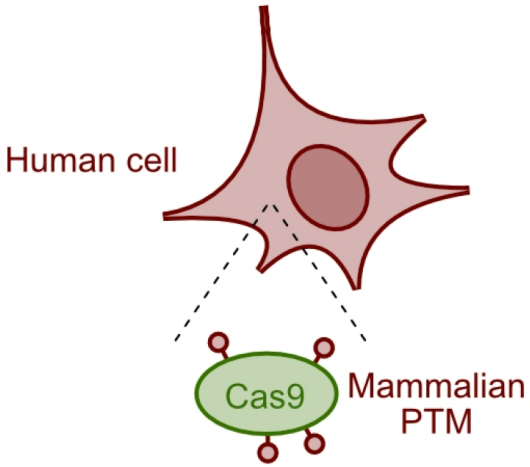


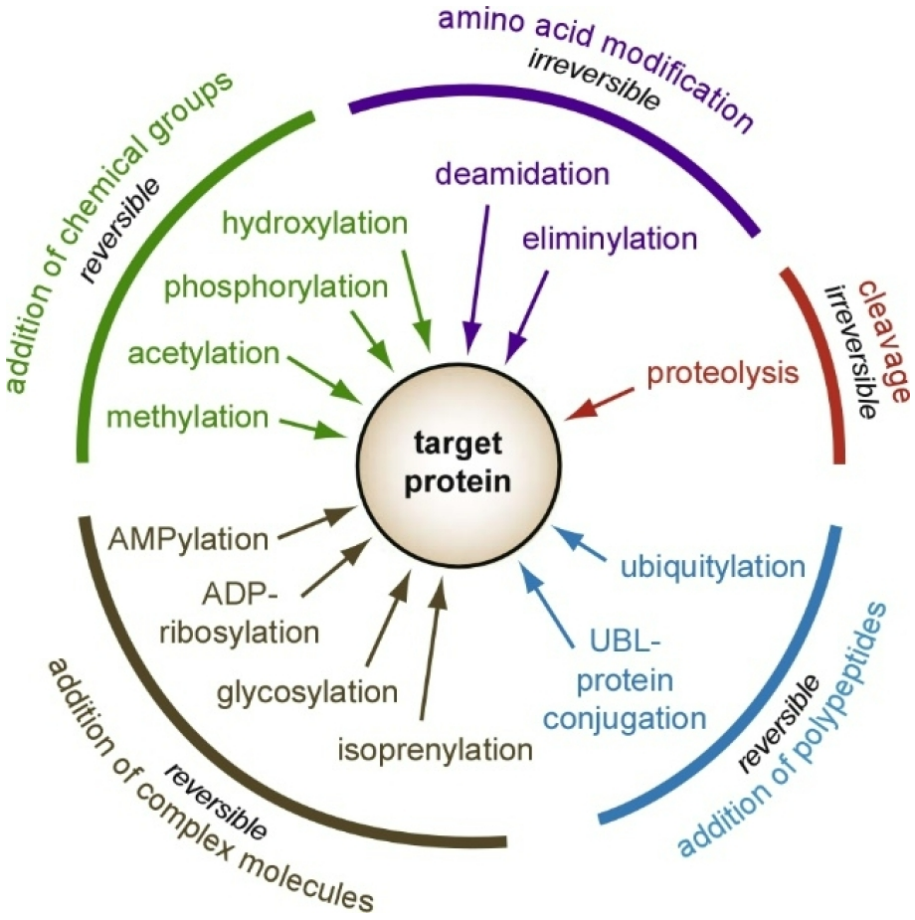
Protein Modifications as a Moiety for Gene-editor Exposure

Natural bacterial CRISPR
Protects against foreign DNA

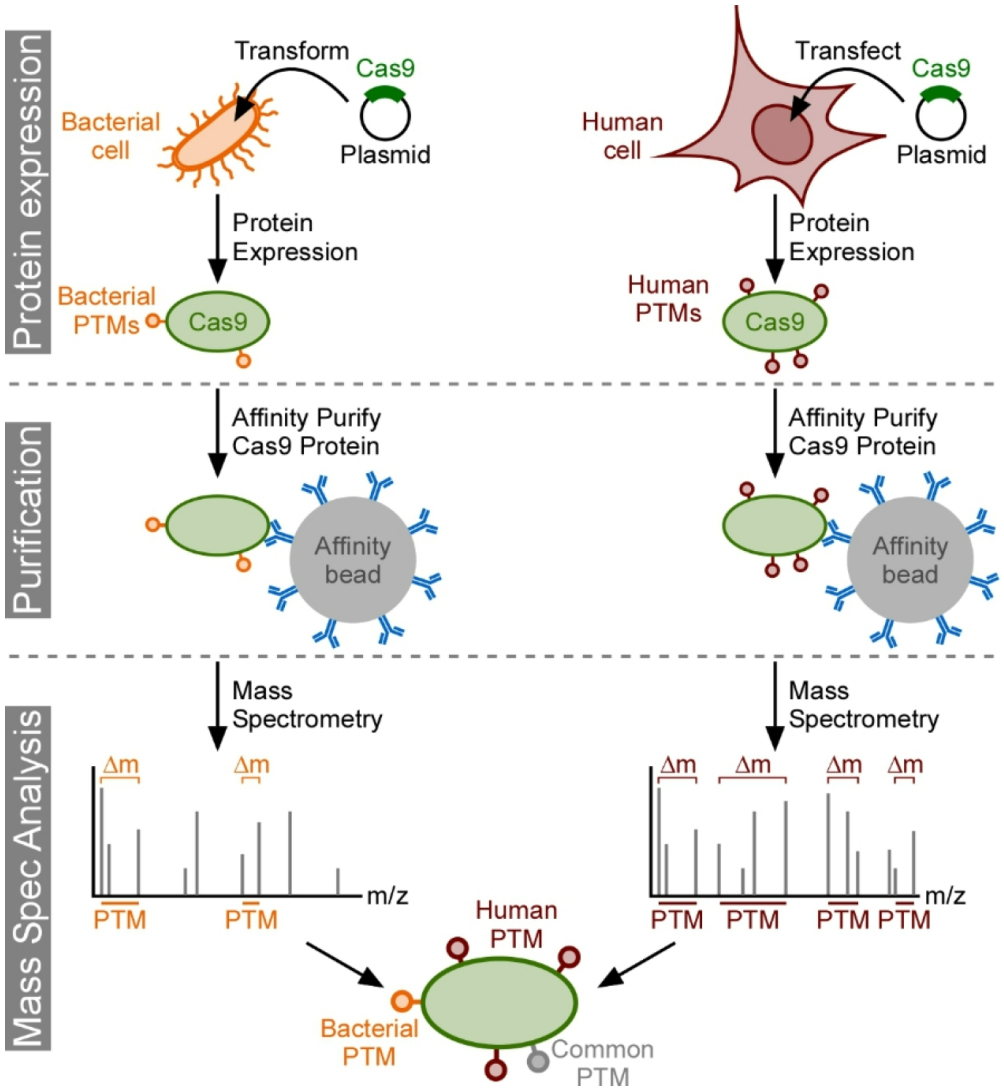


Engineered gene-editing CRISPR
Alter genomic DNA sequence

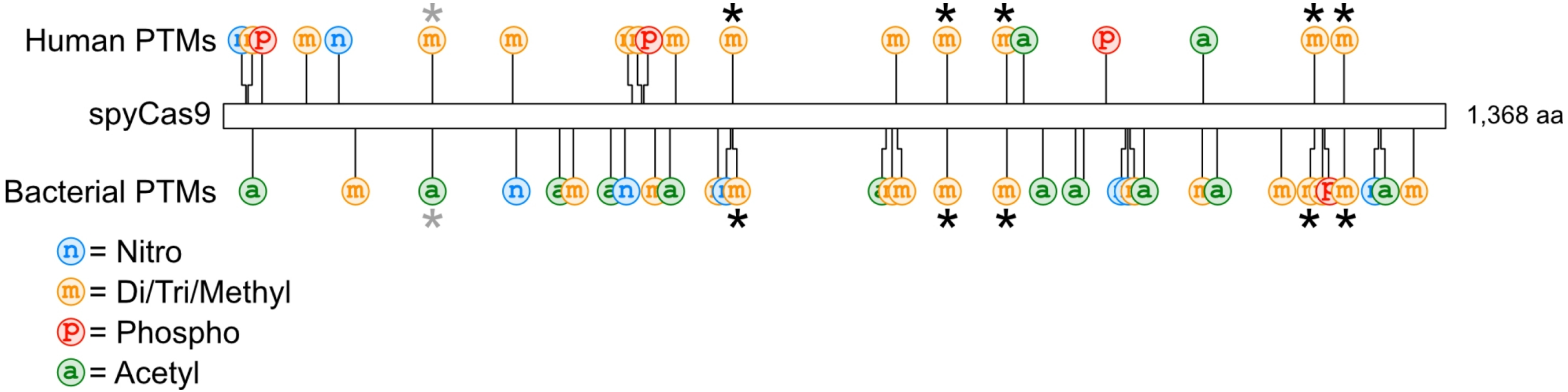




Discovering Post Translational Modifications

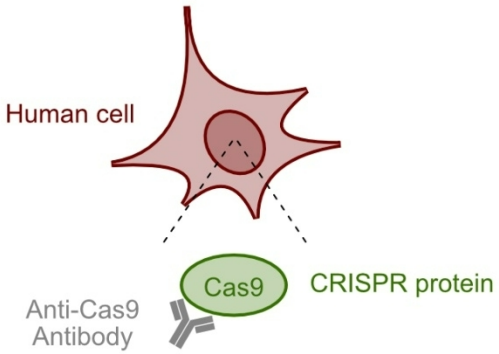


Discovering Post Translational Modifications

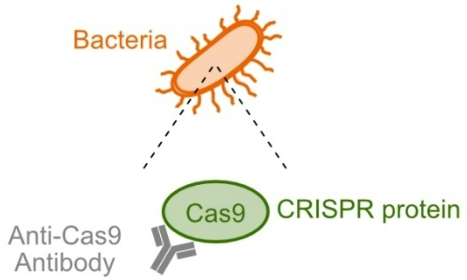


Specific CRISPR Gene-editor Detection

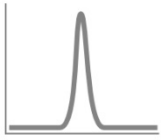
Scenario 1:
Human gene-editor exposure



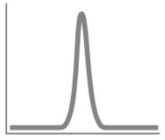
Scenario 2:
Common human pathogen infection



True signal
gene-editor CRISPR

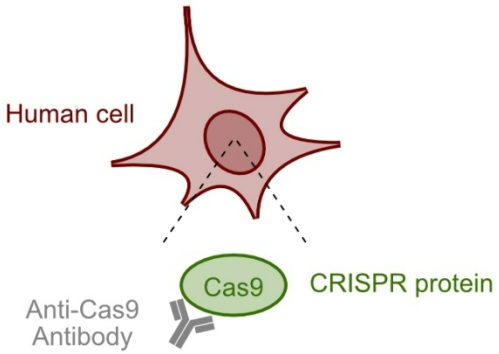


False signal
bacterial CRISPR

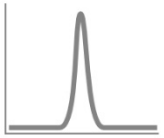


Specific CRISPR Gene-editor Detection

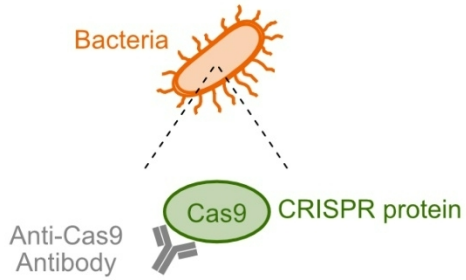
Scenario 1:
Human gene-editor exposure



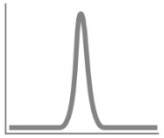
True signal
gene-editor CRISPR



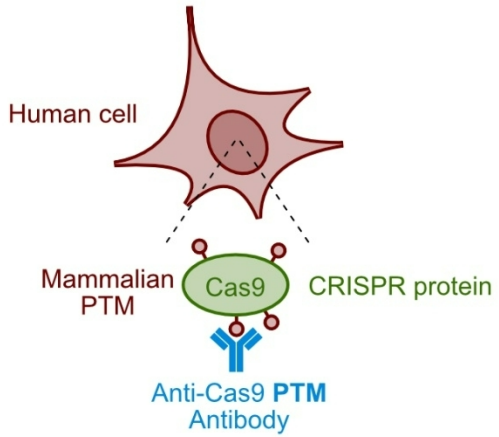
Scenario 2:
Common human pathogen infection



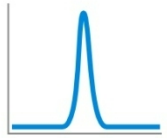
False signal
bacterial CRISPR



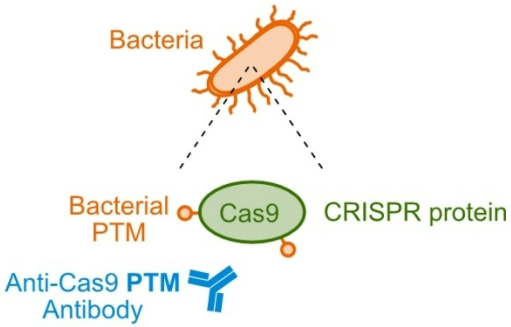
Scenario 1:
Human gene-editor exposure



True signal
gene-editor CRISPR



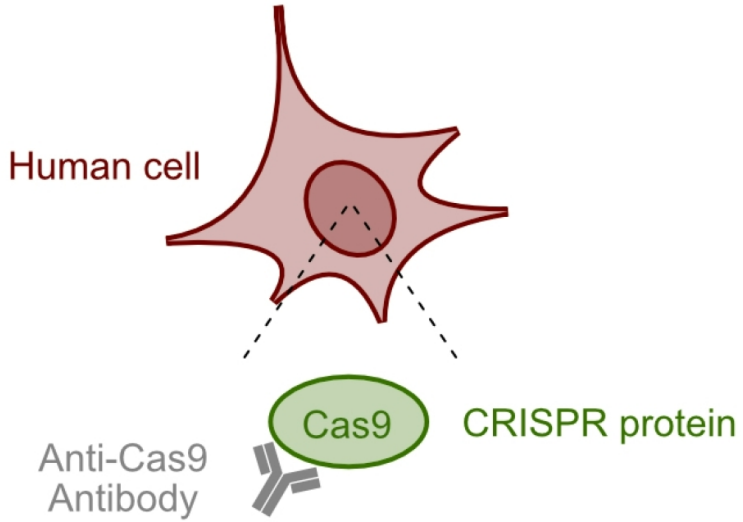
Scenario 2:
Common human pathogen infection



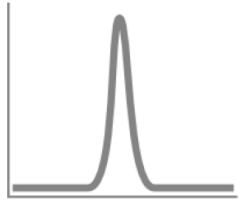
False signal
bacterial CRISPR

Current Detection Limitations

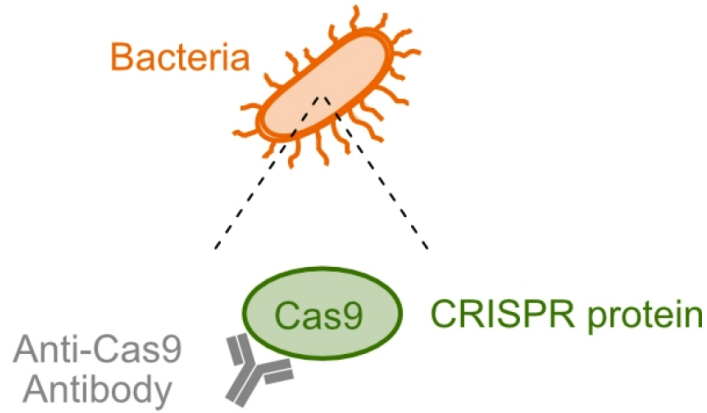
Scenario 1:
Human gene-editor exposure



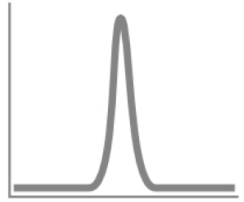
True signal
gene-editor CRISPR



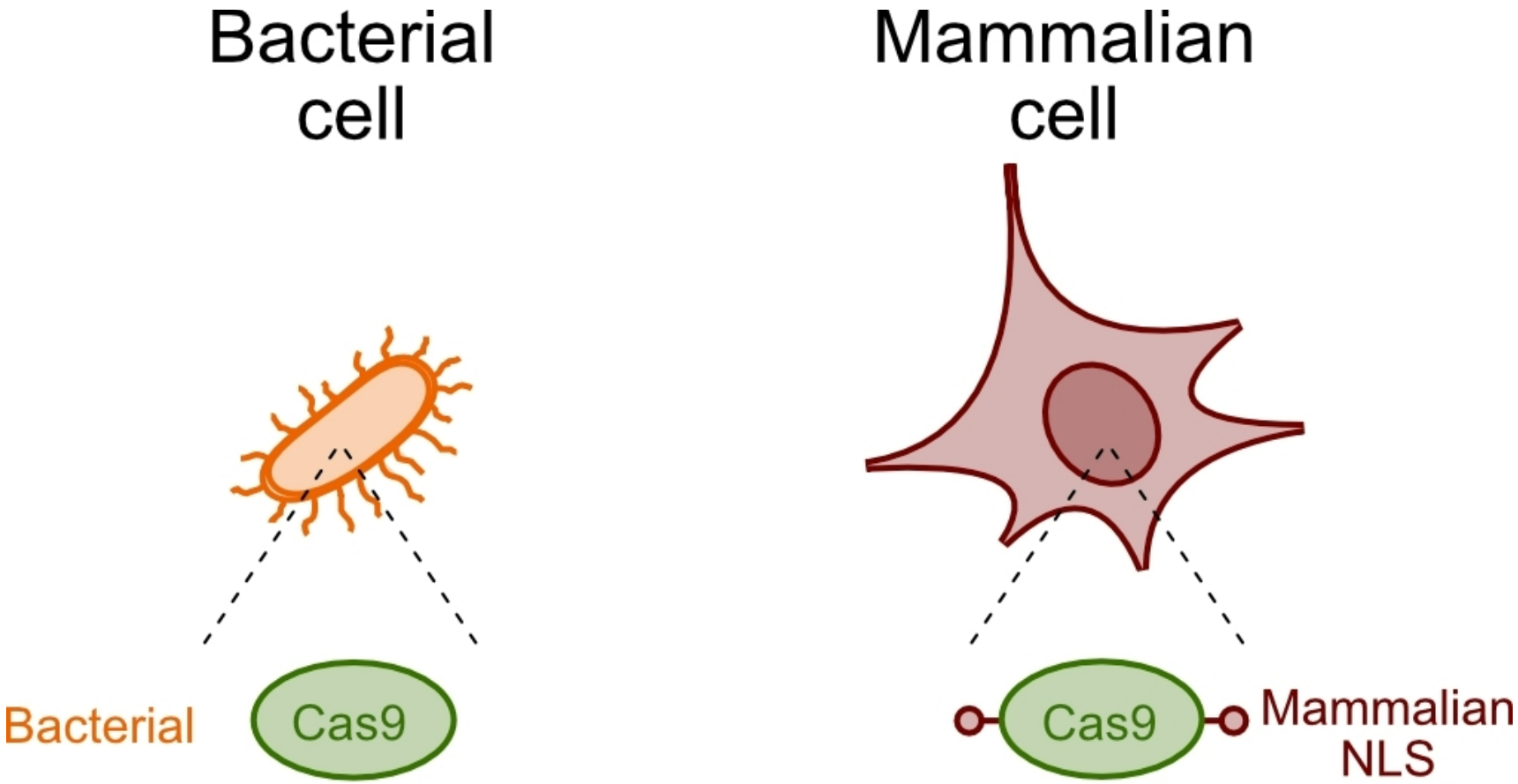
Scenario 2:
Common human pathogen infection



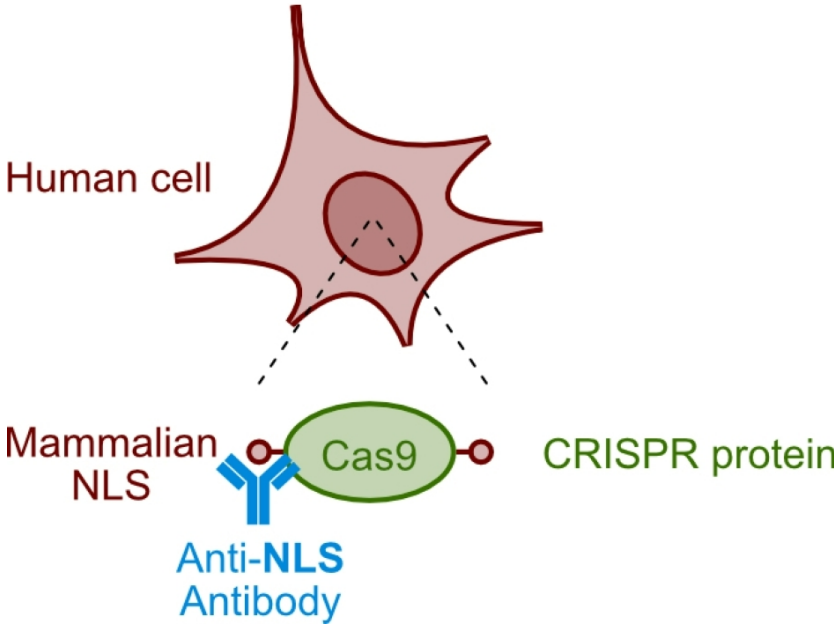
False signal
bacterial CRISPR



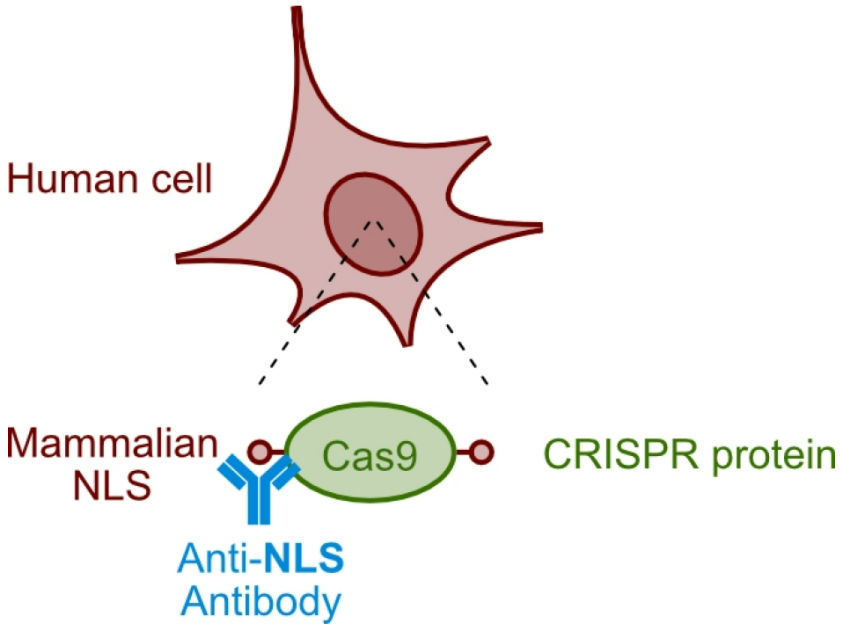
Cas9 Protein Fusion as a Moiety for Gene-editor Exposure

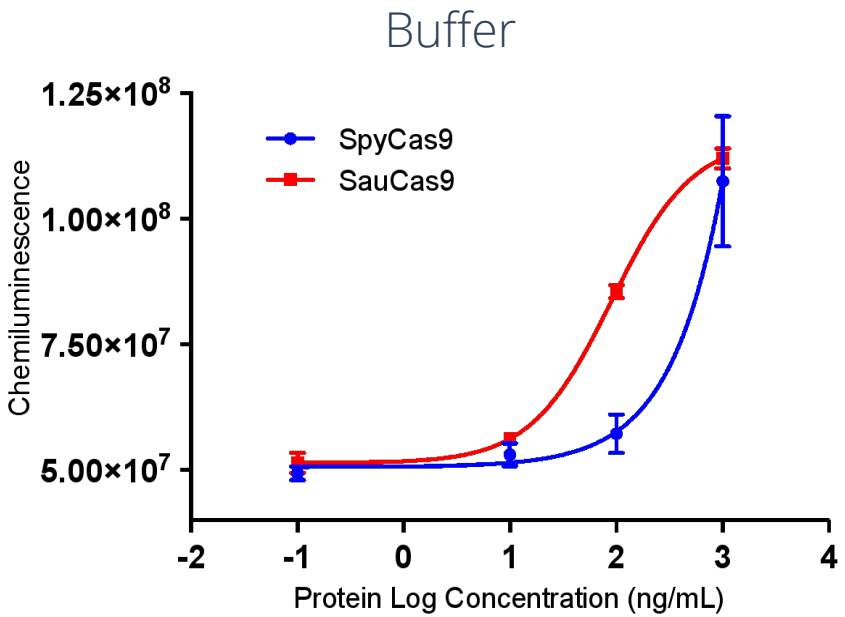


Specific Detection of Cas9 with Anti-NLS Antibody

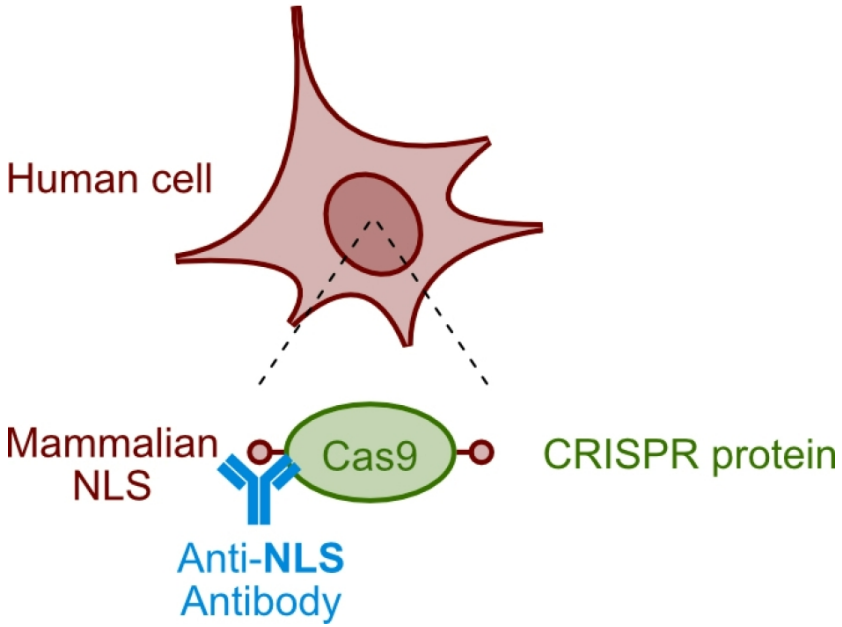


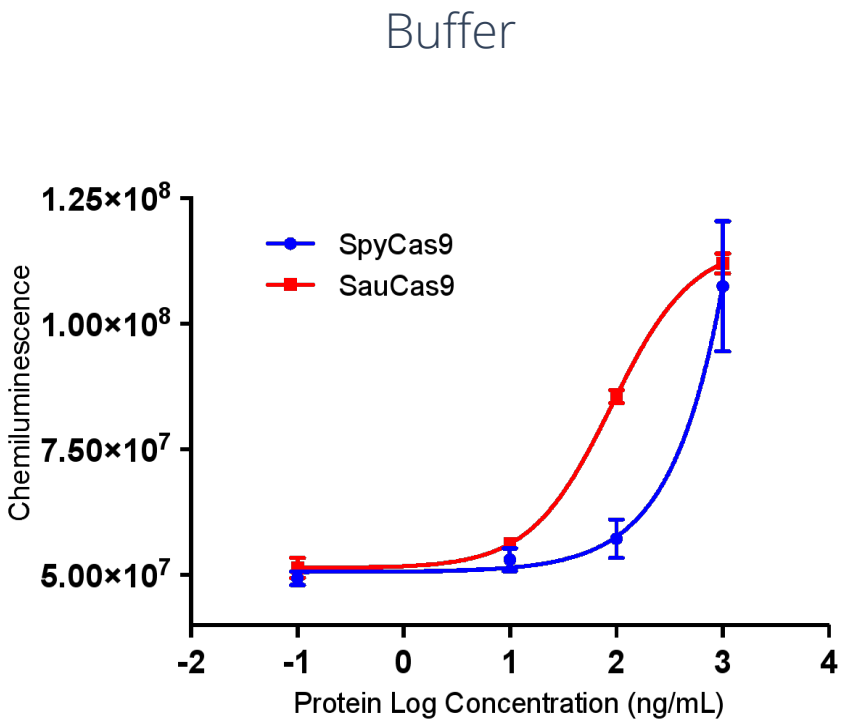
Specific Detection of Cas9 with Anti-NLS Antibody

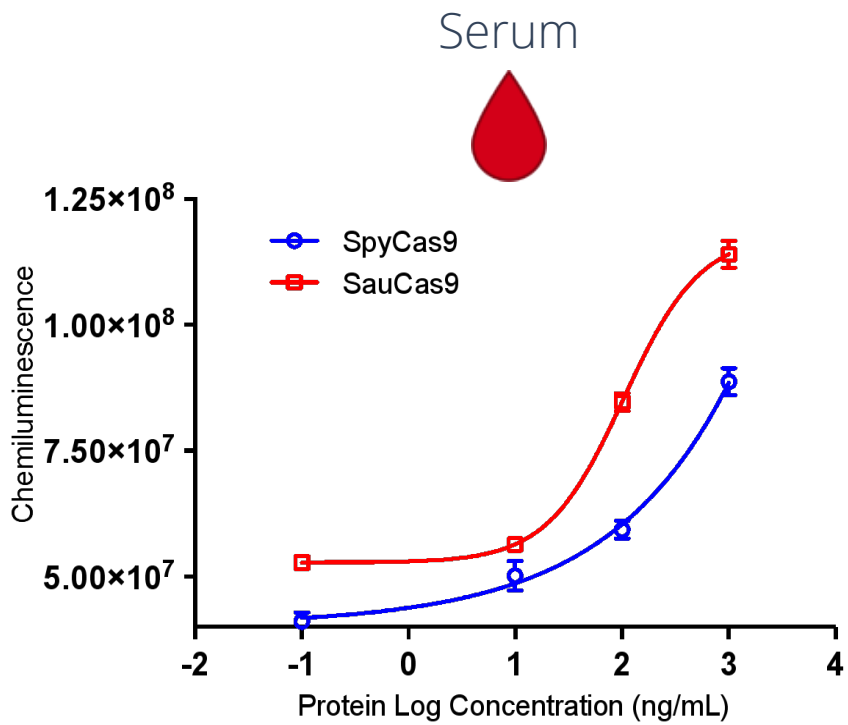




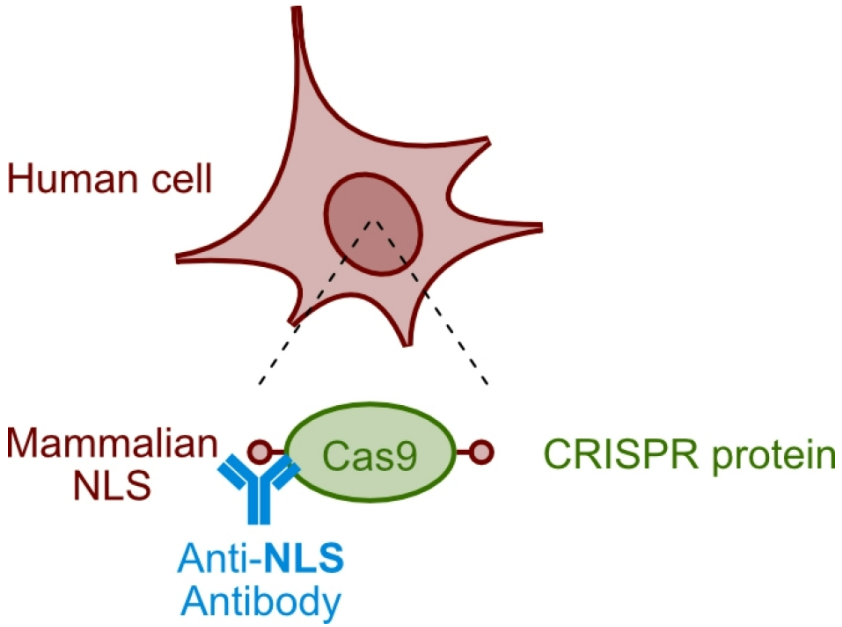
Specific Detection of Cas9 with Anti-NLS Antibody



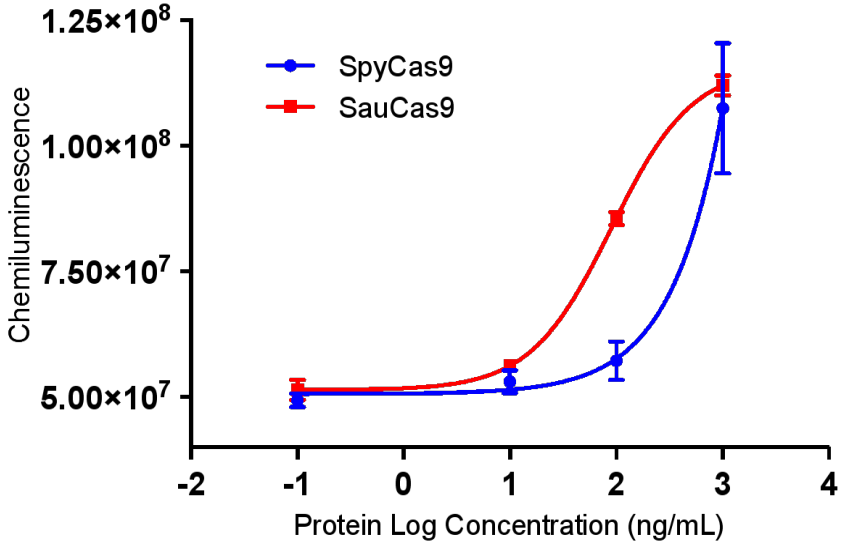




Specific Detection of Cas9 with Anti-NLS Antibody

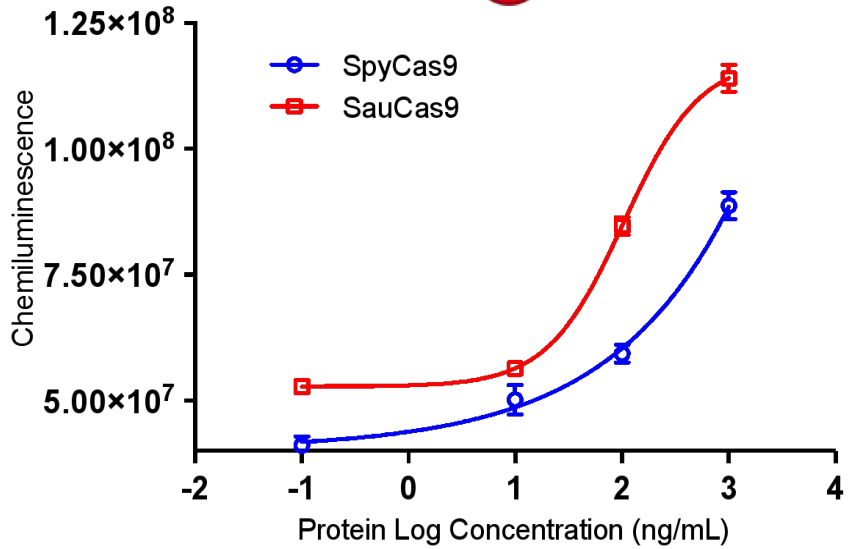


Buffer



LoD = 0.47 ng/ml

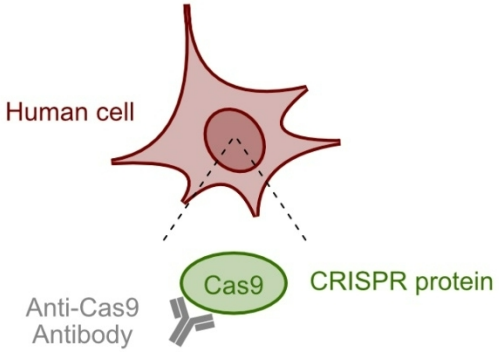
Serum



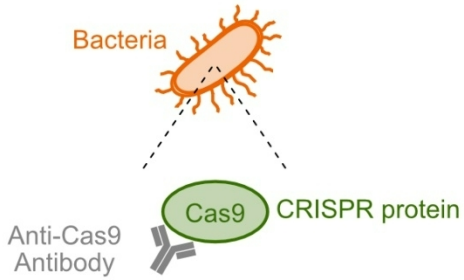
LoD = 0.72 ng/ml

Specific CRISPR Gene-editor Detection

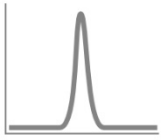
Scenario 1:
Human gene-editor exposure



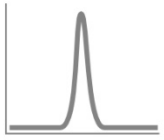
Scenario 2:
Common human pathogen infection



True signal
gene-editor CRISPR

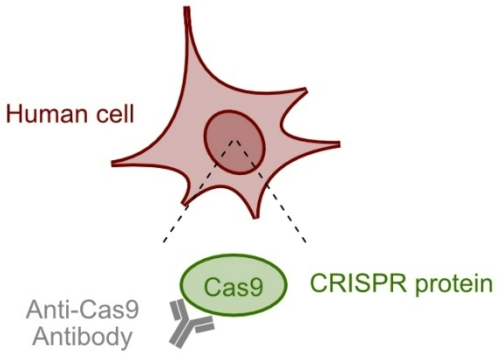


False signal
bacterial CRISPR

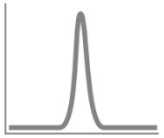


Specific CRISPR Gene-editor Detection

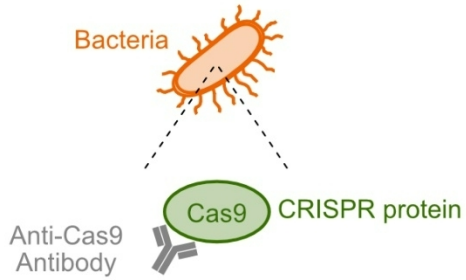
Scenario 1:
Human gene-editor exposure



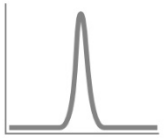
True signal
gene-editor CRISPR



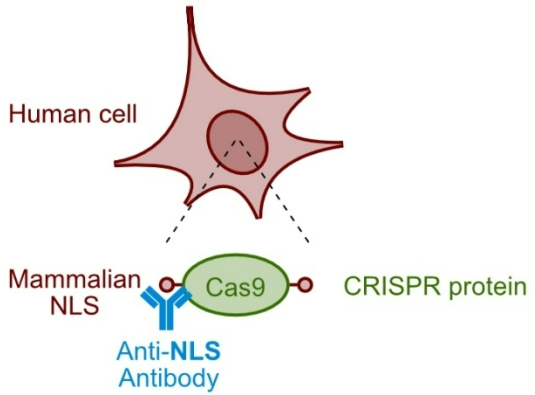
Scenario 2:
Common human pathogen infection



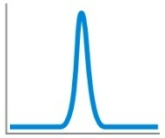
False signal
bacterial CRISPR



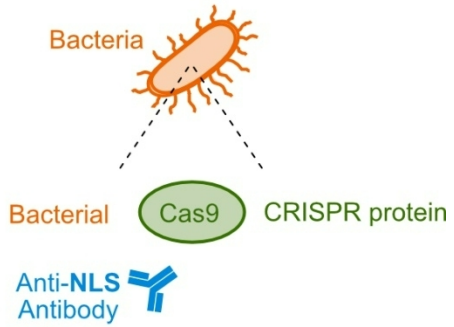
Scenario 1:
Human gene-editor exposure



True signal
gene-editor CRISPR



Scenario 2:
Common human pathogen infection



False signal
bacterial CRISPR

Acknowledgements

sgRNA Detection:

Emmarie Ryan

Leslie Huggins

PTM Detection:

Bryan Carson

NLS Detection:

Betty Mangadu

Sean Lund

Brooke Harmon

Robert Meagher

Oscar Negrete