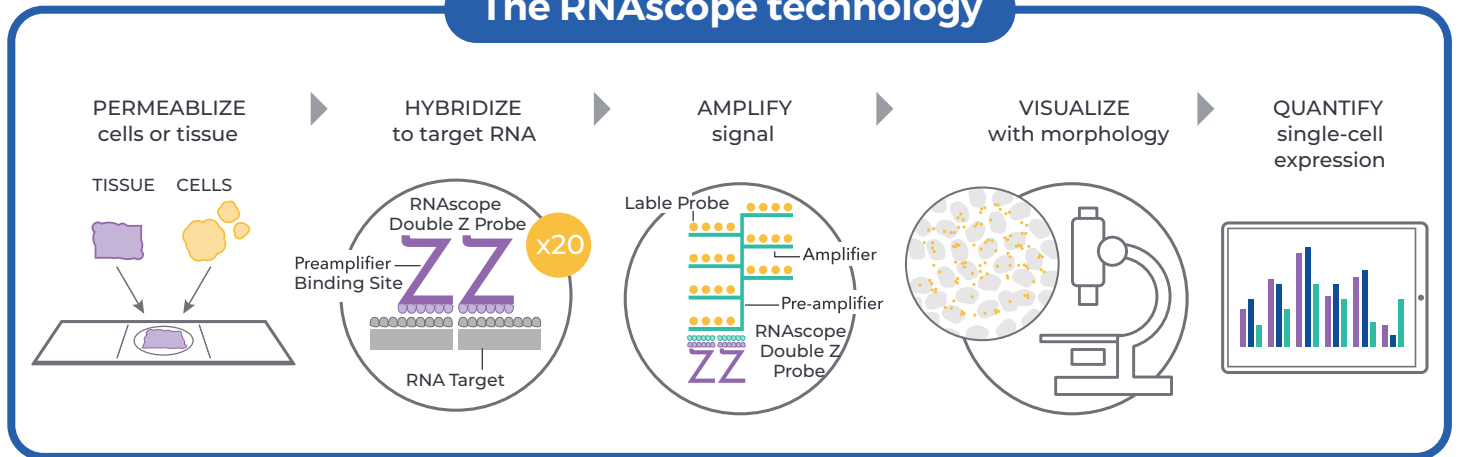


Accelerate COVID -19 research using the highly sensitive RNAscope™ In Situ Hybridization technology

ACD™
a biotechne brand

The RNAscope technology



RNAscope® technology is a new generation RNA fluorescence **in situ hybridization** product developed by ACD, a Bio-Techne brand. The proprietary "**double Z**" probe design in combination with advanced signal amplification techniques enables highly specific and sensitive detection of target RNA.

This technology **decrease** the need for the **costly and time-consuming development of specific antibodies** for newly identified gene targets or pathogens such as the **COVID -19 SARS-CoV-2 virus**. Additionally, the RNAscope technology can be combined with immunohistochemistry (IHC) on the same slide for detection of RNA and protein simultaneously.

ACD has designed **probes specific** for the sequences of **SARS-CoV-2**. In couple with ACD pretreatment and detection kits, they can be used to detect the virus in vivo.

Features & Benefit

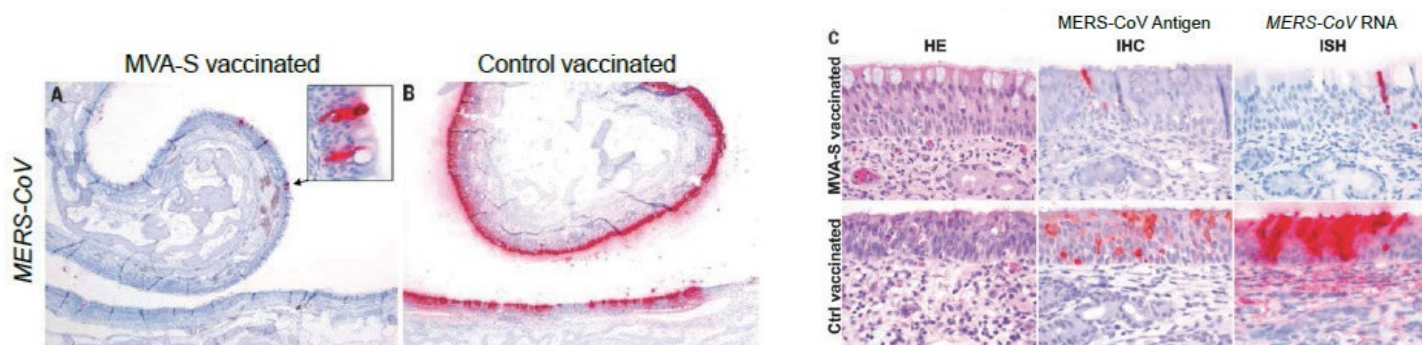
- Highly Specific & sensitive for detection of target RNA
- Available probes specific for the sequences of **SARS-CoV-2**
- Molecular detection and morphological context in single assay
- Universal: Any gene, any genome, any tissue
- Chromogenic & Fluorescence detection

How can RNAscope technology support COVID-19 research?



- The V-nCoV2019 -S probe **detects the SARS-CoV-2 spike protein mRNA** and does **not detect other** coronaviruses or host mRNA
- Using the RNAscope multiplex assays, V-nCoV2019-S probe **can be combined** with probes for the cellular **receptor ACE2** and proteases such as **TMPRSS2, Cathepsin B and Cathepsin L**, all of which facilitate viral entry into the host cells, for the visualization of infected cells.
- The single-molecule sensitivity of RNAscope is particularly well-suited for **detecting low levels of ACE2 expression and identifying virus-targeted cell types**.
- Patients with severe COVID -19 infections suffer from acute respiratory distress syndrome (ARDS) which is induced by the release of cytokines such as **IL-6, IL-1β, IL-10 and TNFα** among others. RNAscope assays can identify the cells secreting **these inflammatory cytokines**.
- The RNAscope assay can **detect viral replication in tissues** by using the **V-nCoV2019 -S sense probe** targeting the **antisense RNA strand** produced during viral replication.

See In Situ Hybridization Technology in cell and tissue



Detection of MERS-CoV virus in vaccinated and non vaccinated camel

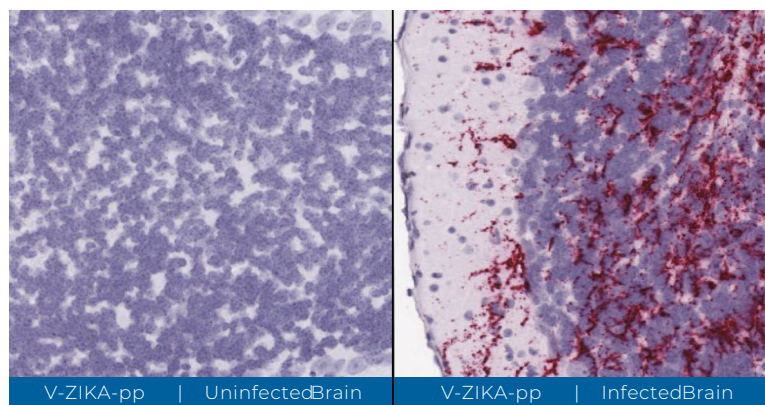
The **Middle East Respiratory Syndrome Coronavirus (MERS-CoV)** is another highly pathogenic coronavirus in recent years. During the development of vaccine, Haaqmans BL et al. tested the effect of the injected vaccine using **RNA scope technology** and found that the virus particles in the camel's nasal mucosa were significantly down-regulated in the vaccination group compared to the control group (see the left figure, the red signal dots shown in figure A, B and C were RNA scope® positive signals). An orthopoxvirus-based vaccine reduces virus excretion after MERS-CoV infection in dromedary camels. *Science* 2016, 35 (6268):77-81

Publications highlighting RNA scope in infectious disease research:

We have over 400 publications using the RNA scope technology for viral detection. Listed below are a few key publications on positive single-stranded RNA viruses.

1. Haagmans, B.L. et al., An orthopoxvirus-based vaccine reduces virus excretion after MERS-CoV infection in dromedary camels. *Science*, 2016. 351(6268): p. 77-81.
2. Cha, R.H.Y., et al., A Case Report of a Middle East Respiratory Syndrome Survivor with Kidney Biopsy Results. *J Korean Med Sci*, 2016. 31(4): p. 635-640.
3. Haagmans, B.L. et al., Asymptomatic Middle East respiratory syndrome coronavirus infection in rabbits. *J Virol*, 2015. 89(11): p. 6131-6135.
4. Vergara-Alert, J.v.d.B., et al., Livestock Susceptibility to Infection with Middle East Respiratory Syndrome Coronavirus. *Emerg Infect Dis*, 2017. 23(2): p. 232 - 240.
5. Bhatnagar, J.R., et al., Zika Virus RNA Replication and Persistence in Brain and Placental Tissue. *Emerg Infect Dis*, 2017. 23(3): p. 405-415.

Detection of positive single-stranded RNA virus



Detection of ZIKA virus strain PRVABC59 in mouse tissues: The RNA scope probe detected positive staining for ZIKA viral RNA in the infected tissues but not in the uninfected tissues demonstrating the specificity of the RNA scope probes.

Listed below are probes and reagent kits for manual RNA scope assays. Corresponding probes and reagent kits for automated assays are also available

RNA scope tools available for COVID-19 research

CAT. NO.	PROBE	TARGET	CAT. NO.	ASSAY
848561	RNA scope® Probe - V-nCoV2019-S	Viral spike protein	322300	RNA scope® 2.5 HD Reagent Kit – BROWN
845701	RNA scope® Probe - V-nCoV2019-S-sense	Spike protein sense strand	322350	RNA scope® 2.5 HD Reagent Kit – RED
848151	RNA scope® Probe - Hs-ACE2	Host cell receptor	322430	RNA scope® 2.5 HD Duplex Reagent Kit
470341	RNA scope® Probe – Hs-TMPRSS2	Serine protease	323100	RNA scope® Multiplex Fluorescent Reagent Kit v2
602051	RNA scope® Probe – Hs-IL10	Cytokine		
310371	RNA scope® Probe – Hs-IL6	Cytokine		
310361	RNA scope® Probe – Hs-IL1B	Cytokine		
310421	RNA scope® Probe – Hs-TNFA	Cytokine		



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