

Rapid development of a point of care test for coronavirus using SIBA technology

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Prinse'20 – Printed Intelligence Industry Seminar

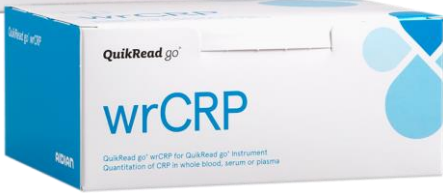




Aidian in a nutshell

- We are a Finnish-based IVD company with almost 50 years of experience in developing and manufacturing reliable, fast and easy-to-use diagnostic tests especially for primary care and point-of-care diagnostics.
- Our global footprint covers over 60 countries and our QuikRead go® flagship products are used globally, with more than 50,000 placed instruments. Our annual turnover is close to 55 MEUR.

Our portfolio



Coronavirus

The New York Times

LIVE UPDATES Updated 8 minutes ago

Coronavirus Live Updates: New Cases Emerge in Germany and Japan as Infections Exceed 4,500

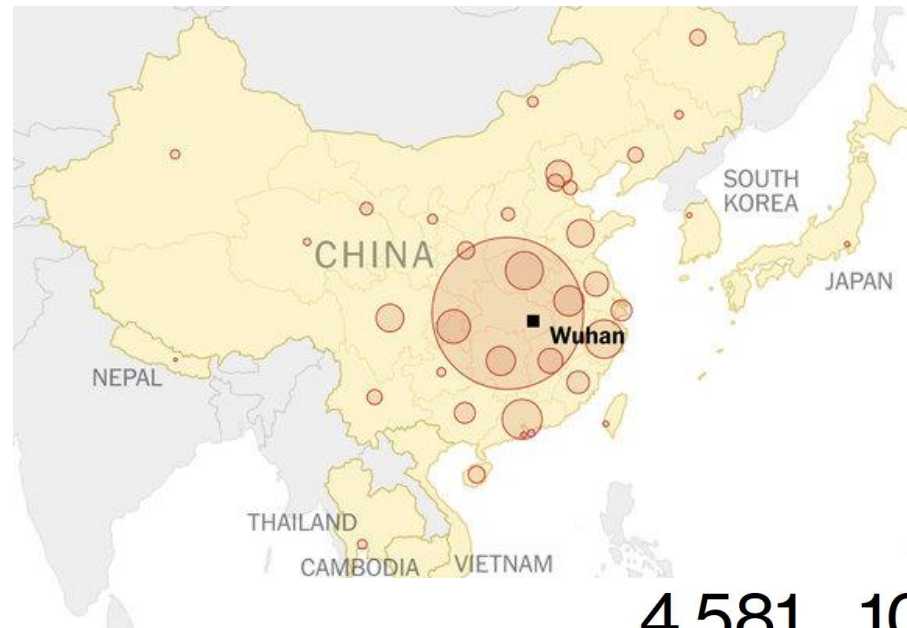
The number of known cases of the new virus rose by nearly 60 percent overnight. A shortage of test kits has led experts to warn that the real number may be higher.

By The New York Times

RIGHT NOW Hong Kong will severely limit travel from mainland China, suspending high-speed rail service and cutting flights by half.

Here's what you need to know:

- [Death toll exceeds 100 as number of infections skyrockets.](#)
- [Germany and Japan say the virus has spread in their countries.](#)
- [Hong Kong puts significant limits on travel from the mainland.](#)
- [World Health Organization buries updated global risk assessment in a footnote.](#)
- [Shortage of test kits in China prompts concern that cases have been underreported.](#)



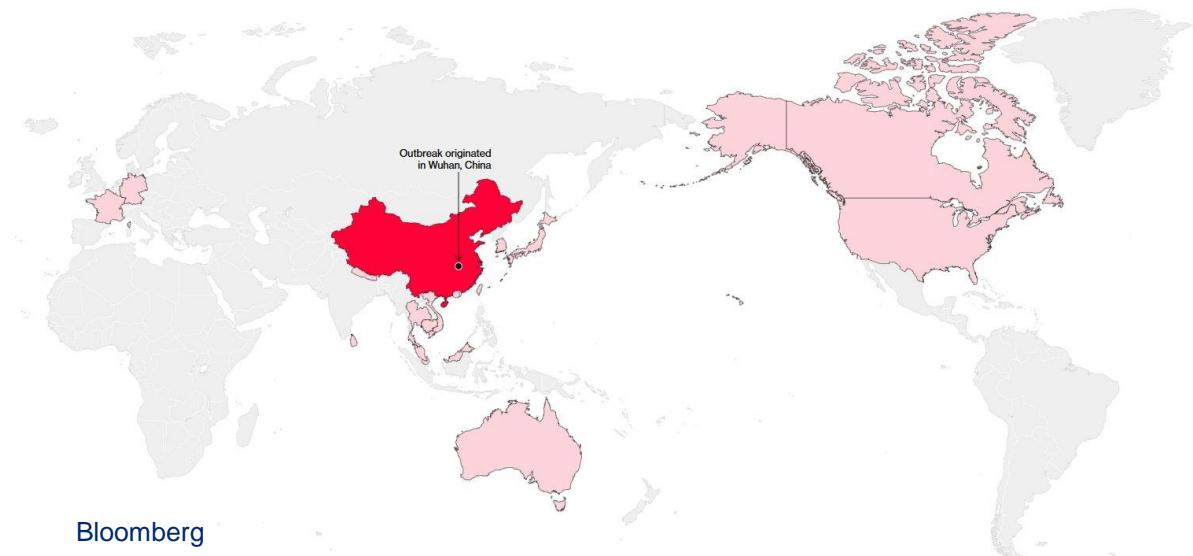
4,581 **106**

Confirmed cases worldwide Deaths worldwide

Jurisdictions with cases confirmed as of January 28, 2020, 5:00 AM GMT+2
1-9 ■ 10-99 ■ 100-999 ■ 1,000 or more



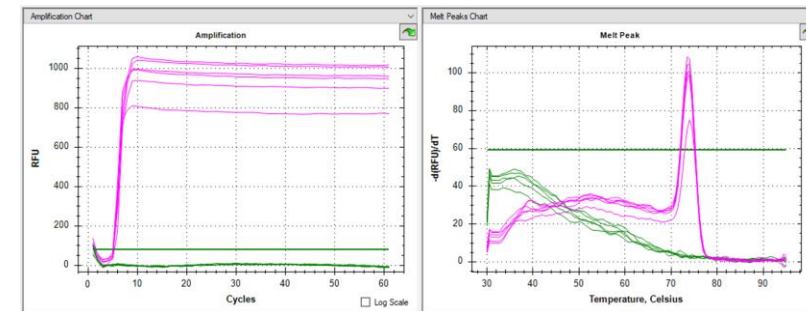
Business Insider



Bloomberg

Strand Invasion Based Amplification – SIBA[®]

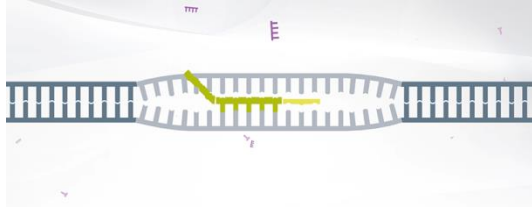
- Isothermal amplification of nucleic acids at ~40 °C, continuous reaction (no cycling)
- Based on recombinase system driven invasion of target strand to enable binding of amplification primers
- Specific – several features to minimize unspecific amplification
- Fast and robust – real-time continuous reaction and detection even from crude lysates
 - Has lower sample preparation requirements than qPCR
- Time-to-Result shown even < 15 min
- DNA and RNA targets; proven with bacteria, viruses and eukaryotes
- Flexible instrumentation
 - Does not require sophisticated instruments, but may also use any existing PCR instrument
 - Suitable for in-the-field and POC applications as well as for centralized laboratories



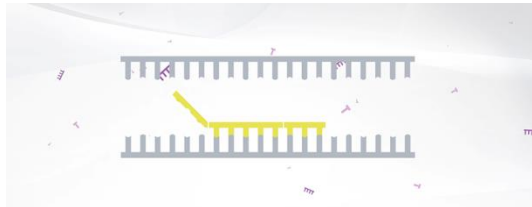
SIBA[®] – continuous exponential amplification

Constant ~ 40° C

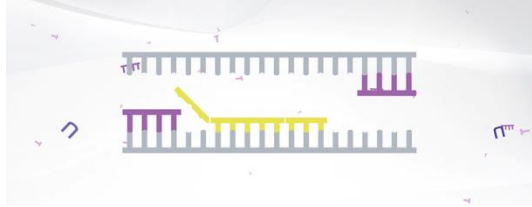
INVASION



DISSOCIATION



AMPLIFICATION



1. Proprietary **invasion oligo** (yellow) penetrates double stranded DNA target by the help of a recombinase enzyme machinery. Invasion oligo modification provides specificity.
2. The invasion process **dissociates** flanking areas and single stranded **target DNA** is exposed.
3. Amplification primers anneal to single stranded DNA exposed by the dissociation.
4. Strand-displacing DNA polymerase **synthesizes complementary strands**. The invasion oligo dissociates. The process starts over.

COUNTRIES WITH CONFIRMED ZIKA CASES



- | | | |
|-----------------|------------------|---------------|
| UGANDA | MICRONESIA | SURINAME |
| NIGERIA | POLYNESIA | CAPE VERDE |
| TANZANIA | EASTER ISLAND | FIJI |
| EGYPT | THE COOK ISLANDS | FRENCH GUIANA |
| CENTRAL AFRICAN | NEW CALEDONIA | HONDURAS |
| REPUBLIC | BRAZIL | MARTINIQUE |
| SIERRA LEONE | CHILE | PUERTO RICO |
| GABON | COLOMBIA | PANAMA |
| INDIA | EL SALVADOR | SAMOA |
| MALAYSIA | GUATEMALA | VANUATU |
| PHILIPPINES | MEXICO | USA |
| THAILAND | PARAGUAY | NETHERLANDS |
| VIETNAM | VENEZUELA | GERMANY |
| INDONESIA | | |

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We've been here before

Diagnostic Microbiology and Infectious Disease 86 (2016) 369–371



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journal homepage: www.elsevier.com/locate/diagmicrobio



Rapid molecular diagnostic test for Zika virus with low demands on sample preparation and instrumentation



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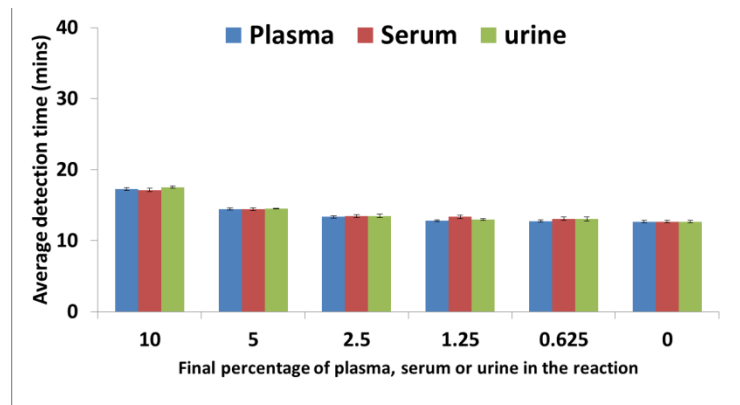
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ABSTRACT

Zika virus has only recently gained attention due to recent large outbreaks worldwide. An easy to use nucleic acid amplification test could play an important role in the early detection of the infection and patient management. Here, we report a rapid and robust isothermal nucleic acid amplification assay for the detection of Zika virus. The method is cost-effective and compatible with portable instrumentation, enabling near patient testing and field use.

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Impact of plasma, serum & urine, Zika virus assay



has been previously applied to the rapid detection of DNA (Hoser 14; Eboigbodin & Hoser, 2016) and RNA (Eboigbodin et al., 2016) hogens. During RT-SIBA reactions, Zika virus RNA is first reverse ed to cDNA followed by amplification and detection of cDNA thermal reaction conditions. SIBA relies on a recombinase-coated anded invasion oligonucleotide (IO) for the separation of a comary target duplex. This results in the generation of a single-target template that is bound and extended by target-specific

NCBI Resources How To Sign in to NCBI

Nucleotide Nucleotide Search Advanced Help

GenBank Send to: Change region shown Customize view

Wuhan seafood market pneumonia virus isolate Wuhan-Hu-1, complete genome

GenBank: MN908947.3
[FASTA](#) [Graphics](#)

Go to:

LOCUS MN908947 29903 bp ss-RNA linear VRL 23-JAN-2020

DEFINITION Wuhan seafood market pneumonia virus isolate Wuhan-Hu-1, complete genome.

ACCESSION MN908947
 VERSION MN908947.3
 KEYWORDS .

SOURCE Wuhan seafood market pneumonia virus
 ORGANISM [Wuhan seafood market pneumonia virus](#)
 Viruses; Riboviria; Nidovirales; Coronaviridae; Orthocoronavirinae; Betacoronavirus; unclassified Betacoronavirus.

REFERENCE 1 (bases 1 to 29903)
 AUTHORS Wu, F., Zhao, S., Yu, B., Chen, Y.-M., Wang, W., Hu, Y., Song, Z.-G., Tao, Z.-W., Tian, J.-H., Pei, Y.-Y., Yuan, M.L., Zhang, Y.-L., Dai, F.-H., Liu, Y., Wang, Q.-M., Zheng, J.-J., Xu, L., Holmes, E.C. and Zhang, Y.-Z.
 TITLE A novel coronavirus associated with a respiratory disease in Wuhan of Hubei province, China
 JOURNAL Unpublished

REFERENCE 2 (bases 1 to 29903)
 AUTHORS Wu, F., Zhao, S., Yu, B., Chen, Y.-M., Wang, W., Hu, Y., Song, Z.-G., Tao, Z.-W., Tian, J.-H., Pei, Y.-Y., Yuan, M.L., Zhang, Y.-L., Dai, F.-H., Liu, Y., Wang, Q.-M., Zheng, J.-J., Xu, L., Holmes, E.C. and Zhang, Y.-Z.
 TITLE Direct Submission
 JOURNAL Submitted (05-JAN-2020) Shanghai Public Health Clinical Center & School of Public Health, Fudan University, Shanghai, China

COMMENT On Jan 17, 2020 this sequence version replaced [MN908947.2](#).

```
##Assembly-Data-START##
Assembly Method      :: Megahit v. V1.1.3
Sequencing Technology :: Illumina
##Assembly-Data-END##
```

FEATURES
 source Location/Qualifiers
 1..29903
 /organism="Wuhan seafood market pneumonia virus"
 /mol_type="genomic RNA"
 /isolate="Wuhan-Hu-1"
 /host="Homo sapiens"
 /db_xref="taxon:2697049"
 /country="China"

Analyze this sequence
 Run BLAST
 Pick Primers
 Highlight Sequence Features
 Find in this Sequence

Related information
 Assembly
 Protein
 Taxonomy
 Identical RefSeq

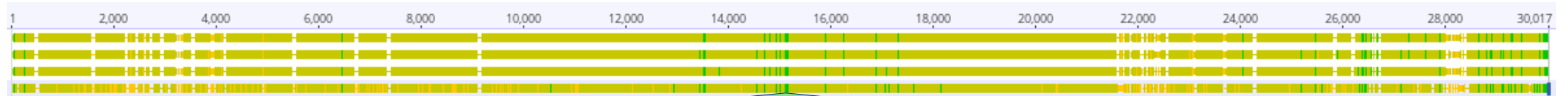
LinkOut to external resources
 Order of1ab cDNA clone/Protein/Antibody/RNAi [OriGene]
 Order S cDNA clone/Protein/Antibody/RNAi [OriGene]
 Order ORF8 cDNA clone/Protein/Antibody/RNAi [OriGene]

Recent activity
 Turn Off Clear
 Wuhan seafood market pneumonia virus isolate Wuhan-Hu-1, complete genc Nucleotide
 ASM985889v3 - Genome - Assembly - NCBI Assembly
 See more...

Sequencing technologies have become fast and powerful giving a speed advantage to the development of sequence based rapid diagnostics, using technologies like PCR or SIBA.

SIBA assay for Corona Wuhan-Hu-1 -virus

Step 1. Database search



| | | | | | |
|-------------|------------|---------------------------|--|-------------------------------|---------|
| SARS Urbani | CGCGTATACT | AAGCGTAATGTCATCCCTACTATAA | CTCAAATGAATCTTAAGTATGCCATTAGTGCAAAGAATAGAGCTCGCACC | GCTGGTGTCTCTATCTGTAGTACTATGAC | AAATAGA |
| SARS TW1 | CGCGTATACT | AAGCGTAATGTCATCCCTACTATAA | CTCAAATGAATCTTAAGTATGCCATTAGTGCAAAGAATAGAGCTCGCACC | GCTGGTGTCTCTATCTGTAGTACTATGAC | AAATAGA |
| SARS Tor2 | CGCGTATACT | AAGCGTAATGTCATCCCTACTATAA | CTCAAATGAATCTTAAGTATGCCATTAGTGCAAAGAATAGAGCTCGCACC | GCTGGTGTCTCTATCTGTAGTACTATGAC | AAATAGA |
| Corona 2020 | CGCATATACA | AAACGTAATGTCATCCCTACTATAA | CTCAAATGAATCTTAAGTATGCCATTAGTGCAAAGAATAGAGCTCGCACC | GCTGGTGTCTCTATCTGTAGTACTATGAC | CAATAGA |

Step 2. Assay design

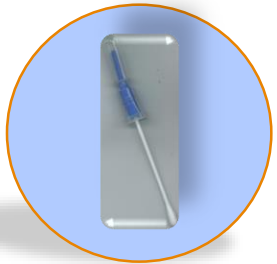
Corona 2020 virus genome
SIBA® Invasion oligo
SIBA® amplification oligos

TGTCATCCCTACTATAA**CTCAAATGAATCTTAAGTATGCCATTAGTGCAAAGAATAGAGCTCGCACC**GCTGGTGTGC
CCCCCCCCCCCCCACTCAAATGAATCTTAAGTATGCCATTAGTGCAAAGAATAGAG
TCATCCCTACTATAACTC**** **AGAGCTCGCACC**GCTGGT**G**

 A functioning assay in days / 1-2 weeks !

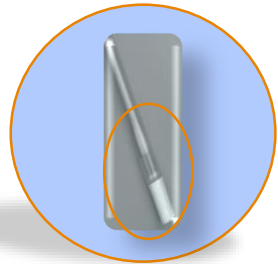
Workflow for a <1 hour TAT* assay at an airport or other point of need

1. Swab Sample



2'

2. Elute Sample



3'

3. Amplify Detect



"BYOD"



30'



Liquid reagents or freeze-dried
A simple to use "just add sample"
formulation



5'

Simple read-out, if
amplification occurs
= positive

Initial result with high
confidence

Total Time-to-Result < 45 min

*TAT = Total Turn Around Time

SIBA[®] licensing

- Partnering and licensing opportunities for our proprietary SIBA technology
- Aidian owns global rights for the SIBA isothermal nucleic acid detection technology in all fields
 - non-IVD, including areas like veterinary, environmental, food and water
 - selected human IVD areas

Thank you!

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