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Comparative evaluation of the sensitivities of SARS-CoV-2 antigen rapid tests

Aim

Comparison of different antigen rapid tests with using identical sample material

Material

Pools from nasopharyngeal and oropharyngeal swabs.

Dry swabs were included in PBS; moist swabs were already included in the transport media of various compositions. Pools are random mixtures obtained from up to 10 samples of comparable CT values diluted 1:10 in negative samples in PBS. The CT values of a pool were determined by means of different PCR assays, and the putative number of RNA copies calculated with the aid of the INSTAND standards. In the case of the PCRs used, a CT value of 25 corresponds to around 10^6 RNA copies/mL. 18 samples each were analysed with $CT < 25$, 23 samples with CT between 25 and 30, and 9 samples with $CT > 30$. The replication of the virus in cell culture was determined as a possible correlate for infectiousness as another characteristic of the samples.

Method

The pools were aliquoted, frozen, shipped, and thawed for evaluation of the tests. For each test, 50 µL of the pool were analysed using the components of the test provided, e.g. swabs. Laboratories participating in the comparative evaluation included the Robert Koch-Institut, the Paul-Ehrlich-Institut, the reference laboratory for coronaviruses (Charité), and the Institute for Microbiology of the German Army (Bundeswehr).

Summary

This comparative evaluation of a large number of SARS-CoV-2 rapid antigen tests (point of care tests; POCT) of different designs and manufacturers with the same sample set allows an overview of the current state of art regarding sensitivity. The results do not allow any conclusions regarding specificity of the tests.

Those POCTs which have up to now been included in the evaluation and have been assessed as reflecting the current state of the art are listed in the table below. Other tests, which were assessed as not reflecting the state of the art were deleted from the list of the Federal Institute for Drugs and Medical Devices (Bundesinstitut für Arzneimittel und Medizinprodukte, BfArM). This comparative evaluation is constantly continued, and the table is amended accordingly.

You should be aware that this comparative evaluation can only cover a random sample of the SARS-CoV-2 rapid antigen tests listed by the BfArM, thus eligible for refunding, and that few other products could not (yet) be taken into account, despite the interests on the part of the manufacturers/distributors.

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Overview of SARS-CoV-2 Antigen Rapid Tests Assessed as Reflecting the Current State of the Art

Name of Test	Manufacturer (Distributor)
Panbio™ COVID-19 Ag Rapid Test Device (NASOPHARYNGEAL)	Abbott Rapid Diagnostics Jena GmbH
RIDA®QUICK SARS-CoV-2 Antigen	R-Biopharm AG
SARS-CoV-2 Rapid Antigen Test	SD BIOSENSOR (Roche Diagnostics GmbH)
NADAL® COVID-19 Ag Schnelltest	nal von minden gmbh
STANDARD™ F COVID-19 Ag FIA	SD BIOSENSOR
STANDARD™ Q COVID-19 Ag Test	SD BIOSENSOR
BIOSYNEX COVID-19 Ag BSS	BIOSYNEX SWISS SA
MEDsan® SARS-CoV-2 Antigen Rapid Test	MEDsan GmbH
TestNOW® - COVID-19 Antigen	Affimedix
NowCheck® COVID-19 Ag Test	BIONOTE
Coronavirus Ag Rapid Test Cassette (Swab)	Zhejiang Orient Gene Biotech Co.,Ltd
Sofia SARS Antigen FIA	Quidel Corporation
COVID-19 Ag Test Kit	Guangdong Wesail Biotech Co., Ltd.
CLINITEST® Rapid COVID-19 Antigen Test	Siemens Healthineers
ESPLINE® SARS-CoV-2	Fujirebio Inc. (Mast Diagnostica GmbH)
BD Veritor™ System for Rapid Detection of SARS-CoV-2	Becton Dickinson
GenBody COVID-19 Ag	IVC Pragen Healthcare
LumiraDx SARS-CoV-2 Ag Test	LumiraDX
Exdia COVID-19-Ag-Test	Precision Biosensor Inc. (Axon Lab AG)
SARS-CoV-2 Ag Rapid Test (FIA)	Wantai (Beijing Wantai Biological Pharmacy Enterprise Co., Ltd.)
SARS-CoV-2 Antigen Schnelltest	Xiamen Boson Biotech Co., Ltd
COVID-19 Antigen Schnelltest (Colloidal Gold)	Joinstar Biomedical Technology Co., Ltd (CIV care impuls Vertrieb)
mö-screen Corona Antigen Test	Mölab GmbH
Rapid SARS-CoV-2 Antigen Test Card	MP Biomedicals Germany GmbH
Lyher Novel Coronavirus (COVID-19) Antigen Test Kit (Colloidal Gold)	Hangzhou Laihe Biotech Co., Ltd. (Lissner Qi GmbH)
AMP Rapid Test SARS-CoV-2 Ag	Ameda Labordiagnostik GmbH
Clungene COVID-19 Antigen Rapid Test	Hangzhou Clongene Biotech Co., Ltd.
DIA-COVID® COVID-19 Ag Rapid Test Kit	GenSure Biotech Inc.
SARS-CoV-2 Antigen Rapid Test Kit	Beijing Lepu Medical Technology Co., Ltd
Hightop SARS-CoV-2 (Covid-19) Antigen Rapid Test	Qingdao Hightop Biotech Co., Ltd.
Rapid Covid-19 Antigen Test (Colloidal Gold)	Anbio (Xiamen) Biotechnology Co., Ltd
Safecare COVID-19 Ag Rapid Test Kit (Swab)	Safecare Biotech Hangzhou Co., Ltd.
QuickProfile Covid-19 Antigen Test Card	LumiQuick Diagnostics, Inc.

Name of Test	Manufacturer (Distributor)
Covid 19 Antigen Schnelltest	BioRepair GmbH
Green Spring SARS-CoV-2 Antigen Rapid Test Kit (Colloidal Gold)	Shenzhen Lvshiyuan Biotechnology Co., Ltd.
CAT Antigen Covid Rapid Test	Oncosem Onkolojik Sistemler San. Ve Tic. A.S.
ScheBo SARS-CoV-2 Quick Antigen	ScheBo Biotech AG
Nova Test SARS-CoV-2 Antigen Rapid Test Kit	Atlas Link Technology Co.,Ltd.
Toda Coronadiag Ag	Toda Pharma
Humasis COVID-19 Ag Test	Humasis Co., Ltd.
Novel Coronavirus 2019-nCoV Antigen Test (Colloidal gold)	Beijing Hotgen Biotech Co., Ltd.
COVID-19 Antigen Rapid Test Kit (Colloidal Gold)	AmonMed (Xiamen)Biotechnology Co., Ltd.
Canea COVID-19 Antigen Schnelltest	Core Technology Co., Ltd.
fluorecare COVID-19 SARS-CoV-2 Spike Protein Test Kit (Colloidal Gold Chromatographic Immunoassay)	Shenzhen Microprofit Biotech Co., Ltd
Testsealabs® Rapid Test Kit COVID-19 Antigen Test Cassette	Hangzhou Testsea Biotechnology Co., Ltd
Lysun COVID-19 Antigen Rapid Test Device (Colloidal Gold)	Hangzhou Lysun Biotechnology Co., Ltd.
Wizbiotech SARS-CoV-2 Antigen Rapid Test SARS-CoV-2 Antigen Detection Kit (Colloidal Gold Immunochromatographic Assay)	Xiamen WIZ Biotech Co., Ltd. PerGrande BioTech Development Co., Ltd.
salocor SARS-CoV-2 Antigen Rapid Test Cassette (Nasopharyngeal swab)	Salofa OY
Genrui SARS-CoV-2 Antigen Test Kit (Colloidal Gold)	Genrui Biotech Inc.
Wondfo SARS-CoV-2 Antigen Test (Lateral Flow Method)	Guangzhou Wondfo Biotech Co. Ltd
Aesku Rapid SARS-CoV-2 Rapid Test	Aesku Diagnostics GmbH
Rapid Response COVID-19 Rapid Test Device	BTNX, Inc. (Biotrend Chemikalien GmbH)
Dia Sure Covid-19 Antigen Rapid Test Device (Nasopharyngeal/Oropharyngeal Swab)	Azure Biotech Inc.
Labnovation SARS-CoV-2 Antigen Rapid Test Kit (Immunochromatography)	Labnovation Technologies, Inc.
V-Chek SARS-CoV-2 Rapid Ag Test Kit (Colloidal Gold)	SGA Mühendislik DAN. EG. İçve DIS.Ltd.STI
SGTi-flex COVID-19 Ag	Sugentech, Inc.
softec SARS COV-2 (Covid-19) Antigen Test Kit	Zet Medikal Tekstil Dis Ticaret Ltd. STI.
Genedia W Covid-19 Ag	Green Cross Medical Science Corp. (Weko Pharma GmbH)
COVID-19 (SARS CoV-2) Antigen Test Kit (Colloidal Gold)	Anhui Deepblue Medical Technology Co. , Ltd.
FREND™ COVID-19 Ag	NanoEntek Inc
RapidFor SARS-CoV-2 Rapid Antigen Test Colloidal Gold	Vitrosens Biyoteknoloji Ltd. Sti
COVID-19 (SARS-CoV-2) Antigen Test Kit PCL COVID19 Ag Gold Saliva	Wuhan EasyDiagnosis Biomedicine Co., Ltd PCL, Inc.
reOpenTest COVID-19 Antigen Rapid Test (Colloidal Gold)	Zhejiang Anji Saianfu Biotech Co.,Ltd.
IMMUNOBIO SARS-CoV-2 Antigen-Schnelltest (COVID-19 Ag)	Hangzhou Immuno Biotech Co.,Ltd.
Zhenrui COVID-19 (SARS-COV-2) Antigen Test Kits	Shenzhen Zhenrui Biotech co.Ltd.

SARS-CoV-2 Ag Diagnostic Test Kit (Colloidal Gold)	Shenzhen Watmind Medical Co.,Ltd.
2019-nCoV Antigen Test Kit(colloidal gold method)	Guangdong Hecin Scientific,Inc.
Asan Easy Test COVID-19 Ag	ASAN PHARM.CO.,LTD.
COVID-19 Antigen Saliva Test Kit (Colloidal Gold)	Nantong Diagnos Biotechnology Co., Ltd.
Axiom Diagnostics COVID-19 Ag Schnelltest	AXIOM Gesellschaft für Diagnostica und Biochemica mbH
Tigsun COVID-19 Saliva Antigen Rapid Test	Beijing Tigsun Diagnostics Co.,Ltd.
PocRoc SARS-CoV-2, Antigen Schnelltest Set (Kolloidales Gold)	Lumigenex (Suzhou) Co., Ltd.
Flowflex SARS-CoV-2-Antigenschnelltest (nasopharyngeal swab)	ACON Biotech (Hangzhou) Co., Ltd
SARS-CoV-2 Ag Diagnostic Test Kit (Immunofluorescence)	Shenzhen Watmind Medical Co.,Ltd.
Covid-19-Antigen-Testkit	New Gene (Hangzhou) Bioengineering Co., Ltd.
CoroVisio Covid-19 Ag Versieglungsröhrchen Teststreifen (Kolloidales Gold)	Amazing Biotech (Shanghai) Co., Ltd
COVID-19 Antigen Schnell Test (Nasopharyngeal / Oropharyngeal Tupfer Kassette)	Chil Tibbi Mal. San. Tic. Ltd. Şti
SARS-CoV-2-Antigen-Testkit (LFIA)	Jiangsu Medomics Medical Technology Co., Ltd
SARS-CoV-2 Antigen Assay Kit (Immunochromatography)	Wuhan Life Origin Biotech Joint Stock Co., Ltd.
COVID-19-Antigen-Schnelltest (Nasopharyngeal-Abstrich)	BIOMERICA Inc.
Covid-19 Antigen Schnelltest	Beijing Beier Bioengineering Co., Ltd.
Ksmart® SARS-COV2 Antigen Rapid Test	Avalun
Rapid Test Ag 2019-nCoV	ProGnosis Biotech
SARS-CoV-2 Antigen Rapid Test Kit	Wuhan UNscience Biotechnology Co., Ltd.
One Step Test for SARS-CoV-2 Antigen (Colloidal Gold)	Getein Biotech, Inc.
SARS-CoV-2 Antigen Rapid Test Kit	Triplex International Biosciences (China) Co., Ltd.
Novel Coronavirus (2019-nCoV) Antigen Testing Kit (Colloidal Gold)	Nanjing Norman Biotechnology Co.,Ltd
SARS-CoV-2 Antigen Rapid Test Cassette	Merlin Biomedical (Xiamen) Co., Ltd.
Edinburgh Genetics ActivXpress+ COVID-19 Antigen Complete Testing Kit	Edinburgh Genetics Limited
Covid-19 Antigen Detection Kit	DNA Diagnostic A/S.
COVID-19 Antigen Speicheltest (Immunochromatographie)	ulti med Products (Deutschland) GmbH
EBS SARS-CoV-2 Ag Rapid Test	Eurobio Scientific
COVID-19 Antigen Rapid Test Cassette (Colloidal Gold)	Jiangsu Diagnostics Biotechnology Co., Ltd