

PRESS RELEASE

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This press release is linked to the publication of the study results in "Nature Biotechnology." Accordingly, the content of published from 29.06.2021, 11 a.m. onwards, be published.

New corona mass test up to 100 times more sensitive than rapid antigen tests

A new corona test developed at the University Hospital Bonn can analyze a large number of swabs simultaneously using sequencing technology and has a similarly high sensitivity as the common qPCR test. The innovative method offers great potential, especially for systematic testing in daycare centers, schools or companies. Today, the results of the study on the new Corona test have been published in the renowned journal "Nature Biotechnology".

Bonn, 6/29/2021 - In addition to vaccination, systematic testing of the population remains of central importance in order to effectively monitor and contain the spread of infections during the Coronavirus pandemic. Only in this way can the spread of the virus be effectively monitored and contained through targeted measures.

The innovative corona test "LAMP-Seq", which has been developed at the University Hospital Bonn (UKB), offers the possibility to test many people regularly for the SARS-CoV-2 virus. In this way, infections can be detected at an early stage and corresponding chains of infection can be interrupted quickly. "Our corona test "LAMP-Seq" can detect about 100 times lower amounts of virus than current rapid antigen tests and is almost as sensitive and specific as the common qPCR test" describes Prof. Dr. Jonathan Schmid-Burgk from the Institute of Clinical Chemistry and Clinical Pharmacology of the UKB the characteristics of the test procedure, which was developed interdisciplinary with other researchers at the UKB.

"Added to this is the high scalability of the test. By using sequencing machines, thousands of samples can be analyzed simultaneously," said Schmid-Burgk, who was appointed to the University of Bonn from the Broad Institute of MIT and Harvard in early 2020. The LAMP-Seq method detects not only corona infections with the original SARS-CoV-2 virus, but also the novel variants of concern alpha to delta.

Ärztlicher Direktor und Vorstandsvorsitzender

Prof. Dr. med. Dr. h.c. mult.
Wolfgang Holzgreve, MBA

Tel: +49 228 287-10900
Fax: +49 228 287-9010900
wolfgang.holzgreve@ukbonn.de

Kommunikation und Medien

Viola Röser
Interimsleitung

Tel: +49 228 287-10469
Viola.Roeser@ukbonn.de

Universitätsklinikum Bonn
Kommunikation und Medien
Venusberg-Campus 1
Geb. 02
53127 Bonn

Ihr Weg zu uns
auf dem UKB-Gelände:



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Members of the ImmunoSensation2 cluster of excellence, the Institute of Hygiene and Public Health, Life&Brain GmbH and Bundeswehr Central Hospital Koblenz were among those involved in the project.

For the "LAMP-Seq" test, the Bonn scientists have adapted the already established LAMP method ("Loop-mediated Isothermal Amplification" - propagation of the viral genome at a constant temperature) and made it compatible with sequencing machines used for biomedical research. As a result, many samples can be analyzed simultaneously in a high-throughput procedure. Before thousands of samples are analyzed together in a sequencing run, each individual sample is linked to a molecular barcode. This barcode ensures that each sample can be assigned without doubt, even after thousands of samples have been pooled. "Retesting of the entire pool in case of a positive test result is therefore no longer necessary" says Dr. Kerstin Ludwig, Emmy-Noether group leader at the Institute of Human Genetics. This technology significantly reduces the cost per test in comparison to the qPCR test and makes the "LAMP-Seq" procedure a scalable corona mass test.

"With its high throughput and sensitivity, the "LAMP-Seq" test can make a significant contribution to the screening of undetected infections. Especially in schools or companies, where many people regularly meet, the corona test is ideal to systematically and preventively monitor the occurrence of infections" describes Ludwig, the co-developer of the test procedure, the possible application scenarios of the "LAMP-Seq" test.

Prof. Wolfgang Holzgreve, Medical Director and CEO of the UKB, explains the benefits of the new test for corona surveillance as follows: "In order to effectively contain a pandemic, infected people must be found before they infect others. To achieve this goal, we need mass screenings with the highest sensitivity that can give us a detailed picture of existing chains of infection. This is exactly what the corona test "LAMP-Seq" developed at UKB is suited for."

Even smaller models of the sequencing machines used are capable of analyzing around 10,000 samples in a single run (duration: around ten to twelve hours). This virtually eliminates laboratory capacity as a limiting factor in testing.

In several large studies (including school and employee testing) with a total of around 20,000 tests, the Bonn scientists have extensively tested, optimized and successfully validated the entire upstream and downstream logistics, from sample collection by throat swabs to fully digital feedback of the test results. The documentation of the study results recently passed an independent peer review process and was published today in the renowned journal Nature Biotechnology.

While the Bonn scientists have currently focused their innovative method entirely on SARS-CoV-2 testing, "LAMP-Seq" can also be used in the future for differential diagnostics in testing for other viruses such as influenza A and can also be quickly adapted to other viruses.

The scientists are currently working on CE certification in order to make the "LAMP-Seq" test available internationally in the near future. Until this approval is obtained, the technically and scientifically fully validated "LAMP-Seq" method will continue to be used for pilot testing.

The scientific team received financial support from the German Federal Ministry of Education and Research BMBF within the framework of the "Bundesweites Forschungsnetz Angewandte Surveillance und Testung" (B-FAST).

Publication: Kerstin U. Ludwig, Ricarda M. Schmithausen, David Li, Max L. Jacobs, Ronja Hollstein, Katja Blumenstock, Jana Liebing, Mikołaj Słabicki, Amir Ben-Shmuel, Ofir Israeli, Shay Weiss, Thomas S. Ebert, Nir Paran, Wibke Rüdiger, Gero Wilbring, David Feldman, Bärbel Lippke, Nina Ishorst, Lara M. Hochfeld, Eva C. Beins, Ines H. Kaltheuner, Maximilian Schmitz, Aliona Wöhler, Manuel Döhla, Esther Sib, Marius Jentzsch, Jacob D. Borrajo, Jonathan Strecker, Julia Reinhardt, Brian Cleary, Matthias Geyer, Michael Hölzel, Rhiannon Macrae, Markus M. Nöthen, Per Hoffmann, Martin Exner, Aviv Regev, Feng Zhang, Jonathan L. Schmid-Burgk: “LAMP-Seq enables sensitive, multiplexed COVID-19 diagnostics using molecular barcoding”, Nature Biotechnology 2021, Internet: <https://www.nature.com/articles/s41587-021-00966-9>

Photos:



Blue-stained swab material from Corona tests is prepared for analysis in a sequencing instrument using a laboratory robot.



A microreaction vessel (often referred to as an "eppi") filled with 1 milliliter of liquid contains the amplified smear material from up to 10,000 corona tests, which are analyzed with a sequencing instrument.



The development team behind the LAMP-Seq method (l-r): Dr. Dr. Ricarda Schmithausen (Institute of Hygiene and Public Health), Prof. Dr. Jonathan Schmid-Burgk (Institute of Clinical Chemistry and Clinical Pharmacology), Dr. Kerstin Ludwig (Institute of Human Genetics) and Dr. Per Hoffmann (Institute of Human Genetics), taken on the campus of the University Hospital Bonn.



Prof. Dr. Jonathan Schmid-Burgk, pipetting in a laboratory on the campus of the of the University Hospital in Bonn.

Picture credits: University Hospital Bonn / F. Heyder

Press Contact:

Felix Heyder
Universitätsklinikum Bonn
Tel.: 0228 287-11904
E-Mail: felix.heyder@ukbonn.de

University Hospital Bonn: The UKB treats over 400,000 patients per year. more than 8,000 employees and has a balance sheet total of over 1 billion euros. In addition to the more than 3,300 medical and dental students, more than 500 young people are trained in other healthcare professions. The UKB is ranked first among university hospitals in North Rhine-Westphalia, has the fourth-highest case mix index in Germany and in 2020 had the most successful annual the most economically successful annual result of all 35 German UKs and the only positive annual annual balance of all UKs in NRW.