

Report

2021

Fraunhofer vs. Corona

Working at the forefront of the fight against the pandemic, Fraunhofer is supporting the efforts of industry and society to cope with the immediate effects and the consequences to come. We are now focusing on projects in the medical and health sectors of direct relevance to the coronavirus crisis, including the development of a vaccine, innovative diagnostic techniques, the development of new drugs, putting into place a powerful IT infrastructure, and prioritizing relevant pre-competitive research. We also provide support by assisting manufacturers who make components for personal protective equipment (PPE).

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Fraunhofer's fight against the pandemic Corona Virus (COVID-19): - Drugs, diagnostics, devices and data are the four major areas of medical science.

A. Drugs

1. **Top-speed antibody development**

The development of biopharmaceuticals is a long and expensive process. A decade or more can elapse between the discovery of a new protein-based active ingredient and the release of a new drug. One major hurdle on this journey is the passage from the lab to clinical trials. As a rule, it takes between 18 months and two years to produce this kind of investigational medicinal product for use in clinical trials. However, at the Fraunhofer Institute for Toxicology and Experimental Medicine ITEM, researchers from the Division of Pharmaceutical Biotechnology have now developed a production method that reduces this step to just six months. [more info](#)

2. **DRECOR – Drug repurposing for Corona**

The DRECOR project team makes use of this approach. Coordinated by the Fraunhofer Institute for Molecular Biology and Applied Ecology IME, in total six Fraunhofer Institutes and a Fraunhofer Project Center – among them the Fraunhofer Institute for Cell Therapy and Immunology IZI – work together in the framework of DRECOR. The project partners aim at generating candidate molecules formulated for inhalative administration or systemic administration targeting the airways. [more info](#)

3. **HeLiMol – Production of lipid nanoformulations for encapsulation of mRNA molecules**

Numerous laboratories around the world are currently searching for an effective vaccine against the novel coronavirus. The German company CureVac is pursuing a particularly promising approach with its proprietary mRNA technology. If a breakthrough is made in this field, it is essential that scalable methods are available for the rapid mass production of the vaccines. To this end, a group of researchers at the Fraunhofer IPK is developing and testing different methods. [more info](#)

4. **C19 lung chip – Drug repurposing using a COVID-19 infection model in an immunocompetent lung-on-chip platform**

The model is used to test the efficacy of drug candidates identified at Fraunhofer IME. For this purpose, Fraunhofer IGB, IZI and IME combine competences in conducting pharmaceutical studies in human OoC and in establishing infection models. [more info](#)

5. **CoroVacc – Development of a SARS-CoV-2 specific vaccine based on attenuated carrier viruses**

Due to a modular approach by the Fraunhofer Institutes IGB and IZI, the carrier virus can be developed with SARS-CoV-2 specific antigens at short notice and tested with regard to its vaccination effect. [more info](#)

6. Fraunhofer research consortium iCAIR® uses synergies to develop new medications against SARS-CoV-2

The new coronavirus SARS-CoV-2 has triggered a public health emergency of international concern. To date, there is neither a vaccine nor drugs for COVID-19 treatment available. Researchers of the international consortium iCAIR® are striving to develop novel anti-infective agents to treat or prevent clinically significant respiratory diseases caused by viruses, fungi and bacteria – and recently started a project to develop medications against SARS-CoV-2. [more info](#)

7. ISE-CoV-2-Screen – Test systems for the identification of specific anti-corona molecules

Fraunhofer IGB and the Fraunhofer Project Center for Drug Discovery and Delivery @ Hebrew University will use computational chemistry (Iterative Stochastic Elimination, ISE) to identify already approved molecules that block the penetration of the virus and evaluate them with a number of already established and new test systems. [Fraunhofer Project Center for Drug Discovery and Delivery at Hebrew University of Jerusalem, Israel](#)

8. Research against the corona virus - tissue models for rapid drug testing

The pandemic caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) is placing unprecedented restrictions on public life and economy. The global research efforts to fill the knowledge gaps regarding the new pathogen and to develop effective therapies are correspondingly large. In Wuerzburg, too, researchers from the Fraunhofer Translational Center for Regenerative Therapies are working together with the virologist Prof. Dr. Bodem from the University of Wuerzburg to identify active substances against the virus. [more info](#)

9. Translational Medicine

The Fraunhofer Institute for Molecular Biology and Applied Ecology IME is providing the key link between biologists and data scientists in the EU funded consortium E4C to counter the coronavirus pandemic. [more info](#)

B. [Diagnostics](#)

10.»CoV-2-KomET« – Optimization and bundling of diagnostic resources:

Increased sample throughput in diagnostic laboratories, mobile laboratory diagnostics and on-site point-of-care testing. The SARS-CoV-2 pandemic is associated with significant consequences that extend to large segments of society. Preventive measures such as the regulation of public behavior and events, as well as isolations up to and including lockdowns, are being used to contain the outbreak. While this is considered necessary to control infection transmission, at the same time the economic, educational and mental health impacts are devastating. Therefore, to balance individual freedom and protection from COVID-19, comprehensive capabilities for rapid identification of infected individuals are particularly needed. [more info](#)

11.M3Infekt – Decentralized monitoring of COVID-19 patients

M³Infekt is a cluster project that aims to develop a patient monitoring system to enable early intervention should a patient's condition suddenly deteriorate, using the example of COVID-19 sufferers. By facilitating the required intervention at an early stage, the

system helps to slow the progression of the disease, shorten the duration of treatment and make flexible use of intensive care units (ICUs). In the long term, the system addresses decentralized monitoring of patients on regular wards and in non-hospital environments. [more info](#)

12. Rapid virus test for the detection of the SARS-CoV-2 virus and an electronic wound patch to stimulate healing processes at virtual.COMPAMED 2020

Get a proof of infection with the SARS-CoV-2 virus or of immunity to the virus within one hour. Accelerate healing processes with electrical stimulation through an active wound patch. Fraunhofer ENAS will present these and other topics for the first time from November 16-19 at the digital medical technology trade fair virtual.COMPAMED 2020 [more info](#)

13. Certainty in just 15 minutes – researchers develop a graphene oxide-based rapid test to detect infections

Researchers at the Fraunhofer Institute for Reliability and Microintegration IZM have joined forces with partners in industry and healthcare to develop a handy graphene oxide-based sensor platform to detect acute infections such as sepsis or the antibodies against the coronavirus within minutes with just one drop of blood for a diagnosis. [more info](#)

14. CoSE-Jump Start – Corona rapid test for self-application

The aim of the project is to develop a rapid corona test for in-house use based on amplification-free detection of the SARS-CoV-2 genome. The SARS-CoV-2 rapid test is designed in such a way that a non-professional user can carry it out independently, without the involvement of medical staff. The consortium of the anti-corona project CoSE Jump Start, consisting of partners from applied science and industry, is developing a cost-effective, widely applicable rapid test for SARS-CoV-2 for in-house use through to market maturity. [more info](#)

15. Recognize possible long-term damage from COVID-19 disease at an early stage

Research project: COVIMMUN - Immunome analysis in COVID-19

This project enables the mapping of the immune response by determining the patient-specific "omics" immunome, and to establish biomarkers for the early detection of severe disease progressions, in order to be able to intervene therapeutically before ventilation is required. New therapeutic starting points can be identified and, if necessary, favorably influenced with known drugs. Patients with defective immune system reconstitution are detected at an early stage in order to achieve a restoration of the immune system after a SARS-CoV-2 infection with targeted therapies and to prevent or attenuate secondary diseases.

The valid monitoring of a dysregulated immune reaction and the proof of its importance for clinical success makes biomarkers for prognosis and therapy control available for the first time. Since patient selection using biomarkers increases the probability of success of a clinical study with a drug by up to 30%, companies with already approved substances already choose Fraunhofer IME as a partner to conduct studies in severe infections. [more info](#)

16.The mobile Fraunhofer IBMT epidemiological laboratory (epiLab) in use for nationwide early detection and prevention of SARS-CoV-2 infections

The remarkable technological advance of the Fraunhofer Institute for Biomedical Engineering IBMT in the field of mobile epidemiological laboratories, as well as its long-time expertise in the setup of biological safety laboratories and its handling of biotechnological samples contributes in times of the Corona pandemic to the fight against SARS-CoV-2. [more info](#)

17.Mobile units and safety laboratories in the context of time-critical pandemic events - Strategies and concepts for productivity assurance through rapid on-site testing

The remarkable technological advance of the Fraunhofer Institute for Biomedical Engineering IBMT in the field of mobile epidemiological laboratories, as well as its long-time expertise in the setup of biological safety laboratories and its handling of biotechnological samples contributes in times of the Corona pandemic to the fight against SARS-CoV-2. The mobile epidemiological laboratory (epiLab) designed and built by the Fraunhofer IBMT in collaboration with the vehicle manufacturer Bischoff & Scheck in the "Laboratory of the Future" project will be used on-site in Rheinmünster on June 18, 2020 for SARS-CoV-2 antibody testing by Bischoff & Scheck employees. [more info](#)

18.Production of a new antibody test system for the diagnosis of COVID-19

The Fraunhofer Research Institution for Marine Biotechnology and Cell Technology EMB in Lübeck is supporting EUROIMMUN AG in producing larger quantities of its new serological test systems for the diagnosis of COVID-19. EUROIMMUN is one of the first companies in Europe to offer a test for the determination of antibodies against SARS-CoV-2 in serum samples, which enables the identification of persons who have already had contact with the virus. This is important to find out who has already been through the infection. In addition, there is evidence that these tests detect those antibodies that are able to neutralize the virus and thus provide immunity to SARS-CoV-2. [more info](#)

19."Access Checker" to remotely gauge body temperature, heart rate and respiratory rate

A novel measuring method is helping to spot coronavirus infections from a safe distance. It detects fever, elevated pulse rates and rapid breathing without endangering the individual taking the readings. Fraunhofer IPA and Fraunhofer IAO are testing the procedure at the Robert Bosch Hospital in Stuttgart. [more info](#)

20.The corona rapid test in under 2.5 hours

The number of people infected with the novel SARS-CoV-2 virus is rapidly increasing worldwide. Affected countries are adopting new measures almost daily to contain the spread, while medical laboratories are working not only on a vaccine but also on new test methods. For the time being, Bosch wants to launch a new rapid test in Germany that shows a result at the test site in under 2.5 hours instead of the previous 2 days. This technical solution is based on a PoC analysis platform, which was developed together with Fraunhofer IZM in the EU project CAJAL4EU. The main objective of the project was to develop miniaturized biosensor technology platforms that enable fast,

robust, user-friendly and cost-effective multi-parameter in vitro test applications. This project was supported by the EU (funding code: FP7-ENIAC-120215) and BMBF (funding code: 13N10925) within the framework of FP7. [more info](#)

C. [Devices](#)

21. Decentralized Oxygen Production

With a worldwide consumption of around 500 million tons per year, oxygen is one of the most frequently required industrial gases. On a large scale, oxygen is produced via cryogenic air separation (Cryo ASU) and usually transported to the customer. The price of oxygen therefore rises significantly for small quantities. Pressure swing adsorption (PSA) or its vacuum alternative (VPSA) is used for local production. However, the O₂ purity is limited to around 93 vol % and the high power consumption strongly impairs the profitability of O₂ use. For cost-efficient on-site oxygen production, Fraunhofer IKTS develops oxygen-permeable ceramic membranes and corresponding oxygen generators. In addition to a high operating temperature, these so-called mixed ionic-electronic membranes (MIEC) only require different O₂ partial pressures to generate pure oxygen. Therefore, the energy demand of the process is caused by the heat required to maintain the operating temperature and by the compression energy required for gas compression. The operators of these oxygen generators remain independent of gas suppliers. [more info](#)

22. Ensuring Medical Care in Crises and Emergencies - Fraunhofer is developing a mobile medical care system.

Mobile, distributed systems that provide medical care to the public can be a crucial addition to the existing healthcare infrastructure in crises and emergencies such as the current Corona pandemic. Six of the FraunhoferGesellschaft's institutes have joined forces under the lead management of the Fraunhofer IFF in Magdeburg and are developing an integrated system for mobile, distributed medical care in the Demo-medVer project. What makes it special is that all of the complete system's components are modularized, are closely interconnected, and complement each other. A functional prototype is intended to be built by the end of next year. [more info](#)

23. 3D printed respiratory masks with replaceable filter

The researchers at Fraunhofer Plastics Technology Center Oberlausitz (FKO) in Zittau have developed and manufactured a reusable respiratory mask by applying a selective laser sintering process using polyamide. Currently approx. 150 to 200 masks can be produced per week. In order to realize a higher number of pieces, the Fraunhofer scientists are investigating the production of respiratory masks by injection molding. [more info](#)

24. Intelligent robots for targeted combating of viruses and bacteria

Service robots can help ensure that buildings and means of transport are cleaned and disinfected regularly and with consistently high quality. Since October 2020, twelve institutions of the Fraunhofer-Gesellschaft have been working on the development of new technologies for this field of application. Led by Fraunhofer IPA, the partners are pooling their expertise in the "Mobile Disinfection" (MobDi) research project to contribute to a safe "New Normal" in times of pandemic. [more info](#)

25.»Next Generation Protection Textiles«

Protective textiles, in particular respiratory protection masks, have become very relevant since the SARS-CoV-2 pandemic. This has led to an increased demand for high-quality protective equipment.

The cluster project Next Generation Protection Textiles offers a vertically integrated approach for the production of improved, high-quality protective textiles. [more info](#)

26."AVATOR" – Anti-Virus-Aerosol: Testing, Operation, Reduction

In addition to technologies for purifying the indoor air, the AVATOR project investigates the spread of aerosols and derives hygiene concepts for different scenarios. The mechanisms of spread are modeled using simulations based on "Computational Fluid Dynamics" right up to zonal and agent-based approaches. In parallel to the simulation-based methods for assessing the spread of microorganisms via the air, the institutes are developing several air purification technologies. These developments will ultimately be tested in laboratory environments and then validated in real environments. The project results will lead to new concepts for reducing the risk of infection with SARS-CoV-2 in various application scenarios. [more info](#)

27.Filter4Flow – A smart, non-invasive respiratory filter system

As part of the Filter4Flow project, we are working on a novel technology for monitoring patients' breathing. It improves clinical treatment processes, allows respiratory parameters to be recorded close to the patient and can be used outside the ICU.

Our smart virus filter revolutionizes respiratory monitoring for patients suffering from conditions such as SARS-CoV-2 by filtering out harmful particles from the air while also continuously monitoring all relevant parameters (breathing flow, oxygen level, tidal volume, etc.). This means that patients can be given ideal respiratory assistance at all times. The design allows filters and sensors to be replaced quickly and easily, thus making life easier for the nursing staff. The simplicity of the application means that it can even be used outside medical institutions, for example in developing countries or crisis regions. [more info](#)

28.Fraunhofer IOSB-AST and BINZ bring forward-looking light disinfection solutions in ambulances onto the market

Disinfection with UVC light is not a new invention, but has been state of the art for many decades, for example in the field of drinking water treatment. However, the comparatively young UVC LED technology expands the range of applications enormously, which Fraunhofer researchers and BINZ Ambulance- und Umwelttechnik GmbH Ilmenau have now achieved for the first time in an ambulance. Their solution enables reliable and quick disinfection of surfaces and air at the push of a button. [more info](#)

29.Plasma decontamination unit disinfects protective masks and clothing

A compact plasma decontamination unit co-developed by the Fraunhofer Institute for Process Engineering and Packaging IVV can help disinfect protective masks and clothing and treat them for reuse. The Bavarian Red Cross is already conducting trials with this system. [more info](#)

30.A fast, safe way of disinfecting smartphones with light

Researchers at Advanced System Technology AST, a department of the Fraunhofer Institute for Optronics, System Technologies and Image Exploitation IOSB, have developed an innovative solution for disinfecting smartphones. In just a few seconds, it rids smartphones of bacteria and viruses such as SARS-CoV-2 using UVC light rather than costly chemicals. Further applications are entirely conceivable. [Fraunhofer IOSB, Advanced System Technology Branch](#)

31.Fraunhofer IPT, Moss and IBF Automation build systems for the production of 50,000 surgical masks per day

Surgical masks can intercept infectious droplets that are expelled when speaking, coughing or sneezing. They may help to protect other people from being infected with respiratory tract infections if the necessary safety distance cannot be maintained. The current shortage of surgical masks is making regular healthcare provision and the fight against the corona pandemic more difficult. Therefore, the Fraunhofer Institute for Production Technology IPT is now setting up a production plant for surgical masks in Germany together with the local machine builder IBF Automation GmbH on behalf of Moss GmbH. [more info](#)

32.3D printer makes emergency ventilator system with integrated electronics and sensors

Researchers at the Fraunhofer Institute for Machine Tools and Forming Technology IWU have developed a prototype for an emergency ventilator made by a 3D printer. Composed of biocompatible plastic, the device can be sterilized with steam. Its integrated electronics and sensors enable the operator to set and monitor this ventilation machine's key parameters. The device alerts clinical users in the event of a disruption. Tested under realistic conditions using a phantom lung, the system proved its merits with physicians on hand to observe the trial. [Fraunhofer IWU](#)

33.DRESDEN-concept: Partner to fight the coronavirus - 3D printing technology can be used to produce urgently needed parts for ventilators

Due to the worldwide spread of the coronavirus, supply chains are currently partly interrupted, leading to bottlenecks in production. In various European countries, 3D printing companies have set up platforms to produce missing components through additive manufacturing processes, e.g. for ventilators, in order to support medical technology companies. [more info](#)

D. [Data](#)

34.Digital System for Epidemiological Patient Monitoring

The pandemic management app provides health authorities and hospitals with a straightforward way of keeping in touch with patients as well as people placed in quarantine because they may have been infected with COVID-19. By answering a series of daily questions, patients can digitally transmit information relating to factors such as temperature, pulse rate and blood pressure without leaving home. The data is then made available to the treating physician or responsible health authority on a clearly structured dashboard. The goal is to guarantee the continuous monitoring of each

patient's condition, making it possible to intervene immediately should that condition drastically deteriorate. [more info](#)

35. DEMIS goes online: Fraunhofer FOKUS supports Robert Koch Institute in design and implementation of electronic laboratory messages

Since a few days laboratories now have the possibility to report pathogen detection of SARS-CoV-2 electronically to the responsible health authorities. The electronic notification means that the information on SARS-CoV-2 infections is faster and more completely available to the public health authorities and that infection control measures can be initiated promptly to prevent further infections. Fraunhofer FOKUS, in coordination with the German Federal Ministry of Health (BMG), is supporting the Robert Koch Institute (RKI) in implementing the project. [more info](#)

36. Fraunhofer assists with the development of a coronavirus warning app

Germany has launched its own coronavirus warning app on Tuesday, June 16, 2020. Released by the Robert Koch Institute (RKI), following development by SAP SE and Deutsche Telekom AG, the new app could prove a key digital weapon in the fight to control and contain the current coronavirus pandemic. The Fraunhofer-Gesellschaft continues to be closely involved in technical aspects of the project – in particular, key components used to estimate physical distance by means of the exposure notification API (application programming interface). manufacturing processes. This paves the way for in-line product customization. Six Fraunhofer institutes have pooled their expertise to take the new process to the next level. [more info](#)

37. Project EpiDeMSE Supports Local Decision Makers in Planning Actions in the Corona Crisis

Especially when an infectious disease is new, mathematical models help to answer the two most important questions: How will the infection spread and what actions are appropriate and effective to contain it? In order to support local decision makers (health authorities, hospitals and especially municipalities) in planning their actions, researchers of the Fraunhofer ITWM are working on the epidemiological modeling, simulation and decision support of Covid-19 within the framework of the Fraunhofer-Gesellschaft's Anti-Corona Program (project name EpiDeMSE). [more info](#)

38. Telemedical platform "ERIC" to improve intensive care

The ERIC Innovation Fund project, in which Fraunhofer FOKUS is involved as a project partner, successfully concludes patient recruitment this March under a selective agreement with BARMER. The telemedical platform set up for ERIC is currently being expanded for the COVID 19 location center in Berlin. [more info](#)

39. NRW adopts Fraunhofer ISST tech to care for COVID-19 patients

The state of North Rhine-Westphalia launched its 'NRW Virtual Hospital' ahead of schedule to provide the best treatment available to patients with severe cases of COVID-19. The Fraunhofer Institute for Software and Systems Engineering ISST's Electronic Case File is a key component of this care provided with telemedical support. [Fraunhofer ISST](#)

40. Central State-Wide Treatment Capacity Indicator (ZLB) for Rhineland-Palatinate

The fight against COVID-19 has offered a stark reminder of what happens when hospital capacity is exhausted. It also confirms how important it is to get the full picture – that is, to keep track of all available hospital and ICU beds and specialized infrastructure such as trauma rooms, operating rooms and CT scanners. Working on behalf of the state of Rhineland-Palatinate to solve this problem, Fraunhofer IESE developed an innovative solution that posts these facts and figures in a web-based information system. The Central State-Wide Treatment Capacity Indicator for Rhineland-Palatinate (ZLB) is a real-time indicator that lists the current admissions capacity of hospitals throughout the state in a table and shows the figures on a map. [Fraunhofer IESE](#)

41. Fraunhofer Austria processes data to support government ministries

Fraunhofer Austria's logistics experts are processing and preparing transport and trade data to help make Austria's supply lines for essential goods more resilient during the corona crisis. [Fraunhofer Austria](#)

Fraunhofer-Gesellschaft: (Web-link)

Fraunhofer headquartered in Germany, is the world's leading applied research organization. With its focus on developing key technologies that are vital for the future and enabling the commercial exploitation of this work by business and industry, Fraunhofer plays a central role in the innovation process. As a pioneer and catalyst for ground-breaking developments and scientific excellence, Fraunhofer helps shape society now and in the future. Its research activities are conducted by 75 Institutes and Research units across locations in Germany. The Fraunhofer employs a staff of 29,000; who are qualified scientists and engineers working with an annual outlay more than 2.8 billion Euros. Of this sum, 2.4 billion euros is generated through contract research. Our global footprint is very strong with offices and research centres in the USA, Europe and Asia. Some of our renowned innovations are the MP3 format, the white LED, the smallest of cameras. In the field of renewable, Fraunhofer holds the world record in solar cell efficiency, battery storage, and cover the entire spectrum of energy (Grid, Renewables, Storage, etc) across the value chain from materials to testing and certification. Fraunhofer has been active in India since the past several years, bringing innovative technologies and research competence to India. Fraunhofer in India is the chosen R&D and innovation technology partner of some of the major players in the field of Energy, Environment, Automotive, Electro-mobility, Materials, Production Technology and Smart Cities working with Industry, Government and Public Sector.