



INNOVATION IN FLANDERS TO COMBAT THE SARS-COV-2 VIRUS OR ITS DERIVED EFFECTS



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Introduction

In the last weeks we have seen in Flanders numerous initiatives to respond to the COVID-19 crisis, many of them arising bottom-up, often in collaboration with European partnerships that received funding from the European Union's Horizon 2020 research and innovation programme. Everywhere in the region, research groups, as well as companies, have reallocated budgets to address different issues related to the COVID-19 pandemic.

The Flemish universities and their experts play a crucial role in the guidance and decision-making of this unseen crisis. This is particularly challenging, as the virus is new and its pathophysiology, the epidemiology and social impact need to be better understood to develop better diagnostics, vaccines, treatments and interventions.

Industry is also committed to developing solutions for various aspects related to COVID-19; from the hackathon¹ organised by the Belgian start-up community, to the unprecedented collaboration² between several life science companies to help address this global health emergency.

In dealing with the COVID-19 crisis, the research has been broadly addressed and covers epidemiology, diagnosis, treatment and social impact. Below you can find an overview of the ongoing initiatives that we know of. If you would like to add an initiative, don't hesitate to contact us.

1. Diagnostic approaches and epidemiological research

Academic research

Prof. Herman Goossens (UZA, UAntwerpen) is coordinating the **PREPARE**³ project, a network financed by the EU, for harmonised large-scale clinical studies on infectious diseases, to prepare for infectious disease outbreaks, and to provide real-time information on clinical management of patients and to guide public health interventions. PREPARE aims to establish a common European clinical research infrastructure with 600 primary care sites and more than 600 hospital sites in 27 EU Member States. It was started after the previous pandemics in order to be prepared and to quickly start the necessary clinical studies. Now it is also being used to tackle the SARS-CoV-2 pandemic.

The **COntAGlous trial**⁴ (COvid-19 Advanced Genetic and Immunologic Sampling), led by Prof. Joost Wauters (UZLeuven, KULeuven) and Rega Institute, wants to deliver an in-depth characterisation of the dynamic host immune response to coronavirus SARS-CoV-2. It will

¹ <https://www.hackthecrisis.be/nl/>

² <https://www.gatesfoundation.org/Media-Center/Press-Releases/2020/03/Life-Science-Companies-Commit-to-the-Fight-Against-COVID-19-Pandemic-alongside-Gates-Foundation>

³ <https://www.prepare-europe.eu/>

⁴ <https://clinicaltrials.gov/ct2/show/NCT04327570>

study the host immune response in severe and extreme severely affected COVID-19 patients as compared to healthy controls.

The Jessa Hospital in Hasselt, together with Sciensano en Mensura, will start, after the approval of the ethics committee, with a pilot study to determine to what extent antibodies in the blood actually **protect against a new COVID-19 infection**. The pilot project will prepare for a large multicentre study in Belgium on protective immunity that will be conducted via the Federal Knowledge Center for Healthcare (KCE).⁵

The Neuro-Aging and Viro-Immunotherapy (NAVI) research group at the Vrije Universiteit Brussel (VUB) will analyse blood samples from COVID-19 patients to see how their **immune system** reacted during and after their illness. The results can be of important value for diagnosis, treatment and prevention of the virus.

A large study led by Prof. Pierre Van Damme (UAntwerpen) and Prof. Heide Theeten (UAntwerpen) maps the proportion of the Belgian population that was infected by the SARS-CoV-2 virus.⁶ **Blood from commercial labs** are being analysed for this purpose.

Prof. Bossuyt (KU Leuven) leads a study that uses a validated unbiased **mass spectrometry** based work-flow to identify disease-related Complementarity Determining Region (CDR) signatures that can be used for prognosis and outcome prediction.

At KU Leuven, the Laboratory of Therapeutic and Diagnostic Antibodies (Prof Paul Declerck) and PharmAbs initiated the development of high affinity mouse monoclonal **antibodies** for use in the development of reliable diagnostic solutions.

The MeBioS Biosensors group of KU Leuven (Prof. Lammertyn) is (1) developing and validating highly sensitive multiplex (IgM, IgG and IgA) **diagnostic tests for measuring immune responses** of patients infected with SARS-CoV-2 virus, and (2) finalizing the development of an innovative **self-sampling cartridge technology** for dried blood spot sampling capable of precisely metering and storing a droplet of blood from a patient's finger prick. Recently a longitudinal study was initiated in collaboration with UAntwerpen, UGent and KU Leuven to validate both technologies (1 + 2) in a primary care setting.

The research group of Prof. Du Laing (UGent) investigates the effect of **selenium shortage** on the severity of COVID-19.⁷

Sciensano and the Institute of Tropical Medicine (ITM) are investigating the **number of COVID-19 infections among healthcare workers** in Belgian hospitals. The study examines to what extent healthcare workers in hospitals come into contact with COVID-19. To this end

⁵ https://www.knack.be/nieuws/belgie/coronavirus-jessa-ziekenhuis-start-met-pilootstudie-rond-antistoffen-in-bloed/article-belga-1591577.html?cookie_check=1587730692

⁶ https://www.standaard.be/cnt/dmf20200331_04908683?articlehash=C232C064C77DC246E3CDDA247CB0F17015D13D174D00F849DD003F703C647AB50943D2B9226AA4228FC1342842951DE9E9A863D8BAF1DB859F2419154B3ADC8A

⁷ <https://edit.ugent.be/nl/actueel/selenium-tekort-corona-covid-onderzoek.htm>

the scientists will monitor 850 health workers who are representative of the health corps involved over a five-month period.⁸

Labs are reducing their research activities to **increase capacity for COVID-19 testing**. An example is the case of the specialised physicians of the Institute of Tropical Medicine in Antwerp who recently strengthened the Antwerp University Hospital in the screening and treatment of COVID-19 patients as they are experienced in working with infectious diseases. Also at the U(Z)Gent campus large-scale logistics is being set to process corona test samples. In the same effort to increase testing capacity, VIB has established a task force to realise a testing capacity of 20-30.000 samples per day. This is done in collaboration with the National reference centre in the Rega Institute, industrial partners and the university hospital Gent. VIB personnel is engaged in the effort on a voluntary base and this further enforced by volunteers of the biotech industry. A thorough selection of the workforce is ensured to guarantee the quality testing. The VIB- VUB center for Structural Biology makes its KingFisher robot available. The robot makes it possible to rapidly test large quantities of samples for the presence of the SARS-CoV2 virus, providing 1000 additional tests per day.

VIB together with LifeTime partners, a transnational and interdisciplinary initiative of leading European researchers jointly coordinated by the Max Delbrück Center in Berlin and the Institut Curie in Paris, is developing an **EU-wide standardised protocol** to test COVID-19 patient samples and to enable exchange of data across borders, using single cell and other technologies.

At the request of the academic Jessa and ZOL hospitals, UHasselt will **validate an alternative diagnostic method** so that general practitioners can perform tests themselves. They will purchase test kits and start validation as soon as possible.

Prof. Dieter Deforce (UGent) started research to see if it is possible to diagnose COVID-19 using **proteomics** technology.

Imec is developing **fast micro-qPCR chips** for the development of specific assays to diagnose the presence of SARS-CoV-2 virus.⁹ They have received requests to set up collaborations from various European countries and China.

Researchers from Flanders Make@UAntwerp developed a device that allows for **remotely listening to the lungs** of patients with COVID-19.¹⁰ The device will become available open-source.

⁸ <https://www.itg.be/E/Article/study-of-the-number-of-covid-19-infections-among-healthcare-workers-in-belgian-hospitals>

⁹ <https://www.imec-int.com/en/expertise/lifesciences/pcr-on-chip>

¹⁰ <https://www.flandersmake.be/nl/nieuws/onderzoekers-van-flandersmakeuwerpen-ontwikkelen-nieuw-toestel-voor-longonderzoek-op>

The EC **MOOD project** aims to identify, monitor and analyse outbreaks of new and existing diseases at an early stage. The Outbreak Research Team of the Institute of Tropical Medicine (ITM) is participating in the project, establishing a bridge between scientists and national and international public health and animal health institutions. The MOOD project started in January and examines a variety of model diseases, including the recent breakout of COVID-19.¹¹

Research is ongoing on **possible transfers of SARS-CoV-2 to pets** and the circulation within animal populations. Researchers, led by prof. Hans Nauwynck together with prof. Bruno Verhasselt and prof. Linos Vandekerckhove (all UGent), are currently preparing a serological test to see to what extent this transfer is happening. This serological test can be used not only for animals but also for humans. The Institute for Nature and Forest Research wrote an advise on the risk of bat infection with SARS-CoV-2 derived from bat researchers.¹²

The Institute of Tropical Medicine wrote a position paper on the use of COVID-19 rapid diagnostic tests. These rapid tests are particularly interesting for low resource settings where lab tests are less obvious.¹³

Industry

Several companies are assisting as well to **increase the capacity of COVID-19 diagnostic testing**: Janssen Pharmaceutical (J&J), GSK, UCB and Biogazelle are installing diagnostic labs on their Belgian sites.¹⁴

FluidA has developed a screening method to detect pulmonary diseases at an early stage. The Broncholab platform was developed with the aim of making parameters of functional respiratory imaging available to medical professionals on an online platform. The platform can be used for multiple pulmonary diseases.¹⁵

The software company icometrix developed, together with more than 40 Belgian and even more foreign partners, the software package icolung, with which it can better predict the chances of survival of very ill COVID-19 patients and also assign patients more precisely to a specific hospital department. By releasing **artificial intelligence (AI) on CT scans** from COVID-19 patients, one can find out whether the lung tissue is strong enough to send the patient home for further home isolation. At the Radiology department of the UZ in Brussels, people

¹¹ <https://www.itg.be/E/covid-19>

¹² [https://pureportal.inbo.be/portal/nl/publications/advies-betreffende-het-risico-op-besmetting-van-vleermuizen-met-covid19-via-vleermuisonderzoekers\(cb72b760-f29d-4d61-b5d5-91510d02a219\).html](https://pureportal.inbo.be/portal/nl/publications/advies-betreffende-het-risico-op-besmetting-van-vleermuizen-met-covid19-via-vleermuisonderzoekers(cb72b760-f29d-4d61-b5d5-91510d02a219).html)

¹³ <https://www.itg.be/E/Article/guidance-on-the-use-of-covid-19-rapid-diagnostic-tests>

¹⁴ <https://www.tijd.be/ondernemen/farma-biotech/gents-biotechbedrijf-start-grootschalige-coronatesten/10218507.html>

¹⁵ https://www.linkedin.com/posts/jan-de-backer-6537645_fda-clears-fluidas-broncholab-platform-activity-6642818289737314304-olGm

quickly started using AI in medical imaging. This makes the hospital one of the top in the field. Meanwhile, the software has been rolled out in 30 Belgian hospitals.¹⁶

AntelopeDx is developing a prototype test for Flu A/B based on a nasal/nasopharyngeal swab. It wants to establish a diagnostic solution for home and other decentralised settings that brings lab quality analysis with the ease-of-use of a pregnancy test at a consumer price tag.

Bingli has developed a COVID-19 triage module. With the help of 10 simple questions, the test can determine whether you should contact a doctor or not.¹⁷

UgenTec supports the diagnostic community in managing the Corona virus crisis. Laboratories that apply today will get access to a free and AI-powered data analysis tool for the CDC's Corona virus assay.¹⁸

2. Development of therapies, medicines and vaccines

Academic research

The lab of prof. Xavier Saelens (VIB-UGent), in collaboration with prof. Nico Callewaert (VIB-UGent) and two research laboratories in the US, has refocused its research to a potential COVID-19 therapy based on VHH **nanobodies**. Following the publication of the SARS-CoV-2 genome in early January 2020, the genome of the new virus was compared to the SARS-CoV-1 on which the research group had been active in recent years. The scientists identified a single-domain antibody with high binding affinity to a unique, conserved conformational epitope present on the receptor-binding domain of SARS-CoV and SARS-CoV-2. Recent findings show that the antibody can neutralise a lab variant of the virus.¹⁹

At KU Leuven, PharmAbs (Prof. Paul Declerck) and MeBioS (Prof. Jeroen Lammertyn) are using their in-house developed microfluidic single B cell screening platform “MabMine” as a tool for (1) selection, cloning and detailed characterization of a SARS-CoV-2 specific human mAbs from patients that will provide insights in the biochemical and functional properties of neutralizing vs. non-neutralizing antibodies and (2) for identification of neutralizing antibodies with drug-like properties.

Prof. Bart Lambrecht (VIB-UGent) and Partner Therapeutics started a clinical study (SARPAC trial) on the use of **Leukine**[®] (granulocyte macrophage-colony stimulating factor or GM-CSF) to reduce the impact of the corona virus on lungs. Initial results indicate that with this treatment we can prevent the patient from developing a cytokine storm.²⁰ He is furthermore

¹⁶ <https://flanders.bio/en/news/icometrix-lanceert-de-eerste-ce-gemarkeerde-ai-oplossing-voor-ct-beelden-van-de-longen-bij-covid-19>

¹⁷ <https://www.mybingli.com/covid19/>

¹⁸ <https://www.ugentec.com/managing-coronavirus-ncov>

¹⁹ <https://www.vib.be/nl/nieuws/Pages/Wetenschappers-van-VIB-boeken-belangrijke-vooruitgang-in-onderzoek-naar-kandidaat-geneesmiddel-dat-beschermte-tegen-coronavi.aspx>

²⁰ <http://www.vib.be/en/news/Pages/University-hospital-Ghent-and-VIB-are-testing-medication-to-treat-COVID-19-associated-respiratory-illness.aspx> and <https://www.partnertx.com/11508-2/>

preparing for a study to compare the impact of treating severe cases of COVID-19 patients on intensive care with anti-IL6 antibodies as compared to anti-IL6-receptor antibodies.²¹

The team of Prof. Johan Neyts (Rega Institute, KULeuven) works on the development of a **vaccine** and on **antiviral therapy**. In the past weeks, two EU-projects²² were submitted and selected for funding (SCORE²³ and EXSCALATE4CoV²⁴). The lab also received funding from the Bill and Melinda Gates Foundation to test candidate drugs against SARS-COV2.²⁵ It received 15000 medicinal molecules from Scripps Institute in California and will test them in the Rega high-biosecurity lab at high throughput. The lab can safely test thousands of candidate molecules for their potential activity against the new coronavirus. The lab is custom designed and runs fully automatically, day and night, seven days a week and is unique in the world. Several molecules were already identified that slow down the SARS-CoV-2 virus in laboratory settings. Clinical studies (Direct Antivirals Working Against nCoV, DAWN) must show whether patients who receive such a drug recover faster and are less likely to end up in intensive care. The study is a collaboration between UZ Leuven, Belgian university and peripheral hospitals and VIB.²⁶

The Centre for the Evaluation of Vaccination (Prof. Pierre Van Damme, UAntwerp) will conduct several **phase 1 SARS-CoV2 vaccine trials** in healthy adults. The centre is being prepared to be able to perform such phase 1 trial in social distancing and semi-quarantine conditions, based on previous experience with polio vaccine trials.

Several research groups across the Flemish universities are working on vaccine development. **Flanders Vaccine** is a non-profit, strategy-driven platform for academic, industrial and public stakeholders that serves as a one-stop-shop for vaccine trials.²⁷ It aims to bring together universities, public and private hospitals, research centres, SMEs, pharma, competence providers, patient organisations, and government bodies to develop novel immunological health solutions and the vaccines of the future.

The Institute of Tropical Medicine (ITM) will start a study to investigate the effect of **hydroxychloroquine**, an existing medicine to treat malaria, on the duration of infectivity of COVID-19. The ITM team conducts the study primarily with health professionals infected with the virus, but showing only mild symptoms.²⁸

²¹ <https://clinicaltrials.gov/ct2/show/NCT04330638?term=NCT04330638&draw=2&rank=1>

²² The other two SC1-CORONAVIRUS projects with Belgian participants are RECOVER (UA) and EpiPose (UA and UHasselt), for more information see:

https://www.ncpflanders.be/sites/default/files/ec_rtd_corona%20virus%20-projects-1.pdf

²³ <https://www.lumc.nl/over-het-lumc/nieuws/2020/Maart/lumc-doet-onderzoek-naar-coronavirus-remmers/?setlanguage=English&setcountry=en>

²⁴ <https://www.exscalate.eu/en/projects.html>

²⁵ <https://www.theguardian.com/world/2020/mar/04/bill-and-melinda-gates-fund-study-into-finding-coronavirus-cure>

²⁶ https://www.knack.be/nieuws/wetenschap/uz-leuven-test-geneesmiddelen-op-covid-patienten/article-news-1584621.html?cookie_check=1586425221

²⁷ <https://flandersvaccine.be/>

²⁸ <https://www.itg.be/N/Artikel/itg-start-onderzoek-naar-hydroxychloroquine-in-strijd-tegen-covid-19>

The team of Prof. Herregodts (UGent, UZGent, VIB) is working on a prototype²⁹ that can be used for the **ventilation of COVID-19 patients**. The prototype has already been tested on a breathing machine in the hospital of Aalst. Industrial Research Fund is being released for the further development of this equipment. Also other ventilation initiatives are emerging.³⁰

The Research Group of Organic Chemistry (ORGC), headed by Prof. Steven Ballet (VUB), intends to lead efforts to design and develop new **peptide-based therapeutics**. Using data gained from high-level molecular modelling studies, the group wants to develop a number of peptide-based therapeutics against COVID-19. These will then be tested in biological systems that are most closely related to COVID-19 to see which are the most effective and which show promise for further development, and, ultimately, use in clinical (i.e. human) settings.

Industry

Pharmaceutical giant Johnson & Johnson and its Flemish subsidiary **Janssen Pharmaceutica** are working on 12 different tracks to develop a vaccine by the beginning of 2021. They will expand the production capacity to ensure that within 12 to 18 months they can supply hundreds of millions of vaccines. The vaccines will be distributed worldwide.³¹

GSK made their **vaccine adjuvant technology** available to scientists and organisations working on promising vaccine candidates and technology platforms. Furthermore, GSK is participating in the new collaborative research effort, the **COVID-19 Therapeutics Accelerator**. The aim of the Accelerator is to bring pharmaceutical companies and expert academic institutions into coordinated research programs, with the aim of bringing the most promising molecules forward that could be used to treat patients with COVID-19.³²

eTheRNA (VUB spin-off) will develop a novel mRNA vaccine against SARS-CoV-2, for which preclinical development has started.³³ Also **Ziphius Therapeutics** announced the acceleration of the development of a mRNA-based vaccine for COVID-19, in collaboration with Prof. Niek Sanders (UGent).

Audi Brussels is producing ventilators. The ventilator has been developed and tested by a group of **FabLab Brussels** (VUB) and in the University Hospital Brussels in recent weeks. The engineers, doctorandi and students of the VUB immediately received support: Flanders Make provided financial support to purchase essential components, DAF Trucks and Volvo Trucks provided the wiper motors that form the heart of the unit and Audi Brussels offered a production line.³⁴

²⁹ <https://www.coronaventilator.be/>

³⁰ <https://no2covid.com/>

³¹ <https://www.vrt.be/vrtnws/en/2020/03/31/corona-vaccine-hopes-are-high-we-can-meet-our-goal/>

³² <https://www.gsk.com/en-gb/media/resource-centre/our-contribution-to-the-fight-against-2019-ncov/>

³³ <https://flanders.bio/en/news/etherna-launches-an-international-consortium-and-starts-development-of-cross-strain-protective-cov-2-mrna-vaccine-for-high-risk-populations>

³⁴ <https://press.vub.ac.be/eerste-vub-fablab-beademingstoestellen-geproduceerd-door-audi-brussels-ism-flanders-make>

A Belgian consortium of seven medical and technological companies (Byteflies, Melexis, Quad Industries, Televic, Z-Plus and the Belgian departments of Henkel and Nitto) has developed an innovative chest patch that can monitor the respiration, heart rate and skin temperature of corona patients wirelessly, continuously and remotely. The '**COVID-19 smart patch**' will digitally transmit the values to the treating doctor or specialist and also has an alarm function similar to the red button in the hospital. The Hospital Oost-Limburg (ZOL) is the first to start clinical tests with about 20 patients.

ElmediX on the other hand, wants to contain the virus with **intensive heat treatment** for COVID-19 patients. Controlled heating to 41.5 °C for three hours can potentially inactivate the virus and activate the patient's immune system. ElmediX, founded as a spin-off of the University of Antwerp, has submitted a European project proposal to obtain accelerated funding to test if this approach slows down or even stops the infection in patients infected with COVID-19.³⁵

3. Prevention

Academic research

The University of Antwerp has launched Rapid European COVID-19 Emergency Research response (**RECOVER**), in collaboration with 9 international partners and led by prof. Herman Goossens. This project was selected for funding by the European Union under the Horizon 2020 research framework and builds on many years of investment by the European Commission in clinical research preparedness for epidemic response. RECOVER will address the most urgent questions for patient and public health by conducting medical research to address key knowledge gaps, such as those about best approaches to prevent further spread of the disease and about the virus interactions with the human host. In this way, RECOVER will provide scientific evidence that can be used by clinical, public health and policy decision-makers about how best to protect health and save lives.

Together with industrial partners, product developers of the Antwerp Design Factory (UAntwerpen) try to set up an emergency production for **protective equipment for health workers**.³⁶

VITO is expanding its existing test infrastructure to control FFP mouth masks. It will become an **accredited laboratory** for quality tests on half-face masks of the types **FFP1, FFP2 and FFP3** in our country.³⁷

³⁵ https://biovox.eu/news/detail/elmedix-wants-to-stop-coronavirus-by-heating-patients-in-a-controlled-manner?utm_source=newsletter&utm_medium=email

³⁶ <https://biovox.eu/insights/detail/professors-of-product-development-from-uantwerp-are-looking-at-emergency-production-of-mouth-masks>

³⁷ <https://vito.be/nl/nieuws/vito-testlab-voor-kwaliteit-mondmaskers>

The Robotics team of VUB has a research line where they want to convert commercially available **snorkel masks** to a suitable protective mask (with extra filter).

VITO has focused on prevention and produced disinfectant gel, made their mouth masks and protective clothing available for hospitals and ordered 30 000 additional masks.

The Institute of Tropical Medicine (Antwerp) coordinated the development of the Belgian **treatment guidelines** for COVID-19, and prof. Wim Van Damme (ITM) is adviser to the Congolese government in regards to the COVID-19 pandemic.

Industry

Van Heurck and **ECA**, two Belgian companies, are starting up the production of surgical and FFP2 mouth masks. The machines can produce 190 million surgical masks per year.³⁸

Pharmaceutical company Janssen Pharmaceutica and gin distillery Filliers are making **disinfectant hand gel**, which is distributed among the Belgian hospitals.³⁹

Laboratory ECCA, Jansen Cleanrooms and GreenX jointly developed a 'Clean Mask Decontamination Room': a **mobile disinfection container** that disinfects FFP2 and FFP3 masks on a large scale, using hydrogen peroxide.⁴⁰

Anthleron is ready to make its **biomedical 3D printing** resources and expertise available to relieve acute needs of various medical parts (e.g. ventricle valves, respiratory system parts, etc.).

Perseus supports their customers in **biosafety management**. They have compiled a biosafety guidance document specifically targeting organisations that are implementing SARS-CoV-2 diagnostic methods.⁴¹

NBD offer **standards for masks and other personal protective equipment** for medical professionals free of charge.⁴²

Seaters – who normally helps to distribute sponsoring tickets for sports and cultural events – has transformed its product into a **Virtual Queuing System**. It allows us to request an appointment voucher for authorised locations. Each voucher mentions an hour of visit, that takes into account the social distancing rules (max. 1 person per 10 m²) and the necessary

³⁸ <https://www.tijd.be/dossiers/coronavirus/van-heurck-en-eca-gaan-belgische-mondmaskers-produceren/10220551.html>

³⁹ https://biovox.eu/insights/detail/janssen-pharmaceutica-and-filliers-make-disinfectant-hand-gel?utm_source=newsletter&utm_medium=email

⁴⁰ <http://www.biotox.be/en/news/decontamination-of-mouth-masks-ecca-your-partner>

⁴¹ <https://www.perseus.be/>

⁴² https://www.nbn.be/nl/nieuwsberichten/gratis-normen-voor-mondmaskers?utm_source=newsletter&utm_medium=email&utm_campaign=Newslettermaart2020nl

time per person (max. 30 min. for groceries, for example). The demo version⁴³ of the platform can be activated nationally in 24 hours.

A grassroots initiative (maakjemonmasker.be) was launched and gives guidelines on how to make your own face masks.⁴⁴

4. e-health and app development

Academic research

A multidisciplinary consortium consisting of academic researchers, privacy experts and app developers (UGent, VIB) has joined to develop a platform to map the further spread of the virus and to contain the epidemic better. The platform combines: a **mobile app** for citizens; a web app for medical personnel; a back-end for data aggregation and an AI system to train models. All these components work together to map potential infected clusters, hotspots and super spreading. Contact tracing can furthermore be done more efficiently. Privacy experts have been involved from day one.

Industry

Belgium will participate in the EUvsVirus **hackathon** (24-26 April 2020).⁴⁵

Rombit launches a **digital bracelet** to prevent Covid-19 contamination in the workplace. The solution allows employees in industry, construction and logistics to resume work safely. If employees come too close to each other, their bracelet gives a warning signal. Port of Antwerp will be the first to test these bracelets.⁴⁶

The company Lopos (imec and UGent spin-off) has developed a **wearable** as well: SafeDistance. The wearable will alert, with an audible signal, vibration and optionally also a burning LED light, if the social distance of 1,5 meters to another device is not respected. The device is a tool for safe collaboration in the workplace or for shopping. SafeDistance uses ultra-wideband (UWB) instead of Bluetooth and is therefore much more accurate and faster.⁴⁷

The **app “Flattening the Curve”**⁴⁸ was developed as a collaborative effort of EPCON, BHIC, Keyrus, Bingli, Adunio, and Gaga. The app tracks users’ movements and regularly checks their health condition by means of a uniform questionnaire. As such, the app can detect areas with a high number of COVID-19 infections, and warns the user when he was recently in such a

⁴³ <https://demo.seaters.com/westandstrong/>

⁴⁴ <https://maakjemonmasker.be/>

⁴⁵ <https://euvsvirus.org/>

⁴⁶ <https://rombit.be/slimme-armband-om-coronabesmettingen-op-de-werkvloer-te-voorkomen/>

⁴⁷ <https://www.lopos.be/>

⁴⁸ <https://www.flatteningthecurve.eu/>

'danger zone'. The app is also useful for governments and hospitals, as it allows them to make decisions and estimates more easily.

The city of Antwerp launched a call for start-ups to develop innovative digital solutions for problems related to the COVID-19 crisis. 8 projects were selected: Artists Unlimited vzw, Bingli, Greygin, Health Endeavour, Helpper, Robovision, Spikes en UZA-FibriCheck.⁴⁹ **Bingli** helps to fight overcrowded doctor's offices and hospitals. The company developed a multilingual, scientifically supported COVID-19 triage module to determine whether a patient should be seen by a physician. The goal is to help doctors identify the people who need more medical attention. **Greygin** developed the online game based learning platform Play it Safe (see also chapter 6. Dissemination of information and debunking fake news). **Health Endeavour** developed a social prescription platform that provides patients who contact their doctor with a "social prescription" to support their psychosocial needs. It creates a link between welfare and primary care. **Helpper** has set up a telephone line for healthcare staff, which can relieve them of tasks such as shopping or walking the dog. **Robovision** offers AI technology to analyse CT scans of lungs and provide reliable evidence of COVID-19 infection. This allows radiologists to work faster. **Spikes** developed a tool that provides accurate management information about the contamination situation of residents and staff in healthcare institutions. It furthermore allows for safely re-deploying volunteers in healthcare institutions. **UZA and FibriCheck** are developing a digital care program for patients with cardiac arrhythmias. In addition to the consultations that are already taking place, FibriCheck adds an app that can monitor cardiac arrhythmias. **Artists Unlimited vzw** develops an online streaming platform for artists and their fans. Online festivals, concerts and live streams will be programmed via the platform in collaboration with Antwerp concert halls, festivals and artists.

5. Behavioural changes and mental health

Academic research

A team with Prof. Philippe Beutels (UAntwerpen) and Prof. Niel Hens (UHasselt, UAntwerpen) will study our behaviour, and hence improve the modelling of the protective measurements taken. They are issuing **weekly online polls**. The first poll issued Tuesday 17 March was answered by no less than 563.796 respondents!⁵⁰

Even with the current measurements, every infected person still infects one other person. A survey by KULeuven and UGent tries to find out if recently infected persons have something in common and want to identify targeted measures to bring down the transmission.⁵¹

A number of surveys were launched at the UGent to get a better picture of the impact of the COVID-19 pandemic on **mental and social well-being**.⁵² They are also monitoring the

⁴⁹ <https://www.ondernemenantwerpen.be/nieuws/antwerpse-start-ups-en-bedrijven-bestrijden-mee-coronacrisis-met-innovatieve-digitale>

⁵⁰ <https://www.uantwerpen.be/nl/projecten/corona-studie/>

⁵¹ <https://coronasurvey.eu/>

⁵² https://ghentpmwop.eu.qualtrics.com/jfe/form/SV_094abYBmjxQT8rj; www.loomi.ugent.be/GLAUCA/index.php/619329?lang=nl; <https://edit.ugent.be/nl/onderzoek/ugent/covid-19-onderzoek.htm>; <https://www.be4life.eu/>

motivation of the population to comply with the COVID-19 measures.⁵³ The research department of IDEWE, in collaboration with KU Leuven, will conduct a study into the **mental well-being of Belgian employees** during the corona crisis.⁵⁴ A survey by IndiVille and Bpact focussed on our **emotions** related to the COVID-19 pandemic and its related measurements.⁵⁵ KULeuven started a longitudinal study where participants keep a **diary** about their experiences, for two months. They are still looking for volunteers.⁵⁶ At the VUB, they investigate how the new coronavirus impacts our daily life.⁵⁷

Prof. Elke Van Hoof (VUB) launched the free online intervention tool '**iedereen ok?**' to help handle loneliness and stressors more easily.⁵⁸

The Institute for the Future (Rega institute, KULeuven) launched a transdisciplinary approach on pandemic preparedness to **map the societal impact** and advise on potential unintended consequences of pandemic preparedness measures.⁵⁹ A first outcome of this team is a manuscript on the usefulness of contact tracing tools for pandemics.⁶⁰

UAntwerpen investigates to what extent people seek out **nature** (more) during corona time and what effect this has on their general health and well-being. The survey is part of a larger university study on the relationship between care and natural living environment that is financed by the province of Antwerp.⁶¹ They also investigate the effect of COVID-19 on our **cooking and eating habits**.⁶²

Thomas Moore investigates the effect the COVID-19 pandemic has on our **travel** plans.⁶³

To help leaders in all sectors to overcome this difficult period, the Vlerick business school bundled all their online learning courses.⁶⁴

Industry

To motivate both the beginner and the more experienced **meditator** to pay attention to mental well-being during this difficult period, Moonbird organises free live webinars from March 23rd onwards. Each weekday at 6pm a Flemish expert will share insights and methods that can really make the difference.⁶⁵

⁵³ <https://www.ugent.be/epg/nl/onderzoek/coronastudie> and <https://www.knack.be/nieuws/belgie/maatregelen-blijven-volgen-wordt-een-marathoninspanning-hoe-motiveren-we-de-bevolking-om-vol-te-houden/article-opinion-1587391.html>

⁵⁴ <https://www.idewe.be/-/wat-doet-coronacrisis-met-u>

⁵⁵ <https://indiville.be/resultaten-onderzoek-coronacrisis/>

⁵⁶ <https://ppw.kuleuven.be/PraxisP/in-de-kijker/deelnemers-gezocht-corona-diaries-een-onderzoek-naar-de-psychologische-effecten-van-de-coronacrisis-en-de-daarmee-gepaard-gaande-maatregelen>

⁵⁷ <https://today.vub.be/en/article/survey-how-does-the-coronavirus-affect-daily-life>

⁵⁸ <https://www.iedereenok.be/>

⁵⁹ https://rega.kuleuven.be/if/coronavirus_challenge

⁶⁰ <https://rega.kuleuven.be/if/tracing-tools-for-pandemics>

⁶¹ <https://www.uantwerpen.be/nl/leerstoelen/zorg-en-natuurlijke-leefomgeving/het-corona-natuuronderzoek/>

⁶² https://uantwerpen.eu.qualtrics.com/jfe/form/SV_25MKsBBrVQV5OLj

⁶³ https://thomasmore.qualtrics.com/jfe/form/SV_dokQYY8pEF42s7P

⁶⁴ <https://www.vlerick.com/en/research-and-faculty/knowledge-items/how-to-cope-with-turbulent-times>

⁶⁵ <https://www.moonbird.life/livestream/>

6. Dissemination of information and debunking fake news

The Flemish government organised a taskforce to map, align and promote all public and private **digital initiatives** to make the world go further during the pandemic.⁶⁶

Several information channels have been set up to inform citizens about the pandemic and the measurements taken. The Flemish agency of Care and Health (Agentschap Zorg en Gezondheid) created a dedicated fact check webpage on the 'health and science' website to help **debunking the fake news** on COVID-19.⁶⁷ Also EOS Science, a magazine partially funded by the Flemish government, has a website on COVID-19 with news and questions⁶⁸ and the Young Academy, an interdisciplinary and interuniversity meeting place for young top researchers and artists, has some initiatives that strive to combine forces within the scientific community⁶⁹, including a Slack-forum "Mitigate Corona"⁷⁰ that is open to all academics. They furthermore created an overview of **all Belgian initiatives on ventilators**, because shortage of ventilators was a crucial bottleneck in Italy.⁷¹

The Institute of the Future (Rega institute, KULeuven) published a living paper about COVID-19.⁷² It is a **structured compilation of scientific data** about the virus, the disease and its control. The aim is to help scientists identify the most relevant publications on COVID-19 in the mass of information that appears every day. The paper is updated weekly.

The institute for the Future, together with a team of KU Leuven and Flanders Business School, furthermore decided to contribute with their knowledge of modelling, **forecasting**, and future scenarios to provide information to the general public as well as to authorities. They offer perspectives for the near future, like about how many people are most likely to die, and when this epidemic wave will be over.⁷³

Both imec and Flanders.bio have an **webpage** where they list several initiatives of companies directly or indirectly linked to the new corona virus.^{74, 75} Various research institutions have an overview webpage as well about their ongoing research related to COVID-19.^{76,77,78}

⁶⁶ <https://www.vlaanderen.be/vlaanderen-helemaal-digitaal>

⁶⁷ <https://www.gezondheidenwetenschap.be/dossiers/coronavirus>

⁶⁸ <https://www.eoswetenschap.eu/tag/coronavirus>

⁶⁹ <https://jongeacademie.be/covid/>

⁷⁰ https://mitigatecorona.slack.com/join/shared_invite/zt-ctipi686-cvH5JGRAx6SkUGkfAJ1Cw

⁷¹ https://docs.google.com/document/d/1IWZg_hImGW_xIDLAtB6wptzKT6Hg1fHMGsYPbO8dEp8/edit#

⁷² https://rega.kuleuven.be/if/corona_covid-19

⁷³ <https://rega.kuleuven.be/if/forecasting-countries/forecasting-covid19>

⁷⁴ www.imec-int.com/en/istart/startup-initiatives-covid-19

⁷⁵ <https://flanders.bio/en/coronavirus-initiatives>

⁷⁶ <https://edit.ugent.be/nl/onderzoek/ugent/covid-19-onderzoek.htm>

⁷⁷ <https://www.kuleuven.be/onderzoeksverhalen/ku-leuven-onderzoekers-strijden-tegen-het-coronavirus>

⁷⁸ <https://www.itg.be/E/covid-19>

Furthermore, information and communication are also part of the missions of universities and in Flanders we have seen many specialists taking part in **radio and TV** programmes. They play a key role in explaining what is happening and in helping the citizens to understand the need for the measures taken by the Belgian government.

At the European level, the European Bioinformatics Institute (EBI) of the European Molecular Biology Laboratory (EMBL) and the European Commission, together with other partners⁷⁹ have recognised the urgency to develop and deploy a **pan European COVID-19 research data platform**⁸⁰ connected to the European Open Science Cloud (EOSC). The objective is to speed up and improve the sharing, storage, processing of and access to research data and metadata on SARS-CoV-2 and COVID-19.

Relevant datasets include:

- Omics data for the characterisation and quantification of biological molecules (including sequence data on both virus genomes and human genomes) and other high-dimensional data such as microbiome data;
- Data from pre-clinical research to test drug candidates, vaccine interventions, or other treatments, for efficacy, toxicity and pharmacokinetic information;
- Research data from clinical trials and from observational studies;
- Epidemiological data, models, codes and algorithms.

The Anticancer fund made an overview of **all interventional clinical trials** ongoing in COVID-19, in an easy to use open-access online database. This will help to reduce the chance of duplicated trials and ideally this should result in more collaborations around the world.⁸¹

#DATA4COVID19 gives an overview of global initiatives to build a responsible infrastructure for data-driven pandemic response⁸² and the OECD, together with the GovLab, collects open data sets that are used in response to the COVID-19 outbreak.⁸³

Industry

EisphorlA now allows researchers to **navigate in thousands of COVID-19 related scientific papers**, being assisted by artificial intelligence. It helps them to find insights, identify trends and apprehend quickly critical contents while working in a collaborative environment.⁸⁴

Knowledge on the Corona virus can save lives. It is therefore crucial that communication on the virus and its prevention should be comprehensible to all of us. To spread the right information in a fun, accessible way, Play it Safe developed the **Corona Prevention Game**.⁸⁵

⁷⁹ Including ELIXIR, Instruct-ERIC, RDA and H2020 projects such as EOSC-Life, CORBEL, RECODID, VEO, EXSCALATE4CoV.

⁸⁰ <https://www.ebi.ac.uk/covid-19> and <https://www.covid19dataportal.org/>

⁸¹ <https://www.anticancerfund.org/en/more-200-trials-fight-covid-19-worldwide>

⁸² https://docs.google.com/document/d/1JWeD1AaIGKMPry_EN8GjlqwX4J4KLQlAqP09exZ-ENI/edit

⁸³ <https://docs.google.com/document/d/1BdSnXzCZ1Z7ovOrPue3O0osRUpiqTKlu8pwG9U4DwWw/edit>

⁸⁴ <https://covid.eisphoria.com/>

⁸⁵ <https://playitsafe.eu/speel-het-corona-preventie-game/>

Using **artificial intelligence and linked data**, the platform of Ontoforce allows the life sciences industry to extract, integrate and analyse their data. To support the industry in the challenges they face now, Ontoforce made the platform freely available for 3 months.⁸⁶

7. Funding

Several projects were submitted from the various universities and ranked for funding by the **H2020 SC1-PHE-CORONAVIRUS 2020 call**. This is a call published under Horizon 2020 on January 30, 2020 with deadline for submission on February 12, 2020, for which 47.5 million euro was made available.⁸⁷ Seventeen projects were short-listed for funding.⁸⁸ Four projects have a Flemish partner (SCORE⁸⁹, EXSCALATE4CoV⁹⁰) of which two are coordinated by a Flemish partner (RECoVER⁹¹ and EpiPose). An overview of all projects supported by the European Commission related to the COVID-19 pandemic is given as well.⁹²

Regionally, budget has been made available to combat the COVID-19 pandemic. **VIB** will reallocate about 1 million euro of the budgets from its Grand Challenges Programme to COVID-19 projects to test novel interventions in patients after preclinical evidence; to test immune status during infection; and to test the potential of suppressing inflammation response. A fast track evaluation procedure was started for ad hoc co-funding of these COVID-19 projects under the thematic domain ‘epidemic control’, and an ad hoc evaluation panel was installed. **VLAIO** may also provide a budget.

Flanders Make has released 1 million euro to participate in the development of several projects⁹³: (1) ventilator prototypes and their scaling-up, (2) infrared fever detection, (3) auscultation, or the medical listening to sounds in the body, at a distance, and (4) the production of mouth masks. They additionally support companies, for example to consider how they can apply social distancing in their processes.

A new council of nine leading scientists should prepare us for the next peak of the virus. The **Flemish government** and **FWO** will provide 2,5 million euros to fund research on the efficacy of a vaccine, the local production of mouth masks and an analysis of the impact of the lockdown. Deadline to apply for funding is 30 April 2020.⁹⁴

⁸⁶ <https://www.ontoforce.com/>

⁸⁷ https://ec.europa.eu/info/sites/info/files/research_and_innovation/research_by_area/documents/ec_rtd_coronavirus-factsheet.pdf

⁸⁸ For an overview of all projects see:

https://www.ncpflanders.be/sites/default/files/ec_rtd_corona%20virus%20-projects-1.pdf

⁸⁹ <https://www.lumc.nl/over-het-lumc/nieuws/2020/Maart/lumc-doet-onderzoek-naar-coronavirus-remmers/?setlanguage=English&setcountry=en>

⁹⁰ <https://www.exscalate.eu/en/projects.html#Covid-19>

⁹¹ <https://www.prepare-europe.eu/News/News-items/ID/1215>

⁹² https://ec.europa.eu/info/research-and-innovation/research-area/health-research-and-innovation/coronavirus-research-and-innovation_nl

⁹³ <https://www.flandersmake.be/nl/covid-19>

⁹⁴ <https://www.fwo.be/nl/actueel/oproepen/bijzondere-oproep-covid19/>

An extra 1,25 million euro will be released in the short term to invest in the **research of VIB** to (1) focus on the effect of medication on lung recovery in patients with COVID-19, and (2) the first phase of a start-up that VIB wants to establish about an antiviral agent.

UAntwerp launched a **twin-call** to the FWO call for COVID-19 research projects of 50,000 to 75,000 euro per project, for a total budget of 500,000 euro. The UAntwerp call largely copies the goals, deadline, template and evaluation criteria of the FWO call to offer synergy and reduce workload.

8. Other actions

The **Flemish Supercomputer Centre (VSC)** provides computing time for research on COVID-19 both for academics and companies.⁹⁵

Biobanks are crucial in the run towards a COVID-19 vaccine and/or treatment. The **BBMRI-ERIC biobank network**⁹⁶ of 600+ biobanks can provide key services to researchers, such as (1) efficient and high-quality storage of samples in clinical and research settings; (2) samples from healthy individuals, to be used as control (collected 2-3 months before outbreak in each country), and (3) guidance and standards for targeted identification, collection and conservation of important samples. The online search catalogue of BBMRI-ERIC has furthermore been adapted with a COVID-19 filter so researchers can find biobanks that have COVID-19 samples available.⁹⁷

VIB and Elixir Belgium contributed to the **open source tools and public cyberinfrastructure** for transparent, reproducible analyses of viral datasets. The goal is to provide publicly accessible infrastructure and workflows for SARS-CoV-2 data analyses.⁹⁸

Due to the COVID-19 crisis, a number of companies and organisations, medical and other, experience supply chain problems. 3DP PAN EU is an EU-wide, web-based matchmaking tool connecting supply and demand in the field of **3D-printing**. Existing initiatives are free to register their offer on the 3DP PAN EU website. Companies and organisations can extend their outreach for a solution to their needs.⁹⁹ The 3DP Pan EU project is a project developed by Vanguard Initiative's 3D Printing pilot, enabled by funding from the European Parliament.

⁹⁵ www.vscentrum.be/covid19

⁹⁶ <https://www.bbmri-eric.eu/covid-19>

⁹⁷ <https://directory.bbmri-eric.eu/menu/main/app-molgenis-app-biobank-explorer/biobankexplorer?covid19=covid19>

⁹⁸ <https://covid19.galaxyproject.org/>

⁹⁹ www.3dppan.eu

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