

# HUMANITY ON TRIAL

Our  
contributions  
to the  
pandemic



# COVID-19 showed the capacity of institutional response

COVID-19 put humanity on trial. Like never before, professionals and the health system have had to work to their full capacity to assist patients, seek new treatments, and develop a vaccine. Other professionals have also contributed their knowledge and time to respond to the effects of the health, social, and economic emergency. The Universidad del Rosario could contribute to Colombia, in this context, on every point, and this has been possible thanks to its commitment to research. The university had the capacity!

By Ángela Constanza Jerez  
y Ninfa Esperanza Sandoval  
Pictures Urosario, Milagro Castro

**T**he Universidad del Rosario has been in the spotlight throughout the year in relation to the good activities undertaken in Colombia as regards the COVID-19 pandemic.

To begin with, the Microbiology Laboratory was authorized to perform the first molecular diagnosis tests of the disease. Then, the Centro de Estudios de Enfermedades Autoinmunes, CREA (Center for Autoimmune Diseases Research) that, together with other institutions, obtained the approval of the Instituto Nacional de Vigilancia de Medicamentos y Alimentos, Invima (National Institute of Drug and Food Surveillance) for the first clinical trial of convalescent plasma in COVID-19 patients. And a few days later, among other good news from the Universidad del Rosario, the project *CoronaMonitor* was disclosed, with the participation of the Faculty of Economics. Its mission is to obtain information in real time about people's health and socioeconomic conditions to help the authorities in their decision-making.

"Although all this has been really difficult, we can say that good things have happened, such as proving that we were sufficiently prepared. For example, we had made significant investments in equipment and spaces; we had trained and hired professors of international standing, including researchers; and we had mapped processes that showed us what to do, which are

the routes, and who are responsible for it. All this was essential to immediately react to the different needs that have arisen in the country," says María Martínez Agüero, the former vice provost of Research and Innovation at the Universidad del Rosario.

Therefore, in her opinion, the greatest lesson learned during these months is that investing in research is definitely an investment and not an expense. "We do not know when that investment will pay off. It may be fast, or it may take years, but it will always be justified," she adds.

## Beyond health

Apart from being prepared with a vigorous research ecosystem, María Martínez reckons that the Universidad del Rosario demonstrated that other areas were also ready to face an emergency such as the current one. This is because each process that needed to be carried out throughout 2020 to respond to the impacts of the pandemic has required the knowledge and commitment of teams other than the scientific team. For example, the mere execution of an agreement with the Colombian National Government requires the articulation of multiple internal parties: Academic institutions, the Legal Department, Financial Direction Office, Research and Innovation Office, and Purchasing, among others. Consequently, had they not had several years

of practice improving the processes and protocols, they would not have been able to respond in time.

"All this shows a very committed human capital and a robust institution that backs it up so that the work can be done. Moments of crisis are always strategic to show strengths, and they have shone," she claims.

The Dean of the School of Medicine and Health Sciences, Gustavo A. Quintero Hernández, adds that the current emergency also evidences how well-prepared they are to think "outside the box." That has allowed them to promptly respond to the daily challenges faced by the different teams because the healthcare area is not the only one that is working to meet the demands posed by the current situation.

Precisely, for Martínez, having a broader vision of the pandemic is another clear example of the institutional commitment of the Universidad del Rosario. Unlike public opinion, which has focused on finding treatments and vaccines against the virus, the researchers of the university have targeted different fronts to address not only immediate issues but also those that are yet to come.

"Healthcare professionals from the Faculty of Sciences, School of Medicine, as well as from hospitals with which we have an agreement, such as Méderi (one of the Colombian Healthcare institutions with the largest number of intensive care unit beds), have been directly addressing all health problems, but since it is a matter of human population, there are other situations that require the intervention of Economics and Human Science professors and others in fields that are asking research questions," she explains.

Indeed, researchers from different schools of the Universidad del Rosario have created projects; they have joined other projects; they have given a turn to those projects wherein they were working; or they have finished them in advance to address situations other than those strictly related to COVID-19 treatment or the quest for a vaccine.

This is the case of the laboratory method carried out at the School of Human Sciences, the purpose of which has been, since April, to solve the concerns arising from the pandemic in the cultural sector. Similarly, the *Generations that Connect* project, also conducted by the School of Human Sciences, aims at helping the elderly to develop digital skills so they feel useful instead of isolated. The project was in its first stage and was suddenly moved on to the next stage to promptly develop such skills in the elderly population, whose mobility has been restricted like no other because of the pandemic.

"Remote working, social distancing, isolation, unemployment, and other situations that we are going through as a human population are worth being analyzed, and it is wonderful to see our researchers do so. Questions are being asked, national and international networks are being created or strengthened, agreements are being executed, and partners are being sought out to face the other side of a reality that nobody had ever experienced before," adds María Martínez.

The Dean of the School of Medicine and Health Sciences highlights that collective work component. In his opinion, one of the biggest lessons learned through this pandemic is the capacity that the university has based in its longstanding reputation to call and convene others in order to achieve solidarity in the country.



"There's never been a collaborative work opportunity in Colombia like the one we have nowadays. All our projects have huge national and international collaboration. Perhaps without even intending to do so, I think we have made open science possible, which was something merely theoretical. We need to share research, works, our results, and publications. COVID-19 has allowed us to open science to the world instead of working in isolation behind the walls of the university," she highlights.

These initiatives, as well as those directly related to the healthcare area, are included in this special report. All of them render account for collective work carried out by professionals from different areas who work untiringly, without having time for themselves or their families. Professionals are committed to the point of risking their own lives.

"An adverse time like the one we are going through nowadays requires everyone's work. It also requires us to understand that this is also an environmental issue. Climate change does exist; deforestation is everyone's problem, zoonosis is real (an animal disease that can be transmitted to humans). Research and state policies are needed to support this," concludes Martínez, professor at the Faculty of Natural Sciences and Ph.D. in Population Genetics and Evolutionary Biology. ■

# The first to perform diagnostic tests for the virus

It had only been three weeks since the Ministry of Health and Social Protection confirmed the first case of COVID-19 in Colombia, when the news was published. The Microbiology Laboratory of the Universidad del Rosario was the first to be authorized to perform tests of molecular diagnosis of the virus.

The laboratory was authorized by the Instituto Nacional de Salud, INS (National Institute of Health) and the District Secretariat of Health of Bogotá. Twenty two public and private university laboratories were preparing to do the tests. In the second week of March, Rosario and Andes had been the first educational institutions to have the INS's authorization to receive such training.

"Understanding that the diagnostic capacity of the institute was not enough to address the situation, the first thing we did with the Andes was to offer our help to the Director of the National Laboratory Network of Public Health of the INS. We offered our infrastructure because as an academy we have extensive experience in the molecular diagnosis of different infectious agents. That way, Rosario and Andes were the first universities to be trained in COVID-19 diagnosis. In a race against time, we were the first ones to comply with the standard required in any clinical diagnosis laboratory," explains Juan David Ramírez, director of the Microbiology Laboratory of Universidad del Rosario, who leads this important project for the university as well as for Colombia.

In one week, the laboratory attained the quality requirements established in the ISO standard 17025, with which they were released to start testing. This type of process usually takes between three and four months, but the laboratory professionals worked more than 12 hours a day and 7 days a week to have everything in order. Ever since, they have not stopped doing it, and every day, they increase their work hours because they feel a certain responsibility to inform people as soon as possible as to whether they have the virus.

In the first days of its management, the



university also helped train the laboratory personnel from regional universities as was the case of the universities of Magdalena and Quindío.

## Fundraising for a robot

The Universidad del Rosario combined training its colleagues with daily work on testing, which was done manually. A group of bacteriologists, biologists, and microbiologists performed the task in three time-consuming phases. First, the group received the samples in the biosecurity package, which had to be unpacked in a biosafety booth (unpacking); then, it extracted the genetic material of the virus from the sample (RNA extraction); and finally, it used a special molecular biology technique that consists of having a chain reaction of genetic material, as though it were replicating itself or making copies (Polymerase Chain Reaction—PCR).

The laboratory started with 100 samples a day, next with 200, and later on with 300; however, it was a demanding task for 14 people, who also could not complete the number of samples required because of the increasing infection rates in the country. Therefore, the Microbiological Research Group (Gimur), managed by Ramírez for the past 6 years—who is

a Ph.D. professor at the Universidad del Rosario and president of the Colombian Association of Parasitology and Tropical Medicine—took on the search for a way to optimize the process.

"This is how we got to the Hamilton brand robot that allowed passing from 300 samples per day to 1,000; the issue was that only the robot cost between 600 and 700 million Colombian pesos. The university had invested what was required for the first 6,000 tests but could not afford it. So, we decided to launch the campaign 'Let's make it possible.' Our calculations showed that more or less we needed 4,000 million Colombian pesos to be able to do approximately 100,000 tests, including buying the robot, reagents, hiring personnel, etc. We thought the amount could be achieved in several weeks, but surprisingly, a big part of the goal was achieved in two days: 3,500 million Colombian pesos, thanks to the business sector. The robot was no longer an illusion; it was a reality," recalls Ramírez.

Donations, which amounted to 6,000 million Colombian pesos, were given by the academic community of the university, major private sector companies: Alpina, Grupo Santander, Seguros Bolívar, Davivienda, and other organizations: The embassy of Canada, Fincomercio, Inversiones Ecológicas S.A, Codensa -Emgesa, Univerisa, Probogotá, and Inversiones González Torres e Hijos SAS. As strategic allies, Fundación El Nogal, Windows Channel, and Colsubsidio.

The robot arrived in Colombia on May 16 and began to work on May 20 because, as Ramírez explains, it is not "a refrigerator that can be connected and works immediately, laboratory tests must be carried out." Now the goal is to conduct 110,000 tests, which are focused on regions that need them the most because of the lack of resources. That way, greater impact on public health is achieved. However, the university is also supporting massive testing of the Mayor's Office of Bogotá.

In the first days of its management, the university also helped train the laboratories' personnel from regional universities as in the case of the universities of Magdalena and Quindío.

## Getting to know the virus

What comes next? That was the recurring question of the laboratory research group in that first moment, and they still ask themselves the same question. To answer it, the group began by explaining the big question of determining the virus biology with the ambitious project of unraveling its genetic sequence, with the INS and the Icahn School of Medicine at Mount Sinai in the United States, also participating in it.

"From the samples we have, we have found that 11 different types of the virus are circulating in the country and two are the most common ones. These types are defined as lineages, which are virus mutations that accumulate with time; that is to say, the virus initially described in Wuhan, China, is different from the one existing now. By this time at least 81 virus lineages have been reported throughout the world," explains Ramírez.

Analysis of virus mutations also allows setting the timescale wherein the lineages were introduced in a specific geographic region. According to the accumulated mutations in the viral genome in Colombia, the virus may have entered the country in the month of January and not on March 6, as it was reported. Furthermore, the probable origin is France and not Italy.

The investigation has yielded at least eight possible introductions in Colombia during the spread of SARS-CoV-2 in the country.

"This is the first robust analysis of SARS-CoV-2 genomes in Colombia and Latin America and provides important information for decision-making in terms of surveillance and planning effective measures against the spread of the pandemic. We need to join forces to learn more about the virus biology and its impact on the Colombian population and on the continent. There are many questions about the virus' biology and its genome, making it impossible to affirm what is coming next," he concludes.

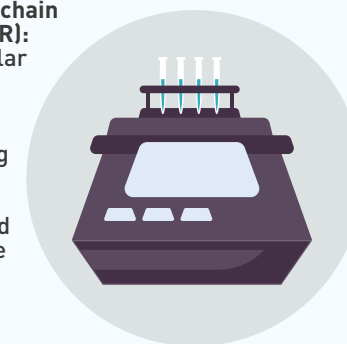
## Manual Analysis



- 1. Receiving and unpacking samples:** In this phase, the samples are received and unpacked in biosafety booths type II to get them ready to start the diagnosis process.



- 2. Nucleic acid extraction:** This phase uses a series of chemicals to obtain and purify the virus's genetic material.



- 3. Detection by polymerase chain reaction (PCR):** This molecular biology technique is like a photocopying machine of genetic material, and it detects the virus.

# Learn to use the technology, the best reason to connect generations

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Every Wednesday, María Helena García and Vanessa Gaitán have an appointment to decide the next day's activities. They begin by recognizing the different functions of a smartphone, and then, they understand how the most used platforms for work and family meetings during the current circumstances work.

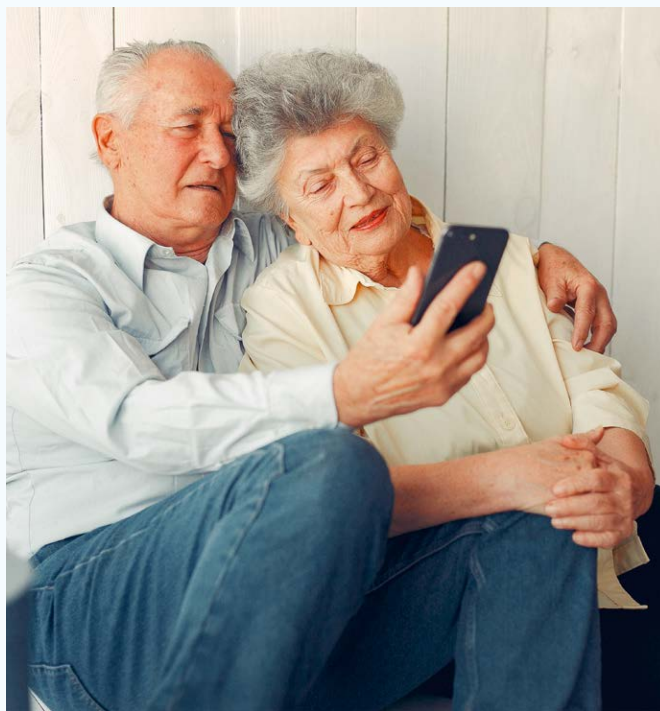
María Helena could be Vanessa's grandmother. She is 78 years old. Vanessa is no more than 23; she just graduated from Social Work, and thanks to a call, she is part of a pilot project of the School of Human Sciences of the Universidad del Rosario, Colpensiones, Icetex, and the Presidential Council for Youth. With this project, they seek to teach the elderly how to use technology and social networks to contact their relatives.

The idea has been in development in the project "Generations that connect," which had to move from theory to practice faster than expected because of the pandemic. It had been identified that it was required to mitigate the effects of isolation, monotony, and loneliness in the population aged over 60 years, and with the health emergency, it was intensified.

"Colpensiones conducted a large survey in 2019 that revealed that the elderly upon retirement had a feeling that their life no longer had a purpose. From this, we build with them the initiative to unite young people with the elderly for them to have an intergenerational exchange of experiences and knowledge and attract the latter to the world of technology and social networks so they can maintain contact with their families through current tools," explains Carlos Gustavo Patarroyo, dean of the School of Human Sciences of the Universidad del Rosario.

To make the project a reality, courses for young volunteers were designed and taught, volunteers were sensitized and trained about what it is like to be an elderly person and how to teach them to handle Information and Communication Technologies (ICT).

Although the emphasis was placed on teaching how to use technology, the truth is that other lessons have been learned from both sides. Vanessa says that with María Helena, they have gone from talking about technology to recognizing to-



gether support networks, the importance of self-care, and that of controlling emotions.

"For me, it is not just a professional experience. From María Helena I have learned how to be a better daughter, a better granddaughter, and a better person, through her life experiences and her teachings. One call can make a difference," assures the young woman.

María Helena says she is happy to know she has responsibilities and can connect even with her great-grandchildren, who offer their help to be better at the work she is willing to do.

## It starts with a call

Telephone meetings, which are twice a week, will initially be maintained until November.



## Colombia has an increase in the population aged over 65 years

According to the World Bank, Colombia is the fifth country of Latin America and the Caribbean with the largest number of people aged above 65 years.

According to the 2018 population census from the Departamento Administrativo Nacional de Estadística, Dane (National Administrative Department of Statistics), people over 65 years of age represent 9.1% of the country's population, which means 4.5 million inhabitants.

Although its population is increasingly aging, the country does not have public policies and actions for the elderly to be considered as having equal conditions so that they can provide the nation with all their experiences.

That is the time stipulated for the pilot, in which 300 pensioners and 152 young volunteers (students or recent graduates from the Social Work, Psychology and Gerontology fields) participate; then, communication will include a larger population because it is planned for the time the pandemic lasts.

"It will continue through digital channels, but what follows is to take it to physical settings, broaden the spectrum to include more elder people in addition to those of Colpensiones and give face-to-face and certified training at the university," explains the dean.

Project volunteers acquire competencies of active listening and assertive conversation during the process. In the first approach with the pensioner, the mission is to know how they live, their family environment, their preferences, and what kind of technology is available to them.

This way, they jointly carry out a work plan that includes activities such as teaching them how to use email and WhatsApp, take pictures with their cell phones, make digital albums, record short audios with their life experiences, visit virtual museums, and solve crosswords and word search puzzles.

"Bringing them closer to their loved ones through technology is a mechanism to close this digital gap, which sometimes isolates them even from their own family. If they know how to use the tool, they can be included in the family chat, and thus, they can be informed and integrated," adds Patarroyo.

Although intergenerational projects have been tested in countries such as the United States, this is the first to achieve such a high level of articulation from the academy, private companies, and public institutions.

## An initiative with future

The first to widen the intergenerational solidarity network has a great scope:

1,400,000

Pensioners in Colombia

32,000

Young Volunteers

143,000

Beneficiaries of Periodical Economic Benefits (PEBS)

## A bet for information in real time for decision-making

Process data provided by people in real time on their health status, contagion patterns, and economic capacity, in order to provide information to authorities and decision-makers in times of pandemic, is the main objective of the universities that created *CoronaMonitor*.

“The idea came from Eafit, together with other organizations, among them the Universidad del Rosario and Innovations for Poverty Action (IPA). The three of us are part of the scientific committee that is made up of five researchers. In the committee, decisions are made; for example, we design the questionnaire,” explains Juan Fernando Vargas, professor at the Faculty of Economics of the Universidad del Rosario.

The essence of the initiative is to ensure that as many people as possible answer a short questionnaire, which does not take more than 2 min to complete, with questions about their health condition, symptoms, household supplies regarding food and medicine, supply chain provision, behaviors during quarantine, sufficient income to subsist, among other issues.

“With this information, researchers and above all, authorities, and those who make public policy decisions, have the data to design convenient policies to face both contagion and diffusion of the virus, and the economic consequences created on households,” adds Vargas.

Those who answer the questionnaire can rest assured because the information is stored on a server with the highest security protocols. It is shared with whoever wants it, but anonymously, and the questionnaire is only given to people who have provided prior explicit consent. Moreover, just those who explicitly authorize it are contacted again because the idea is that they can answer additional questions in the future.

At the beginning of June, there were about 11,500 surveys in a total of 182 municipalities in the country, that is, almost one-fifth of Colombia. Among the findings of that moment, the ones that drew attention were:

The proportion of people with symptoms associated with COVID-19 was declining, going from 6% to 2% of the interviewees, between the end of March and the beginning of June.

The proportion of people who took the diagnostic test was almost three times higher during that same period.



Roughly 6% of the interviewees reported not having enough supplies for 3 days, and the figure did not improve with respect to the previous survey cut-off. 73% of the households reported having decreased their labor income, and 10% reported not having enough money to meet their needs.

The percentage of people who reported not finding basic medications near their place of residence such as acetaminophen or alcohol was decreasing. At the end of March, it was 43%, and in early June, it was 3%, which would suggest that medication's supply had improved a great deal.

The percentage of people with mental health damage symptoms from confinement was high and constantly rising. About 73% of the people reported having difficulties sleeping, anxiety, or aggressive behavior—a disturbing fact. 47% of the people reported complying with confinement regulations, while late in March the figure was 93%, a situation understood by the long duration of the quarantine and its multiple extensions.

Any institution, public or private, and whether an educational institution or not, can participate or contribute by spreading the survey to improve its coverage. That way, *CoronaMonitor* information can be strengthened, making it a tool that will continue operating while the pandemic and the dynamics associated with it last.

Promoters hope that from the information collected from other research projects or reports can be created to give new paths to address and prevent emergency situations such as the current one.

You can fill out the survey at: <https://corona-monitor.co/participa>

## Universidad del Rosario Biomedical Engineering participates in the prototype design of the mechanical ventilator

The University Biomedical Engineering Program of the Universidad del Rosario is part of the group of programs and academic institutions of the country that are helping to fill the deficit of mechanical ventilators to assist COVID-19 patients.

After improving the bed supply in the emergency room and Intensive Care Unit (ICU), Colombia was faced with the lack of this equipment, which is essential to serve between 5% and 7% of COVID-19 patients arriving at these hospital areas.

European countries and the United States, due to their large number of cases, bought ventilators available in the market; thus, the national industry had to make them.

The Universidad del Rosario contributes to the prototype design of a mechanical ventilator, which also has a battery for autonomous use of 2 hours, making it possible to use it in places where electrical energy is not continuous.

“There were no ventilators developed in Colombia, and in the specific case of ventilators to assist patients with COVID-19, these should follow technical specifications regarding pressure and volume; therefore, it was not easy to get the prototype required,” explains Néstor Flórez, professor of the Biomedical Engineering Program of the Universidad del Rosario.

The prototype must be approved by the Instituto Nacional de Vigilancia de Medicamentos y Alimentos, Invima (National Institute of Drug and Food Surveillance) so that it passes to industrial production. This phase will have the support of allies. The first calculations indicate that an imported ventilator can cost up to three times more than the one produced in Colombia.



# With patient information from Bogotá and Cali, researchers will provide clues about the virus behavior in Colombia

Pictures Ximena Serrano Gil, Milagro Castro



**B**y the end of 2020, Colombia and the world will have information that will surely be useful for the development and evaluation of treatments against COVID-19, screening tests, and markers of the severity of the disease. Moreover, it will be helpful to define health public policies that counteract the pandemic that is putting the planet in check.

A group of researchers from different institutions, led by Dr. Ángela María Ruiz from the School of Medicine and Health Sciences of the Universidad del Rosario, obtained the National Government's approval to carry out a study that seeks to identify variants of the SARS-CoV-2 virus genome, drawn from 1,000 samples of patients from Bogotá and Cali with different level degrees of the disease.

"Our purpose is to carry out the massive sequencing of the SARS-CoV-2 genome, which produces COVID-19, in two large cities of the national territory severely affected by the pandemic. That means identifying and analyzing modifications that occur in the vi-

**The Ministry of Science, Technology and Innovation selected the project together with 24 other projects among over 500 presented to the call #MinCienciatón, created by this department to answer questions on epidemiology topics and treatment that may impact the COVID-19 pandemic.**

rus genome in Colombia. To survive, the virus needs cells to enter, and by introducing its RNA into the cell, it replicates its own genetic material; errors may occur in that transcription. Those mistakes are virus mutations," explains Dr. Ruiz.

Mutations may not have greater meaning; however, they could also represent major changes in virus behavior. For example, they could weaken the virus or in contrast they could increase its infectious capacity or lethality. Furthermore, if major changes were to occur in the regions for which the vaccines are currently being developed, it could happen that these vaccines have no effect. This occurs in the case of vaccines for Influenza, which is a seasonal infection, and because the virus mutates significantly, doctors recommend getting vaccinated every year.

That is why scientists work against the clock to understand the SARS-CoV-2 genome. Dr. Ruiz says that research that is being carried out in Colombia will provide valuable information to the world genome repository,

which contains the findings achieved in all regions since the virus genome was first described in China. At the beginning of June 2020, it had more than 46,000 sequences.

## Clinical correlations

Apart from analyzing the genome sequence in 1,000 Colombian patients, researchers are reviewing one by one its characteristics in order to make clinical correlations because COVID-19 has the ability to mutate as it spreads from one patient to another or from one place to another.

"These genetic variations, combined with the individual characteristics of the infected people, could relate to the disease outcomes in terms of how symptoms present, as well as complications, mortality, and persistence of the infection," says the researcher.

In this sense, not all the evaluated patients are in the ICU; the study also considers hospitalized patients with less severe clinical manifestations and outpatients who present with mild clinical symptoms. Outpatients have their sample taken, and they are controlled via remote monitoring to have all their clinical characteristics evaluated in order to make correlations of data such as age and sex.

The Ministry of Science, Technology and Innovation selected the project, together with 24 other projects, from the over-

500 who presented to the call for #MinCienciatón, created by this department to respond to epidemiology and treatment issues that may impact the COVID-19 pandemic. It was the second project with the highest amount: 1,800 million Colombian pesos, which, with its cost sharing, amounts to 2,161 million Colombian pesos. In total, the call of the Ministry will allocate resources for 26,000 million Colombian pesos.

This project is developed through an alliance between the Universidad del Rosario—which is at the head—, the University Hospital Mayor Méderi, the Valle del Lili Foundation, and the Gencell Pharma Laboratory. Moreover, it has the advice of BGI, a Chinese company specialized in genomics, which is responsible for the identification of the SARS-CoV-2 genome.

The team of researchers consists of doctors, epidemiologists, public health workers, pathologists, intensivists, geneticists, and pharmacologists, among others.

# Fundación Cardioinfantil and the Universidad del Rosario innovated the laboratory method for COVID-19 tests

Pictures Rodrigo Cabrera, [www.prnewswire.com](http://www.prnewswire.com)

One of the great needs that Colombia had in the first moments of the pandemic was performing prompt and effective COVID-19 diagnostic tests. Therefore, the Centro de Investigación en Genética y Genómica, Ciggur (Research Center in Genetics and Genomics) from the Universidad del Rosario and the Molecular Biology Laboratory of the Fundación Cardioinfantil joined forces to present a proposal that responded to the immediate problem to the country with an additional ingredient: Developing and implementing a new technology that would render the nation prepared for similar situations that may arise in the near future.

“The proposal was to improve an already existing methodology that is called single-molecule sequencing in real time, using nanotechnology. With this, we can identify in respiratory and blood samples a large number of pathogens present in a person and distinguish COVID-19 from other respiratory illness caused by other pathogens,” explains Dora Fonseca, professor of the School of Medicine and Health Sciences of the Universidad del Rosario.

The methodology can be applied without requiring a laboratory because it is a portable device with small mole-



↑ Molecular Biology Laboratory Fundación Cardioinfantil.

cules in charge of making the diagnosis. “It is a nanotechnology strategy, whereby the equipment can be taken to remote areas, without needing to move patients,” says Carlos Martín Restrepo, also from the School of Medicine and Health Sciences of the Universidad del Rosario, highlighting the aspect of methodology adaptation, which adds a new innovative element.

Dr. Rodrigo Cabrera, from the Fundación Cardioinfantil is the main researcher of the project and will be in charge of its execution together with Doctors Restrepo and Fonseca. It was possible to design and write the initiative in just 5 days with the support of the entire group of researchers from Ciggur, thanks to their knowledge, trajectories, and maximum efforts. Their work was rewarded by the initiative’s selection from among 60 proposals to the call of the Ministry of Science and Technology, which allocated an amount of

2,300 million Colombian pesos in royalties from Bogotá. With the cost sharing of the two institutions, the resources amounted to 2,700 million Colombian pesos.

This way, for the first time in Colombia, the methodology has been adapted to this type of problem, with which the country is left with a new and innovative technological tool that prepares the country to face other infectious diseases that may arise or contingencies that occur with already known viruses, such as zika and chikungunya.

### Three in one

The processing of approximately 18,000 samples coming mainly from the capital of the country is the fundamental objective of the project; however, having these many samples provides invaluable genetic material to answer two questions of great importance that doctors, nurses, patients, and science in general, are asking themselves, which are relevant issues for treatment and prevention.

One: Why are some people not severely affected by the virus and others, on the contrary, get close to passing away? And two: Why do some people have effective results with medications, while others do not?

Restrepo explains that to answer the concerns, they will perform a contrast analysis among 150 people who recovered and 150 who were severely affected by the disease (only in Bogotá) in order to “find out in detail its clinical history and analyze 24,000 genes with a laboratory test to determine their genetic peculiarities and contrast this with their clinical history and treatment.”

In the specific case of medications, they will search for patients who have taken the antivirals that are today being supplied for respiratory conditions and that on some occasions have had therapeutic failures. This is in order to deliver elements for international community analysis.

“Certain medications that some people infected with COVID-19 receive as treatment generate severe heart problems (ventricular arrhythmias), which can lead to death. We should know, a priori, whether, by their genetics, these people are at



The methodology can be applied without requiring a laboratory because it is a portable device with small molecules in charge of making the diagnosis.

risk of unwanted adverse events because of the medication that can be life-threatening for them,” Fonseca adds.

In a maximum of 2 years, the team in charge of the project in the two laboratories (biologists, microbiologists, bacteriologists, and cardiologists, among others) hopes to have answers that will allow science to have an advantage over the virus by acquiring more knowledge about it and the disease.

### How does it work?

In 2014, a third-generation SMRTS technology, known as Nanopore Sequencing (or NS), was introduced, which allows sequencing individual molecules of DNA or RNA in a direct manner, obtaining results in minutes. Moreover, it has protocols for preparation, samples, and portable equipment that can be used in field without even having direct power supply (a part of the NS equipment can be connected to the USB port of a laptop).

This technology has been successfully used to detect the agents causing respiratory infections with better results than those of PCR tests (also used to determine whether a person has COVID-19). In addition, this technology was able to obtain the sequence of the complete SARS-CoV-2 genome from nasopharyngeal swab samples in just some hours.

In the context of infectious outbreaks in Colombia, this technology could do the following:

- 1) Quickly identify a new biological agent.
- 2) Diagnose it in suspected cases and exposed persons without requiring additional development or validations.
- 3) Rule out cases with suspicious symptoms that have another infectious cause.

# Scientists from the Universidad del Rosario, among the researchers that seek treatment with recovered patients' plasma

Colombia will have definitive results of the clinical trial with plasma from COVID-19 patients who have recovered. An interdisciplinary group of scientists from Bogotá and Medellín have been working on this project to deliver the best news regarding the treatment of the disease.

Researchers at the Center for Autoimmune Diseases Research (Crea) from the Universidad del Rosario are part of that project. In addition, there are scientists from the Universidad CES, from Medellín; from the Instituto Distrital de Ciencia e Innovación en Salud, Idcbis (District Institute of Science, Biotechnology, and Innovation in Health), Fundación Universitaria de Ciencias de la Salud, Fucs (University Foundation of Health Sciences); and Servicios y Asesoría en Infectología (Services and Consultancy in Infectology), from Bogotá. Transfusions are carried out at the Clínica de Occidente and the Hospital Méderi in the capital of the country and at the CES Clinic in the capital of the department of Antioquia.

The principle of the trial is that patients who are cured of COVID-19 have antibodies and other substances of the immune system that could be of great help to those who still suffer from the disease and whose immune response is insufficient.

"In this disease, there is an exaggerated reaction of the immunological system, so we assume that in the recovered patients, there are not only antibodies that will work against the virus but also other substances that can be used to counteract this hyper-response of the immune system," explains Juan Manuel Anaya, director of Crea from the Universidad del Rosario.

Approximately 80% of the COVID-19 patients are asymptomatic or have mild symptoms, while the remaining 20% have an exaggerated inflammatory reaction to the infection. In this sense, the World Health Organization (WHO) has indicated that approximately 15% of all patients will require hospitalization because of the severity of the disease and that 5%, being in critical condition, will need to be in the ICU. The analysis is being conducted in patients who have severe infection but are not in critical condition, precisely to avoid the evolution of the disease.

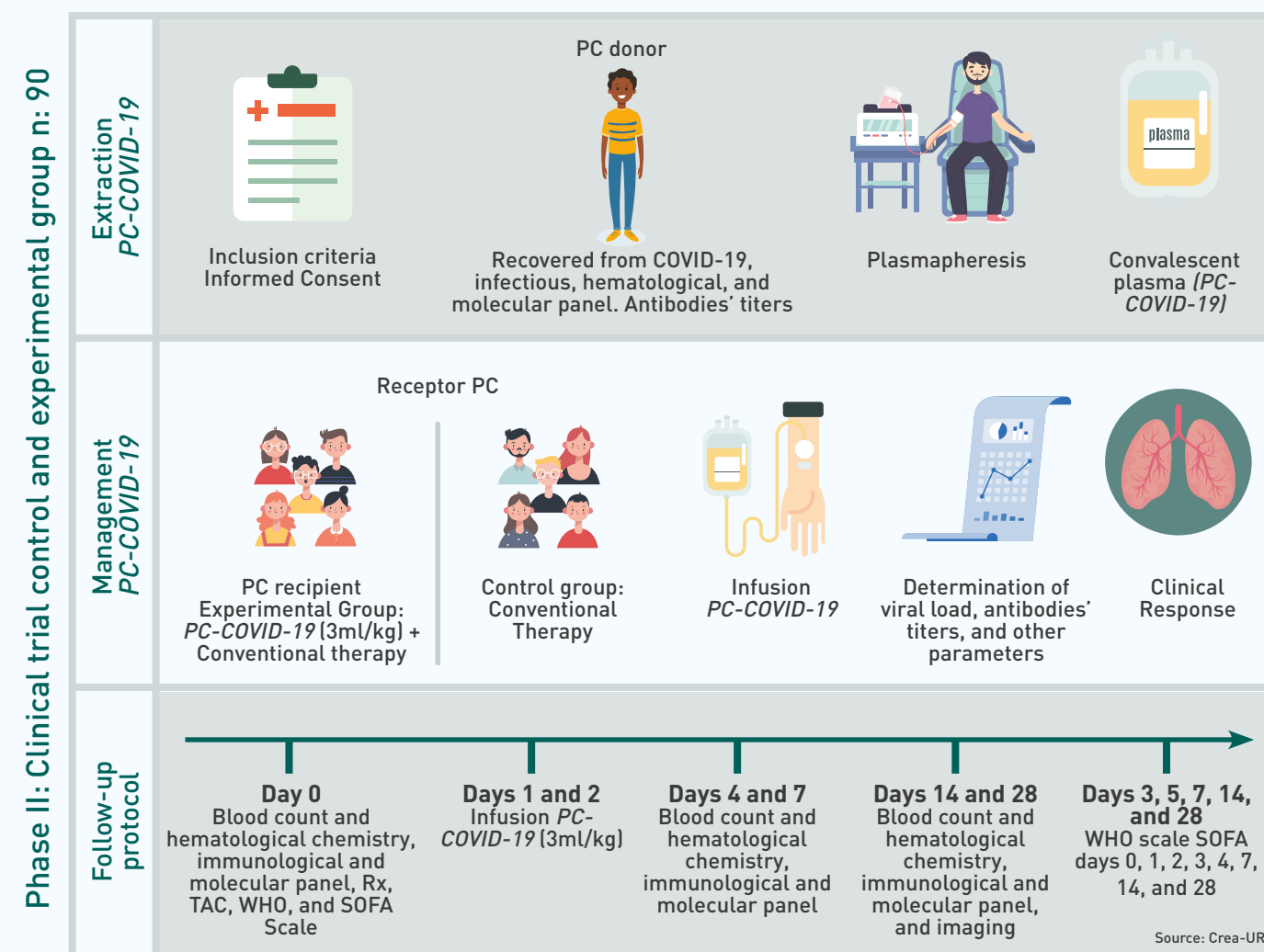
## A month of follow-up

The PC-COVID-19 Study: Convalescent plasma was the first to be endorsed in Colombia to treat these patients. The Instituto Nacional de Vigilancia de Medicamentos y Alimentos, Invima (National Institute of Drug and Food Surveillance) enabled scientists through the 2020017267 Resolution of May 28, 2020, after their having complied with strict requirements in each of the different clinical trial procedures, including a researcher manual and good clinical and insurance practices, among others. In addition, the group had the endorsement of the Secretariat of Health of Bogotá and the Secretariat of Health of Medellín.

The first phase of the study is a pilot test with five donors and 10 patients. Donors had to comply with a series of characteristics: They must be men between 18 and 60 years of age, they must have been hospitalized, they must have been cured of the disease, which is confirmed with a negative test, they must be asymptomatic for at least 14 days and maximum 30 days (ideally three weeks after having COVID-19 infection), they must not have had hepatitis, syphilis, or HIV, and have high antibody titers. "This because the beginning implies passive immunity, which means to take a patient's plasma (plasmapheresis) who has sufficiently high antibody titers and transfuse it to other patients. We estimate the ratio of one donor for two patients," explains the director of Crea.

Women who have not been pregnant, but were hospitalized and recovered can also be donors. The ones excluded are those who have had children, for security reasons, be-

## PC-COVID-19 Study Convalescent plasma for COVID-19 patients



cause they contain a type of antibody that could cause side effects in recipient patients.

The patient receiving the plasma is hospitalized but is not in the ICU. On the first day, he receives 250 milliliters per infusion and the same amount on the second day. During 28 days, they have rigorous follow-up. On Days 4, 7, 14, and 28, the patient has laboratory examinations.

In the second phase, which is with 90 patients, the same follow-up is performed, but the results of the plasma are compared with conventional treatment to determine whether the plasma treatment is superior. Thus, a group of 45 patients will receive plasma and conventional treatment, and another group will receive only conventional treatment.

"With respect to other studies that are being done in the world and have not reported results yet, this has two important advantages. First of all, it is a controlled and randomized study. Second, contrary to the other studies, we used plas-

ma in hospitalized patients but not in the ICU because the disease immunology varies depending on the time of evolution. We think that if a treatment is to be offered to a COVID-19 patient, it is not necessary to wait for the patient to be in critical condition, but as long as they have the disease, the healing potential plasma can be offered to them," adds Anaya.

Finally, he highlights that this study has a high component of collaboration and interdisciplinarity because there are more than 25 scientists from different areas and institutions from two cities. Similarly, in this study, universities, companies, and the State converge as the private sector supports with financial resources and the State, with legitimation.

# Social networks and mobility, keys to decision-making to deal with the pandemic

It took a month for the research project around the influence of human mobility on the spread of the malaria pathogen, developed by the Faculty of International, Political, and Urban Studies of the Universidad del Rosario, to become the most useful tool in times of pandemic.

Today, it is used by government administrations of the country to analyze the spread of COVID-19 and to make public policy decisions regarding its containment. The Rosario research group, consisting of four principal scientists, experts in anthropology, data analysis, environmental management, systems engineering, mathematics, genetics, and topology, did not hesitate to answer the call of the intersectoral team of the Bogotá Mayor's Office, in charge of responding to the challenges posed by COVID-19. The mission given was to design useful reports to make decisions in the face of the pandemic.

Human mobility is the main risk for the importation and spread of the virus. Therefore, the results of the measures taken to reduce it and the reliable epidemiological information allowed to be accessed in order to draw inferences about the growth of the infection and its effect on the health system's responsiveness at the national and regional levels. In other words, with this information, it is possible to evaluate the risk of isolation or social distancing decisions at the regional level, design policies to reduce mobility and enforce partial isolation (spatial segregation that allow sectors and regions mobility according to the risk), as well as focus efforts on places with different types of threats.

In the same way, it is a tool to apply tests based on information that can establish the extent to which the population is exposed in regions with different connectivity. In turn, the tool's usefulness for health policies aimed at containing the epidemic depends on the reliability and availability of epidemiological information about the infection.

"With the information we already had—mobility data (time and place) of Facebook users who have location services enabled and mobility data provided by Servi Información—we design a periodic report to analyze how the virus spreads in megaregions and perform individual tracking through data

collected by mobile applications," explains Alejandro Feged, senior lecturer at the Faculty of International, Political, and Urban Studies, and project leader, who emphasizes that data are anonymous and their analysis is exclusively used to address the health crisis.

Feged adds that to contain the virus, we cannot think only as a city; it is necessary to think as megaregions such as the Bogotá Region, for example, where the capital is closely related to the surrounding municipalities. The region must be observed to make decisions and analyze the measures' effectiveness.

The Situation Report: *Mobility and COVID-19 in Colombia* is updated and analyzed daily; it identifies mobility patterns and population flows in operational units using mathematical algorithms and artificial intelligence that show the behavior of the virus in defined zones. It also allows digital tracking of active cases using cell phones, which allows the tracking of infected people and the obtainment of knowledge regarding whether they respect the quarantine or are moving around and contacting people in different areas.

All that information is extremely important right now, because it allows the making of differentiated decisions based on the virus displacement in operational units, regions, or megaregions. That way, for ex-

The Situation Report: *Mobility and COVID-19* in Colombia is updated and analyzed daily; it identifies mobility patterns and population flows in operational units using mathematical algorithms and artificial intelligence that show the virus behavior in defined zones.

ample, borders and international flights were closed; national, regional, or local quarantines were decreed; and the alertness degree was defined in megaregions.

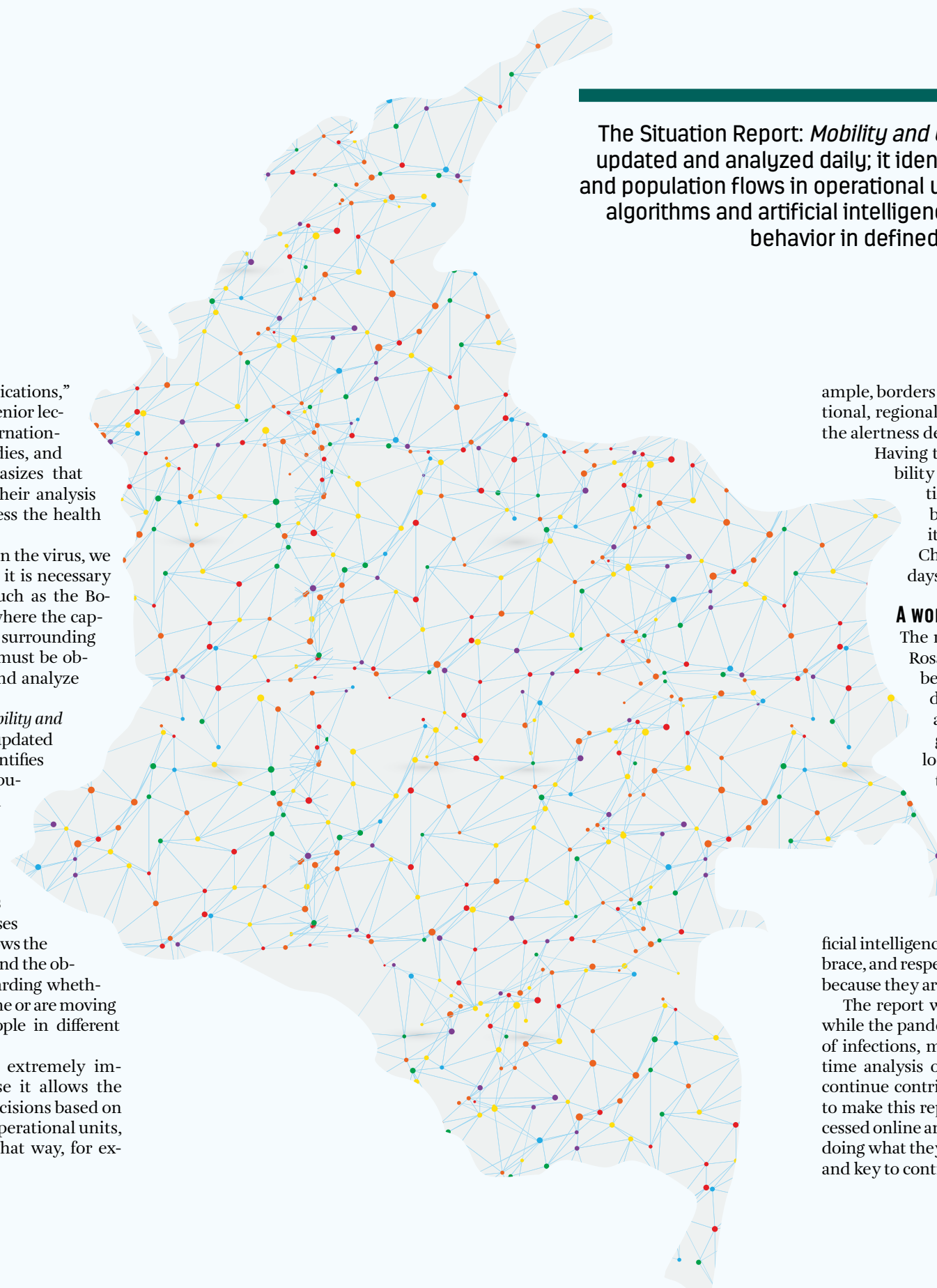
Having this report also allows comparison of mobility and the number of virus cases in a functional territory or a megaregion of Colombia (the Bogotá Region, for example) with its similar areas in Brazil, Italy, Peru, or Chile to build the risk profile for the next few days for that territory.

## A work of many

The reports generated by the Universidad del Rosario are part of great collaborative work between private companies that provide the data; the academy that makes a scientific and important economic contribution to generate reports and their analysis; and local, regional, and national administrations that receive and use analytics to make decisions based on science.

In this sense, the professor emphasizes that "It is important that citizens know that Colombia is on a par with countries that are cutting edge regarding technologies that involve data analysis, georeferencing, and artificial intelligence, among others. Similarly, they trust, embrace, and respect the measures taken to contain the virus because they are informed and grounded decisions."

The report will continue to be generated and refined while the pandemic lasts, it will evolve from the analysis of infections, movements, and places to perform space-time analysis of the different virus genomes." We will continue contributing from the Universidad del Rosario to make this report easier to analyze so that it can be accessed online and each institution involved contributes to doing what they do best. The information we use is public and key to control the pandemic," he concludes.



# Conversations in COVID-19 times

Almost a month after the first case of COVID-19 infection in Colombia, meetings began. The appointment began with four public officials from the cultural and touristic sector of the country, and soon after, they numbered 22 from different departments and municipalities, with one participant from Costa Rica and another from Spain. Each Saturday, they meet virtually, at 9 a.m., to pose a specific problem based on the challenges they face in their management because of the impact of the pandemic, and this way, they share and suggest public management alternatives that are urgent, feasible, sustainable, and relevant.

That 88-minute conversation space was aimed at a specific purpose, that is, the Laboratorio de Gestión y Política Cultural (Management and Cultural Policy Laboratory). A methodology of the research line of art and cultural policies of the School of Human Sciences from the Universidad del Rosario to help and follow up with public officials in the

cultural sector for them to do their best possible job in a difficult time for humanity.

"Before, these laboratories were face-to-face and were associated with the exercise of cultural management of an organization. We made them once a month to treat problems such as "How much do I charge to do a concert?" With COVID-19, the approach and the laboratory are addressed to officials for cultural governance topics and toward overcoming the challenges they face. They are new governments, they have difficulties because they are asked for re-

sources, and at the beginning of the year, they were with the budget of the previous mayor's office, tasked with building the Plan of Territorial Development at the height of the pandemic," explains Johanna Mahuth Tafur, director of the research line of art and cultural policies, who also calls and leads the session.

One of the first topics covered in these sessions was the call for artists in times of emergency. Some officials were concerned about the levels of corruption in their municipalities and the consequences on citizens trusting them to carry out their duties virtually. Among the advice they received from their colleagues, one was to carry out actions such as hiring recognized juries with an impeccable reputation; appeal part of the payroll of officials or contractors already linked and suitable enough to allow streamlining the process without questioning; and make public the different stages of the process.

"The exercise implies its own conditions, such as having assistants who have a profile that allows them to contribute from their experience to the solution of the problem and who question more or provide development or solution options. We start by raising the problem, and then, we ask questions: How do you think it can be solved? How are you implementing that? How would you like it to be done? How have others implemented it? And everyone responds," Tafur explains.

The conversation is completely directed so that the answers intertwine, and in the end, they have concrete ideas for a solution to the problem. That way, participants come up with ideas to meet their challenges and with the feeling that they are not alone. Someone else has the same problem, and there is a solution.

Having a "time traveler," such as the participant from Barcelona (Spain), has helped a lot. The director calls it that because Spain started the management of the emergency, and therefore, it has been anticipating different measures. He was invited for a specific topic and stayed; the same happened with a professor of Medicine at the university, who helped them clear up doubts about biosecurity; and likewise with other participants who have seen this conversation format as a good way to do catharsis and solve their difficulties.

Moreover, as in Las Vegas, "What happens in the laboratory stays in the laboratory." The information provided in the meeting of specific cases cannot be disclosed.



## Some of the topics discussed

- ✓ Alternatives to formulate calls for artists in times of COVID-19.
- ✓ Strategies to link cultures, arts, and heritages in need to mitigate COVID-19.
- ✓ Activate the arts sector, cultures, and heritages with initiatives different from the use of the Internet in COVID-19.
- ✓ Strategies to strengthen the arts and cultural sector in moments of COVID-19 and post-COVID-19.
- ✓ How to manage the demands of the cultural sector in the short, medium, and long term?
- ✓ How can the public sector activate artistic practices in the middle of social isolation?
- ✓ Strategies and tools from the public sphere to achieve the leverage of resources for the cultural sector versus reducing own budgets in the middle of COVID-19.
- ✓ In the current moments of discussion and approval of development plans in municipal councils and department assemblies, how to guarantee the participation of the cultural sector and citizens in isolation due to COVID-19?
- ✓ Communication strategies and speeches to make culture visible as a basic resource in the middle of the health emergency.
- ✓ What anchor projects can we design or carry out for the economic reactivation of the cultural sector from the public administration?
- ✓ Implementation of alternatives for economic reactivation for the second semester of 2020 and the first semester of 2021.



## A new social contract to come out stronger from the pandemic

As in the rest of the world, the pandemic in Colombia not only had an impact on health but also seriously affected the social and economic dimensions. In the latter, figures say it all. The economic behavior, which was positive during the months of January and February, shrank, and from March, it became negative, after having the first case of infection in the national territory. In April, unemployment reached 19.8 percent; therefore, the Banco de la República (Bank of the Republic) did not hesitate to lower its projections and predicted a growth slump between 2 and 7 percent by 2020.

"The country requires a total reorganization. A series of structural reforms that can leave us in a better place after the crisis. Regaining lost jobs won't be easy in the short term," assures Carlos Eduardo Sepúlveda, dean of the Faculty of Economics from the Universidad del Rosario, who has been analyzing the measures that could be designed for Colombia to emerge strengthened from the pandemic.

In this sense, the dean points out that a "new social contract" is required, which has structural solutions in the economic and social fields, and which includes different measurements.

"First, a tax adjustment is necessary so that taxation is fairer and retributive, which implies, among other things, eliminating so many exemptions and lowering the rent that stifles small- and medium-sized businesses. In the case of natural persons, it is necessary to broaden the base of contributors and do it progressively through a universal income statement," he assures.

**It is necessary to lower public spending, create a more balanced and sustainable social protection system, rethink the health sector, and ensure a minimum subsistence income.**

He also highlights that it is necessary to lower public spending, create a more balanced and sustainable social protection system, rethink the health sector, and ensure a minimum subsistence income.

Second, the labor market should be more dynamic and flexible so that there is a sustained income generation. It should be focused on worker protection and care, not just on the job position. This requires, for example, training that person to move from one job to another. It also requires a new approach to minimum wage," he explains.

### An informal country

The dean draws attention to the fact that Colombia has made positive progress with regard to poverty reduction and good middle-class growth, two segments that, in the current circumstances, are vulnerable and therefore at high risk.

He also considers that informal employment must have special treatment. He believes that informality is multidimensional, affecting both workers and companies, and amid the crisis, informal workers are being left out of government aid and support because they are not stratified as poor, are not registered, and have low banking access, with an aggravating circumstance: They are more sensitive to the crisis because they have lost up to 100% of their income.

"Not creating a protection network that covers them during the pandemic can push them to poverty, and therefore, this requires an additional initiative to assist them during this stage and prepare them for what is to come through job creation and incentives so that they are trained, formalized, and made visible. We must guarantee them a minimum income through cash or in-kind subsidies," he states.

Finally, he points out the relevance of the educational system, which must advance not only in coverage but also in quality and must promote science, technology, and innovation. "A great bet must be made for the productive system to be more innovative. Competitiveness must be broader so that we reach the international market, and it is essential to formalize small- and medium-sized companies," he points out.

## More scientific initiatives from the Universidad del Rosario

### Project/Activity

