ICGEB International Centre for Genetic Engineering and Biotechnology | Developing Knowledge

ICGEB Research Grants awarded under the 2020 Call for applications COVID-19 Special Call

Title: Development and production of a diagnostic kit for the SARS-CoV-2 virus by RT-PCR
Principal Investigator: Prof. Mohammed Sebaihia, University Hassiba Benbouali of Chlef, Chlef, Algeria
ICGEB Reference No. CRP/DZA20-03
Abstract: There is little doubt that accurate pathogen detection methods are fundamental to any public health strategies aimed at monitoring and limiting the spread of infectious diseases. This is best illustrated by the current COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2. The World Health Organization has made it abundantly clear that comprehensive testing is the most effective way to prevent infections and save lives. Of the currently available methods for the detection of SARS-CoV-2, the RT-qPCR is considered to be the gold standard. However, the deployment of RT-qPCR tests has been rather variable internationally due to the high global demand and the interruption of the supply chain; and thus, many developing countries, including Algeria, have experienced severe shortages of these kits, which has limited their testing capabilities. The main objective of this project is to produce locally all the enzymes, primers and probes necessary for cost-effective RT-qPCR kits.

Title: One Health International Network for SARS-CoV-2 real time genomic monitoring
Principal Investigator: Prof. Marta Giovanetti, Oswaldo Cruz Institute/FIOCRUZ Rio de Janeiro, Brazil
ICGEB Reference No. CRP/BRA20-03*
Abstract: In this project, we propose to build an international network between Brazil and Italy, in human, animal and environmental health (One Health), aiming to foster the generation of knowledge about SARS-CoV-2, with an emphasis on real-time sequencing, which will allow issues of epidemiological, virological and clinical relevance to be addressed. In this context, the proposed project will generate real-time SARS-CoV-2 genomic data that will allow the monitoring of viral dispersion dynamics. It will also support the development of strategic action in public health systems, as well as giving insight into SARS-CoV-2 national and international transmission routes.
Funded by IILA - Organización Internacional ítalo-latinoamericana

Title: A cellular-based surrogate assay for the identification of neutralizing antibodies against SARS-CoV-2 and the screening of receptor-binding inhibitors
Principal Investigator: Prof. Eugenia Corrales-Aguilar, Centro de Investigación en Enfermedades Tropicales (CIET), Universidad de Costa Rica, San José, Costa Rica
ICGEB Reference No. CRP/CRI20-03
Abstract: The ongoing SARS-CoV-2 epidemic makes it painfully clear that our current options for treating life-threatening zoonotic coronavirus infections are limited. Thus, we aim to contribute by implementing a state-of-the-art assay with two aspects: (i) the identification of individuals who have mounted an immune response against the virus is important, e.g. to determine which healthcare workers could care for COVID19 patients with a minimal risk, and for essential public health decisions; (ii) there remains an urgent need to develop antiviral therapeutics, and because this is a time-consuming process, drug repositioning may be a critical solution. Therefore, we will develop a cell-based laboratory test to simulate SARS-CoV-2 binding to its receptor, without having to work with the infectious virus in high-level biosafety labs. We expect this tool to be instrumental in accelerating the availability of reliable serological neutralization assays and the repositioning of available drugs against SARS-CoV-2.

Title: Phenotypic and functional characterization of the adaptive immune response during differential progression of COVID-19

Principal Investigator: Prof. Maria Teresa Rugeles Lopez, Universidad de Antioquia, Sede de Investigación Universitaria, Laboratory 532, Antioquia, Colombia

ICGEB Reference No. CRP/COL20-01*

Abstract: Due to the recent appearance of the COVID-19 pandemic, our knowledge of the immunological mechanisms triggered by this infection, and their association with the disease severity, remain limited. This has made it difficult to suggest preventive and therapeutic strategies that have been developed for other infections and which might be extrapolated to COVID-19. Previous evidence may suggest that the severity of the disease in some patients is caused by an exacerbated inflammatory response against the virus. With this in mind, our project aims to characterize the phenotypic and functional alterations of adaptive immune cells in a panel of confirmed SARS-CoV-2 patients who show different clinical presentations of COVID-19. This information could help in the identification of possible therapeutic targets and also biomarkers likely to predict the clinical course of the patient. This information could then assist the treating physicians to take more assertive decisions.

Funded by IILA - Organización Internacional ítalo-latinoamericana

Title: Characterization of the SARS-CoV-2 virus and antibodies

Principal Investigator: Dr. Tindih Sheltone Heshborne, Department of Biological Sciences, School of Pure and Applied Sciences, Machakos University, Machakos, Kenya

ICGEB Reference No. CRP/KEN20-01

Abstract: Severe Acute Respiratory Syndrome Corona virus-2019 (SARS-CoV-2), which causes COVID-19 disease, has been confirmed to cause fatalities, although cases of mild asymptomatic reactions and different mutants/variants have been shown. There are many efforts across the globe aimed at developing vaccines, drugs and immunotherapies against the virus to supplement physical distancing as control strategies. However, it is important to note that drugs and vaccines may specifically target only certain isolates, variants and strains of circulating viruses. Hence, understanding the variant pool, the infection reservoirs (other animals that can be infected) and the nature of their antibodies will be an important aspect of the control strategy. Therefore our aim is to identify the circulating strains of SARS CoV-2 virus through characterization; to understand the magnitude of infections through sero- and molecular surveillance; and to understand the characteristics of the anti-SARS-CoV-19 antibodies. These three attributes will be an important aspect of developing an integrated control strategy for COVID-19.

Title: Large scale biobanks from underserved populations to accelerate COVID-19 host genetics studies in Latin America and Oceania

Principal Investigator: Prof. Andrés Moreno-Estrada, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV), Guanajuato, Mexico

ICGEB Reference No. CRP/MEX20-01*

Abstract: Indigenous peoples in under-served regions around the world are disproportionally suffering from the devastating disease burden of the COVID-19 pandemic. Our understanding of human genetic variation and its role in the susceptibility to the disease is critically important to allow precision medicine strategies, and to ensure equality. Existing biobanking and DNA profiling efforts in diverse populations are valuable resources for exploring the distribution of COVID-19-associated genetic variants that arebeing discovered in ongoing association studies worldwide. Latin America and Oceania are among the most underrepresented regions in genomics, and this project aims to harness the diversity represented in existing DNA biobanks from Mexico, Chile, Southeast Asia and the Pacific to inform public health measures to tackle the COVID-19 pandemic in these regions. This project is a unique and affordable opportunity to bring under-served populations from Latin America and the Asia-Pacific region one step closer to the benefits of COVID-19 scientific research.

Funded by IILA - Organización Internacional ítalo-latinoamericana

Title: Human germinal center organoids as a tool to understand B cell biology and for the identification of monoclonal antibodies with therapeutic potential against SARS-CoV2

Principal Investigator: Dr. Hilda Minerva González Sánchez, Instituto Nacional de Salud Pública, Santa María Ahuacatitlán, Cuernavaca, Morelos, Mexico

ICGEB Reference No. CRP/MEX20-04_EC

Abstract: Within our body, B cells, a type of white blood cells, produce and release antibodies to protect us against invaders such as the coronavirus that causes the current COVID-19 pandemic. To obtain antibodies *in vitro*, we propose to develop a three-dimensional cell culture that replicates the function of the anatomical structures called germinal centers, where B cells activate, expand, and form antibody-secreting cells. Our aims are: (i) to develop methods for obtaining antibodies with high affinity against SARS-CoV2, using microscopic particles that will act as the "invaders" and which will transport substances to specific B cells for their activation, and (ii) to find the best culture conditions to mimic the germinal center structure and function. The proposed model will advance our understanding of B cell activation, and will collaborate with an alternative option for the prevention and treatment of COVID-19. Moreover, this model could be used to generate antibodies against other targets of interest.

Title: Natural antibody responses in asymptomatic/mildly symptomatic, severely symptomatic and critically ill patients with COVID-19

Principal Investigator: Prof. Irina Panovska-Stavridis, University Clinic of Hematology-Skopje, Skopje, North Macedonia

ICGEB Reference No. CRP/MKD20-01

Abstract: The COVID-19 pandemic is characterized by considerable variability in infection rate and mortality, even among neighboring countries. Although some of these differences may be due to different diagnostic testing strategies and confinement measures, the higher mortality rates in countries with more advanced healthcare systems suggest a role for genetic factors. The main goal of this project is to determine whether differences in the severity of the disease are caused by genetic factors that regulate the immune response. In particular, we will investigate whether disease progression is caused by defective natural antibody and cytotoxic T cell responses, and whether such defects result from genetic risk variants associated with more severe disease in other viral infections. The answers to these questions will have key implications for the appropriate design of clinical trials aimed at modulating the anti-COVID-19 immune response, and for the identification of patients at greater risk for disease progression.

Title: Focused drug discovery against SARS-CoV-2: Targeting cell invasion and replication

Principal Investigator: Dr. Gloria Virginia López, Departamento de Química Orgánica, Facultad de Química, Institut Pasteur de Montevideo, Montevideo, Uruguay

ICGEB Reference No. CRP/URY20-03

Abstract: RNA viruses are etiologic agents of zoonotic, acute and mortal diseases, including COVID-19, in humans. Compared with DNA viruses, RNA viruses generally have very high mutation rates, which hamper the development of long-term effective vaccines. Antivirals are useful for prevention and treatment of these illnesses, alone or in combination with immunization. The current SARS-CoV-2 pandemic has shown the urgent need for antivirals to limit the course of the infection. The genome of SARS-CoV-2 encodes structural and non-structural proteins that play key roles during infection. The structural spike glycoprotein is critical for virus recognition and internalization by the host cells. The non-structural viral proteases are essential for pathogen replication and for antagonizing the host immune response. This project aims to contribute to the development of potential antiviral agents against SARS-related infections by addressing the identification and characterization of drug-like compounds targeting these two major and essential viral components.