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The Responses of Biobanks to COVID-19

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Editors' Introduction

The effects of the coronavirus disease 2019 (COVID-19) pandemic globally are striking, as it continues to greatly impact the social, political, economic and health care aspects of countries and regions. During a pandemic, there are multiple concurrent clinical priorities, ranging from an immediate need to understand the pathophysiology of the disease[1] to a need for optimized patient care and prevention of future cases.[2] To tackle the many different needed responses to COVID-19, research infrastructures, and in particular biobanks, have found themselves on the front line. Efforts have been reported in the European Union (EU), in Taiwan, and elsewhere[3–6] to create population-level collections of COVID-19 patients, asymptomatic carriers, and members of the public. In low resource settings, where such infrastructures were available and supported long term, an effort to assemble clinically relevant cohorts is also ongoing,[7] and in many cases associated with a governance framework that is increasingly amenable to the sharing of samples and data.[8]

However, there are associated risks with the collection and processing of large volumes of human biospecimens, whether infectious or not, for diagnostic, therapeutic, or research purposes. For example, a proportion of the biosamples from patients with cancer, which continue to be collected and stored in biobanks during the pandemic, is likely to be infected with SARS-CoV-2. It is a best practice to assume that any biospecimens collected and stored by biobanks can be infected. Therefore, although biobanking continues to demonstrate its scientific and clinical relevance,[5,9,10] there are heightened biosafety concerns.[11] In addition, there are still ongoing discussions as to the financial sustainability of the many sample collections focused on COVID-19 after the pandemic wanes, as well as to the degree of availability of those collections to industrial or other academic partners.

In an effort to describe and further understand the impact of the COVID-19 pandemic on biobanking, a number of experts in the field from different parts of the world and from different resource contexts were asked to answer a set number of questions describing their experiences thus far. The global and asynchronous nature of the pandemic necessitate such discussions so that experiences and expertise gained from forward-affected geographies and infrastructures can inform policies and practices of those impacted later in the event.

Thus, each author was asked by June 12, 2020, to introduce themselves and their region and describe:

1. the pandemic's effects in their respective region,
2. the pandemic's impact on current biobanking operations,
3. their biobank's engagement with current research on COVID-19, and
4. whether biobanks were prepared for these changes and how this experience has modified preparedness and risk management plans/perceptions.

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Expert Response: Jajah Fachiroh (Indonesia)

Dr. Jajah Fachiroh is based at the Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada (FK-KMK UGM), Yogyakarta, Indonesia. Her research focus is on cancer molecular epidemiology, biomarker development, and smoking-related diseases. She is head of the biobank development team at FK-KMK UGM since 2015. The biobank services at FK-KMK UGM (''UGM Biobank'') started in 2018 and are in the process of developing a hospital-based biobank with the local academic hospital, as well as a population-based biobank in the local municipality.[12] The UGM Biobank coordinates the activities of the Indonesia Biobank Network for Health Research, is a member of the Biobank and Cohort Building Network (BCNet) World Health Organization(WHO)-International Agency for Research on Cancer (IARC)[13] and member of the International Society for Biological and Environmental Repositories (ISBER).[14]

Pandemic's effects in Indonesia

The first case of COVID-19 in Indonesia was diagnosed on March 2, 2020, much later than in other surrounding countries such as Singapore and Malaysia. On April 13, 2020, the Indonesian government declared a state of health emergency. By June 2020, when surrounding countries were reaching a plateau of COVID-19 incidence, or a decline in reported cases, Indonesia was still at the logarithmic growth phase of the pandemic.[15] As of June 11, 2020, 35,295 confirmed COVID-19 cases were reported with 2000 deaths across all 34 provinces of the nation (population 237.6 millions). Molecular diagnostic services (reverse transcription [RT]-polymerase chain reaction [PCR] based) as of the end of June 2020 are performed by $\sim$144 laboratories nationwide including hospitals, state universities, and state-owned health research facilities. In addition, mobile laboratories are also operating to reach many more people in places of high footfall, such as traditional markets. Diagnostic laboratories work under the guidance of the Indonesian Ministry of Health (MOH), following WHO guidelines on sample collection, processing, and disposing. All results are reported to the MOH, although anonymized, aggregated data can be accessed online. However, the decision of disposing or retaining the leftover diagnostic biospecimens remains within each institution. The institutions that have decided to collect the specimen have developed their own systems and processes.

Impact on current biobanking operations

The daily operations of the UGM Biobank were performed by two laboratory technicians and one data manager, managing the collection of research-based clinical samples from 12 projects since 2018, stored in −80°C storages. Liquid nitrogen (LN2) tanks were recently purchased and were planned to operate in 2020. The UGM Biobank serves the research needs of the university faculty and its academic hospitals and applies a partial cost recovery of its operations by charging processing and storage fees. As COVID-19 started to be diagnosed in the Yogyakarta area, the university decided to apply a total campus lockdown, which meant students and staff began working from home, including biobank staff. As such, all services ceased. During the lockdown period, the conditions of storage were being monitored both from home and by periodic on-site visits of the storage room, while the electricity needs of the −80°C freezers were protected by the existence of a backup generator.

Engagement with current research on COVID-19

As the UGM Biobank was designed for noninfectious diseases collection, currently it cannot receive COVID-19–related biospecimens and, therefore, there is no engagement with current COVID-19 research.

Impact on operational preparedness and risk management

The UGM campus will reopen gradually, including research infrastructures such as the UGM Biobank. Since the pandemic is ongoing, despite the routine SARS-CoV-2 screening done in the hospital, and the decision not to receive COVID-19–related samples, the UGM Biobank decided to treat all samples as ''potentially infectious.'' This decision is in line with other research laboratories on campus that also handle human biospecimens. Consequently, the UGM Biobank, under the guidance of the local biosafety team, underwent a self-assessment for its current capacity. The biosafety team identified further improvements needed from infrastructure to manpower, and the handling of potentially infectious samples. These results will then be consulted with the budget provided for the UGM Biobank on a quarterly basis. After all necessary safety measures are in place, including manpower and facilities, the UGM Biobank will resume its operations.

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Expert Response: Beatrice Wiafe Addai (Ghana)

Dr. Mrs. Beatrice Wiafe Addai is a consultant breast surgeon and chief executive officer of the Peace and Love Hospitals in Ghana (Kumasi and Accra). She is the founder and president of Breast Care International (BCI) and BCI America, as well as a former member of the ethics committee of IARC/WHO. Dr. Wiafe is the chairman of the Ghana NCD Alliance and the chairman of the Ghana Cancer Board. Dr. Wiafe has been a principal investigator for several research activities of the Peace and Love Hospital, including the National Cancer Institute (NCI)'s Ghana Breast Health Study and Royal Marsden Foundation's projects in Ghana. Peace and Love Hospitals and BCI have been part of IARC/BCNet,[13] since 2013, with some members of the laboratory staff being trained in biobanking by IARC.[16]

Pandemic's effects in Ghana

The first two COVID-19 cases were reported in Ghana on March 12, 2020, and have since escalated to 6468 cases, with 31 deaths and 1951 recoveries as of May 22, 2020 (population 31.07m). This works to a recovery rate of ~30.2% (lower than the global average), and mortality rate of ~0.1% (higher than the global average). The rate of infections remains relatively constrained, and the gender distribution is 61% males to 39% females. The government's response to the outbreak included key measures such as the closure of all borders and partial lockdown of selected areas. Given that Ghana is an import-driven economy, COVID-19 has significant adverse impacts on the country's international trade and reserves. If the COVID-19 situation persists longer than anticipated, the economy could suffer from significant decline in government revenue and expenditure resulting in potential job losses. This could, in turn, erode the economic gains achieved in recent years and significantly slow down Ghana's economic development. In addition, the unplanned increase in expenditure, particularly in the health sector, could adversely impact the fiscal deficit in light of current developments. Currently the government estimates a decrease in projected gross domestic product (GDP) growth for 2020 at −2.6%, which is significantly lower than the originally projected GDP growth of 6.8%.

Impact on current biobanking operations

The COVID-19 pandemic exposed the shortfalls in the country's health care delivery system, from research to prevention, diagnosis, treatment, infrastructure, equipment, and manpower, etc. The government of Ghana is pulling national resources to strengthen the public health system to meet not only COVID-19 demands, but also in preparation for future pandemics. These include building a standalone 100-bed capacity infectious/isolation center, while a project has been initiated for 88 new district and regional hospitals.

The office of BCI's Biobank is situated in the Ashanti region, an area that accounts for the second highest COVID-19 case count after the capital of Accra. In accordance with the president's directive, sample collections in the field and in hospitals (all nonemergency activities), including most laboratory services, have been put on hold. Activities such as community engagements and institutional review board committee meetings have been suspended in accordance with the president's declaration on ban of public gatherings, which encompass committee meetings, social activities, conferences, religious activities, and outreach programs, etc. The BCI Biobank storage facilities, which include −80°C and −25°C units, have been maintained and monitored periodically to ensure optimal quality of specimen under the respective temperatures.

Engagement with current research on COVID-19

In Ghana, the BCI Biobank has a memorandum of understanding with the Kwame Nkrumah University of Science and Technology, whose auspices house the second biggest SARS-CoV-2 testing center of the country—the Kumasi Center for Collaborative Research. The biobank staff members maintain a consistent dialogue with scientists of the center, as well as participating in virtual meetings on COVID-19 and the impact of it on cancer care and the other noncommunicable diseases (NCDs) research in the country. As a member of BCNet and ISBER; and collaborators of the International Bladder Cancer Network (IBCN) and U.S.-NCI, as well as bilateral and multilateral organizations, we have been privy to and regularly participating in webinars on COVID-19 and biobanking research activities globally.

Impact on operational preparedness and risk management

There is doubt that any institution was ever prepared for this COVID-19 pandemic, but a robust risk management plan has been developed since the pandemic. We had a strong need for new policies and procedures to be adopted as a response to pandemics, including COVID-19. Some of these safety measures include handwashing with soap under running water, greater use of alcohol-based hand sanitizers, persistent social/physical distancing, the use of face masks (no mask, no entry policy), and the encouragement for people to stay at home and keep safe.

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Expert Response: Xun Xu (China)

Dr. Xu is CEO of the BGI Group, president and chief scientist of the BGI Research Institute of Life Sciences, and president of BGI College located in Shenzhen, China.

The BGI Group is a global technology provider specializing in integrated genomic sequencing, proteomic services, and research solutions, including solutions against COVID-19. Dr. Xu is also director-at-large–China for ISBER, member of the China National Committee for Standardization of Biological Samples, vice chairman of the International Organization for Standardization/Biotechnology Committee (ISO/TC276), and member of the Global Future Council of the World Economic Forum.

Pandemic's effects in China

The COVID-19 pandemic has been one of the most difficult epidemics in China (population 1.34bn). China launched a resolute battle to prevent and control its spread, implementing a strict and thorough quarantine policy, millions of RT-PCR tests, and timely treatment as fundamental tools to disrupt SARS-CoV-2 transmission. Utilizing these measures, China has managed to mitigate the epidemic with daily new infections dwindling from thousands to single digits in fewer than 3 months. Currently, China has entered a stage with relatively moderate measures such as social distancing, wearing masks, and temperature measurement. Everyday life has been gradually returning to normal, including economic activity; nevertheless, the country remains vigilant over potential infections and asymptomatic cases (State Council Information Office of China, 2020). As of June 8, 2020, China had 84,634 confirmed cases, 79,865 recovered cases and 4645 deaths.

Impact on current biobanking operations

During the outbreak, an entire laboratory in the China National GeneBank (CNGB) was repurposed and transformed to a clinical testing laboratory in response to the increasing needs of COVID-19 testing capacity. The transformation was accomplished in 1 week with great support from the local government, as part of BGI's ''Fire Eye'' laboratory network.[17] ''Fire Eye'' laboratories were built in >12 cities across China, including Wuhan, as well as at locations in other countries.[18] They played a positive role in the testing capacities surge and eventually controlling the spread of the virus within China. From February 16 to April 4, 2020, for 7 weeks, the ''Fire Eye'' laboratory in CNGB tested $\sim$136k samples received from local hospitals, the Chinese Centre for Disease Control, customs, and health care centers.

Within the transformed laboratory, separate areas were set up for sample receiving, sample inactivation, sample preparation, sample extraction, and quantitative PCR: each area having a gradient-negative room air pressure. Separate pathways were implemented for staff, samples, and waste, as well. In some locations, such as CNGB, the samples arrived mostly at night, as the sample collection occurred during the day. Hence, staff members were reallocated to rotating shifts to adapt to the new sample arrival time.

Engagement with current research on COVID-19

In response to the needs of virus sequence data from the research community, CNGB established a virus portal (VirusDIP) through a strategic cooperation with the Global Initiative on Sharing All Influenza Data (GISAID). Integrated as part of CNGB's database (CNGBdb), the virus portal aims to share and analyze genetic data of viruses associated with respiratory infectious diseases. A BGI global initiative was also organized (Global Initiative on Open-Source Genomics for SARS-CoV-2 [GIO-S]) to facilitate the rapid and open sharing of the virus genome data through CNGBdb. In GIO-S, BGI will provide to its collaborators SARS-CoV-2 sequencing solutions and considerable support for the costs on kits and reagents for library preparation and sequencing. Data output will be published by CNGBdb and exchanged with GISAID.

BGI cooperated with the Institute of Microbiology of the Chinese Academy of Sciences and Shandong First Medical University, assembled and uploaded the sequence of SARS-CoV-2 to CNGBdb. The article was published in January,[19] with 2542 citations to date. Working with IARC, BGI-Research/CNGB facilitated two large COVID-19 research proposals, in which COVID-19 data from CNGBdb will be open access and compared with the data from samples analyzed within Europe; currently the proposals are in peer review. Such proposals are urgently needed to understand the pathogen better and achieve a rapid and successful public health response.

Impact on operational preparedness and risk management

The protection of CNGB staff was the key to all laboratory operations and in managing the risk of cross infection. Thus, additional risk mitigation measures were implemented. Personal protective material became obligatory for all laboratory personnel, such as protective eye goggles, face masks, double gloving, and protective overalls. A triple packaging system was required for all sample transportation.[20] Samples were received in a separate sample receiving area outside the building where the surface of the outer containers was disinfected with 75% alcohol, before being transferred to the laboratories for unpackaging. After unpackaging, the whole tube racks containing COVID-19 samples were inactivated by heat in a water bath (65°C 30 minutes) or dry heat (65°C 40 minutes). To reduce mistakes, independent double checking for tube ID and plate positions was carried out by laboratory staff working in pairs. Waste was decontaminated in autoclaves within each laboratory. Tested samples were kept for 14 days before being decontaminated by autoclave and then disposed of as clinical waste. For the environmental disinfection, ultraviolet and dry mist hydrogen peroxide systems were used for room sterilization. The floor was cleaned with sodium hypochlorite after each shift.

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Expert Response: Sameera Ezzat (Egypt)

Dr. Sameera Ezzat is vice dean for Community Services and Environment Development at her institutions, responsible for ensuring a safe environment for both the employees and the patients, including their visitors. This responsibility extends to community involvement for health initiatives. As such, early in the course of the pandemic, she managed the conduct of several awareness sessions through different media. Dr. Ezzat is also responsible for the overall management of the National Liver Institute-Sustainable Science Institute Collaborative Research Center in which the biobank is one of the main activities—processing blood samples and fresh frozen tissues from hepatitis C virus-infected and hepatocellular carcinoma patients. In Luxor, upper Egypt, Dr. Ezzat is a consultant for research at the Shefa El Orman Oncology Hospital (SOH). She directs the SOH Biobank, created specifically to collect biospecimens from cancer patients.

Pandemic's effects in Egypt

Egypt reported the first case of COVID-19 on February 14, 2020. Nonpharmaceutical preventive measures started with the implementation of school closures on March 14 and banning of large gatherings on March 19. The country started a partial curfew on March 25, while having a total of 196 cases at that time. The Egyptian government mandated a 14–28-day self-isolation for anyone returning to the country from abroad at the start of the pandemic. This mandate was relaxed to at least 7 days of isolation in specialized places, such as students' accommodations or certain high-occupancy buildings. From the end of May 2020, wearing a face mask in public places became obligatory, and nonadherence carried a heavy penalty of 4000 Egyptian pounds (ca. 250 USD).

As of June 11, 2020, the total number of COVID-19 cases in Egypt reached 38,284 (population 98.4m). This is likely an underestimate due to the low number of tests performed, as RT-PCR testing is limited to MOH laboratories. There were 1342 deaths reported, with a case fatality rate of 3.5%. At the start of the pandemic, 27 quarantine hospitals were assigned for COVID-19 in different governorates all over Egypt. Those hospitals filled with patients quickly. Therefore, the MOH amended COVID-19 response plans and required that mild cases were self-isolated at home. At the same time, the MOH continued converting more hospitals to treat COVID-19 patients. University hospitals were requested to work on emergency conditions only, for any non-COVID-19 subjects, so that bed capacity was reserved for COVID-19 patients. Often hospitals assigned entire wings for COVID-19 patients. Although the MOH asked private hospitals to also create isolation spaces that could be used for COVID-19 patients, disagreement over the MOH-suggested price list has slowed this process down.

Impact on current biobanking operations

Recently, two entire floors of the hospital were converted to treat COVID-19 patients, where Dr. Ezzat supervised the establishment of the flows for patients and health care workers and provided consultation for infection control procedures. At the start of the pandemic, a difficult decision was taken to continue the biobanking activities. However, the pandemic has affected the continued biobank operations in several ways. First, since the biobank staff continued processing blood and tissue samples from participants with an unknown COVID-19 infection status, staff members were requested to wear masks, face shields, and gowns throughout sample collection and processing, as if they were handling COVID-19–infected samples.

During this period, there was a notable decrease, by $\sim$50%, in the number of biobank participants, due to the patients' fear of exposure to the virus during their hospital visit and to avoid crowded spaces in health care facilities. Patients also declared an inability to travel due to the travel restrictions announced by the Egyptian government. Moreover, there was a decrease in the number of tissue samples coming to the biobank, since all nonurgent surgical procedures were also postponed.

One of the major challenges the biobank faced was shortage of supplies for operation. The shortage was more prominent in the SOH Biobank as it is based in upper Egypt, around a 10-hour drive from the capital, Cairo. Furthermore, as COVID-19 cases increased, a sudden decrease in biobank manpower ensued. Several staff members were asked to self-isolate if they had potentially been in contact with infected persons. As transportation and internal flights were completely disrupted across Egypt, teleworking practices by e-mails, telephone, or online meeting platforms had to be implemented.

Overall, there are also positive impacts from the pandemic in Egypt. One is the increase in patients' awareness toward biobanks and being more eager to participate. The importance of research has been highlighted during the pandemic as a hope for finding effective treatment and a vaccine. Another positive development is the increased availability of free courses and webinars online; that has allowed staff to engage more in a variety of educational activities.

Engagement with current research on COVID-19

During the pandemic, epidemiological research was conducted with an aim to understand the COVID-19 transmission in Egypt, while looking into the effect of each preventive measure, such as school closures, partial or complete lockdown, and on the doubling time of the infected cases. However, this research was not utilizing samples from the biobank.

With the subsequent conversion of part of the National Liver Institute (NLI) dedicated to treat COVID-19 patients, additional studies will be conducted. The first study will describe the epidemiology of COVID-19 infections among health care workers in the NLI Isolation Hospital. The second study aims to describe the epidemiological and clinical characteristics of COVID-19 patients in the NLI Isolation Hospital, analyzing factors affecting COVID-19 infection outcomes.

Impact on operational preparedness and risk management

A full preparation to all changes caused by the pandemic was not possible. For example, staff members were prepared in managing with infectious diseases through applying the infection control measures while obtaining consents and handling suspected COVID-19 samples. However, the sometimes severe lack of biobank supplies and/or staff was difficult to predict during the pandemic. On some days,

biobank operations were obliged to decrease or even stop completely, based on shortages.

We plan to create a stock of supplies as a likely first action, as soon as the restriction measures are eased. In addition, we are planning a revision of existing disaster management standard operating procedures (SOPs) as a top priority in the coming period. We have plans to engage staff in viewing different webinars about biobank pandemic responses, to learn from other biobanks worldwide.

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Expert Response: Heidi Wagner (Canada)

Ms. Wagner is the head of operations of the UHN Biospecimen Services with direct oversight of the McCain GU Biobank, the GU Clinical Trials, and the Princess Margaret Oncology Biobank. In this capacity, Ms. Wagner oversees all aspects of the biorepository and clinical trial operations, including personnel, finances, infrastructure, end-user satisfaction, and program expansion. Her role focuses on the goal of maximizing collection and effective storage of biospecimens and related metadata, while promoting process improvement and sustainability. For the past 10 years, Ms. Wagner has led central biorepositories at the largest cancer centers both in Canada (Princess Margaret Cancer Center) and in the United States (MD Anderson Cancer Center). She is an active member of ISBER and serves on several of the advisory committees and task forces.[21]

Pandemic's effects in Canada

The COVID-19 pandemic has been an unprecedented event worldwide and has had extensive health care, economic, and social impacts. In Canada (population 37.6m), the province of Ontario was one of the hardest hit provinces with 35,535 confirmed cases and 2682 deaths, and the city of Toronto was the most affected municipal jurisdiction with 14,270 cases and 1090 deaths. A disproportionate number of deaths have occurred in long-term care (LTC) facilities, with cumulative resident death in LTC facilities being 1817. The immediate challenge for the health care system in Toronto was to estimate the demographics of the COVID-19 impact. In the absence of accurate data, a lockdown was imposed early, further straining the health care system to care for emergent non-COVID-19 patients. Owing to the lockdown, there was an immediate impact on logistics and supply chains, which further impacted delivery of health care in the city of Toronto.

Impact on current biobanking operations

The biobanking operations in Canada became a nonessential health care service in the early phases of COVID-19, but as essential research operations started, COVID-19–related studies were authorized and initiated. This change made biobanking an essential service, which allowed for expediting COVID-19 research and sustaining essential research operations. At its peak COVID-19 operations, the UHN Biospecimen Services was supporting >20 essential clinical trials. Major challenges faced by our biospecimen service have included data management and secure exchange, considering our remote operations of staff. We resolved a large part of the data management challenge by employing additional firewalls and two-factor authentication. Also, we exchanged data over enterprise-level packages of project management tools for HIPAA compatibility. Similarly, navigating the scarce and often competitive health care supply chains during the pandemic was crucial for our ongoing operational needs. We identified additional suppliers across Canada and the United States to reinforce our supply chains, and built redundancy while ensuring that our orders were filled at a relatively competitive price point.

Engagement with current research on COVID-19

We have adopted a holistic approach to research on COVID-19 to support research interests in various cohorts. We have ongoing research studies involving health care providers and research personnel and these studies are aimed at prevention from exposure to COVID-19. We are also supporting longitudinal research studies in confirmed COVID-19 patients and obtaining liquid biopsies from these patients, along with associated metadata for long-term follow-up. Furthermore, we are involved in evaluating the efficacy of the Bacille Calmette-Guérin vaccine for the prevention of COVID-19 infection in first responders.

Impact on operational preparedness and risk management

We have faced challenges that were similar in nature to most global health care facilities: broadly, human resource management and financial challenges. Although we had a robust emergency plan for biospecimens, an emergency response plan for biobank personnel was deficient. Many biobank personnel could not effectively self-quarantine due to their social interactions and responsibilities such as caring for young children and elderly. This was our most important challenge. When necessary, we recruited research professionals from other biobanks and core services to fill this crucial demand. We also invested heavily in digital collaboration platforms and prioritized secure data exchange to continue communications and accessibility. We also improved our supply chain management and increased the granularity of our management plans, emphasizing the need for available backup and emergency supplies.

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Expert Response: Márcia M.C. Marques (Brazil)

Dr. Márcia Marques leads the Barretos Cancer Hospital Biobank, which contains ~244,000 samples from 44,000 patients. This is one of the largest biobanks in Latin America. The experience accumulated in oncology, in conjunction with the active participation in teaching and research at the institution, allows the Barretos Cancer Hospital and its biobank to carry out multidisciplinary translational research.

Pandemic's effects in Brazil

In Brazil (population 209.5m), the first case of the new coronavirus, SARS-CoV-2, was detected on February 26 in São Paulo. Since then, the MOH has been looking for strategies to help the country face this pandemic. Among the actions are donations of 22.9m tests to diagnose COVID-19, the release of approximately BRL$ 85.8b (ca. USD 16.2b) to states and cities to combat the coronavirus, and funding support of BRL$ 600 (ca. USD 115) for each informal worker prevented from working because of the pandemic. As of this writing, Brazil has reached the milestone of >60,000 deaths.[22]

Impact on current biobanking operations

Currently, patients from 1889 cities in 26 Brazilian states plus the Federal District are received in Barretos Cancer Hospital. During this pandemic, social isolation measures have drastically reduced the number of visits, including the observed cancellation of scheduled surgeries, resulting in a serious crisis in the follow-up and treatment of cancer patients. In turn, the biobank has had a major impact on its daily routine of activities related to the collection, processing, and management of biological samples. Research projects had to be stopped and the staff reorganized in alternate shifts to avoid greater exposure of the employees to COVID-19.

In Brazil, the National Research Ethics Coordination, linked to the MOH, issued in May 2020 a letter with all the guidelines for conducting research and activities of the research ethics committees during the pandemic. This document emphasizes that if any Brazilian biobank wanted to take advantage of its installed capacity for the storage of human biological material related to SARS-CoV-2/COVID-19 for research purposes, an application may be made for emergency approval for expansion aimed at this type of storage.

Engagement with current research on COVID-19

The Barretos Cancer Hospital, following the principles of commitment to health, has initiated participation in some research projects in the area of COVID-19 aimed at evaluating clinical data, some including biological sample collections and temporary storage at the biobank. However, we were not prepared for the management of this type of sample-handling procedure and the risks linked to this process, thus it has not been possible to store the COVID-19–infected samples long term for future research. This experience brought an important reflection on how the Barretos Cancer Hospital biobank can seize such opportunities to learn, expand, and adapt its activities to moments like these.

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Expert Response: Birenda K. Yadav (India)

Dr. Birendra Yadav is the manager of India's first liver biobank known as the National Liver Disease Biobank (NLDB) at the Institute of Liver & Biliary Sciences (ILBS), New Delhi, India. His roles and responsibilities include managing the overall operations, establishing and developing biobank SOPs, policies, and supporting collaborations with hospitals and research institutes. Dr. Yadav is an ISBER Indo-Pacific regional ambassador.

Pandemic's effects in India

The first case of COVID-19 in India, which was traced from China, was reported on January 30, 2020. India currently has the largest number of confirmed cases in Asia with a total of 173,763 confirmed cases, 82,370 recoveries, and 4971 deaths as of May 30, 2020, reported by the MOH and family welfare (population 1.35bn). By the order of the prime minister's office, India has been observing a nationwide lockdown beginning on March 24, 2020. The lockdown aims to break the transmission chain of the coronavirus yet affecting a vast population of 1.3 billion people.

Impact on current biobanking operations

The sudden lockdown brought both opportunities and challenges to our biobank. The direction and immediate challenges are (1) financial, (2) operational, and (3) the overall sustainability. The financial grant for the current year was delayed due to the lockdown and the biobank had to borrow funds from the host institute for staff salaries and routine purchases.

Other challenges that were confronted included maintaining storage units. During the lockdown, one of the −80°C freezers stopped working, consequently we had to quickly shift samples to a backup freezer. However, the repair of the failed freezer was not possible due to the restricted movements of staff and a limited supply of spare parts. Also, the hospital asked for a dedicated freezer in our biobank for COVID-19 samples. We had to reorganize existing samples to other tanks/freezers to arrange for this dedicated unit. Four new freezers that we had purchased for the biobank were delayed due to limited transportation during the lockdown. As a result, all the backup storage space has quickly become occupied. The lack of back up has created further pressures and risk to our biobank in case any further freezer failures occur.

In addition, the biobank does not have a LN2 plant, so it is entirely dependent on the LN2 supply from outside sources. With the closedown of LN2 factories, local shortage/limited access to LN2 is making it difficult to get the LN2 tanks across the country refilled. Moreover, the market price of LN2 within India has increased threefold, as compared with the prepandemic rates.

With regard to manpower, the ban and restrictions on public transport have affected the employees' ability to work, resulting in only 40% staff attendance rates. Also, our software engineer was not able to be onsite, thus we have experienced software issues that could not be resolved as effectively. In addition, some biobank staff members were diverted to the hospital to support the COVID-19 testing laboratory, thus routine collection of samples was affected.

Outpatient departments and surgeries were limited to only emergency cases, so the collection and transportation of samples were affected for both the host institute and satellite centers, due to limited number of patients and staff. Before the pandemic, the biobank was generating income to support its sustainability by providing training in analytical services, such as next-generation sequencing, mass spectrometry, florescent-activated cell sorting, and pathology work, as well as participating in joint research projects. All of these services were halted due to the pandemic, with demand for samples and work orders for analytical services dropping by $\sim$90%. New collaborations and joint projects and analytical work have not been possible, either due to limited operations of research institutes or due to the COVID-19–focused research in research centers.

Engagement with current research on COVID-19

There is a way to convert every threat into an opportunity, if we think creatively. Biobank processes were developed to treat all collected samples as suspected pathogen positive until proven to be negative. Our host hospital, ILBS, has been designated as a COVID-19 testing laboratory by the Indian Council for Medical Research/Government of India (ICMR) and >500 samples from 7 government and 19 privately operated hospitals for COVID-19 testing have been transported to ILBS. The ICMR also designated NLDB as a COVID-19 sample biobank and allowed NLDB to provide COVID-19 samples to researchers for research, developing diagnostics, and vaccines. This designation has expanded the services of our biobank and has created an opportunity for our future activities.

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Editors' Conclusion

The COVID-19 pandemic has had a major impact on health care and biobank operations across the world. The experts provided the status of the pandemic within their countries in early June 2020. As is apparent from the reported experiences, the sweep of the pandemic across the globe has affected and continues to disrupt health care and biobank operations. Many of the experts reported the interruption of care for patients with NCDs and elective procedures, whereas testing, care, and treatment of COVID-19 patients were ramped up in their facilities. Several of the facilities redeployed staff from biobank operations toward collection and testing of samples taken from suspected infected patients.

Most of the biobank experts noted that their operations were not prepared for this type and level of disruption on an operational or financial level. Biobank collections were halted in some countries or regions, whereas operations were moved to merely maintenance mode. Supply chains for critical supplies and services were delayed or completely disrupted. Human resources were affected, either by being unavailable due to the virus or being used in a different capacity within their organizations. Some biobanks were able to engage their operations in support of COVID-19 research, by collection, processing, and storage of patient samples and data for current research and for future use. Specific protocols were activated, if available, or modified to manage infectious or potentially infectious biospecimens based on standard precautions.[23]

A consensus is noted in that all of the biobanks used or are using the COVID-19 pandemic as a learning experience for their staff and to modify their operational and business plans for future pandemics and crises.[24]

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Disclaimer

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