Preparing for the Unprecedented: The Association of Biomolecular Resource Facilities (ABRF) Community Coronavirus Disease 2019 (COVID-19) Pandemic Response

Part 1: Efforts to Sustainably Ramp Down Core Facility Activities

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The coronavirus disease 2019 (COVID-19) pandemic has curtailed all but the most critical laboratory research in many institutions around the world. These unplanned and unprecedented operational changes have put considerable stress on every aspect of the research enterprise, from funding agencies to research institutes, individual and core laboratories, researchers, and research administrators, with drastic changes in demands and deliverables. The Association of Biomolecular Resource Facilities Core Administrators Network Coordinating Committee initiated a forum-wide discussion followed by a global survey to gain information on how institutions and, specifically, shared resource core facilities were responding to the COVID-19 pandemic. The survey aimed to identify shared resource core facility challenges and opportunities related to operational ramp downs, shutdowns, or research “pauses” during the COVID-19 pandemic, as well as new practices and resources needed to ensure business continuity. Although a number of positive outcomes from remote work hold promise for improved core operations, the survey results revealed a surprising level of unfamiliarity with business continuity planning for cores and limited coordination within institutions. Recommendations for business continuity planning include key stakeholders working together to assess risk, prioritize work, and promote transparency across campus.

KEY WORDS: resource core, shared resource, core facility, shared resource, continuity planning, emergency response

INTRODUCTION AND BACKGROUND

In early 2020, humanity confronted an unprecedented global threat from a highly contagious outbreak of the respiratory disease coronavirus disease 2019 (COVID-19), caused by the novel viral pathogen SARS-CoV-2. The COVID-19 outbreak was declared a public health emergency of international concern on January 30, 2020, with rapid spread across all continents.1, 2

With physical distancing interventions enacted globally to reduce the spread of infection and numbers afflicted by COVID-19,3 disruptions to every element of society have occurred, with mandatory shelter in place; shuttering of schools, libraries, and all public and private gatherings; and closures of federal, state, and local government offices, institutions, organizations, and businesses. Academic and research institutions were no exception; they acted quickly to restrict access to ensure the safety of their various constituents and stakeholders, in compliance with World Health Organization and Centers for Disease Control and Prevention guidelines regarding physical distancing and sanitization of common workspaces,1, 4 while maintaining critical infrastructure to be poised to contribute to international research efforts to fight the COVID-19 pandemic.5, 6

The Association of Biomolecular Resource Facilities (ABRF) Core Administrators Network Coordinating Committee (CAN-CC)7 conducted an initial rapid assessment of ABRF member cores’ operational status in response to COVID-19 through the CAN-CC listserv, followed by an online Qualtrics survey. Here, we present a snapshot of institutional readiness and response in the early days of the COVID-19 pandemic and the impact to cores, with the goal of creating a resource for the ABRF membership to inform response and continuity planning for core sustainability.
INFORMATION SOUGHT REGARDING INSTITUTIONAL READINESS

Many academic research institutions have dedicated emergency management departments to ensure that institutions are positioned to quickly respond to and minimize the negative consequences of emergency and disaster challenges. Emergency plans cover in-the-moment procedures in a crisis, such as a pandemic, and how to function when things are not normal. Academic research institutions are also businesses, with continuity and contingency (i.e., an alternate plan if the original plan no longer works) plans for how to return to normal operations expeditiously. So, planning requires a collaborative and integrated campus approach in which each institution, department, or organizational unit understands the role it will play in managing the crisis, restoring services, and returning to normal operations. The best plans include the cores as key stakeholders, with specific plans tailored to their business but performed in concert with institutional plans. Disaster planning for the COVID-19 pandemic mandated research reductions and closures, and cores were required to ramp down laboratory services and contribute to research programs remotely from home quarantine. Can cores support research and budgetary requirements when not physically accessible for an extended period of time? Were institutional COVID-19 pandemic plans inclusive of cores to ensure their sustainability?

MATERIALS AND METHODS

Survey overview

The CAN-CC Qualtrics online survey was developed to determine the impact of COVID-19 on core operations. The survey was announced on the ABRF website and shared by ABRF regional chapters and the Core Technologies in Life Sciences, the European-based core facility association. The survey had a 2-wk window for responses (April 11–26, 2020). All survey participants remained anonymized.

Data analysis

The survey contained 24 multiple-choice and open-ended text questions (see Supplemental material) capturing 5 major themes: 1) respondent demographics; 2) institutional pandemic preparedness and initial positioning; 3) pandemic response and actions taken by cores; 4) implications, outcomes, and impact of actions taken; 5) lessons learned and positioning for return to operations. Results from the multiple-choice questions were calculated by counting the number of responses for each element for a given question. The open-ended text questions were evaluated by first conducting an inductive content analysis (Inductive content analysis utilizes the process of abstraction to reduce and group verbal and written responses to identify patterns and gain insight.) of text to categorize the responses. The authors discussed any discrepancies and reviewed differences to determine whether consensus could be reached. Results reflect the average counts of responses in each category.

RESULTS

Survey demographics

The Qualtrics online survey was completed by 92 respondents from a total of 18 countries across 3 continents; 35% of respondents were from Europe and Australia, and 65% were from Canada and the United States. Respondents from the United States included 23 states from the East Coast, West Coast, Midwest, South, and Southwest regions of the continental United States and Hawaii.

Survey results

An initial ABRF member query regarding COVID-19 institutional closures was posted to the CAN-CC listserv on March 18, 2020, and elicited 22 responses (http://list.abrf.org/groups/cancc/). Responses indicated initiation of "research pause" ranging from March 9 to March 20 and spanned partial shutdown of operations (level 2) to full shutdown (level 4) based on the Oregon Health Science University (Chitty A, personal communication 3/18/2020) incidence response scale (Table 1) and corresponding to the Federal Emergency Management Agency (FEMA) Pandemic Influenza Continuity of Operations. The range of institutional closure dates reflected the varied responses across research institutions globally and highlighted the disparity of responses across U.S. institutions in the absence of a U.S. federal mandate.

The Qualtrics survey was opened April 11 for a period of 2 weeks. Recorded responses from 92 participants were collected, with the majority (76%) representing public, nonprofit academic institutions and the remainder either private (14%) or government organizations (10%). Core directors or managers of individual cores (61%) represented the major response group, followed by directors or managers responsible for institutional cores (23%) (Fig. 1). Regardless of country, the majority of respondents (80%) affirmed that their institution had a continuity plan in place in response to COVID-19, indicating strong institutional readiness. Of those, 58% existed prior to the pandemic, with the remainder creating institutional emergency and business continuity plans in direct response to the pandemic. No respondents indicated having a specific pandemic response plan prior to COVID-19. As reported, almost half of the institutional continuity plans were based on standard planning protocols, such as those established by FEMA (United States), the European Centre for Disease Prevention and Control, or other emergency response planning organizations.
than half (66%) of those institutional plans included the cores. Survey results showed that all Australian respondents were involved in institutional planning, vs. 38% of U.S. and 21% of European respondents. Nearly one-quarter (23%) of all respondents were not aware of having an institutional plan, nor did they have a specific disaster or continuity plan for their core(s).

As evidenced by the survey responses, the COVID-19 pandemic response was not uniform and varied by country and institution. Fully half of all respondents were aware of emergency planning and business continuity planning prior to COVID-19, which varied by geographical location [Europe (14%), Australia (33%), and North America (51%)]. Regardless, all survey respondents had some level of physical access restriction to their institution. A research pause full shutdown was imposed on 35% of U.S. respondents, similar to Australia (33%); European institutions had fewer full closures (24%). Full closure was not relegated to any geographical area, but all international respondents had country-wide COVID-19 mandates, whereas the United States did not, contributing to the institutional disparity reported across the United States.

Those respondents who had a partial research pause also had reduced staff and research activities. And whether full or

### TABLE 1

| Level | Basic/animal research | Clinical research |
|-------|-----------------------|--------------------|
| 0     | Normal operations     | Normal operations  |
| 1     | Teleworking encouraged| In-person nonessential clinical research highly discouraged |
|       | Social distancing required | Discontinuation of all in-person nonessential clinical research |
| 2     | No new experiments    | Discontinuation of all in-person nonessential clinical research visits |
| 3     | All experiments stopped| Discontinuation of all in-person nonessential clinical research activities, including sample collection and sample processing |
|       | Building access restricted to designated and approved key personnel for essential (maintenance, COVID-19, or approved exceptions) | Only essential research that immediately affects the health of the participant |
| 4     | No building access at all except approved essential | |

Oregon Health Science University (OHSU) response levels for COVID-19.

[FIGURE 1] Survey distribution (location, title) of 92 respondents from 18 countries representing 3 continents (Australia, Europe, North America). Respondents were from 15 European countries (Austria, Belgium, Czech Republic, France, Germany, Hungary, Ireland, Italy, The Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom), 3 Australian territories, and 1 Canadian province. The U.S. responses were from 23 states encompassing the East Coast, West Coast, Midwest, South, and Southwest regions of the continental United States and Hawaii. In total, 35% of respondents were from Europe and Australia, and 65% were from Canada and the United States. Core directors or managers of individual cores (61%) represented the major response group (61%), followed by directors or managers responsible for institutional cores (23%). The Qualtrics survey was open for a period of 2 wk (April 11–26, 2020).
partial, it was uniformly evident that all research undertaken during the COVID-19 pandemic was subject to institutional review, with 85% decided by either institutional research leadership or a COVID-19 task force. Nearly all respondents (93%) were permitted access only for essential research, which always included COVID-19; the few projects deemed essential that were not COVID-19 were those that, if halted, would generate significant financial or data loss for the institution. No new research was initiated under these restrictions unless it met one of these 2 categories. Very few exceptions (<5%) were allowed for those in the user community who requested unsupervised access to core instrumentation. All institutions made exceptions for access to maintain critical instrumentation and equipment, cell lines, and animal colonies. Ultimately, whether fully closed or partially closed, the cores pivoted to mobilize expertise for COVID-19 research, such as performing essential COVID-19 patient isolate sequencing, viral research, and COVID-19 assay development. It should be noted that although cores were supporting essential research with essential expertise, no core was designated essential. Although not directly queried in the survey, write-in responses indicated that core staffing limitations as a result of physical distancing requirements were further negatively impacted by staff childcare or public transportation issues. The end result was reduced productivity as a result of both external restrictions and internal resource limitations.

Without exception, the majority of the survey respondents continued to work remotely. Remote work was most easily accomplished by those in administrative roles and informatics/bioinformatics and those performing data analyses. Core staff who were primarily laboratory based had more difficulty with remote work. However, the majority of survey respondents reported on the benefits of remote work and catching up on their backlog of protocols and technology developments (54%), followed closely by paperwork and data analysis (47%). Importantly, the COVID-19 research pause allowed ample time for both manuscript and grant writing (25%), and based on write-in responses, respondents embraced remote technology to offer virtual technology seminars; professional development activities for core directors, managers, and staff members; and networking with peers and vendors. When asked what worked well during the pause, the overwhelming majority of respondents said remote communication strengthened team cohesion and improved communication with institutional leadership, emphasizing the importance of strong communication strategies and skills to actively manage expectations during uncertain times. Overall, the survey results revealed remote work to be very positive for their teams, with communication facilitated with Zoom, WebEx, and Microsoft Teams software. Slack was often mentioned as easy to implement and allowing coworkers impromptu access, analogous to walking next door to chat.

When asked what they would do differently, respondents cited future planning to position their cores for return to operations, with 80% of respondents performing in-depth operations review of their core(s) for business continuity and emergency response planning. A quarter of respondents (26%) anticipated more involvement with their leadership and further contingency planning as an outcome of COVID-19. Of note, defining “essential” and “critical” core functions, developing protocols for essential cores, and cross-training staff to fairly distribute scheduling remote and on-site work were major considerations. Although not directly queried, many respondents expressed concern for the safety of their team on returning to work and adequate personal protection equipment for their team.

With cores either closed or operating well below capacity because of COVID-19–mandated shutdowns, respondents from all countries expressed concern for meeting expectations for ramp-up timelines and financial recovery from the higher-than-anticipated revenue deficits. The majority of respondents were working with instrument vendors to ensure adequate delivery of reagents and supplies and requesting adjustment of service contracts for instrument shutdowns during the COVID-19 research pause (83%). And 23% of respondents requested bridging funds to avoid staff cuts and loss of critical expertise to manage the ramp-up demand surge. Of note, several respondents developed partnerships with cores at other institutions to outsource services to meet timelines for deliverables and provide services that were eliminated as a consequence of in-depth core operations review.

The inclusion of remote work in future planning featured improvements in remote technology to facilitate communication between team members, institution members, and customers and remote monitoring and improved Laboratory Information Management System (LIMS) for off-site management of instruments and users. It is difficult to determine how sustainable remote work will be in the future, but the majority of respondents saw clear benefits, with increased productivity, both individually and for their team, and increased transparency of their scientific contributions to their institution. But the biggest advantage of remote work cited was by those juggling work, childcare, and education, who valued its flexibility to accommodate the 24/7 pandemic quarantine family lifestyle.

CONCLUSIONS/DISCUSSIONS/LESSONS LEARNED
Disasters present unique challenges and opportunities for the research community at large. In the United States, the academic community embraced comprehensive emergency
management planning approaches post 9/11; following the 2003 issuance of Presidential Directive 5, U.S. academic institutions seeking federal funding for preparedness activities are required to adopt FEMA National Incident Management System–based approaches to disaster response planning.21 And natural disasters, such as Hurricane Katrina, Hurricane Harvey, and Superstorm Sandy, are frequent reminders in the United States of the need for emergency response plans.11–13

Globally, the H1N1 influenza pandemic in 2009 highlighted the challenges of doing scientific research in the face of a public health crisis and provided a clear call to do a better job of “scientific research in response” by strengthening the evidence base to inform preparedness, making decisions with the best available science, and increasing collaboration between academia and industry.22 But the question remains how we judge institutional readiness and response. As many countries reopen research institutions while COVID-19 infections continue to emerge, they face unprecedented challenges. Core sustainability is increasingly critical to the scientific mission of the institution and, by extension, the entire research ecosystem. As expected, no one had a specific pandemic plan prior to COVID-19. However, a clear outcome of the COVID-19 institutional research pause was clarity on the importance of emergency management and business continuity planning. The survey responses clearly indicated that better preparation for business continuity planning was the predominant takeaway and remote work was an essential requirement.

Ramping down academic research and development around the world will undoubtedly contribute to long-term economic ramifications. For cores, it resulted in operations well below capacity, leading to higher-than-anticipated deficits and further emphasizing the critical importance of business continuity planning with financial models for recovery from catastrophic loss of income. Regardless of management structure or geographical location, successful cores must keep their business running. Supplemental funding for research institutions, and specifically for cores, was advocated by the American Association of Universities, Association of American Medical Colleges, Association of Public Land-grant Universities, and American Council on Education.23 In partnership with the Council on Government Relations, these groups have urged the Office of Management and Budget to extend the flexibilities in M-20-17, “Administrative Relief for Recipients and Applicants of Federal Financial Assistance Directly Impacted by the Novel Coronavirus (COVID-19) due to Loss of Operations,” until September 30, 2020, to coincide with the end of the federal fiscal year for reassessment.24 It remains unclear whether these advocacy efforts will be successful because many of the operational impacts and costs are unknowable at this point. However, the longer-term impacts on cores from these financial deficits are of significant concern among core administrators and directors regarding future resources for current and emerging research, including COVID-19 and plans for sustainability.

Good institutional emergency planning is inclusive of all key stakeholders, including cores, working together to assess risk, priorities, and recovery.16, 17 Pandemic planning emphasizes prolonged disruptions (2-month minimum) with the following considerations:

- Instruct staff on the Centers for Disease Control and Prevention and World Health Organization guidelines for COVID-19 symptom monitoring; remain at home if appropriate.
- Ensure protocols are in place for adequate personal protective equipment (PPE) and cleaning and disinfection.25
- Prepare staff for remote work (hardware, software, and communication tools).
- Anticipate issues arising from ramping down core operations. Develop a decision tree for designating essential cores to position them more efficiently.
- Develop protocols and schedules that are mindful of physical distancing.
- Ensure redundancy with staff cross-training.
- Identify minimal personnel who will perform essential maintenance activities.
- Identify remote activities for all team members, and equip them for remote work.
- Anticipate scaling research needs and expectations while ramping up to full operations.
- Engage and collaborate with key stakeholders and partners for the financial viability and sustainability of cores.

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