

Supplemental Table 1: COVID-19-triggered research institutional polices

Organization	Website	Research policy overview
Universities		
Columbia University	https://research.columbia.edu/covid-19-novel-coronavirus-frequently-asked-questions-relating-research#/text-14638	<p>Essential research applies both to research on COVID-19 and its downstream effects and to laboratory work that must be done in support of ongoing clinical trials. Further, “essential” means either that the research is critical to the health of the public or that valuable resources, such as cell lines, animal lines, instrumentation requiring regular attention, etc., cannot be shut down are kept going at a basal level.</p> <p>Essential functions include the maintenance of equipment, laboratory resources, critical animal resources, and cell lines.</p>
Cornell University	https://www.cornell.edu/coronavirus/statements-news/20200315-research.cfm	<p>Critical activities are those necessary to maintain laboratory viability such as:</p> <ul style="list-style-type: none"> • Care for animals, plants and unique or expensive cell cultures or biological specimens, • Preservation of unique reagents and other unique or expensive materials, and • Maintaining equipment (e.g. liquid nitrogen and liquid helium systems, and shared computational clusters) that cannot be maintained remotely or shut down without significant cost or consequences to the research effort.
Duke University	https://research.duke.edu/covid-19-laboratory-based-research-curtailed	<p>Only hands-on activity essential to preserve the future viability of research programs will be permitted in most laboratories, effective 3/17/2020. All non-laboratory research in Duke facilities that requires direct person-to-person contact must also cease at this time.</p> <p>This directive does not apply to essential clinical research studies involving human subjects, clinical research that may be done remotely or laboratories actively supporting direct ongoing clinical care (addressed in a separate communication). In addition, research work directed towards vaccination against, treatment, or diagnosis of COVID-19 is exempt from this directive, but must be approved in advance by the Dean.</p> <p>Each wind-down plan should have identified no more than three key individuals who have been assigned to maintain essential experiments/activities, and those that need special attention to avoid catastrophic financial and data loss. To the extent possible, these individuals should only be in the laboratory for the time it takes to secure</p>

		the continuity of the research program. All research group meetings must be conducted virtually.
Massachusetts Institute of Technology	https://covid19.mit.edu/scaling-back-on-campus-research	<p>Critical activity is defined based upon local criteria, but some suggestions include:</p> <ul style="list-style-type: none"> • Lab work where discontinuation would generate significant data and sample loss, • Work to maintain critical equipment and safe standby mode in laboratories, • Work to maintain critical samples and animal populations, and • Work that directly relates to COVID-19 that has a timeline for deployment that could address the current crisis.
Northwestern University	https://www.research.northwestern.edu/ramp-down-memo/	<p>“Essential” research can continue on campus. Such work is defined as:</p> <ul style="list-style-type: none"> • COVID-19 research that has the potential to mitigate the pandemic’s spread, • Certain medical research that, if paused, would harm its research participants, • Procedures to maintain critical research infrastructure. For example: animal care, irreplaceable cell lines, laboratory equipment that requires gas or cryogenic monitoring, etc., and • Activities that if discontinued would result in significant degradation of safety and/or the loss of time and data.
Stanford University	https://healthalerts.stanford.edu/2020/03/17/updated-guidance-for-researchers-in-laboratories/	<p>Essential on-campus research functions include the following:</p> <ul style="list-style-type: none"> • Completing shutdown procedures. • Conducting critical maintenance procedures that require regular attention from a person to maintain laboratory viability. For example, providing animal support, maintaining shared computational equipment, and maintaining equipment that requires gas or cryogen monitoring/service, such as deep-storage freezers, electron microscopes, mass spectrometers, and incubators. • Certain clinical research; please see separate guidance from the School of Medicine. • COVID-19 research that has the potential to mitigate the spread of the pandemic. Please consult your local building staff about needed support as well as indicate the necessary activities as critical on your Lab Level Continuity Plan (see below). <p>For experimental laboratories, personnel who perform critical procedures, processes or equipment management that require regular personnel attention to maintain laboratory viability (e.g. liquid nitrogen tank filling, animal</p>

		<p>support, maintaining shared computational equipment) will still be able to access their labs. No others should be going to their laboratory until further guidance is issued. These individuals should already be identified on each lab’s Lab Level Continuity Plan. Labs that are closing down for now may find this shutdown checklist helpful.</p>
<p>University of California – San Diego</p>	<p>http://adminrecords.ucsd.edu/Notices/2020/2020-3-24-1.html</p>	<p>Undergraduate and graduate students cannot be required to work in person on campus during the stay-at-home order; this specifically includes research and instructional duties.</p> <p>Research settings will strictly apply staff limits, social distancing and sanitation requirements. Specifically, students are strongly discouraged from coming to their research sites; there should be no more than one person per site at any given time (e.g., use shifts when necessary), social distancing should be rigorously adhered to, and sanitation efforts (limiting unneeded touching of equipment, cleaning high touch spaces such as door knobs, light switches, and keyboards) should be fully implemented. No student (undergraduate, graduate or postdoctoral scholar) should be required to come to the lab for their work, and flexibility should be afforded to the completion of the research projects. Challenges to this policy should be directed to deans and the Vice Chancellor for Research for final management.</p>
<p>University of California – San Francisco</p>	<p>https://research.ucsf.edu/important-directive-ucsf-researchers-cease-research-activities</p>	<p>Each laboratory (or neighboring group of laboratories) identify 1-2 key personnel who will be responsible for this <i>essential</i> ongoing maintenance. Laboratories with large numbers of animals are allowed to name as many as 3-4 key personnel. When selecting key personnel, consider those whose commute does not depend on public transportation. (clarification: if the PI listed as a key personnel member, the PI is included as part of these counts.)</p> <p>When determining the appropriate size of your lab’s “skeleton crew,” please also consider any equipment that might require gas or cryogen monitoring/service, such as deep-storage freezers, electron microscopes, mass spectrometers, and incubators. Keep in mind that any potentially hazardous operation will require at least two trained and qualified persons be present. By the afternoon of March 16, a Lab Ramp-Down Checklist will be available at www.ehs.ucsf.edu. In mouse facilities, breeding should be reduced to the minimum possible; no increases in cage counts will be permitted and all researchers should plan for additional reductions of cage counts in the future. Labs using aquatic or avian species are expected to maintain basic animal care and husbandry operations, and labs with</p>

		<p>USDA-covered animals that require specialized lab care or intensive husbandry operations are expected to continue providing this care. For all key personnel, it has been mandated that everyone practice good hygiene and social distancing, in part by coordinating with others to minimize time on campus and to avoid being in the lab or animal facilities at the same time as others.</p> <p>Exceptions to these requirements will be made for studies of COVID-19 that have the potential to mitigate the spread of the pandemic.</p>
University of Michigan	https://research.umich.edu/covid-19	<p>Critical Research Activities:</p> <ul style="list-style-type: none"> • Directly relate to COVID-19 and have a timeline for deployment that could address the current pandemic, • Ensure the continued viability of critical samples and/or animal populations that are not readily available from non-U-M entities, • Keep critical equipment and infrastructure safe; • If discontinued, would pose a safety hazard, or • Include onsite research efforts where the nature of the work is essential to avoiding catastrophic loss to equipment or critical samples and/or data.
University of Minnesota (UMN)	https://research.umn.edu/covid-19-guidance-research/overview#wfh	<p>UMN researchers are working from home unless there is an extraordinary and college-recognized need to be on-campus or onsite that aligns with these criteria:</p> <ul style="list-style-type: none"> • COVID-19 research that has the potential to mitigate the pandemic's spread, • Certain biomedical/clinical research that, if paused, would harm its research participants, • Procedures to maintain critical research infrastructure. For example: animal care, irreplaceable cell lines, laboratory equipment that requires gas or cryogenic monitoring, etc., and • Activities that, if discontinued, would result in significant degradation of safety.
University of Pittsburgh	https://www.svcresearch.pitt.edu/pitt-researchers/covid-19-updates-and-resources	<p>Essential Activities. Access to research buildings is permitted for the following activities:</p> <ul style="list-style-type: none"> • research on COVID-19, • work for which a stop or delay could cause harm to research participants' well-being, • work for which a stop or delay could cause harm to animal populations or other vital living collections, • work whose suspension would cause a critical loss of unique or irreplaceable materials or data, or • management of equipment, instruments, or research infrastructure where the lack of maintenance could create damage or endanger safety.

University of Wisconsin-Madison	https://covid19.wisc.edu/research/	<p>Examples of essential work include, but are not limited to:</p> <ul style="list-style-type: none"> • research that has the potential to address the COVID-19 crisis, • human-subjects research that would endanger research participant lives if stopped, and • projects in which termination would lead to loss of long-running experimental data, critical time-series or time-sensitive data, loss of equipment, or to the loss of life of critical research-related organisms.
Vanderbilt University	https://www.vanderbilt.edu/coronavirus/2020/03/15/mar-15-2020-on-campus-research-laboratories-ramping-down/	<p>Beginning March 18, access to labs will only be available for essential personnel who perform critical procedures, processes or equipment management that requires regular personnel attention to maintain laboratory viability (e.g. liquid nitrogen tank filling, maintaining shared computational equipment). PIs should immediately identify essential research experiments that are at a critical phase, meaning that abandoning them would cause a major or irreversible loss in project momentum. This high-priority work should be a limited set of the current laboratory bench-based experimentation. Even essential work in labs should be staggered so that minimal laboratory personnel are present at any one time.</p>
Institutes		
National Institutes of Health Intramural Research	https://www.nih.gov/news-events/news-releases/nih-shifts-non-mission-critical-laboratory-operations-minimal-maintenance-phase	<p>Beginning on Monday, March 23, only mission-critical functions within NIH research laboratories will be supported. Mission-critical functions include the following: care of research participants in NIH clinical protocols that are non-elective, research directly on COVID-19, urgent public health research recommended by NIH scientific leadership, work involving significant research investments that could be lost if not continued, and protection of life, property, and resources, including the care of research animals. NIH will strictly limit the presence of staff in laboratories supporting non-critical functions to focus on maintenance. All research functions suitable for remote work, such as data analysis, literature reviews, or drafting and review of manuscripts, is expected to be performed remotely.</p>
Salk Institute	https://www.salk.edu/news-release/salk-minimizes-on-site-staff-and-takes-additional-steps-around-coronavirus-covid-19/	<ul style="list-style-type: none"> • The majority of Salk staff are now working remotely. A small number of personnel authorized to remain on campus are performing essential maintenance functions to protect life, safety and property. • All Salk labs have taken steps to pause, delay or terminate research, with no new research efforts initiated.
Wistar Institute	https://wistar.org/covid-19-research-update	<p>To protect the Wistar community during the current pandemic, The Wistar Institute has canceled or postponed all public events and business travel.</p>

		Our scientists and core facilities continue to advance critical research while limiting onsite work and following practices for infection prevention and social distancing when working in the lab. Non-essential personnel are working remotely.
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Supplemental Table 2: An example of animal operations continuity plan during the COVID-19 pandemic

Phase of Emergency	Guidance	Animal Operations Response
I	Notification from Federal, State and University about Emergency	<ul style="list-style-type: none"> - Assess staffing levels, cancel discretionary absences, vacations to insure maximum staffing is available. - Provide “essential employee” documentation to staff and vendors. - Contact suppliers for feed, bedding, chemicals to ensure supply for 2-3 months. Get delivery on site if storage is available. - Assess PPE supplies. - Stop animal orders for USDA regulated species. - Assess surgical needs for ongoing studies. - Develop continuity plans for research staff performing ongoing studies - Train research team on husbandry activities. - Secure laboratory volunteers for assistance with animal care.
II	<ul style="list-style-type: none"> - State or Local government ordinance on people and materials movement - Potential community spread of infection - Staffing reduces by 25% 	<ul style="list-style-type: none"> - All non-essential employees (billing, procurement, finance) must work from home. - Animal orders are suspended. - Research Staff training is stopped or restricted. - Cage change intervals reconsidered based on performance criteria. - All survival surgery studies are ceased. - Breeding for all commercially available strains is ceased, males and females are separated. - Low level breeding is permitted for in-house developed strains to maintain the genetic phenotype. - No “New” studies can commence. - Researchers should identify “critical” ongoing studies. - Conserve or reuse PPE. - Cryopreservation of rare genetic strains is initiated.
III	Staffing levels fall below 50%	<ul style="list-style-type: none"> - Staggered or split shifts for staff - Cease all breeding. - Focus Animal Care staff on cage wash operations; utilize research staff to help with cage changes. - Restriction on research team hours in the vivarium - Only allow “critical” studies approved by the Dean or delegate. - No census activities will be undertaken.
IV	Staffing levels below 30%	<ul style="list-style-type: none"> - Shift to weekend schedule. - Reduce cage changing to the minimum. - Reduce animal capacity to less than 20%.

Supplemental Table 3: Examples of COVID-19 funding opportunities

Sponsor	Sponsor Link	Description
Federal		
NIH-National Center for Advancing Translational Sciences	https://grants.nih.gov/grants/guide/notice-files/NOT-TR-20-011.html	NOT-TR-20-011: NCATS is particularly interested in projects focusing on the use of informatics solutions to diagnose cases and the use of CTSA-supported core resources (e.g., advanced scientific instruments, highly-specialized facilities, and regulatory expertise) to facilitate research on COVID-19 and advance the translation of research findings into diagnostics, therapeutics, and vaccines.
NIH-National Heart, Lung and Blood Institute (NHLBI)	https://grants.nih.gov/grants/guide/notice-files/NOT-HL-20-757.html	NOT-HL-20-757: NHLBI encourages the submission of applications for Administrative Supplements and Competitive Revisions to active NHLBI grants to support research on SARS-CoV-2 and HLB COVID-19 disease. Of particular interest are studies that take advantage of human research or unique model systems to study the consequences of SARS-CoV-2 infection. Supported research is expected to inform future efforts to diagnose, prevent, mitigate, or treat this viral infection and associated HLB manifestations.
NIH-National Institute for Allergy and Infectious Disease (NIAID)	https://grants.nih.gov/grants/guide/notice-files/NOT-AI-20-031.html	NOT-AI-20-031: NIAID is particularly interested in new projects focusing on viral natural history, pathogenicity, transmission, as well as projects developing medical countermeasures and suitable animal models for pre-clinical testing of vaccines and therapeutics against SARS-CoV-2/COVID-19.
NIH-National Institute for Allergy and Infectious Disease (NIAID)	https://grants.nih.gov/grants/guide/notice-files/NOT-AI-20-034.html	NOT-AI-20-034: NIAID is particularly interested in projects focusing on viral natural history, pathogenicity, transmission, as well as projects developing medical countermeasures and suitable animal models for pre-clinical testing of vaccines and therapeutics against SARS-CoV-2/COVID-19. NIAID is offering Competitive Revisions to active NIAID grants addressing specific research objectives.
NIH-National Institute for General Medical Sciences (NIGMS)	https://grants.nih.gov/grants/guide/notice-files/NOT-GM-20-025.html	NOT-GM-20-025: NIGMS will accept the submission of applications for Competitive Revisions to active grants to address only the following research areas of interest: <ul style="list-style-type: none"> • Incorporation of data related to SARS-CoV-2 into ongoing research efforts to develop predictive models for the spread of SARS-CoV-2 and other related infectious agents (all relevant grants). • Repurposing or modification of diagnostic tools currently under development to enable rapid detection of SARS-CoV-2 infection (SBIR/STTR grants only). • Rapid development of potential therapeutic agents for COVID-19 (SBIR/STTR only).
Private		

Amazon Web Services	https://aws.amazon.com/government-education/nonprofits/disaster-response/diagnostic-dev-initiative/	The Amazon Web Services Diagnostic Development Initiative (DDI) provides support for innovation in rapid and accurate patient testing for 2019 novel coronavirus (COVID-19), and other diagnostic solutions to mitigate future outbreaks.
American Heart Association Rapid Response Grant	https://professional.heart.org/professional/ResearchPrograms/UCM_505867_AHA-Rapid-Response-Grant-COVID-19-and-its-Cardiovascular-Impact.jsp	American Heart Association (AHA) invites cardiovascular-focused applications that will contribute to understanding the cardiovascular and cerebrovascular pathogenesis, diagnosis, prevention, clinical manifestations, clinical management (including critical care management), and social behaviors which can lead to dissemination, containment, and complications of COVID-19.
C3.ai DTI	https://c3dti.ai/research/applying-ai-to-mitigate-the-covid-19-pandemic/	C3.ai DTI is soliciting Research Award proposals that catalyze cooperative research activities and advances in machine learning and other AI subdisciplines, analytics, statistical analysis, and advanced computing research aimed at (1) the current acute challenges with COVID-19 and (2) the methods for containing and addressing pandemics more generally for longer-term preparedness, including for future pathogens and SARS-like viruses.
Gates/Wellcome/Mastercard COVID-19 Therapeutics Accelerator	https://www.gatesfoundation.org/Media-Center/Press-Releases/2020/03/COVID-19-Therapeutics-Accelerator	The COVID-19 Therapeutics Accelerator will operate jointly as an initiative of the funders, drawing on expertise from inside and outside their organizations. The Accelerator will pursue several aspects of the development cycle to streamline the pathway from candidate product to clinical assessment, use, and manufacturing. To identify candidate compounds, the Accelerator will take a three-pronged approach: testing approved drugs for activity against COVID-19, screening libraries of thousands of compounds with confirmed safety data, and considering new investigational compounds and monoclonal antibodies. Gates will review all offers of support and respond to those that align with the priorities needed at this time.
IBM Call for Code Challenge	https://callforcode.org/challenge/	Call for Code asks innovators to create practical, effective, and high-quality applications based on one or more IBM Cloud™ services (for example, web, mobile, data, analytics, AI, IoT, or weather) that can have an immediate and lasting impact on humanitarian issues. Teams of developers, data scientists, designers, business analysts, subject matter experts, and more are challenged to build solutions to mitigate the impact of COVID-19 and climate change.

LifeArc	https://www.lifearc.org/funding/covid-19/covid-19-funding	<p>LifeArc has made available an initial £10M for the identification of therapeutics that can be rapidly deployed to treat COVID-19. The aim is to run trials in patients during the current epidemic. It is anticipated that applications will be for funding to repurpose one or more drugs that are generic, already licensed, or are in late stage development for another indication.</p>
Russell Sage Foundation	https://www.russellsage.org/how-to-apply	<p>Because of the effects of COVID-19 on all facets of American life, the Russell Sage Foundation (RSF) is changing its immediate priorities. RSF will only consider LOIs that satisfy at least one of the following criteria: (a) The research is so timely and time-sensitive that the project must start before April 1, 2021; or, (b) the research analyzes social, political, economic, or psychological disruptions resulting from the coronavirus crisis that affect social and living conditions in the United States.</p>