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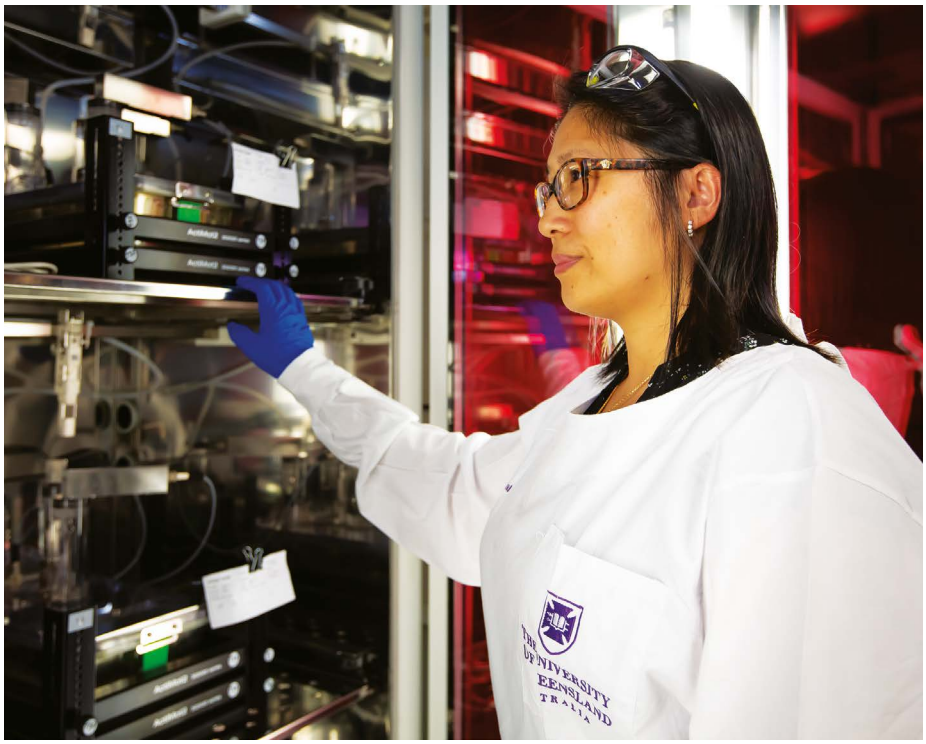

MARTIN GIBBONS/DIGITAL BLACK

Shyuan Ngo and her lab members work in rotating groups to maintain distance.

KEEPING ON WITH ESSENTIAL SCIENCE

For scientists working on urgent research, staying home is not an option. By Virginia Gewin

Around the world, universities have closed because of COVID-19 – forcing an increasing number of researchers to work and teach from home.

Some scientists can't simply stop going to their laboratories – especially not those who are overseeing clinical trials that could offer life-saving vaccines and therapies, particularly against the new coronavirus. And some research activities unrelated to vaccine production must continue, even in the face of an institutional shutdown.

"Animals need to be looked after, and breeding lines must be kept going. Many of these are unique and can't be regenerated," says Mike Turner, director of science at Wellcome, a research-funding charity in London.

If you have to go to your lab, says Turner, comply with all of your institution's safety regulations, not just those for preventing COVID-19. For example, stick to the 'buddy system' – by working in groups of at least two people – when necessary for your safety. Many current guidelines advise a person not to come within 2 metres of anyone for longer than 15 minutes.

Turner also suggests creating schedules to make sure the essential tasks of each lab at an institution get done if COVID-19 strikes among the members in any one of the labs.

"If someone gets ill, they know who to tell, and that person knows it is their role to continue the task," he says. "If your work is contributing to [research against] COVID-19, we applaud you, and please carry on. If it's not, ask, 'Is it absolutely essential?'"

Here, four scientists offer advice on the precautionary measures necessary to continue essential research in the face of the pandemic.

JOHN MORRISON
REDESIGN STUDIES TO BE LESS LABOUR-INTENSIVE

The status of the lab changes every day. In California, we have a statewide order to 'shelter in place', or to stay home except to do essential tasks, such as seeking health care or buying groceries. My colleagues and I are exempt from that order because we are beginning aggressive COVID-19 research in collaboration with the Center for Immunology and Infectious Diseases at the University of California, Davis, and we care for animals.

We are exercising an extreme form of social distancing while at work. It's complicated for our group. We have to worry about the health of our people – our primary concern – as well as the health of the primate colony we use for research. We have to assume that there could be human–monkey transmission and vice versa. And we have to maintain the colony.

We are not starting any new protocols or studies beyond COVID-19 research, and are doing what we can to keep existing research protocols going. We decided to give preference to longitudinal studies, to make sure data collected previously remain meaningful. We are asking people to redesign their studies to require 50% less labour while salvaging the study and making it rigorous and reproducible. It can be terribly difficult to decide which studies must have data collection stopped. It's important to keep the measures going that yield the biggest bang for the buck, or the most information for the least effort and lowest cost. For example, can you collect samples less often without compromising the validity of the study? In some instances, the smartest thing to do might be to accelerate the study's completion to get it out of the way.

We have 300 people here, and are reducing our on-site staff by at least 50%. But we are the only primate-research centre growing the new coronavirus to help develop clinical tests. People are working from home, staggering their shifts and spreading out across labs. What gets hard is launching new COVID-19 research with our reduced capacity. And it became very clear that most of the national primate-research centres are initiating COVID-19 research as a high priority. We're doing that because the monkey model for the disease will be extraordinarily powerful, and we need it yesterday.

Protecting our workforce is our highest priority, followed closely by helping to fight this pandemic while keep our monkeys safe.

John Morrison is director, California National Primate Research Center at the University of California, Davis.

VIJI VIJAYAN
COLLECTIVELY SACRIFICE TO KEEP WORK GOING

Our university has not yet considered shutting down, but we encourage those who can to work from home. For those continuing wet-bench lab work, we follow the clear advice that we receive from Singapore's Ministry of Health and our university administrators on social-distancing guidelines and on specific directives, such as a 14-day self-quarantine for people arriving from certain countries. Fortunately, the university already had a robust biorisk-management system in place, which made it easier to beef up our response to the COVID-19 outbreak. We are now taking precautions to make sure work goes on, because not everyone can work remotely.

During the first couple of days of the outbreak, our infectious-disease researchers were working long hours. We reduced those, because it is not safe to work while fatigued. We now make sure that working hours are within acceptable limits so that people don't get tired — and have time to take breaks.

> **"Our work isn't about academic credit right now — it's about what we can do for our country and the world."**

There are about 400 researchers at our medical school across roughly 50 wet-bench labs. Roughly 20% of them work on infectious disease, and the others work on cancer, metabolic disorders and neurobehaviour. We have thinned our workplace staff by reducing the number of people working in labs by about 40–50%. Labs have broken into teams, and have adopted a variety of strategies to distance workers in both time and space.

Our biosafety-level 3 (BSL-3; level 4 is the most strict) lab is small, so researchers working in that space have split into early-morning and late-afternoon shifts. In other labs, teams either switch days of each week — working Monday to Wednesday or Thursday and Friday — or split into different floors of the building, depending on what works best for their research. That way, if one group is quarantined, the other group can take over. The teams each wear differently coloured stickers all the time to avoid members from other teams.

In addition, given the increased demand for the small BSL-3 space, researchers can make non-infectious coronavirus by extracting its RNA so they can work with it, when feasible, in the less-stringent BSL-2 lab environments.

Continuing lab experiments is possible, but not easy. It's a collective sacrifice to make big changes in the way you work and live, but these are absolutely essential to combat this outbreak. Our biggest asset is our people at work.

Viji Vijayan is associate dean of safety and emergency management, Duke–National University of Singapore Medical School.

SHYUAN NGO
LET ETHICS GUIDE WHICH RESEARCH TO CONTINUE

My lab of ten includes postdoctoral researchers, PhD students and research assistants. Normally, we do natural-history studies with people with motor-neuron disease (MND) in a clinical setting, and take everything we learn back to the preclinical laboratory, using mouse models of MND and stem cells from people with the condition. Right now, the University of Queensland remains open, although it recently announced a move to teaching online and advised against non-essential travel.

Research-group leaders were asked to develop contingency plans to reduce the number of people in their labs. My lab is one of the few on campus that has adopted those plans. We shut down clinical research because our participants are at risk of respiratory distress from COVID-19. We also stopped projects that were initiated in January, choosing instead to focus our efforts on projects that were closer to completion. It would be unethical to cull animals that we have already been working with for almost a year. Similarly, we're invested in making sure we get all the data necessary from stem cells grown from people with MND, because they have donated their time and invested in the project. And this research was funded by publicly donated money — another reason not to shut it down. For safety, we divvied the lab into two groups, each composed of four individuals. Within each team, we rotate the schedule, leaving a 30-minute gap between shifts, so that people never cross paths in the lab. We do this throughout the open space we share with three other labs. The stem-cell work happens in the early morning and late afternoon, so that the animal team can continue collecting samples at the same time it hasbeen doing every day, for continuity.

Consult with your whole team on how to prioritize projects and schedules and involve everyone in decision-making, to avoid a sense of uncertainty and disgruntlement. We don't need that right now. We need to all work together.

Shyuan Ngo is an MND researcher at the University of Queensland in Brisbane, Australia

MARK DENISON
COMMUNICATE CONSTANTLY

I started working on coronaviruses in 1984, and have worked through severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). I am sobered and subdued by the reality of the COVID-19 pandemic. Our team's priority is work on countermeasures.

We are conducting *in vitro* studies of potential antiviral drugs including remdesivir, alone or in combination with other compounds, while continuing our long-standing collaboration with Ralph Baric's lab at the University of North Carolina in Chapel Hill. Theat group is developing animal models to test these potential COVID-19 therapies. We expect to continue participating in collaborations to test vaccines. My goals are making sure nothing hampers the speed of vaccine trials, and identifying any drug combinations that could have a high impact in mitigating the disease.

Our work isn't about academic credit right now — it's about what we can do for our country and the world. We want to contribute swiftly, so I'm working out how to do that with what we have. Already, the university has recognized our essential work and commitment to safety, and has allowed postdocs and graduate students to continue working in our lab.

I have a 12-member team; 6, including me, are trained to work in a BSL-3 lab. We work long days, seven days a week. I try not to do that, but people in the emergency rooms in Italy are working more than that — and they don't have a choice.

At the same time, we can't get so tired that we make mistakes. We can't work all the time. We take steps to protect ourselves and each other. Everyone absolutely has to report any symptoms of any kind — from an earache to a runny nose. We are in constant contact.

To keep everyone more than 2 metres apart, we have got people working in other labs that shut down. We conduct our staff meetings by talking across the halls from individual labs, or through the videoconferencing platform Zoom. If one of us gets COVID-19, the whole research programme could shut down.

Mark Denison is director of paediatric infectious diseases, Vanderbilt University Medical Center, Nashville, Tennessee.

Interviews by Virginia Gewin

These interviews have been edited for length and clarity.