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Rules for scientific progress while living with the COVID-19 Pandemic: from 'benchside' to 'fireside.'

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As part of the nationwide restrictions to "flatten the curve," many bench researchers (albeit those working directly on COVID-19-related research) have been told to telework as much as possible. Defining "essential laboratory personnel" at institutions for ongoing long-term experiments are changing with the fluidity and uncertainty of each day. In short, labs around the country are going dark, but that doesn't mean scientific progress has to be stifled. To navigate this uncertain time, we would like to share how we have been proactive and productive while teleworking. This is by no means a definitive set of rules or the only way we believe progress can be made, it is more of a catalyst to spark a dialogue within your team and inspire scientific progress.

We have utilized 4 key strategies that we strongly believe are essential during this COVID-19 era.

- Make a plan early for essential lab work.
- Set up the expectation for fluid communication and an infrastructure to support it.
- Use this as an opportunity to fill gaps in knowledge; finalize figures; write manuscripts and explore new avenues of research.
- Use this opportunity to strengthen internal and external collaborations.

Rule#1: Making a plan for essential lab work

This plan should already be implemented. Make a plan to wrap-up any existing experiments, terminate any non-essential work, and limit foot-traffic for individuals having to go in for essential experiments such as animal work and necessary ongoing experiments. Next, devise an expectation plan that works with your team. This means, scheduling meeting times in advance, and instructing lab members to submit daily/weekly to-do lists, all with rules and guidelines laid out. It is important to set tangible goals with achievable deadlines to keep the lab motivated and keep morale high. This structure will provide accountability and allow individuals to build a new routine. Finally, it is important to be adaptable and have contingency plans to account for government and institutional guidelines. As the world continues to adapt to the nature of this pandemic, we must be prepared for the long haul. *Examples: Freeze down important cell lines; wrap up important animal experiments; designate 1-2 or rotating lab members to manage long-term chronic animal experiments.*

Rule #2: Set up and integrate a web-based communication infrastructure

Setting up avenues for communication with all lab members is imperative. In a remote work environment, this relies heavily on efficient, user-friendly technology. To allow for real-time updates and focused discussion, we have created a workspace for our lab in the messaging platform, Slack (https://slack.com/), which is typically a platform used by IT-based companies. This productivity application allows for real-time instant messaging as well as message boards called "channels" that are useful for focused communication to the entire group. For in-person meetings, we have utilized Google Hangouts and Zoom (https://zoom.us/) for sharing presentations and hosting live discussions.

Rule #3: Staying current on research topics, finalizing figures, writing manuscripts, and exploring new paths for current research.

As bench scientists we often get caught up in the minutiae of physical lab work (i.e., chasing after that next piece of exciting data); however, now we can take this opportunity to spend work time catching up on the literature, learning about cutting-edge trends in the field, and allocating time for manuscripts, reviews, and grants. Moreover, aside from short-term tasks, take this opportunity to evaluate long-term goals of your lab and yourself. This includes retooling your lab's focus and goals for where

you wish to direct your research. Now that you've taken the time to get caught up on literature, it's time to ask yourself where your work fits into the scope of the field, and how is it going to make a difference in the field? Specifically, our lab has gone from weekly lab meetings to daily lab google hangout meetings, lasting up to two hours. We are taking the opportunity to rotate lab members who present daily. We are documenting these sessions on a google/shared drive as we plan to use these sessions to demonstrate productivity for grant(NIH) progress reports and Individual Development Plans (IDP) for trainees (grad students, residents, post-docs and master's students).

Examples: These daily meetings (1-2 hours face-to-face with a web-based app that can share screens/data) entail: 1) going through figures or outlines of manuscripts; 2) updating and troubleshooting on long-term animal experiments; 3) potential practice talks for upcoming meetings; 4) journal clubbing relevant lab related publications; 5) proposing new grant ideas.

Rule #4: Use this opportunity to strengthen internal and external collaborations (virtual meetings, etc.)

An important point to realize, is that we aren't in this alone. Many of our colleagues and peers around the globe are facing similar restrictions to our everyday lives. So take this opportunity to include outside personnel into your group meetings and discussions mentioned above. Prepare journal clubs, didactics, and/or talks that can educate and engage all parties. Our lab has ongoing relationships and collaborations with other researchers, and we have invited their teams to join our web chat meetings to provide new perspectives on our research. We will invite clinicians to our meetings in an effort to get a "clinical/translational" perspective on our work, and similarly, we will invite basic science experts in our field to join certain meetings to enhance the rigor of our work.

Final thoughts

Many in the field have not been this isolated since the days or weeks before their qualifying exams. Still, we must look for a "silver lining" and realize that this is a unique opportunity (in a unique time) to improve other skill sets essential for our work that we often overlook. A positive side-effect of all the suggestions above is that we continue to keep connected to our lab family to make sure everyone feels less isolated during these unusual, stressful times. A critical part of lab morale and good lab culture is that everyone continue to believe that their project matters, and by continuing to work on these projects "off line" could help to re-energize a trainee's devotion to a project. We have already discovered on day 2 of this pause in our normal research routine more intense group meetings that include constructive criticism, self-reflection, creative thinking, and "out of the box" suggestions. In sum, let's use this time efficiently and wisely, so once science tackles this virus, we won't miss a beat in our progress towards understanding and curing other terminal diseases (e.g., cancer) that have historically plagued society much more profoundly than COVID-19.