A call to action for translational sciences in COVID-19 and future pandemics

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Translation Together, a transnational consortium of translational research organizations, reflects on successes and challenges in regional COVID-19 pandemic responses and proposes five priorities to improve preparedness for future global public health crises and improve the global approach to translational research and science.

In response to the COVID-19 pandemic, the global research community made tremendous scientific progress in record time in areas such as vaccine development. Nevertheless, persistent barriers to progress in other areas were also apparent. Here, as Translation Together (TT), a global group of translational research organizations (Supplementary Table 1), we draw on our experiences and lessons learned to propose five actions to improve the preparedness of the translational research community for future public health crises and improve global health.

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Proposed actions to improve preparedness

Establish a global 'safe-zone' for open and real-time sharing of precompetitive data. In the race to stem the spread of SARS-CoV-2, open data sharing was critical to identify complementarity and minimize duplicative efforts. Sharing both positive and negative data without restrictions is crucial to recognizing opportunities and focusing limited resources towards fruitful research. To this end, we observed swift dissemination of key research results via online preprints. However, publication priorities and/or intellectual property (IP) considerations still prevented many research organizations from fully embracing the open data model.

A notable success in data sharing was in high-throughput screening for rapid drug repurposing, with several groups openly sharing results (Supplementary Table 2; examples 2.1, 2.2) to help the community avoid unproductive or duplicative research directions. Yet in general, calls to share screening data openly were met with reservation due to IP ownership and exclusivity concerns, possible alternative findings, and/or lead authorship considerations. Some groups were only willing to share curated positive data. In fact, IP concerns, along with a lack of obvious financial incentives, were common barriers to research progress across the spectrum of preclinical development. For example, disagreements over indirect costs for grants and contracts often resulted in a loss of months of progress. Complex legal agreements compounded these delays. In clinical development, lagging and reluctance in sharing data was common (Supplementary Table 2; examples 2.3, 2.4). Such reactions are unintended products of conventional incentive structures and are not consistent with a collaborative model for translational research.

For labs reliant on external competitive funding, traditional success metrics unwittingly became major obstacles to data sharing. Focus on high-profile senior authorship and quantity of publications/patents provide little opportunity to form the necessary multidisciplinary research teams, despite newly available COVID-19 research funding. In some instances, as is commonly the case, sizable portions of funding went toward institutional overheads instead of direct research activities or they were allocated to researchers peripheral to the funding call due to insufficient numbers of specialists (Supplementary Table 2; example 2.5).

For the future, as a collective research community, we must devise alternative incentive structures for assessing and benchmarking translational efforts. It is imperative that we establish a global 'safe zone' for real-time sharing of precompetitive data during global health crises, suspending typical success metrics so individual researchers and institutions are not penalized for sharing, and instead incentivized to share, findings openly.

Build flexible and responsive infrastructures for critical drug development resources. TT members witnessed the importance of ready access to resources across the translational science pipeline. Supplies and infrastructures were scarce, quickly exhausted or inaccessible due to tight border controls, especially for groups in

smaller or less-developed countries. Most prominent were shortages in (or a lack of flexibility in the utilization of) high-containment biosafety facilities (that is, BSL-3/BSL-4; Supplementary Table 2; examples 2.6, 2.7), small animal and non-human primate (NHP) models and testing facilities, and GMP drug manufacturing capacities. Consequently, valuable time and effort were spent gaining access to these resources in numerous cases. Equally important and in shortage was a ready workforce with the expertise to carry out experiments in biosafety environments (Supplementary Table 2; examples 2.8, 2.9).

Shortages of GMP manufacturing capacities hampered preclinical development as well as drug and vaccine production (Supplementary Table 2; example 2.10). Rare successes in preparedness, such as in Brazil (due to their previous experiences with infectious disease outbreaks) highlighted the need to create and maintain established manufacturing facilities in non-pandemic times (Supplementary Table 2; example 2.11). The capacity to produce vaccines regionally remains a limitation in overcoming a pandemic, especially in the poorest countries, exacerbating the imbalance in the global distribution of vaccines, although progress continues to be made in sharing existing vaccine stocks across national borders.

For rapid responses in future outbreaks, we must build and maintain ready-to-use testing/manufacturing facilities and animal models (Supplementary Table 2; example 2.12). Such resources should be prioritized towards the most promising translational opportunities via easily accessible international collaborations, as have been spearheaded by EATRIS (Supplementary Table 2; example 2.13).

Improve tracking and coordination to avoid undesired duplicative efforts. The rapid pandemic response resulted in many duplicative efforts within and across regions. Some redundancies were due to an avertible lack of data sharing, while others resulted from a lack of project tracking and coordination (Supplementary Table 2; example 2.14). At the start of the pandemic, TT partners engaged and re-directed available resources as they were able. TT members who had effectively accounted for existing research, facilities, laboratories and resources in non-pandemic times were able to mobilize more quickly and avoid duplicative efforts within their regions. Most members ultimately established COVID-19 resource registry systems within their institutions (Supplementary Table 2; examples 2.15–2.17). Such tracking systems are critical and should be integrated into each research community's operational model and expanded to track its full portfolio of projects. Also urgently needed is a transnational framework for clear coordination across all funding and policy regions to leverage global resources maximally and minimize waste (Supplementary Table 2; example 2.18).

Establish adaptive funding structures. The pressures and urgency of pandemic response in many TT members' regions surfaced issues with funding mechanisms that compromised efficiency and effectiveness. In some cases, inflexibilities in funding rules/laws added difficulties to adapt, pivot or redirect funds from existing projects to new priorities. Consequently, COVID-19 research and development often had to be mainly supported via extra funding and new emergency funding mechanisms (Supplementary Table 2; example 2.19). Better preparedness must include building flexibility in funding systems and establishing readily accessible emergency funds to accommodate rapidly shifting translational priorities. Non-traditional funding opportunities for research that can fill gaps and/or delays in government funding mechanisms should also be facilitated. In Brazil, contributions from non-profit foundations, the commercial sector and private citizens all proved invaluable in mobilizing a maximal research response (Supplementary Table 2; example 2.20).

Work towards establishing and maintaining public health and pandemic readiness. Appropriate balance of the many disease areas and priorities is a constant struggle, and recent decades have witnessed diminished public health funding and antiviral research capacities in many regions. Capturing the current momentum to sustain and expand public health and infectious disease research is essential to better prepare for future outbreaks (Supplementary Table 2; examples 2.21–2.23).

Many national and international efforts have recently initiated such readiness programmes (Supplementary Table 2; examples 2.24, 2.25). The at-times fractured and duplicative COVID-19 response we experienced shows that global coordination of these preparedness programmes is essential. These include developing easily activated drug repurposing platforms; expanding screening libraries to include broader ranges of agents with likely antiviral activity; developing a pipeline of phase II-ready agents for rapid clinical evaluation; and building stockpiles of approved drugs with regulatory agency exemptions for cross-referencing drug master files to facilitate repurposing efforts.

Conclusion

The global translational science community responded to COVID-19 at unprecedented scale and speed, with an unparalleled level of international collaboration. The response has led to remarkable scientific advances, but also revealed areas that can be improved. TT members faced similar bottlenecks and challenges in facilitating and coordinating translational efforts, irrespective of regional locations. We urge the global translational science community to join us in working across organizations and borders to address these barriers.

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Competing interests
The authors declare no competing interests.

Supplementary information
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