Anomalous COVID-19 tests hinder researchers

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Some positive COVID-19 test results reflect researchers' exposure to non-infectious nucleic acids rather than a true infection.

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Universities conduct a large proportion of the community surveillance testing for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (*1*). At the same time, they have shifted focus to SARS-CoV-2 research to address critical needs during this pandemic. There are now multiple reports of asymptomatic researchers who worked with or near non-infectious SARS-CoV-2 nucleic acids and subsequently tested positive during SARS-CoV-2 surveillance screening (*2*, *3*). Such positive test results and the resulting isolation and quarantine are deleterious to the health of researchers, their research programs, and their close contacts. Universities and labs should take steps to identify and prevent misleading test results among their researchers.

Because health departments cannot distinguish positive test results reflecting exposure to non-infectious nucleic acids from those revealing true active SARS-CoV-2 infections, affected U.S. researchers are removed from the testing pool for 90 days, a period during which true infections could be missed (*4*). Additional false positives could result when monitoring of wastewater for viral outbreaks detects DNA products that are washed down the drain as non-biohazardous waste (*5*). As polymerase chain reaction tests, other DNA amplification tests (*6*, *7*), and the recently approved at-home nucleic acid tests (*8*) become more widespread, these cases will likely become more frequent among researchers.

To mitigate harm from misleading results, we recommend the implementation of extra safety controls (*2*) in addition to standard practices for handling nucleic acids (*9*). Genetic loci should be chosen with care to not interfere with any available tests. Incorporation of deoxyuridine triphosphate, codon optimization, and DNA watermarks can prevent detection of a laboratory-generated nucleic acid and differentiate it from circulating pathogens (*10*, *11*). DNA products should be treated with bleach or other DNA-damaging agents before disposal. The best policies and practices for preventing laboratory contamination should take place before initiating research: Once a space is contaminated with DNA, it is extremely difficult to decontaminate (*2*). These policies should accommodate the specific needs of the research and the institutions and not place undue burden on the essential work of studying these pathogens.

For individuals who are asymptomatic, have no history of SARS-CoV-2 exposure, and are affected by anomalous surveillance test results, we propose verification with orthogonal follow-up testing. At an institutional level, administrators, environmental health and safety personnel, and departments of public health should collaborate to determine who is at risk for anomalous tests and coordinate immediate follow-up testing. Alternate providers using orthogonal tests should be established before surveillance testing and/or research initiation.

Community-wide COVID-19 surveillance testing directly improves human health (*12*). Given the extensive development in testing infrastructure amassed during this short period, viral testing will likely extend to other pathogens, endemic or emergent. Sensible policies governing the stewardship of nucleic acids will help protect this vital asset.

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COMPETING INTERESTS

L.R.R.-M., A.J.M., G.T.F., R.F., O.D., D.T.-O., G.M.C., and J.M.T. are co-inventors of MAP-Dx, a COVID diagnostic platform. J.J.C. is a co-founder and director of Sherlock Biosciences. G.M.C.'s tech transfer, advisory roles, and funding sources can be found at http://v.ht/PHNc.

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Data-driven solutions to U.S. polarization

In their Policy Forum "Political sectarianism in America" (30 October 2020, p. 533), E. J. Finkel *et al.* summarize research on the multiple sources of the decades-long U.S. march to toxic polarization. However, the mitigation tactics they offer seem piecemeal and insufficient. To reverse a 50-year trajectory of runaway division (*1*), we need an evidence-based strategy tailored to structural change.

Research on how deeply divided societies change course (*2*) suggests that how leaders approach entrenched problems, especially early on in their tenure (*3*), can make the difference. Transformations are most likely to occur when leaders take office after a major political shock—like the COVID-19 pandemic or the 6 January storming of the Capitol by political extremists—has destabilized the status quo (*4*) and lead in a way that differs dramatically from the leadership that instigated the divisions (*5*). Moreover, in societies where distrust and suspicion reign (*6*), changes in political strategies are often best introduced with a public declaration of intention.

The Biden-Harris administration could apply such research by announcing a two-pronged strategy to defeat toxic division in America. First, given that many Americans feel left behind, the new leaders should begin by launching a listening tour during which they partner with local, trusted community groups to elicit grievances and proposed remedies (*4*). Research has shown that when members of disenfranchised groups feel heard by those in power, it can lead to constructive shifts in attitudes (*7*). Large-scale initiatives like these, when transparent and brought to completion, can begin healing (*8*).

Second, the new administration should seek to strengthen our national immune system. Research on international peacebuilding finds that many of the more sustainable initiatives helping communities transition out of intergroup strife come from within (*9*). These local initiatives (*8*) emerge in response to community challenges and manage to thrive under difficult circumstances. Today, there are thousands of bridge-building groups (*10*) across the United States that fit this bill, whose impact could be scaled up through federal funding, recognition, and coordination. They fight against the pathologies of hate and can help citizens build bipartisan alliances that take on the structural incentives that divide us. This is critical. We will never talk our way out of this division (*11*); we must aim for structural change (*12*).

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China is pivotal to the ocean's future

Since the 1980s, China has developed into the most important player in global capture fisheries; the country now catches about 15% of the global total (*1*). As scientists and environmental groups called for an end to harmful fishing subsidies (*2*, *3*), China spent US$5.89 billion in 2018—more than twice that of the European Union—on subsidies that increase fisheries capacity (*4*). However, China has indicated a willingness to make commitments that would move the nation toward a more sustainable path. We call on the country to take these steps. Without China's action, attaining international fisheries sustainability will be unachievable.

China has discussed both domestic and international steps forward. The country pledged to reduce fuel subsidies for its domestic fishing fleet by 60% between 2014 and 2019 (*5*), and in 2016 it stated its intention to cap its distant water fishing fleet at 3000 vessels by the end of 2020 (6). In addition, China has taken part in the World Trade Organization (WTO) fishery subsidy negotiations (*7*), and the country's domestic fisheries behavior indicates that it may be poised to ratify the Agreement on Port State Measures (*8*) to prevent, deter, and eliminate illegal, unreported, and unregulated (IUU) fishing. China is also participating in the UN conference for an international, legally binding instrument to protect biodiversity beyond national jurisdiction (*9*) and has agreed to implement the 2030 Agenda, including Sustainable Development Goal 14. By committing to these international efforts and acting to eliminate harmful subsidies, end IUU fishing, and protect marine biodiversity, China could mark a profound turnaround. Currently the nation with the largest and most heavily subsidized distant water fishing fleet (*4*) and the most fishing vessels on the global IUU list (*10*), China has the opportunity to transform into a global leader in ocean sustainability.

In its position paper on WTO Reform in 2019 (*11*), China's refusal to give up its "developing country" status—despite being the world's second-largest economy—has exacerbated fears that the WTO subsidy negotiations may mean little for the world leader in international fishing. Such sidestepping has also been seen in China's distant water fishing growth strategy, which has slowed in terms of vessel numbers but increased in individual vessel size and capacity (*12*), posing a serious and continued threat to fish stocks globally

and signaling a continued unwillingness to collaborate in ocean conservation outside of its domestic waters. The WTO subsidy negotiations missed the December 2020 deadline to end harmful fishing subsidies (*7*). The agreement, now likely to be finalized in early 2021, will be one of the biggest global milestones in international fisheries to date, but meaningful change will depend on China's cooperation.

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COMPETING INTERESTS

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TECHNICAL COMMENT ABSTRACTS

Comment on "Boosted molecular mobility during common chemical reactions"

Jan-Philipp Günther, Lucy L. Fillbrook, Thomas S. C. MacDonald, Günter Majer, William S. Price, Peer Fischer, Jonathon E. Beves

The apparent "boosted mobility" observed by Wang *et al*. (Reports, 31 July 2020, p. 537) is the result of a known artifact. When signal intensities are changing during a nuclear magnetic resonance (NMR) diffusion measurement for reasons other than diffusion, the use of monotonically increasing gradient amplitudes produces erroneous diffusion coefficients. We show that no boosted molecular mobility is observed when shuffled gradient amplitudes are applied.

Full text: dx.doi.org/10.1126/science.abe8322

Response to Comment on "Boosted molecular mobility during common chemical reactions"

Huan Wang, Myeonggon Park, Ruoyu Dong, Junyoung Kim, Yoon-Kyoung Cho, Tsvi Tlusty, Steve Granick

Günther *et al*. report that their control experiment using randomized magnetic field gradient sequences disagreed with findings we had reported using linear gradients. However, we show that measurements in our laboratory are consistent using both methods.

Full text: dx.doi.org/10.1126/science.abe8678

ERRATA

Erratum for the Research Article "Identification of Integrator-PP2A complex (INTAC), an RNA polymerase II phosphatase" by H. Zheng *et al*., *Science* **371**, eabg4122 (2020). Published online 15 January 2021; 10.1126/science.abg4122

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