

The Role of Science in Responding to the COVID-19 Infodemic



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Disclosures: John Inglis PhD

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Professor

Co-founder, bioRxiv and medRxiv

Founding Executive Director and Publisher, Cold Spring Harbor Laboratory Press

Executive Committee Member and Academic Mentor, School of Biological Sciences

Principal Investigator

Chan Zuckerberg Initiative: the growth and development of bioRxiv

Chan Zuckerberg Initiative: to scale the growth and curation processes of medRxiv

Solebury Trout LLC: distribution of *A Cure Within*

Flowers Foundation: distribution of *Malaria: Biology in the Era of Eradication*

External

Co-founder, Life Science Alliance LLC

Advisory Board Member, MIT Press

Advisory Board Member, Research On Research Institute

Preprints are not new

Physics, math, quantitative science: 1.8 million papers on arXiv in 30 years

Biology: 100,000 papers from 138 countries on bioRxiv in 7 years

Health science: 14,000 papers from 123 countries on medRxiv in 18 months

2426 pandemic-related papers on bioRxiv, 6% of its 2020 total

8782 pandemic-related papers on medRxiv, 66% of its 2020 total

Why preprints?

"It's just incredible how we need something like medRxiv at a time of a pandemic. We cannot wait six months for the standard peer review process at a time when people have information that desperately needs to be shared. As long as it comes with the appropriate disclaimers, which medRxiv does very well, I think we can learn from each other. We don't just learn from formal randomized controlled trials. We learn from data that's shared in real-time with the appropriate limitations understood, so medRxiv has been a great disruptor of our very clunky and slow system that was never designed for a pandemic or health emergency. It was designed for peacetime, slow movement".

Marty Makary, Johns Hopkins University,
Editor-in-Chief, MedPage Today

Each paper is screened by scientists, not to judge quality but to reduce risk

Is it pseudoscience or nonsense?

Is it a research paper?

Have conflicts of interest been stated?

Has ethics approval been given or waived?

Have clinical trials been registered?

Are patient data identifying?

Might it cause alarm about the safety of vaccines, drugs, common substances?

Does it promote conspiracy theories?

Does it predict therapeutic efficacy based only on computer modeling?

Does it claim therapeutic benefit based on retrospective analysis of patient data?

Might it result in reduction of drug availability for patients who need it?

bioRxiv declines 5-10% of submissions medRxiv declines 20-40% of submissions

Many bioRxiv and medRxiv preprints are important

New Results Comments (27)

Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin

Peng Zhou, Xing-Lou Yang, Xian-Guang Wang, Ben Hu, Lei Zhang, Wei Zhang, Hao-Rui Si, Yan Zhu, Bei Li, Chao-Lin Huang, Hui-Dong Chen, Jing Chen, Yun Luo, Hua Guo, Ren-Di Jiang, Mei-Qin Liu, Ying Chen, Xu-Rui Shen, Xi Wang, Xiao-Shuang Zheng, Kai Zhao, Quan-Jiao Chen, Fei Deng, Lin-Lin Liu, Bing Yan, Fa-Xian Zhan, Yan-Yi Wang, Gengfu Xiao, Zheng-Li Shi

doi: <https://doi.org/10.1101/2020.01.22.914952>

Now published in *Nature* doi: [10.1038/s41586-020-2012-7](https://doi.org/10.1038/s41586-020-2012-7)

New Results Comments (29)

A SARS-CoV-2-Human Protein-Protein Interaction Map Reveals Drug Targets and Potential Drug-Repurposing

David E. Gordon, Gwendolyn M. Jang, Mehdi Bouhaddou, Jiwei Xu, Kirsten Obernier, Matthew J. O'Meara, Jeffrey Z. Guo, Danielle L. Swaney, Tia A. Tummino, Ruth Huettnerhein, Robyn M. Kaake, Alicia L. Richards, Beril Tutuncuoglu, Helene Foussard, Jyoti Batra, Kelsey Haas, Maya Modak, Minkyu Kim, Paige Haas, Benjamin J. Polacco, Hannes Braberg, Jacqueline M. Fabius, Manon Eckhardt, Margaret Soucheray, Melanie J. Bennett, Merve Cakir, Michael J. McGregor, Qiongyu Li, Zun Zar Chi Naing, Yuan Zhou, Shiming Peng, Lisa T. Kirby, James E. Melnyk, John S. Chorba, Kevin Lou, Shizhong A. Dai, Wenqi Shen, Ying Shi, Ziyang Zhang, Inigo Barrio-Hernandez, Danish Memon, Claudia Hernandez-Armenta, Christopher J.P. Mathy, Tina Perica, Kala B. Pilla, Sai J. Ganesan, Daniel J. Saltzberg, Rakesh Ramachandran, Xi Liu, Sara B. Rosenthal, Lorenzo Calviello, Srivats Venkataramanan, Jose Liboy-Lugo, Yizhu Lin, Stephanie A. Wankowicz, Markus Bohn, Phillip P. Sharp, Raphael Trenker, Janet M. Young, Devin A. Caverio, Joseph Hiatt, Theodore L. Roth, Ujjwal Rathore, Advait Subramanian, Julia Noack, Mathieu Hubert, Ferdinand Roesch, Thomas Vallet, Bjorn Meyer, Kris M. White, Lisa Miorin, Oren S. Rosenberg, Kliment A. Verba, David Agard, Melanie Ott, Michael Emerman, Davide Ruggero, Adolfo Garcia-Sastre, Natalia Jara, Mark von Zastrow, Jack Taunton, Alan Ashworth, Olivier Schwartz, Marco Vignuzzi, Christophe d'Enfert, Shaeri Mukherjee, Matt Jacobson, Harmit S. Malik, Danica G. Fujimori, Trey Ideker, Charles S. Craik, Stephen Floor, James S. Fraser, John Gross, Andrej Sali, Tanja Kortemme, Pedro Beltrao, Kevan Shokat, Brian K. Shoichet, Nevan J. Krogan

doi: <https://doi.org/10.1101/2020.03.22.002386>

Now published in *Nature* doi: [10.1038/s41586-020-2286-9](https://doi.org/10.1038/s41586-020-2286-9)

Comments (12)

A serological assay to detect SARS-CoV-2 seroconversion in humans

Fatima Amanat, Daniel Stadlbauer, Shirin Strohmeier, Thi Nguyen, Veronika Chromikova, Meagan McMahon, Kaijun Jiang, Guha Asthagiri-Arunkumar, Denise Jurczynski, Jose Polanco, Maria Bermudez-Gonzalez, Giulio Kleiner, Teresa Aydlor, Lisa Miorin, Daniel Fierer, Luz Amarilis Lugo, Erna Milunka Kojic, Jonathan Stoeber, Sean T.H. Liu, Charlotte Cunningham-Rundles, Philip L. Felgner, Daniel Caplviski, Adolfo Garcia-Sastre, Allen Cheng, Katherine Kedzierska, Olli Vapalahti, Jussi Hepojoki, Viviana Simon, Florian Krammer, Thomas Moran

doi: <https://doi.org/10.1101/2020.03.17.20037713>

Now published in *Nature Medicine* doi: [10.1038/s41591-020-0913-5](https://doi.org/10.1038/s41591-020-0913-5)

Comments (18)

Effect of Dexamethasone in Hospitalized Patients with COVID-19: Preliminary Report

Peter Horby, Wei Shen Lim, Jonathan Emberson, Marion Mafham, Jennifer Bell, Louise Linsell, Natalie Staplin, Christopher Brightling, Andrew Ustianowski, Einas Elmahi, Benjamin Prudon, Christopher Green, Timothy Felton, David Chadwick, Kanchan Rege, Christopher Fegan, Lucy C Chappell, Saul N Faust, Thomas Jaki, Katie Jeffery, Alan Montgomery, Kathryn Rowan, Edmund Juszczak, J Kenneth Baillie, Richard Haynes, Martin J Landray, RECOVERY Collaborative Group

doi: <https://doi.org/10.1101/2020.06.22.20137273>

Now published in *New England Journal of Medicine* doi: [10.1056/NEJMoa2021436](https://doi.org/10.1056/NEJMoa2021436)

Some are flawed

Comments (577)

COVID-19 Antibody Seroprevalence in Santa Clara County, California

Eran Bendavid, Bianca Mulaney, Neeraj Sood, Soleil Shah, Emilia Ling, Rebecca Bromley-Duifano, Cara Lai, Zoe Weissberg, Rodrigo Saavedra-Walker, James Tedrow, Dona Tversky, Andrew Bogan, Thomas Kupiec, Daniel Eichner, Ribhav Gupta, John Ioannidis, Jay Bhattacharya

doi: <https://doi.org/10.1101/2020.04.14.20062463>

This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should not be used to guide clinical practice.

Abstract Info/History Metrics Preview PDF

Abstract

Background Addressing COVID-19 is a pressing health and social concern. To date, many epidemic projections and policies addressing COVID-19 have been designed without seroprevalence data to inform epidemic parameters. We measured the seroprevalence of antibodies to SARS-CoV-2 in a community sample drawn from Santa Clara County. Methods On April 3-4, 2020, we tested county residents for antibodies

Withdrawn This article has been withdrawn. Click here for details 127 comments

Uncanny similarity of unique inserts in the 2019-nCoV spike protein to HIV-1 gp120 and Gag

Prashant Pradhan, Ashutosh Kumar Pandey, Akhilesh Mishra, Parul Gupta, Praveen Kumar Tripathi, Manoj Balakrishnan Menon, James Gomes, Perumal Vivekanandan, Bishwajit Kundu

doi: <https://doi.org/10.1101/2020.01.30.927871>

This article is a preprint and has not been certified by peer review [what does this mean?].

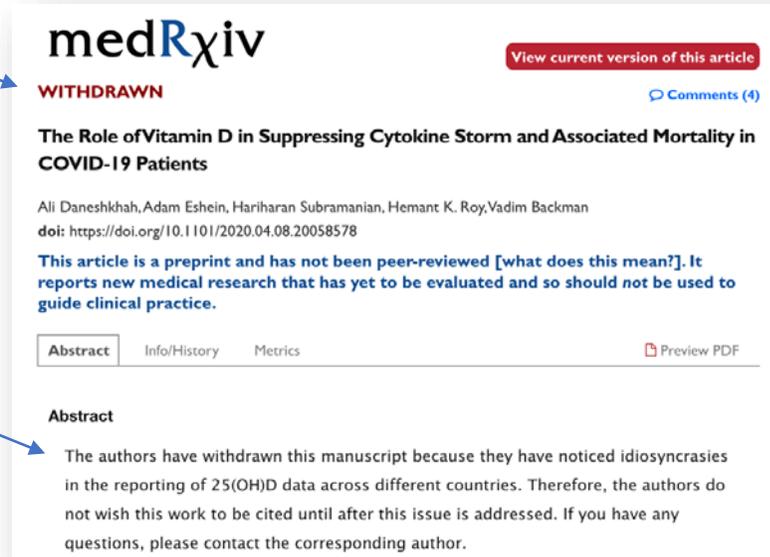
Abstract Full Text Info/History Metrics Preview PDF

Abstract

23 pandemic-related preprints have been withdrawn by authors
24 pandemic-related papers have been retracted by journals

Not all “preprints” are responsibly screened and curated

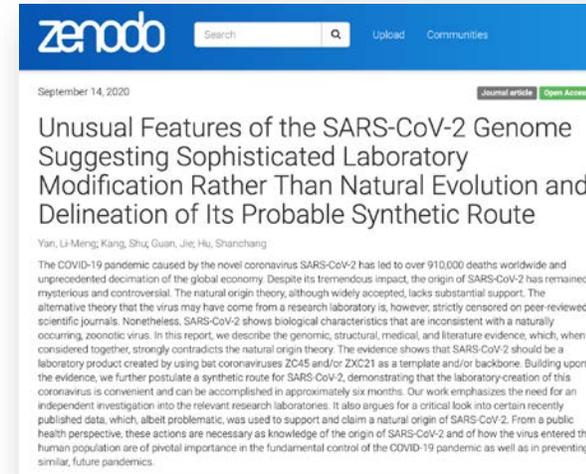
April 10, 2020



The screenshot shows a medRxiv preprint page. At the top left, the medRxiv logo is visible. To its right, a red button says "View current version of this article". Below the logo, the word "WITHDRAWN" is written in red. To the right of "WITHDRAWN" is a link for "Comments (4)". The title of the article is "The Role of Vitamin D in Suppressing Cytokine Storm and Associated Mortality in COVID-19 Patients". Below the title, the authors are listed: "Ali Daneshkhan, Adam Eshein, Hariharan Subramanian, Hemant K. Roy, Vadim Backman". A DOI link is provided: "https://doi.org/10.1101/2020.04.08.20058578". A blue warning box states: "This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should not be used to guide clinical practice." Below this, there are tabs for "Abstract", "Info/History", and "Metrics", and a "Preview PDF" button. The "Abstract" tab is selected, and the text reads: "The authors have withdrawn this manuscript because they have noticed idiosyncrasies in the reporting of 25(OH)D data across different countries. Therefore, the authors do not wish this work to be cited until after this issue is addressed. If you have any questions, please contact the corresponding author."

- Screened before posting
- Authors withdrew paper after criticism
- Authors resubmitted improved versions
- Paper has now been published

September 14, 2020



The screenshot shows a Zenodo preprint page. At the top, the Zenodo logo is visible. To its right, there is a search bar and buttons for "Upload" and "Communities". Below the logo, the date "September 14, 2020" is shown. To the right of the date are links for "Journal article" and "Open Access". The title of the article is "Unusual Features of the SARS-CoV-2 Genome Suggesting Sophisticated Laboratory Modification Rather Than Natural Evolution and Delineation of Its Probable Synthetic Route". Below the title, the authors are listed: "Yan, Li-Meng; Kang, Shu; Guan, Jie; Hu, Shanchang". The abstract text begins: "The COVID-19 pandemic caused by the novel coronavirus SARS-CoV-2 has led to over 910,000 deaths worldwide and unprecedented decimation of the global economy. Despite its tremendous impact, the origin of SARS-CoV-2 has remained mysterious and controversial. The natural origin theory, although widely accepted, lacks substantial support. The alternative theory that the virus may have come from a research laboratory is, however, strictly censored on peer-reviewed scientific journals. Nonetheless, SARS-CoV-2 shows biological characteristics that are inconsistent with a naturally occurring zoonotic virus. In this report, we describe the genomic, structural, medical, and literature evidence, which, when considered together, strongly contradicts the natural origin theory. The evidence shows that SARS-CoV-2 should be a laboratory product created by using bat coronaviruses ZC45 and/or ZXC21 as a template and/or backbone. Building upon the evidence, we further postulate a synthetic route for SARS-CoV-2, demonstrating that the laboratory-creation of this coronavirus is convenient and can be accomplished in approximately six months. Our work emphasizes the need for an independent investigation into the relevant research laboratories. It also argues for a critical look into certain recently published data, which, albeit problematic, was used to support and claim a natural origin of SARS-CoV-2. From a public health perspective, these actions are necessary as knowledge of the origin of SARS-CoV-2 and of how the virus entered the human population are of pivotal importance in the fundamental control of the COVID-19 pandemic as well as in preventing similar, future pandemics."

- Not screened before posting
- Major media reports and interviews
- Fierce criticism but no onsite commenting
- Paper remains unmodified and unpublished

In the context of an infodemic, how should preprints be read?

They give free and open access to new results, months or years before journal publication

But they are preprints

bioRxiv is receiving many new papers on coronavirus SARS-CoV-2. A reminder: these are preliminary reports that have not been peer-reviewed. They should not be regarded as conclusive, guide clinical practice/health-related behavior, or be reported in news media as established information.

“This is how science actually works. It’s less the parade of decisive blockbuster discoveries that the press often portrays, and more a slow, erratic stumble toward ever less uncertainty.” Ed Yong, *The Atlantic*, April 29, 2020

That stumble is more public than ever, so papers should be read cautiously and skeptically

Consider the source: not all preprint platforms work the same way

Read multiple, independent assessments of any paper, including twitter, commentary, and peer review

Grateful thanks to the founders, staff, and funders of bioRxiv and medRxiv



BMJ Yale

Chan
Zuckerberg
Initiative