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Towards Open Science at RIKEN オープンサイエンスに向けて

RIKEN Executive Director 国立研究開発法人理化学研究所 Dr. Shigeo Koyasu 小安重夫

RIKEN 理化学研究所



Japan's sole comprehensive research institute in the natural sciences

日本で最初の自然科学の総合研究機関

- Cutting-edge research in a wide range of scientific areas covering physics, engineering, chemistry, computational science, biology, and medicine 物理学、工学、化学、計算科学、生物学、医科学など幅広い分野で先導的な研究を推進
- Advanced, large-scale research infrastructure for the scientific community and its shared use 最先端、大型研究施設を研究コミュニティに共用、提供
- Innovation exploiting such research results
 革新的な研究成果を創出することにより、イノベーションを創出

RIKEN's mission in the RIKEN Law (Purpose of the Institute : Article 3) **RIKEN aims to raise the standard of science and technology** by

comprehensively carrying out experiments, research and other operations related to science and technology (excluding those which solely concern the humanities).

理研法

科学技術に関する試験及び研究等の業務を総合的に行うことにより、<u>科学技術の水</u> <u>準の向上を図ることを目的とする。</u>

RIKEN 理化学研究所



Chief Scientist Laboratories

Cluster for Pioneering Research

Pioneering and creating new fields of science in order to sustain continuous innovation

Research Infrastructure Centers

Promotion of research and development, improvement, and public utilization of the world's toplevel research infrastructure

Strategic Research Centers

Promotion of strategic R&D to address national and social demands

Center for Computational Science SPring-8 Center BioResource Research Center

Information R&D and Strategy Headquarters

Enhancement and implementation of digital research infrastructures for information and data science

Cluster for Science, Technology and Innovation Hub

Promotion of returning the benefits of research to society by strengthening partnerships with relevant organizations

Program for Drug Discovery and Medical Technology Platforms Baton Zone Program Industrial Co-creation Program Center for Advanced Intelligence Project Interdisciplinary Theoretical and Mathematical Sciences Program Center for Integrative Medical Sciences Center for Biosystems Dynamics Research Center for Brain Science Center for Sustainable Resource Science Center for Emergent Matter Science Center for Quantum Computing Center for Advanced Photonics Nishina Center for Accelerator-Based Science

Infrastructure Research and Development Division Advanced Data Science Project Guardian Robot Project

> RIKEN Innovation Co., Ltd.

Technology licensing Start-up support Joint research promotion Membership-based cocreation

Promotion of Open Access Journal





2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 year4 **Towards Open Science**



Processing of Data-Sharing, Open Data Construction Research Data Platform

研究データの公開および共有のための研究データ基盤構築

Promotion of Open Access Journal

学術論文のオープンアクセスの推進

Open Science

Raising the standard of science and technology 科学技術をより高い水準に

Research Integrity 公正な研究活動

Platform based on Global collaboration



国際連携に基づくプラットフォーム FANTOM = <u>Functional ANnoTation Of</u> Mammalian genome

Global collaboration project led by RIKEN 理化学研究所の主導による国際共同研究プロジェクト



Research results, Data used for analysis, and Analysis results are fully open.

研究成果、解析に用いたデータ、その解析結果は 完全に公開

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Number of Hits for Fantom website



Platform based on Global collaboration



国際連携に基づくプラットフォーム



HUMAN CELL ATLAS

AREAS OF IMPACT

Where do we start?

「ヒト全細胞アトラスプロジェクト」

ヒトの全細胞(約37兆個)について、種類・状態・系統 などを最新の1細胞解析手法によって分類し、カタログ 化することを目的とした国際プログラム「セルアトラス (ヒト細胞百科事典、HCA) プロジェクト」。 欧米の主要な研究機関(欧州:サンガー研究所・カロリ ンスカ研究所、米国:ブロード研究所、等)を中心に提 案。

Studying all the cells in the human body is an enormous endeavor-current estimates suggest that an average human being is made of at least 37.2 trillion cells. To take on this bold task, we are conducting preliminary pilot projects that will not only reveal interesting biology, but also inform us about efficient and

effective sampling and analysis strat as effort. These pilot projects will also begin to build the collaborative international network that is essential for the cell atlas's success. A few examples are:

analysis tools



Diagram of key components of

the open-source data coordination platform

Open Access Database



FMO Database (FMODB)

The database of quantum mechanical data based on the FMO method フラグメント分子軌道法(FMO法)によるオープンアクセス分子構造データベース







Search Sample

FMO Database (FMODB)



Contribution for Drug Design 創薬への貢献

The molecular interaction between the new coronavirus (SARS-CoV-2) protein and the therapeutic drug candidate compound is calculated by the "fragment molecular orbital method (FMO method)", and the data can be freely used by drug discovery researchers around the world.

新型コロナウイルス(SARS-CoV-2)タンパク質と治療薬候補化合物の分子間相互作用を「フラグメント分子 軌道法(FMO法)」で計算し、そのデータを、世界中の創薬研究者が自由に利用できる「FMOデータベース (FMODB)」にて公開。



Prediction of conformational dynamics of proteins using "Fugaku"



スーパーコンピューター「富岳」を用いたタンパク質の動的構造予測

Predicted dynamic structures of the spike protein (S-protein) will be used to develop drugs for inhibiting the interaction between the S-protein and the receptor (ACE-2) on the host cell.

溶液中でのウィルス活性化の構造変化を動的に予測、ウィルスの活性化を抑える薬剤の開発へ の貢献を期待



Open source software :

Molecular dynamics and modeling software for bimolecular systems such as proteins, lipids, nucleic acids, glycans, and their complexes.

タンパク質、脂質、核酸や糖鎖、そしてそれらの 複合体の動的構造を予測する公開ソフトウェア

> S-protein on the surface of SARS-CoV-2 SARS-CoV-2表面のスパイクタンパク質の構造



Exploring the molecular dynamics of the new coronavirus



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新型コロナウイルス(SARS-CoV-2)メインプロテアーゼの 分子動力学シミュレーションデータを公開



The raw data from the simulation has been published on Mendeley Data for use by researchers around the world.

世界の創薬研究者が自由に利用できるよう、RAW DATAをリポジトリ*Mendeley Data*に 2020年3月17日公開。

Mendeley Data is an open, free-to-use research data repository, which enables researchers to make their research data publicly available.

The Role and Responsibility in the Post-pandemic Era R



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Impact of COVID-19 pandemic on STI

COVID-19 pandemicが科学技術に与えた影響

- Changes in the environment surrounding global research activities Stagnation of International collaboration and Global brain circulation Activation of Discussion via remote at any time and place 世界的な科学技術、研究活動を取り巻く環境の変化 (特に、世界的な研究交流、国際頭脳循環の停滞)
- Impact on investment in STI and R&D due to economic stagnation 経済活動の停滞、科学技術、研究開発に対する投資への影響
- \rightarrow Accelerating Open Science

Social cohesion in With-/Post-COVID-19 pandemic era

COVID-19 pandemicの先にある社会との結束

Expectations for Science, Technology and Innovation ٠

科学技術イノベーションへの期待

\rightarrow Prompt dissemination of "Accurate" and Comprehensible Information

"正確"でわかりやすい情報の迅速な普及

Two conspicuous retracted COVID-19 papers



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注目された取り下げ論文2報

This article has been retracted: N Engl J Med. DOI: 10.1056/NEJMc2021225.

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Hydroxychloroguine or chloroguine with or without a macrolide for treatment of COVID-19: a multinational registry analysis

Mandeep R Mehra, Sapan S Desai, Frank Ruschitzka, Amit N Pate

Summary

Background Hydroxychloroquine or chloroquine, often in combination with a second-generation r widely used for treatment of COVID-19, despite no conclusive evidence of their benefit. Although

The Lancet and The New England Journal of Medicine (NEJM) retracted two papers after a company declined to Provide the underlying data.

The LancetとThe New England Journal of Medicine(NEJM)に掲載された2報の 論文は、企業がデータセットの提供やアクセスの求めに応じず、取下げることとなっ た。

METHODS

Using an observational database from 169 hospitals in Asia, Europe, and North America, we evaluated the relationship of cardiovascular disease and drug therapy with in-hospital death among hospitalized patients with Covid-19 who were admitted between December 20, 2019, and March 15, 2020, and were recorded in the Surgical Outcomes Collaborative registry as having either died in the hospital or survived to discharge as of March 28, 2020.

RESULTS

Of the 8910 patients with Covid-19 for whom discharge status was available at the time of the analysis, a total of 515 died in the hospital (5.8%) and 8395 survived to discharge. The factors we found to be independently associated with an increased risk of in-hospital death were an age greater than 65 years (mortality of 10.0%, vs. 4.9% among those ≤65 years of age; odds ratio, 1.93; 95% confidence interval [CI], 1.60 to 2.41), coronary artery disease (10.2%, vs. 5.2% among those without disease; odds ratio, 2.70; 95% CI, 2.08 to 3.51), heart failure (15.3%, vs. 5.6% among those without heart failure; odds ratio, 2.48; 95% CI, 1.62 to 3.79), cardiac arrhythmia (11.5%, vs. 5.6% among those without arrhythmia; odds ratio, 1.95; 95% CI, 1.33 to 2.86), chronic obstructive pulmonary disease (14.2%, vs. 5.6% among those without disease; odds ratio, 2.96; 95% CI, 2.00 to 4.40), and current smoking (9.4%, vs. 5.6% among former smokers or nonsmokers; odds ratio, 1.79; 95% CI, 1.29 to 2.47). No increased risk of in-hospital death was found to be associated with the use of ACE inhibitors (2.1% vs. 6.1%; odds ratio, 0.33; 95% CI, 0.20 to 0.54) or the use of ARBs (6.8% vs. 5.7%; odds ratio, 1.23; 95% CI, 0.87 to 1.74).

cinnati (T.D.H.); the D€ medical Engineering, U

Salt Lake City (A.N.P.); a Institute, Nashville (A.I print requests to Dr. N and Women's Hospita Boston, MA 02115, or a .harvard.edu.

This article was publishe and updated on May 8, 2

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218-1.531). chloroquine with a macrolide (22.2%; 1.368, 1.273–1.469) were each Prof Mandeep R Mehra. Brighar f in-hospital mortality. Compared with the control group (0.3%), an increased and Women's Hospital Heart and Vascular Center and Harvard 935-2.900, hydroxychloroquine with a macrolide (8.1%; 5.106, 4.106-5.983), Medical School, Boston, 0-4.596), and chloroquine with a macrolide (6.5%; 4.011, 3.344-4.812) were MA 02115, USA an incr d risk of de-novo ventricular arrhythmia during hospitalisation. mmehra@hwh ha

nfirm a benefit of hydroxychloroquine or chloroquine, when used alone or with Interpretat Ne v nital outcomes for COVID-19. Each of these drug regimens was associated with decreased a macro on i in-hospit reased frequency of ventricular arrhythmias when used for treatment of COVID-19.

y Distinguished Chair in Advanced Cardiovascular Medicine at Brigham and Women's Hospital. Funding Willia

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Introduction

The absence of an effective treatment against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection has led clinicians to redirect drugs that are known to be effective for other medical conditions to the treatment of COVID-19. Key among these repurposed therapeutic agents are the antimalarial drug chloroquine and its analogue hydroxychloroquine, which is used for the treatment of autoimmune diseases, such as systemic lupus erythematosus and rheumatoid arthritis.12 These

drugs have been shown in laboratory conditions to have antiviral properties as well as immunomodulatory effects.34 However, the use of this class of drugs for COVID-19 is based on a small number of anecdotal experiences that have shown variable responses in uncontrolled observational analyses, and small, openlabel, randomised trials that have largely been inconclusive.56 The combination of hydroxychloroquine with a second-generation macrolide, such as azithromycin (or clarithromycin), has also been advocated,

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CONCLUSIONS

Two conspicuous retracted COVID-19 papers

注目された取下げ論文2報

Summarv

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The NEW ENGLAND IOURNAL of MEDICINE

ORIGINAL ARTICLE

Hydroxychloroguine or chloroguine with or without a macrolide for treatment of COVID-19: a multinational registry analysis

Mandeep R Mehra, Sapan S Desai, Frank Ruschitzka, Amit N Patel

In an examination of the most recent 200 academic articles published in 2020 that cite those papers, Science found that more than half-including many in leading journals-used the disgraced papers to support scientific findings and failed to note the retractions.

これらの取下げ論文を引用した2020年に発表された200論文を精査した結果、有力 誌を含むその半数以上が知見の裏付けとして引用、取下げについては示していなかっ た。

Referred 15 JAN 2021 NEWS SCIENTIFIC COMMUNITY BY CHARLES PILLER

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This article was publishe and updated on May 8, 2

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Funding William ev Distinguished Chair in Advanced Cardiovascular Medicine at Brigham and Women's Hospital.

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Introduction

The absence of an effective treatment against severe antiviral properties as well as immunomodulatory acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection has led clinicians to redirect drugs that are known to be effective for other medical conditions to the treatment of COVID-19. Key among these repurposed uncontrolled observational analyses, and small, opentherapeutic agents are the antimalarial drug chloroquine label, randomised trials that have largely been and its analogue hydroxychloroquine, which is used for inconclusive.56 The combination of hydroxychloroquine the treatment of autoimmune diseases, such as systemic with a second-generation macrolide, such as azithrolupus erythematosus and rheumatoid arthritis.12 These mycin (or clarithromycin), has also been advocated,

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Articles

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) Learning from a retraction

Published Online September 17, 2020 https://doi.org/10.1016/ S0140-6736(20)31958-9 See Editorial Lancet 2020; 396: 799

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for-authors





The publication and subsequent retraction^{1,2} in June, 2020, of the Article Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis, based on an alleged dataset associated with Surgisphere, prompted us to examine *The Lancet*'s peer-review processes to identify ways of further reducing risks of research and publication misconduct. As a result of this review, with immediate effect, we have made changes to the declarations we seek from authors, the data sharing statements we require for published research papers, and the peer-review process for similar papers based on large datasets or real-world data.

Changes to the signed declarations by authors in the author statements form will require that more than one author has directly accessed and verified the data reported in the manuscript. We will require that the authors who have accessed and verified underlying data are named in the contributors' statement. For research Articles that are the result of an academic and commercial partnership, one of the authors named as having accessed and verified data must be from the academic team. In addition, all authors will be asked to sign the author statements form to confirm they had full access to the data reported in their Article, and accept responsibility for submitting the Article for publication.

Journals that adhere to guidance from the International Committee of Medical Journal Editors require a data-sharing statement for papers that report results of a clinical trial.³ *Lancet* journals will now require all research papers, irrespective of method, to include a data-sharing statement that details what data will be shared, whether additional documents will be shared

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(eg, the study protocol), when data will become available, and by what access criteria data will be shared. Investigators should be aware that editors will take data-sharing statements into account when making editorial decisions.

All *Lancet* journals will now introduce additional peerreview requirements for papers based on large, realworld datasets. Editors will ensure that at least one peer reviewer is knowledgable about the details of the dataset being reported and can understand and comment on its strengths and limitations in relation to the research question being addressed. For studies that use very large datasets, editors will ensure that in addition to statistical peer review, a review from an expert in data science is obtained. Finally, we will explicitly ask reviewers if they have concerns about research integrity or publication ethics regarding the manuscript they are reviewing.

Throughout the COVID-19 pandemic the work of the research community in generating new knowledge has resulted in rapid advances in our understanding of severe acute respiratory syndrome coronavirus 2 and COVID-19. As trusted sources of information, the *Lancet* journals are committed to ensuring that our editorial processes will continue to be as robust as possible.

The Editors of the Lancet Group

The Lancet, London EC2Y 5AS, UK

- 1 The Lancet Editors. Expression of concern: Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis. Lancet 2020; **395:** e102.
- 2 Mehra MR, Ruschitzka F, Patel AN. Retraction—Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis. *Lancet* 2020; **395:** 1820.
- 3 Taichman DB, Sahni P, Pinborg A, et al. Data sharing statements for clinical trials: a requirement of the International Committee of Medical Journal Editors. Lancet 2017; 389: e12–14.