



OPINION no. 2021-42

“SCIENTIFIC COMMUNICATION DURING A HEALTH CRISIS: PROFUSION, VALUE AND ABUSE”

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Foreword by the COMETS chair

Like many other people, COMETS members were stunned to learn on 16 March 2020 that their busy lives, with constant comings and goings, long-distance travel, participation in symposia, public conferences or lectures, working lunches or even, for some, dinners in town, cocktail evenings, handshakes and hugs had suddenly come to an end. A new sedentary and isolated social life became the norm, with the increased use of video-conferencing tools with which we were not very familiar. Through them, COMETS defied fate—which appeared to want to reduce the committee to inaction—by continuing to meet and advance its work. At its meetings, members all spoke of the great unease they felt about the public treatment of scientific information: on the one hand, we had never seen so many researchers invited to speak in the mass media, which COMETS members could only welcome; but on the other, the word of scientists was being subjected to public controversy, threats and even virulent attacks by all sorts of people outside the world of science, whether so-called experts, charismatic personalities in search of glory, or polemicists.

Mere opinions, empirical observations, hasty conclusions drawn from these observations and rigorously proven results were all placed on an equal footing. Some argued that the exceptional situation gave everyone a licence to speak out on health issues. COMETS then felt obliged to recall, in a joint press release with the CNRS's Scientific Integrity Office, the importance of the validation procedures implemented by researchers in their research activities, even in emergency situations.

This then led COMETS to deliberate on scientific communication in general and, more specifically, on scientific communication during a health crisis, whether communication between scientists—which has changed substantially recently due to both open access to data and papers and the digitisation of journals; communication between scientists and the general public—which has undergone major upheavals with the development of the mass media, such as 24-hour news channels, and social media; and finally communication by scientists addressing political decision-makers—which has also been transformed by the transparency requirements imposed by the COVID-19 Scientific Council set up in early March 2020. This led to discussions on the conditions for successful scientific communication that would convey the scientific community's current state of knowledge and ensure it was fully understood. This Opinion is the outcome of these deliberations.

Because it was written in the heat of the crisis and the shortcomings it revealed, it will no doubt sometimes appear a little harsh in its wording. It is certainly not exhaustive either, as new questions always arise over time, inviting further work. Thus, after the controversies about masks, advice for stopping viral spread, medical treatment and lockdown, came those about tracing, testing, vaccination, the health pass, etc. Some may also regret the lack of advanced theoretical development; although COMETS unites all scientific disciplines, it includes very few specialists in social communication, which prevented concerted progress in this area. Despite these shortcomings, all its members thought it would be useful to publish this Opinion in order to share the collective debate. Indeed, the work of conceptualisation may come later, and in that case, this report will be very useful because, although imperfect, it provides a broad overview of the issues raised by scientific communication, its recent developments and the pitfalls encountered. Finally, it clarifies the specific status of researchers in public communication, and in particular their obligation to convey the current state of knowledge accurately and honestly, without any personal prejudice.

Moreover, all of us at COMETS hope that this report will help institutions to develop a policy on scientific communication so that, while preserving the freedom of expression of researchers, they disclose and make understood to the greatest number of people knowledge that is both reliable and intelligible, avoiding suspicions and unproductive discussions, as has too often been the case during this crisis.

I would like to take this opportunity to pay a heartfelt tribute to all the COMETS members, who spent a considerable amount of time preparing this Opinion. There were no less than 16 long and arduous online

working meetings devoted entirely to this theme, not counting the half-dozen plenary sessions where it was discussed at length. Each and every member is warmly thanked for their efforts, with a special mention for Lucienne Letellier, who took on the task of compiling the contributions and writing the final version.

Jean-Gabriel Ganascia
COMETS chair



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I. SUMMARY

In this Opinion, COMETS addresses the multiple forms of scientific communication in the context of the health crisis caused by the COVID-19 pandemic due to SARS-CoV-2. The hindsight of almost two years of crisis is drawn upon to make an initial assessment of the strengths and weaknesses of this communication. We first examine how the crisis has affected communication within the scientific community. We then show how the relevance of the communication offered to the public through various sources of information has been decisive in citizens' perception of the crisis and in their acceptance of the scientific discourse. We address the issue of the relationship between the remit of scientific experts and the imperatives of decision-makers. Finally, we discuss the difficulties faced by scientists when confronted with citizens' distrust of science and the emergence of 'scientific populism'.

The Opinion begins with a positive observation: knowledge about SARS-CoV-2 and COVID-19 has developed very rapidly due to an unprecedented mobilisation of the international scientific community, the sharing of data and an editorial policy of opening up publications, all of which are the consequences of the recent advances made possible by open science. However, COMETS also takes a critical look at certain editorial abuses and, in particular, at the violations of scientific integrity and ethical standards that accompanied the publication of questionable work on the treatment of COVID-19 with hydroxychloroquine. More generally, COMETS deplores the irresponsible behaviour of some researchers who are ignorant of, or deliberately disregard, the fundamentals of the scientific process, i.e. rigour, honesty, reliability and transparency of the methods used, with a critical peer review of publications. The abuses observed have serious consequences because of their impact on health and because they contribute to citizens' distrust of science and scientists. This mistrust is all the more difficult to overcome as knowledge about the virus and ensuing pandemic is constantly evolving, and any information that is considered true one day may be contradicted the next. Different sources of information—whether institutions, the press or media, but also social networks—have been decisive in informing citizens. COMETS wishes to underline the duty of the whole scientific community to share knowledge with the public and commends the difficult and indispensable work of journalists. However, it has to be said that there have been many abuses: some mainstream media have fostered communication that is deliberately polemical for its sensationalistic 'entertainment' value, thus maintaining the confusion between scientific truth and opinion. The media have also been used as a platform for scientists to develop questionable theories. New information mediators—internet and social networks—have also contributed to the public's disinformation and the spread of conspiracy theories. COMETS has attempted to analyse the reasons that have led some citizens to adhere to these conspiracy theories and how a wave of scientific populism, in which opinion takes precedence over scientific fact, has been propagated.

COMETS has also addressed the sensitive issue of the link between scientific expertise and political decision-making in a crisis context, and ultimately the acceptability of the expert's message when it is communicated to citizens.

In conclusion, crisis communication has uncovered a multifaceted and far-reaching crisis in scientific communication. One of the challenges in solving it is undoubtedly to raise the level of scientific culture of both citizens and policy makers, which is an ethical duty to which researchers must contribute.

II. FORMAL INTERNAL REQUEST

The COVID-19 pandemic caused by the SARS-CoV-2¹ coronavirus, which began in late 2019, has created a global health crisis of unprecedented proportions. It has called for urgent responses from the scientific community and healthcare professionals. Scientists have been widely called upon by politicians, who rely on their expertise to make decisions. Their voice has also been awaited by citizens worried about the uncontrollable spread of the virus.

The international scientific community quickly rallied in response to these challenges. Research results have been communicated faster than usual, revolutionising the time normally needed to validate scientific knowledge. Witnessing 'ongoing' research, citizens have been confronted with a profusion of often fluctuating information, the relevance of which they have found difficult to assess. They have also been faced with the scientific uncertainties, doubts and controversies that form part of the knowledge development process but that may be difficult for an uninformed public to grasp. The relevance of information targeting the general public through various sources—whether institutions, the media, but also social networks—has therefore been decisive in how citizens perceive the crisis and support the accompanying scientific discourse. While some media have endeavoured to communicate quality information based on scientific evidence, others have preferred a deliberately polemical, sensationalistic approach for its 'entertainment' value, which has contributed to the mistrust of some citizens towards science and scientists. The scientific community has also been uncomfortable with the media's treatment of certain news items, where equal weight was given to reliable research results, empirical observations, hasty conclusions drawn from these observations and mere opinions.

This COMETS Opinion addresses the multiple forms of scientific communication in the unprecedented circumstances of the health crisis. We examine their impact on the transmission of knowledge. We ask how scientific communication and trust in science may be reconciled in a context of strong media pressure pitting opinions against scientific evidence. We address the issue of the relationship between the remit of scientific experts and the imperatives of decision-makers. Finally, we discuss the difficulties inherent in communication when scientists are confronted with citizens' distrust of science and a type of 'scientific populism'. We conclude with recommendations to encourage knowledge-sharing and honest, responsible and non-partisan scientific communication to inform public debate.

¹ COVID-19 (Coronavirus Disease 2019) is the name assigned by the World Health Organization to the disease caused by the SARS-CoV-2 coronavirus.

Preliminary remark

Written between June 2020 and August 2021, this Opinion takes stock of events up to that date. The authors are aware of the limitations of an analysis made in the heat of the moment and in an ever-changing crisis context. Nevertheless, we believe that this Opinion is justified by the novel aspects of scientific communication that it addresses, which are likely to have an impact beyond the health crisis.



III. ANALYSIS

A. . Impact of the health crisis on scientific communication

Communication is inherent to the practice of science. The transmission, exchange and sharing of knowledge takes place mainly through publications in specialist journals. Validated by peers, the results are then intended to be communicated outside the scientific sphere to inform the public and potentially support political decision-making. However, the health crisis has profoundly changed this pattern of communication. The editorial policies of scientific journals have been relaxed, and the opening up of data and publications has allowed potentially important results to be released without delay. Preprint platforms have stimulated discussions between scientists. The research community has been very active in immediately informing the public of knowledge gained. The media in all their diversity have been ubiquitous mediators of such information.

The success of any communication is measured by its ability to provide information in a rigorous, honest and objective manner so that everyone can form their own opinion. During the health crisis, these objectives have been only partially achieved. There are many reasons for this.

(i) Communication between scientists has undoubtedly been very enriching, but also marked by malfunctions that have impacted both the scientific community and the public.

(ii) The very purpose of scientific communication has been hijacked by some media, which have used it as a marketing tool. They have thus helped perpetuate the confusion between scientific truth and opinion, a confusion that has been fuelled by several research players who have little respect for the principles of scientific integrity and who have used these media to convey messages of questionable purpose.

(iii) Social networks and various blogs have served as a forum for research players to communicate scientifically questionable information, not validated by peers, serving to defend ideological positions on subjects far removed from their professional competence² while fostering confusion between their expression in a personal capacity and in the capacity of their institution³.

(iv) As knowledge about the virus and ensuing pandemic is constantly evolving, information that is considered true one day may be disputed the next. However, in the anxiety-filled context of the pandemic, the public cannot be satisfied with answers that appear ambiguous or uncertain, although the latter merely reflect the evolving phases of research. This unsettling situation may lead the public to choose the information that reassures them or confirms their opinion. This behaviour is further exacerbated by the fact that the mainstream media, relayed by social networks, promote what panders to their audience.

(v) The fear aroused by the pandemic has encouraged the search for outlets that some citizens find in social media that convey disinformation or even conspiracy theories on a large scale.

Nearly 18 months after the beginning of this ongoing health crisis, it seemed appropriate to take stock of the abundant scientific communication it has generated. Identifying and analysing the strengths and weaknesses

² *Academic debates and the complexity of the HCQ controversy. Debaz et al.*

³ *See the CNRS statement of 24.8. 2021 (in French): "le CNRS exige le respect des règles de déontologie des métiers de la recherche" [the CNRS demands compliance with the ethical standards of the research profession]*

of this communication, its excesses and abuses, requires an understanding of the expectations and aims of the different players involved, and how their discourse was audible to some and inaudible to others.

B. Communication within the scientific community

As a foreword to this chapter, we should stress **the strong mobilisation of the international scientific community** from the outset of the COVID-19 pandemic. In France, this mobilisation concerned not only the [health and life sciences](#)⁴ but all research disciplines, from mathematics and computer science to the [humanities and social sciences](#)⁵ (HSS). Numerous calls for projects were issued in unprecedented time frames by research organisations, universities and research agencies. Exceptional project selection and [funding](#) procedures were set up. While this responsiveness is to be commended, it must be noted that it has been accompanied by a certain lack of coordination and communication between institutions and between researchers, as highlighted in a [Senate](#) briefing note.⁶

The responsiveness of institutions should not obscure the fact that for several decades virology research has been a poor relation of biology, though AIDS research is an exception. COMETS can only agree with the analysis of virologist [Bruno Canard](#), a CNRS specialist in the replication of RNA viruses, including coronaviruses. Long-term research is needed to anticipate changes in the viral world and "fundamental science is our best insurance against epidemics".

1. Publishing science. Some welcome initiatives, but also some abuses

SARS-CoV-2 and the COVID-19 pandemic have been the subject of considerable research, some of which has had an impact on health policy and the economy. This is reflected in the 272,000 papers and 42,000 preprints listed for 2020 in the [Dimensions](#)⁷ database. It will be very interesting to analyse the future of this abundant literature with the benefit of hindsight, but we can already highlight its strengths and weaknesses.

a. Sharing research data and opening up publications

The speed at which knowledge about SARS-CoV-2 has been acquired and shared is remarkable. Data on the virus have been freely available to researchers since its identification in early January 2020, and its genome made openly available on the [GISAID](#)⁸ platform and on both the [COVID-19 Data Portal](#) and the [Research Data Alliance](#) (RDA) portals. The [PubMed Central](#) (PMC) platform has allowed extensive open access to published papers.

⁴ For a summary, see: "COVID-19 un an après : mobilisation générale au CNRS" [One year after COVID-19: general mobilisation at the CNRS] CNRS info, 30 March 2021.

⁵ "Les sciences humaines et sociales face à la première vague de la pandémie de COVID-19 : enjeux et formes de la recherche" [The humanities and social sciences in the context of the first wave of the COVID-19 pandemic: research issues and forms]

⁶ "Le manque de stratégie nationale de recherche sur la COVID-19 et l'absence de structure de pilotage unique" [The lack of a national research strategy on COVID-19 and the absence of a single governance structure]. Note of 8 April 2020.

⁷ COVID in papers: a torrent of science. *Nature* 588, 553 (2020).

⁸ GISAID: Global Initiative on Sharing Avian Influenza Data.

Open access to the data means, among other things, that the data's reliability can be checked, as illustrated by an analysis⁹ of the virus genome's phylogenetic network¹⁰, the scope of which was expected to have profound implications for understanding and managing the COVID-19 pandemic. The impact of the paper was immediate ([Altmetrics score](#): 7016). However, after re-analysis, an international consortium of 37 researchers concluded that the data were biased and [unreliable](#), forcing the publisher to issue a correction. The self-correction mechanism worked well in this case for both the scientists and the publisher. All these initiatives are **a strong indication of the need to consolidate open science**.

In response to the need to communicate research results in a timely manner, **the publishers of scientific journals have "adapted" their editorial standards**. [EASE, the European Association of Scientific Editors](#), acknowledged the need to reduce the time taken to provide information¹¹. Some publishers decided to accept the publication of preliminary results and have admitted that they were assessed by the publishers themselves or by a single expert. [EMBO Press](#)¹² and Wiley agreed to publish all manuscripts and source data related to COVID-19 without an article processing charge (APC) and to make them immediately available under open access conditions. They also consented to share the information with the World Health Organization.

In the HSS, journals and book editions have adapted their content to the fields of knowledge relevant to overcoming the health crisis and emergency. Thus, since the first lockdown in 2020, law journals have been publishing articles on the right of workers to withdraw from work, the constitutionality of restrictions of freedom or the recognition of COVID-19 as an occupational disease. [Numerous articles and books](#) have been published in sociology, economics, political science or demography, ranging from analyses of the consequences of the health and economic crisis on professional inequalities or education, to political outlooks on the "post-crisis world"¹³. It is still too early to assess the scope and impact of the abundant literature published in 2020, but it bears witness to an **unprecedented mobilisation of the scientific community, its creativity and its capacity to serve society**.

Nevertheless, we cannot ignore the abuses that have accompanied this mobilisation, some of which have had an impact beyond the scientific community.

b. Failures in the management of research data

The retractions of two major studies published in internationally renowned medical journals—The Lancet and the New England Journal of Medicine (NEJM)—are indicative of dysfunctional editorial processes. They also raise **the fundamental question of the researcher's responsibility**, particularly when the impact of published work goes beyond the scientific community and leads to political decisions taken in a time of urgency that have direct repercussions on citizens' health. On 22 May 2020, The Lancet published a study

⁹ P. Forster et al. *Phylogenetic network analysis of SARS-CoV-2 genomes*. *Proc. Natl. Acad. Sci. USA* 117, 9241 – 9243 (2020).

¹⁰ To understand how the virus had spread from Wuhan to Europe and North America, researchers reconstructed the evolutionary pathways of the virus by analysing the first 160 viral genomes of COVID-19 patients using phylogenetic network techniques.

¹¹ "In times of crisis it may not always be possible to obtain all required data, and that reporting may—of necessity—be curtailed. To avoid misinterpretation, but also to facilitate the rapid sharing of information, we encourage editors to ensure that authors include a statement of limitations on their research. This will inform readers and strengthen the usefulness of any published research."

¹² EMBO Press policies related to the COVID-19 pandemic: How we support scientific communication during the COVID-19 pandemic, 27 March 2020 (updated 8 April 2020)

¹³ "La pandémie interroge notre façon de faire de la recherche en SHS" [The pandemic is challenging the way we do research in the HSS] CNRS info 14.1.2021

based on data collected by Surgisphere¹⁴, and focusing on the use of hydroxychloroquine (HCQ) to treat COVID-19¹⁵. On 24 May 2020, more than 200 scientists co-signed a letter to The Lancet's editor-in-chief, Richard Horton, criticising the [conditions under which the data were obtained](#) and their statistical analysis¹⁶. On 4 June 2020, [the article was retracted](#) as three of the four authors admitted that they had been unable to confirm the veracity of the primary data sources.

On 1 May 2020, NEJM [retracted](#) another paper¹⁷ with the same lead author, Mandeep Mehra, and whose data also came from Surgisphere. The speed with which these articles were withdrawn (in 3 days!) illustrates the exceptional mobilisation of the international scientific community and bears witness to more than ten years of worldwide efforts to gain acknowledgement of the importance of research integrity¹⁸. However, it cannot hide the many malfunctions that have accompanied such publications¹⁹, which call into question the authors themselves in addition to the editors and reviewers. That the authors of the paper were not concerned about the lack of access to the raw data is indicative of the race to publish, exacerbated by the crisis. Horton, The Lancet's editor-in-chief, admitted in an interview with Le Monde that "*no one ... knew the exact status of the data, and there are no independently verified or validated data to support what the article says.*" It is opportune to consider the limitations of the peer review process, which has been undermined. In their open letter to Horton¹⁴, the 200 researchers demand access to reviewers' comments. This access, which was instigated by a few publishers (EMBO J. for example) several years ago, makes perfect sense in such circumstances and deserves to be generalised.

Such misconduct also raises questions about the ethical issues raised by the management and commercialisation of research data by private companies.

The retraction of The Lancet's publication had repercussions among national and international institutions in charge of [clinical trials](#) on [hydroxychloroquine](#). Its high media profile—it was described by Le Monde as [Lancetgate](#)—reflects negatively on research at a time of crisis when society is particularly looking for answers from scientists and the medical world.

2. Violations of scientific integrity and ethical standards with serious consequences

In response to the urgent need to find therapeutic solutions for COVID-19, some research and health professionals argued that medical intuition or "common sense" would be sufficient to decide on the effectiveness and safety of a treatment. They declared themselves to be advocates of 'treatment ethics' as opposed to 'research ethics'²⁰. This discourse was used by Didier Raoult and his team at the Marseille university hospital institute (IHU) to promote the treatment of COVID-19 with HCQ, a long-established antimalarial drug. Widely open to the public, under conditions that did not respect the rules of medical ethics, this treatment was the subject of a media and political frenzy even though its effectiveness on COVID-19 was based only on a questionable clinical study. The abuses that accompanied the publication of this study

¹⁴ Surgisphere is a private US company founded in 2008 that analyses anonymised health data from hospital patients.

¹⁵ Mehra et al. *The Lancet*, 2020, doi: 10.1016/S0140-6736(20)31180-6

¹⁶ Open Letter to M.R. Mehra et al. and to Richard Horton, Editor of the Lancet: "Concerns regarding the statistical analysis and data integrity", 2020, doi: 10.1016/S0140-6736(20)31180-6

¹⁷ Mehra et al. *N. Engl. J. Med.* 2020, doi: 10.1056/NEJMc2021225

¹⁸ It took *The Lancet* 12 years to retract Wakefield's fraudulent work on the relationship between autism and the MMR (measles, mumps, rubella) vaccine; *The Lancet*, 351, 637, (1998). Even though it was retracted, the paper continues to be cited. It contributes to the mistrust of some people towards the vaccine and is a reference within the anti-vax movement.

¹⁹ "COVID-19 retractions raise concerns about data oversight", *Nature*, 582, 160 (2020):

²⁰ Lutte contre le COVID-19: "La médecine ne relève pas d'un coup de poker" [Combating COVID-19: medical science is not a gamble] [Opinion piece \(in French\) written by a group of healthcare workers and researchers](#)

in the *International Journal of Antimicrobial Agents*²¹ alerted the scientific community²² (see ANNEX 1). They are edifying: accepted 24 hours after its submission, the paper had a huge international impact²³; as soon as it was published, it was criticised for its [methodology](#) (elimination of cases, statistical bias, lack of robust evidence) and gave rise to [comments](#) on the peer review process, one of its signatories—Jean-Marc Rolain—also being the journal's editor-in-chief. In response to pressure from the scientific community, the paper was re-assessed after publication. The expert appraisal, made public by the journal²⁴, recommended that the paper be withdrawn; this did not happen, however, as the editor-in-chief preferred simply to "open it up for discussion". We can only deplore a decision that calls into question the peer review process and goes against the unanimous criticism of the peers.

Nearly 40% of the articles published in the *International Journal of Antimicrobial Agents* since its creation in 2013 have been co-authored by its editor-in-chief, Jean-Marc Rolain, and one or more members of the Marseille IHU, including Didier Raoult.²⁵ Such conflicts of interest cast suspicion on the validity of their work and are all the more objectionable as this self-promotion contributes to the authors' career advancement and research funding, both of which are contingent on the number of papers published²⁶.

The article by Didier Raoult and his team forces us to question the responsibility of the authors in view of the enormous impact of their results in terms of healthcare. It is worrying that such an inconclusive study attracted so much public support, whose effects were subsequently impossible to rectify. As we discuss below, this situation brings together many of the ingredients of what amounts to **'scientific populism'**.

The controversies surrounding the effectiveness of HCQ led several teams to conduct new studies. Following the publication of one of them²⁷, which did not confirm the clinical effectiveness of HCQ, its [authors](#) were subjected to a violent campaign of **cyber harassment** on social networks, including death threats²⁸. This situation was also experienced by three head doctors who wrote about it in an article published in *The Lancet*²⁹. Such behaviour, which is exacerbated by the new mediators of information that the internet and social media have become, **is totally unacceptable and we denounce it in the strongest terms.**

COMETS is also concerned about attempts to judicialise the scientific debate for the purpose of intimidation and has released a [statement](#) to this effect (ANNEX 2). It should be remembered that, as long

²¹ Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non randomized clinical trial. P. Gautret et al., *International Journal of Antimicrobial Agents* (2020) (doi:10.1016/j.ijantimicag.2020.105949).

²² The many violations of scientific integrity and ethical standards alerted the scientific community: at the CNRS, the Conference of Presidents of the National Committee (CPCN) stated this in a motion; COMETS and the CNRS Scientific Integrity Office signed a joint release (see ANNEX 1). Let us also mention the statement of the academies of medicine, pharmacy and science. Finally, this mobilisation took on a European dimension with the publication of an ENRIO statement.

²³ Publishing in face of the COVID-19 pandemic. Editorial. *International Journal of Antimicrobial Agents*. 2020, 56, 106081

²⁴ Frits Rosendaal, Review of "Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non randomized clinical trial" *Jul;56(1):106063*: "This study suffers from major methodological flaws that make it almost, if not completely, uninformative. Therefore, the tone of the paper, in presenting this as evidence of an effect of hydroxychloroquine and even recommending its use, is not only unfounded, but—given the desperate demand for treatment for COVID-19, coupled with the potentially serious effects of hydroxychloroquine—totally irresponsible".

²⁵ Publication by association: how the COVID-19 pandemic has shown relationships between authors and editorial board members in the field of infectious diseases. Locher et al. *BMJ Evidence-based Medicine*. 2021. DOI: 10.1136/bmjebm-2021-111670

²⁶ It should be remembered that funding for institutions with medical research activities is calculated on the basis of SIGAPS points. SIGAPS (Système d'Interrogation, de Gestion et d'Analyse des Publications Scientifiques) is a French bibliometric system used to consult, manage and analyse scientific papers based on the number of publications, the SIGAPS score being calculated according to the journal's category.

²⁷ Fiolet et al. Effect of hydroxychloroquine with or without azithromycin on the mortality of COVID-19 patients: a systematic review and meta-analysis. *Clin Microbiol Infect* (2020)

²⁸ Peiffer-Smadja et al., Hydroxychloroquine and COVID-19: a tale of populism and obscurantism

²⁹ Samer C, Lacombe K, Calmy A. Cyber harassment of female scientists will not be the new norm. *Lancet Infect* 2020 Dec 23:S1473-3099

as they are based on tangible factual data, the discussion of published hypotheses and results and the questioning of evidence procedures are part of a researcher's normal activity.

We will conclude this chapter by recalling that the tensions between "medical research" and "medical care", between the urgency of care and the obligation of rigour, even if they pose particularly painful ethical problems, should not prevent researchers from taking an upright approach.

3. Unprecedented increase in preprints. Progress but abuse too

Preprints offer scientists the opportunity of being their own publisher by uploading the results of their research to archive platforms free of charge³⁰. Usually intended for publication in scientific journals, preprints allow for a rapid and spontaneous discussion open to all, but as they are not peer-reviewed, they do not have the status of scientific papers.

Some disciplines—in particular physics, mathematics and economics—adopted the use of preprints several years ago.

With the health crisis, they have seen [unprecedented development](#) in the health and life sciences³¹. Thus, by early 2021, there were more than [10,000 articles](#) related to COVID-19 on the medRxiv server, created in 2019 for medical preprints, and nearly [3,000 preprints](#) on the bioRxiv server.

There have been instances of abuse, however. Results were made public by the media, which failed to point out—at least at the beginning of the health crisis—that preprints are not peer-reviewed. [Twitter](#) was used to relay preprints, some of which were shared more than 10,000 times, thereby contributing to the spread of [disinformation](#). It was said, for example, that the sequences of SARS-CoV-2 and HIV, which causes AIDS, were similar—an assertion rapidly [refuted](#) thanks to the responsiveness of scientists. Some academic networks have also unwittingly contributed to the confusion between preprints and published papers. This is the case, for example, of [IZA](#), an international network of labour economists whose preprints—listed under the heading "IZA publications"—have received worldwide media attention.

Preprints are a real asset for the scientific community, and the pandemic has helped to promote their use, but they can also represent a risk—especially in times of crisis—when "misused" by the media, politicians, or even by unscrupulous scientists!

4. Are we moving towards the development of 'virtual' communication between scientists?

The pandemic has changed the way researchers communicate with each other. The impossibility of organising national or international scientific meetings in person has encouraged "[virtual](#)" means of communication using networked computer resources. The negative aspects of this mode of communication—loss of social ties and the benefits of informal discussions, technical constraints or unsuitability in the particular case of (competitive entry) examinations, etc.—should be set against the many positive points. One of them was to break down the isolation of researchers during the pandemic and lockdown. Other advantages are likely to have more lasting repercussions, such as a gain in flexibility by freeing up the rigidly structured organisation of congresses, and a greater international opening of conferences to researchers

³⁰ COMETS Opinion no. 2019-40 COMETS: *Publications in the open science era*

³¹ Pierre Corvol. *L'envolée des publications scientifiques au temps de Covid-19. Séparer le bon grain de l'ivraie. [The upsurge in scientific publications during COVID-19. Separating the wheat from the chaff.] Médecine/Sciences 2021*

who, for lack of financial resources, cannot participate. By reducing travel, virtual communication also allows substantial savings, helps reduce the [carbon footprint](#) and is in line with the proposals of the [Labos 1point5 collective](#) for more environmentally-friendly science. Its long-term success will also depend on the ability of organisers to find a suitable and attractive virtual format!

C. Scientific communication addressing the general public

1. The scientific community serving public information

It should be remembered that sharing knowledge with the public is one of the duties of researchers, many of whom have been successfully involved since the beginning of the health crisis. The [scientific community](#) and institutions ([CNRS](#), [INSERM](#), [INRAE](#), [Institut Pasteur](#), Universities, etc.) have helped to inform the general public, the written press and various media on both the virus itself and the COVID-19 pandemic. [The French Academy of Sciences](#) made public their online conferences. Numerous articles, podcasts and videos were broadcast. One such production is the web series “[Diffusons la Science / Pas le virus \[Let’s spread science, not the virus\]](#)”, which gave scientists the chance to talk and provide the public with reliable data, or the public outreach performed by “[Grand Labo](#)”. We should also mention the remarkable work of the online journal [The Conversation](#), which gives a voice to academics from all walks of life, particularly from the humanities and social sciences, who have been particularly responsive in this time of crisis. While these initiatives have enabled the transmission of reliable and validated knowledge, they have not completely ruled out abuses. Some information was thus diverted from its initial goal³² or led to [defamatory rumours](#)³³, forcing the French Ministry for Higher Education, Research and Innovation (MESRI) to open up a [platform](#) to denounce these rumours and giving access to reliable scientific content from the major French research organisations.

2. Scientific information in the media

The media's handling of the health crisis has been a determining factor in citizens' perception of the pandemic and in their acceptance of the scientific discourse. ‘Slow’ media such as the press or certain TV programmes, have offered informative communication but only reached a limited audience. In contrast, ‘fast’ or even ‘ultra-fast’ media such as 24-hour news channels have reached a wider audience while often focusing on entertainment value at the expense of science per se. The success—and failures—of this crisis communication are also dependent upon the presence in the media of scientific experts to inform debates, a challenging task in a context of constantly-evolving knowledge conducive to conjecture. Intellectual honesty would require experts to communicate the most relevant hypotheses and evidence, to disclose uncertainties, to acknowledge the limits of their knowledge and even to point out their mistakes, all of which can only be

³² One example is a well-documented and scientifically rigorous article (in French) published by the CNRS journal examining all the hypotheses on the origin of SARS-CoV-2. From its title, “Almost one year after the SARS-CoV-2 coronavirus was identified, researchers still have not determined how it could have been transmitted to humans. Virologist Etienne Decroly reviews the various hypotheses, including that of an accidental escape from a laboratory”, the media, for the most part, only retained the hypothesis of an accidental escape from a laboratory, thus demonstrating the perverse effect of catchy titles!

³³ The Institut Pasteur was accused of creating the SARS-CoV-2 virus and then releasing it in the town of Wuhan to cause a pandemic and place the fault on the Chinese authorities.

done if the media grant the time needed for explanations. We will see that, for various reasons, these conditions have not always been met.

c. The challenges to scientific journalism raised by SARS-CoV-2

The commitment of journalists from the daily press and certain print, radio and television magazines³⁴ is to be commended, as is the explanatory and educational work of [science journalists](#). Tasked with urgently reporting on the progress of research or the pandemic, they were daily confronted with an influx of results likely to have an impact on the health of citizens, contradictory information, pressure from social media, untimely declarations and more.

The health crisis has revealed how indispensable science journalism is. Dialogue between journalists and researchers also needs to be strengthened, not only to inform but also, as the journalist Sylvestre Huet pointed out, to "act effectively and [combat ignorance](#)".

Science has been in the media spotlight during this crisis and the public's demand for information is continuing to grow. We cannot, however, ignore the fact that the future of science journalism remains [uncertain](#)³⁵, as shown by the [merging](#) of the monthly magazine "La Recherche" with "Sciences et Avenir"³⁶ at the beginning of 2021 and, more generally, by the insufficient number of science journalists in the media.

In this context, the creation of a "House of Science and Media"³⁷, provided for in the French multi-annual programming act and designed along the same lines as the UK [Science Media Centre](#), requires particular attention to ensure that scientists are involved, in addition to the communication departments of institutions and science journalists from the various media. It also requires vigilance to avoid any shaping of information and pressure from lobbies.

d. Scientific communication and the mass media: the abuse of science as sensationalistic entertainment

While some media have endeavoured to communicate quality information based on scientific evidence, others have preferred a deliberately polemical, sensationalistic approach for its 'entertainment' value, which has contributed to the mistrust of some citizens towards science and scientists.

In a period of crisis, when public demand is high, mass television broadcasting services—including 24-hour news channels—should ideally be used to inform citizens. However, competition and financial pressure lead them to prioritise strategies aimed at gaining the largest audience. In the first few months of the health crisis, these media repeatedly disseminated anxiety-provoking information almost 24 hours a day, giving it considerable resonance and mixing scientifically-established facts with mere conjecture or even rumours without either contextualising or querying them. However, trying to debunk nonsensical information through rational argumentation is very costly. [Brandolini's law](#), or the 'bullshit asymmetry principle', is an internet adage that emphasises how difficult it is: "The amount of energy needed to refute bullshit is an order of magnitude bigger than to produce it"!

³⁴ These include daily programmes such as "La Méthode Scientifique" by Nicolas Martin on France Culture, "La Terre au carré" by Mathieu Vidard on France Inter and the excellent informative work of the doctor and journalist [Damien Mascret](#).

³⁵ In disagreement with the editorial policy of their owner Reworld Media, almost the entire editorial staff of the science magazine "Science & Vie" resigned at the end of March 2021 and launched [a new science magazine](#)

³⁶ The journal is now called "Sciences et Avenir - La recherche"

³⁷ The multi-annual programming act provides for the creation of a House of Science and Media to "promote rapid contact between journalists and researchers and access by citizens to reliable scientific information, and to strengthen the contribution of scientific insights to public debates on major current issues".

Some audiovisual media also give people the impression that they are actually taking part in debates on ideas, by organising falsely contradictory forums between scientists and guests who are described as experts but whose arguments are unscientific and deliberately polemical. Discussions are therefore organised not in well-argued terms suited to controversies but in more 'sellable' terms of power relations. It is then difficult for a scientist who is thus 'cornered' to convey the fact that it is not about confronting opinions but presenting knowledge, with its share of doubt and uncertainty. The responsibility of researchers (and sometimes that of the organisation that employs them) may be engaged even though they have no control over the use that is made of their words. However, it is also clear that some scientists are adding to the confusion of messages addressed to the public through their deliberately provocative and unscrupulous, even irresponsible, statements.

In the mainstream media, we have heard over and over again the terms 'renowned professor', 'prestigious scientist' or 'eminent researcher'. These expressions, used excessively, may have given the public the feeling that, because of their status, single individuals were the bearers of 'scientific truth'. COMETS has repeatedly stated in its Opinions, and the scientific community as a whole acknowledges, that truth is expressed collectively and not by the voice of a single person, even if he or she is the recipient of prestigious awards³⁸ or the author of numerous publications.

D. Scientific communication addressing policy makers: experts to inform their decisions

COMETS has addressed the issue of [scientific expertise and appraisals](#) on several occasions. It should be remembered that the expert's role is to act as an intermediary between the 'producers of knowledge' and the clients to whom he/she provides scientific advice, in complete independence, objectivity and transparency. The expert is therefore expected to master knowledge at the highest level in a field of competence and to pass it on, specifying whether it is established fact and with what margin of uncertainty, or whether it is a matter of hypotheses still under debate. In a crisis situation and a context of uncertainty, their task is a particularly challenging one. Indeed, the knowledge they transmit is likely to be called into question at any time as scientific knowledge evolves. Furthermore, the factual and objective information provided by the expert (or group of experts) may conflict with the decision-making choices of the politician. The health crisis provides an example of the difficulties of communication between scientific experts and policy makers³⁹. The latter have set up several structures. [CARE](#) performs a rapid scientific expert appraisal at the request of the government, to which it sends its opinion. The [COVID-19 Scientific Council](#), which works closely with CARE, provides the government with information on the status of the health crisis and the measures planned to address it. Unlike CARE, the Scientific Council shares its opinions with the public. This requirement for transparency places it in a difficult situation: when the executive follows its recommendations, the Council is accused of taking the place of politicians and exercising what has sometimes been erroneously called—by misusing a concept introduced by the philosopher Michel Foucault—a 'biopower'. When the executive departs from them, it is said to have been rejected. While laudable in principle, transparency can only be enforced if those for whom the information is intended are able to assess the credibility of the expert appraisal

³⁸ *In this respect, it is worth mentioning the disastrous impact on the public of the word of Prof. Montagnier, winner of the Nobel Prize in Medicine in 2008, when—interviewed on the CNews channel—he used a debunked Indian study to assert that SARS-CoV-2 was made from the AIDS virus.*

³⁹ *L'expertise scientifique au défi de la crise sanitaire [Scientific expertise and the challenges of the health crisis]; L. Nouaille-Degorce ENA research papers, 2020-09; Collection "Administration et gestion publiques".*

and weigh up the uncertainties. Finally, we must also recognise that “scientific reality sometimes involves the words that nobody in politics likes to utter: I don’t know”⁴⁰.

The health crisis has undoubtedly brought scientists closer to political decision-makers, but if scientists are to have an authoritative voice among politicians, it is essential that the latter be better trained in scientific thinking and procedures⁴¹.

E. Mistrust of science. When the scientist’s word comes up against ‘scientific populism’

Social representations have played a key role in the difficulties inherent to scientific communication⁴². While some of these appear irrational to scientists, it is not enough to simply denounce their invalidity. Indeed, it is only by understanding their origin and the reasons behind them that we will be able to combat the obscuring effects they exert on proven knowledge and prevent a rift from developing between researchers and citizens. In response to the health crisis, citizens are divided among several attitudes ranging from trust in science to mistrust and full-blown opposition⁴³. For some, trust follows the progression of knowledge on the virus, and the word of scientists is considered legitimate. For others, less familiar with the scientific approach, mistrust prevails. Fuelled by fear of the disease and by certain questionable political decisions, it extends to everything that has anything to do with the virus (PCR tests, wearing masks, the usefulness of lockdowns and vaccination, etc.). Citizens’ distrust of proven scientific facts goes beyond the medical context and has analogies with the mistrust of political power. This is why some people have put forward the still uncertain concept of **‘scientific populism’**, by analogy with political populism.

The concept of political populism was born two centuries ago and has taken on very different meanings depending on the political regime to which it has been applied. In its current general meaning, the word ‘populism’ refers to a political approach tending to oppose the people to political, economic or media elites. The word ‘populism’ refers to the people considered to be excluded from the exercise of a power that they believe is cut off from the reality at grassroots level, even if its representatives have been democratically elected. In extreme cases, populist currents suspect political leaders of corruption and attack the democratic foundations of the state. This line of political thought can take on demagogic aspects by advocating and supporting simplistic solutions to various social problems. One feature of scientific populism is similar to that of political populism: it gives the illusion of being able to access ‘knowledge’ without going through the bodies that validate scientific fact. The political populist seeks consensus without referendum representativeness, while the scientific populist relies on opinion without academic representativeness.

In the context of the health crisis, the undivided support of a part of the population for the HCQ treatment advocated by Didier Raoult has certain features of scientific populism: mistrust of those who speak out but do not provide immediate answers to the questions posed; preference for simple and reassuring solutions; distrust of elites supposedly ignorant of the realities at grassroots level; opposition of regional communities

⁴⁰ Stanislas Lyonnet, director of the IHU Imagine in “*AEF info*”

⁴¹ COVID-19, la recherche en première ligne : comment les scientifiques sont devenus les conseillers du pouvoir [COVID-19, research on the front: how scientists have become government advisers] *AEF info*

⁴² Social representations cover all the beliefs, knowledge and opinions that are produced and shared by individuals in the same group with regard to a given social object.

⁴³ [Les Français ont-ils encore confiance dans la science \[Do the French still trust science?\]](#). *The Conversation*. Luc Rouban. 27.4.2020

far from the Parisian centre of gravity for decision-making; rejection of the assertions of scientists deemed compromised by their proximity to the political body they advise; finally, a form of fascination exercised by a 'charismatic personality' who asserts him/herself through his/her challenges against academic representativeness.

The populist tendency of science can also be upheld by a politician. Thus, Philippe Douste-Blazy, former minister and professor of public health, and Christian Perronne, professor of medicine, initiated an [online petition](#) in early April 2020 asking the government to accelerate the procedures for making HCQ available as a treatment, and collected nearly 600,000 signatures! A few days later, a [poll](#) was published in *Le Parisien*, and widely reported in other media, on the public's 'belief' in the effectiveness of HCQ⁴⁴. It is a matter of concern that the choice of a treatment can be decided by public opinion on the basis of a petition or a poll, and that political decisions can be made on the basis of irrational beliefs or arguments, appealing only to fear or emotion.

Conspiracy theories⁴⁵ are also used to fuel scientific populism and go beyond mere distrust of science. The 2h40min-long documentary film "[Hold-Up](#)" released online in late 2020 is an edifying example⁴⁶. Its simplistic, conspiracy-driven discourse, mixing the truth with untruth, was widely reported in the media and on social networks, and thus contributed to the disinformation of citizens about the COVID-19 pandemic. Needless to say, the fallacy of the discourse and its polemical nature have been denounced by scientists and alerted the [Academies](#)⁴⁷. Nevertheless, as pointed out in the [COMETS Opinion](#) on post-truth, the belief in fake news is often difficult to combat even when it is proven false.

F. Conclusions

The mobilisation of the scientific community and its commitment to sharing information within unprecedented time frames have undoubtedly been beneficial in advancing knowledge about the SARS-CoV-2 virus and the COVID-19 pandemic. The successes and the value of this communication cannot, however, allow us to overlook the abuses. The legitimacy of scientists' opinions has been questioned in many circumstances. Through irresponsible or even deliberately provocative statements, some scientists bear part of the responsibility for this. This inappropriate communication has made it difficult to access clear, understandable and evidence-based scientific information.

The anxiety-inducing context of the health crisis has added to some citizens' mistrust of science. Lacking the scientific knowledge to make their choices, they have preferred irrational attitudes fuelled by social media whose influence has shaped public opinion without any respect for truth, and this to the detriment of democratic debate.

⁴⁴ COVID-19: 59% of French people believe in the efficacy of chloroquine. Poll published by *Le Parisien*, 6 April 2020

⁴⁵ [Pourquoi croit-on. \[Why do we believe?\]](#) Thierry Ripoll. *Le Monde. Apocalypse cognitive [The cognitive apocalypse]* G rald Bronner; (2021) ed. PUF

⁴⁶ "Hold-up" : les huit personnages cl s qui font une bonne th orie du complot. ["Hold-up: the eight key characters who make a good conspiracy theory] *The Conversation*, 17.11.2020. "In psychology, belief in a conspiracy theory tends today to be understood as the result of cognitive mechanisms common to all... By simplifying reality, it allows us to quickly understand how the world works, thus provoking a feeling of control, while meeting other conspiracists and thus forming a social circle."

⁴⁷ [Joint statement](#) by the French Academies of Sciences, Medicine, Pharmacy and Technologies

The crisis needs to be seen in a longer time frame. If minds had been better prepared by education in the scientific approach, its rigour, and the notion of proof, communication would have doubtless been easier. Developing a culture of scientific knowledge is one of the great [challenges of democracy](#). It must be shared by as many people as possible, whether citizens or policy makers, and, as COMETS had already recommended in a [previous Opinion](#), researchers have an ethical duty to help develop a culture of scientific knowledge.

The health crisis is a major anthropological disruption for society and its consequences remain to be seen. This is the challenge of the [COVID-19 Ad Memoriam Institute](#), which proposes to bring together multiple players in society to reflect on the COVID-19 pandemic.



IV. RECOMMENDATIONS

Although based on observations made during the COVID-19 health crisis, these recommendations are intended to be more general in scope.

A. Communication addressing the scientific community

1. Research data

- 1) Open science has been a driving force behind advances in research on SARS-CoV-2 and COVID-19. This momentum must be maintained by reminding researchers of the importance of **making their data available** whenever they can.

2. Publications

- 2) In order to **stop predatory journals from undermining science**, the CNRS should alert researchers to the fact that articles published in these journals will not be taken into account in their assessments and that the APCs of these journals will not be paid with funds allocated to these researchers. The CNRS could rely for this on the definition of 'predatory journals' recently given by a group of researchers and editors (*Predatory journals: no definition, no defence*; Nature, 2019, 576, 21) and on the opinion of the various disciplinary sections.
- 3) In the light of the abuses observed during the health crisis, which once again highlighted the limitations of the peer review system, it would be desirable for the researchers and research structures concerned to join the international deliberations proposing that **access to reviewers' comments be extended to all editorial processes**.

B. Scientific communication in the public arena

1. Reminders on the rights and obligations of researchers who intervene in the public arena

- 4) By expressing themselves in the public arena, researchers engage their responsibility as scientists. If they give their job title, they must specify in what capacity they are speaking: as a specialist providing expertise on the subject under discussion, as a representative of the research organisation or an institution, or as a committed citizen or even an activist.
- 5) Researchers must distinguish between knowledge validated by scientific methods and what is a working hypothesis or a matter of debate. It is also necessary to point out the margins of uncertainty in the research results.
- 6) It should be remembered that any researcher who gives an interview or participates in a debate in the media can demand a right of reply if his or her words have been distorted or edited in the broadcast.

2. Recommendations to foster dialogue between scientists, journalists and the media

- 7) Research institutes and the institution's communication department should encourage scientists to be among the **experts** who are put in touch with the media.
- 8) It is preferable to strengthen exchanges between scientists and journalists on their respective professions, on the one hand by temporarily integrating researchers into press organisations so that they can understand the constraints of communication, and on the other hand by inviting journalists to participate in laboratory life. These exchanges could take place in conjunction with the CNRS communication department and lead to a **joint CNRS / AJSPI** symposium (AJSPI being the French Association of Science Journalists).
- 9) The idea of creating a "**House of Science and Media**" provided for in the multi-annual programming act requires particular attention to ensure that scientists are involved, in addition to the communication departments of institutions and science journalists from the various media. It also requires vigilance to avoid any shaping of information and pressure from lobbies.
- 10) Aware of the critical decrease in the number of journalists with scientific competence and the indispensability of this role in disseminating scientific results, COMETS supports the AJSPI in its efforts to have the profession of science journalist recognised and valued.

C. Recommendations to research and higher education institutions on scientific communication

- 11) In an environment where scientific communication is becoming increasingly significant, it is important to **encourage researchers to take part in training courses on science mediation**, on the one hand to contribute to institutional communication, and on the other, to respond to requests from the media and press and make them aware of the difficulties and pitfalls inherent in public communication.
- 12) In a context where it is increasingly difficult to distinguish scientific truth from mere opinion, it is essential that those responsible for communication implement, with the support of researchers, a **strategy to combat disinformation** not only for their respective organisations but also for the media.
- 13) **An interdisciplinary symposium on scientific communication** could be planned in conjunction with the Ad Memoriam Institute to discuss the major issues that scientists faced during the health crisis. This symposium could lead to the initiation of a **research programme on scientific communication** involving researchers from all relevant disciplines.⁴⁸

⁴⁸ *Pandémie de Covid-19 : ce qu'en disent les SHS [What the HSS have to say about the COVID-19 pandemic]*



V. ANNEXES

A. ANNEX 1

Research during a health crisis. Ethical debates and observance of scientific integrity Joint statement issued by COMETS and the CNRS's Scientific Integrity Office

16 April 2020

Faced with the COVID-19 pandemic due to the SARS-CoV-2 coronavirus, scientific research is confronted with three somewhat conflicting requirements. Firstly, biomedical research must comply with humanistic ethical principles while acting urgently to find therapeutic solutions as quickly as possible to put an end to the pandemic. Secondly, in its communication with the general public, it must answer the population's legitimate questions, while avoiding sensationalism and remaining restrained, prudent, instructive and precise. Finally, in its unconditional quest for truth, scientific research must base its approach on principles of scientific integrity that sometimes appear difficult to reconcile with urgency. However, this situation does not allow any of these principles to be disregarded.

It should be remembered that scientific integrity covers all the rules and values that govern scientific activity and guarantee its reliable, rigorous and truthful character. It is vital that they be observed; only in this way can the credibility of science be assured and the trust placed in it by society be justified.

Nothing can justify, in the name of emergency pragmatism, bypassing the requirements of the scientific process and the usual procedures, in particular on the reliability and transparency of the methods used, the critical peer review of publications and the absence of conflicts of interest. However, we have some reasons to remain optimistic in the current crisis situation. On the one hand, the worldwide accessibility of data can fuel the debate on the reliability of the work carried out; on the other, open access to papers in traditional journals and the online availability of preprints enable the rapid dissemination of information and immediate reaction to a submitted article along with its critical analysis.

In response to what is in many ways an exceptional situation, the scientific community must remember, and remind everyone, that its role is to conduct honest and responsible research without compromise.

Ethical issues in biomedical research can be debated, especially in the context of the current crisis. They were recently analysed by Emmanuel Hirsch, professor of medical ethics at the University of Paris-Saclay, in an article entitled "*Recherche biomédicale: quels principes éthiques en temps de pandémie?*" [What ethical principles apply to biomedical research during a pandemic?] (The Conversation, 27 March 2020). We repeat here some of what he said.

- *The use of an unvalidated treatment in a health crisis raises ethical issues.*
- *There is a moral duty to implement rigorous trials and to comply with international criteria on good practices in clinical trials.*
- *The ethics of research in a pandemic situation involve responsibility, rigour, but also prudence. Its framework is inspired by the values of humanity, preservation of dignity, respect for the individual, integrity and loyalty.*
- *Transparency on all aspects of care, informed consent, freedom of choice, confidentiality, respect for the individual, preservation of dignity but also, in order to assess the effects of treatment, the "moral obligation to collect and share all data generated, including from treatments provided for 'compassionate use' (access to a drug that is not approved outside of a clinical trial)".*

- *In a context where so much is expected of research, its promises are of such importance that we must not betray them. It is necessary to protect them from controversy, as this could not only create mistrust—which is already threatening our national cohesion—but also make it difficult to develop medical strategies in a context favourable to good progress.*



B. ANNEX 2

COMETS statement on the complaint filed by Professors Didier Raoult and Éric Chabrière against Elisabeth Bik and Boris Barbour

07 June 2021

On the initiative of Professor Didier Raoult and his colleague, Professor Éric Chabrière, legal proceedings have been initiated against two scientists—Elisabeth Bik and Boris Barbour—for harassment. To clarify the facts: a microbiologist by training and a specialist in vaccines and microbiomes, Elisabeth Bik has been tracking down misconduct in scientific research for several years. It was in this role that she identified anomalies (in particular duplicate images) and raised questions about the methodology used in several publications signed by Didier Raoult and his colleagues; she then submitted them, in full transparency, to the PubPeer forum for online discussion of scientific articles. Boris Barbour, the administrator of PubPeer and a senior researcher at the CNRS, is accused of complicity for having relayed these questions by hosting them on his site.

Publicly available scientific papers are intended to convey the results of research and to be discussed within the research community; this is how science has always progressed and will continue to do so, by accumulating and challenging scientific results. As long as they are based on tangible factual data, the discussion of hypotheses and results and the questioning of evidence procedures are part of a researcher's normal activity. By asking Didier Raoult and Éric Chabrière to account for the papers they wrote, Elisabeth Bik and Boris Barbour are simply doing their job. Controversy is actually a scientific activity, as long as it obeys the rules of intellectual debate and is based on objectifiable facts.

The complaint filed by Didier Raoult and Éric Chabrière follows a number of threats they (or their supporters) made on social media. This is an unacceptable strategy of intimidation. COMETS wishes to express its concern about such practices, which should be strongly condemned.

Furthermore, COMETS deplores the gradual judicialisation of research integrity issues, which are above all a matter for scientific appraisal and authority.



VI. QUALIFIED PERSONS CONSULTED

- Sophie Chevallon, Communication Director for the CNRS
- Sylvestre Huet, journalist
- Brigitte Perucca, Communication Director for the CNRS (2011-2020)



VII. GLOSSARY: abbreviations or acronyms used

AEF: *Agence Education et Formation* [French Education and Training Agency]

AJSPI: *Agence des Journalistes Scientifiques de la Presse d'Information* [French Association of Science Journalists]

APC: Article Processing Charge

CPCN: *Conférence des Présidents du Comité National de la recherche scientifique* [Conference of Presidents of the National Committee]

EASE: European Association of Scientific Editors

ENRIO: European Network of Research Integrity Offices

GISAID: Global Initiative on Sharing Avian Influenza Data

HCQ: Hydroxychloroquine

IHU: *Institut hospitalier universitaire* [University hospital institute]

NEJM: New England Journal of Medicine

