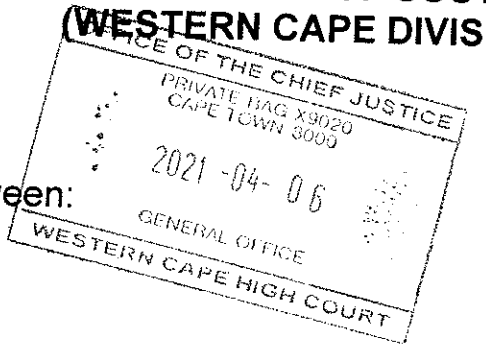
IN THE HIGH COURT OF SOUTH AFRICA
(WESTERN CAPE DIVISION)



CASE NO: 5852/21

In the Matter between:

RICARDO MAARMAN — APPLICANT

AND

THE PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA — FIRST RESPONDENT

AND

THE MINISTER OF CO-OPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS — SECOND RESPONDENT

AND

PROFESSOR SALIM ABDOOL KARIM on behalf of the GOVERNMENTAL COVID 19 ADVISORY COMMITTEE — THRID RESPONDENT

NOTICE OF MOTION
(Interim urgent interdict)

TAKE NOTICE THAT;

The Respondent are hereby called upon to show cause, if any, to this Honourable Court, sitting at Cape Town on the day of ***20 April 2021, at 10H00***, or so soon thereafter as the matter may be heard, why an order should not be issued in the following terms:

1. That this Application is heard as a matter of urgency and that the Applicant's failure to comply with the time limits imposed by the Rules of this Honourable Court be condoned in terms of Rule 6 (12).

2. That the respondents produce the isolated and purified physical SARS-CoV-2-virus (not a culture isolate or any mixture within in which the supposed virus is, nor a photograph or the RNA-sequence only), to the applicant at the place and in terms of their security measures of choice, within 7 days.

3. Further or alternative relief.

4. Cost of the application if opposed.

TAKE NOTICE FURTHER THAT, the affidavit of, ***RICARDO MAARMAN***, the Applicant herein, annexed hereto, will be used in the support of this Application.

TAKE NOTICE FURTHER THAT if you intend opposing this application you are required; to notify the applicant in writing on or before ***13 April 2021*** of your intention to oppose.

To file your answering affidavit, if any on or before ***13 April 2021***

And further that you are required to appoint in such notification an address referred to in rule 6(5)(d)(i) of the rules of this Honourable Court at which you will accept notice and service of all documents in these proceedings, such an address (not being a post office box) to be one within 15 (Fifteen) kilometres of the office of the registrar.

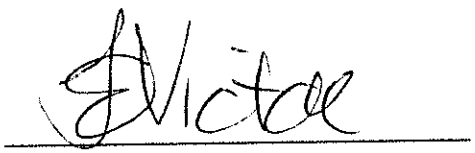
The applicant consents to exchange taking place via email to

carlo@victorlegal.co.za

TAKE NOTICE FURTHER; that the Applicant has appointed ***VICTOR AND ASSOCIATES, 24*** Viola Road, Bloubergstrand, Cape Town, ***C/O ROB GREEN*** Attorneys, Room 305 Benzal House, 3 Barrack Street, Cape Town as its attorney of record and his service address as the address at which the Applicant will accept service of all process in these proceedings.

KINDLY PLACE THE MATTER ON THE ROLL ACCORDINGLY.

DATED AT CAPE TOWN ON THIS THE 18th DAY OF MARCH 2021.



T VICTOR AND ASSOCIATES

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C/O

ROB GREEN Attorneys,

Room 305 Benzal House, 3 Barrack Street, Cape Town)

TO: **THE REGISTRAR CAPE TOWN HIGH COURT**

AND TO; **THE FIRST RESPONDENT**

Tuynhuys, Plein St,

Cape Town.

AND TO; **THE SECOND RESPONDENT**

The Minister of Cooperative Governance and Traditional Affairs

Good Hope Building, 1st Floor, Room 1,

Plein Street, Cape Town.

AND TO: **THE THIRD RESPONDENT**

Professor SALIM ABDOOL KARIM on behalf of the

Governmental Covid 19 Advisory Committee

ALL RESPONDENTS SERVED AT THE OFFICE OF THE STATE ADVOCATE CAPE TOWN

IN THE HIGH COURT OF SOUTH AFRICA
(WESTERN CAPE DIVISION)

CASE NO:

In the Matter between:

RICARDO MAARMAN	APPLICANT
AND	
THE PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA	FIRST RESPONDENT
AND	
THE MINISTER OF CO-OPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS	SECOND RESPONDENT
AND	
PROFESSOR SALIM ABDOOL KARIM on behalf of the GOVERNMENTAL COVID 19 ADVISORY COMMITTEE	THRID RESPONDENT

FOUNDING AFFIDAVIT

I, the undersigned

RICARDO MAARMAN
820531 5257 086

Hereby state under oath:

1. The facts set out within this affidavit are within my personal knowledge and expertise with reference. To the best of my knowledge, all the facts are correct. In certain aspects, I have relied on documentary evidence, of which

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relevant portions are attached as annexures, whilst others are easily obtainable from our very own government websites.

THE PARTIES.

2. The Applicant is an adult male, Ricardo Maarman, who holds an MA International Politics obtained at the University of Leicester in the UK. he specialized in the Post-Cold War World Order, International Security, Intelligence and Security and US Foreign Policy, his service address for the purposes of this application is Rob Green Attorneys, Room 305 Benzal House, 3 Barrack Street, Cape Town, as the address at which the Applicant will accept service of all process in these proceedings.

3. The first respondent is the President of the Republic of South Africa who is cited herein in his official capacity and whose Cape Town office is situated at Tuynhuys, Plein St, Cape Town and whose full and further details are unknown to me.

4. The second respondent is the Minister of Cooperative Governance and Traditional Affairs who is cited herein in her official capacity as the Minister mandated in terms of the provisions of the Disaster Management Act, 57 of 2002 ("the DMA") and whose Cape Town office is situated at the State Attorney 4th Floor, 22 Long Street, Cape Town, and whose full and further details are unknown to me.

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5. The third respondent is Professor Salim Abdool Karim who is cited herein in his official capacity as the head of the Governmental Covid 19 Advisory Committee and whose Cape Town office is situated at the State Attorney 4th Floor, 22 Long Street, Cape Town, and whose full and further details are unknown to me.

NATURE OF THE APPLICATION.

This is an application for an order as follows.

6. That this Application is heard as a matter of urgency and that the Applicant's failure to comply with the time limits imposed by the Rules of this Honourable Court be condoned in terms of Rule 6 (12).

7. That the respondents produce the isolated and purified physical SARS-CoV-2-virus (not a culture isolate or any mixture within in which the supposed virus is, nor a photograph or the RNA-sequence only), to the applicant at the place of their choice and under the security measures as preferred by the respondents, within 7 days.

8. Further or alternative relief.

9. Cost of the application if opposed.

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URGENCY.

10. I respectfully submit that this matter cannot wait to be dealt with in the ordinary course, as such I ask the Court to dispense with the forms and service provided for in the Rules and to indulge in my non-adherence with the normal rules of procedure as set out in Rule 6.

11. This matter is of such urgency that it simply cannot wait for the normal procedures to be complied with.

12. I respectfully submit that this Application should be heard other than in the normal course, otherwise the relief which we seek will be rendered ineffective.

DETAIL OF THE CIRCUMSTANCES WHICH MAKE THE MATTER URGENT.

13. Currently the Entire State is under Lockdown level one, which is a serious violation of the citizens Fundamental rights. To date, the Minister of Health has uttered and there are circulating discussions that the Lockdown measures will be tightened, which begs for these measures to be scrutinised. Accordingly, this has been stated in the following sources:

https://www.timeslive.co.za/news/south-africa/2021-03-25-level-2-on-the-cards-for-easter-here-are-some-major-changes-that-could-be-in-place-before-the-holiday/;https://www.iol.co.za/news/politics/mkhize-says-move-to-level-2-during-easter-will-prevent-super-spreader-events-a5f88b6b-63a1-4b1c-95d8-a841099bd415 (***see annexed hereto marked as annexure RM 1)***

RM

14. There is a massive nationwide roll out of a vaccine claimed by the respondent that must be used in the prevention of being infected by the alleged virus.

15. This vaccine-roll-out has begun in other countries and it has resulted in deaths and vaccine injuries, ***RM2.***

16. The national disaster has been declared and is in ongoing for almost a year affecting the entire nation with dire consequences.

17. There is no end in sight in the foreseeable future to this pandemic.

18. It is an urgent matter of national concern.

19. The outcome of the order could very well mean a quick recovery to normal circumstances for the entire nation.

20. In South Africa, there is vast unemployment and poverty as such, the questioning of the very cause that threatens to drastically increase the already desperate circumstances must at least be thoroughly investigated and with utmost haste.

21. On 6 May 2020 Africa's Medical Media Digest reported that Pandemic Data and Analytics (Panda), a multidisciplinary initiative co-ordinated by actuary Nick Hudson reported that If South Africa's present economically restrictive lockdown measures are not discontinued immediately, they may cause 29 times more deaths

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than the measures aim to prevent the spread. And each week of continuing lockdown will, in the long run, cause more loss of life than the virus itself. ***RM3***

REASONS WHY RELIEF CAN NOT BE OBTAINED IN THE ORDINARY COURSE.

22. If this matter is heard in the normal course, the relief sought would be of no use, since it is critical for the entire nation.

23. Attached hereto and marked ***RM4*** is a medico legal report stating that the virus has not yet been proven to exist.

HIGH DEGREE

24. I respectfully submit that this application carries a High Degree of urgency in that we are faced with the imminent impoverishment, deterioration of the wellbeing of the entire nation and their constitutional fundamental right infringements.

TIMETABLE FOR THE FILING OF DOCUMENTS.

25. I propose the following timetable for the processes in this matter which will allow this matter to return to Court in the shortest possible time and which will also allow the respondents reasonably enough time to respond.

26. The matter to be heard on 20 April 2021.

27. Filing of respondents Heads on 16 April 2021.

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28. Filing of applicants Heads on 15 April 2021.

29. Applicants replying affidavit on 14 April 2021.

30. Respondents' Notice of opposition and answering affidavit on 13 April 2021.

31. Service on respondent on 9 April 2021.

THE APPLICANT'S LOCUS STANDI

32. The applicant brings this application by virtue of section 38(a) of the Constitution by acting in his own interest and in accordance with its own objectives directed at the protection of his Constitutional Rights and financial sustainability.

33. The Applicant also brings the application in the public interest of all South Africans as a whole and in terms of section 38(d) of the Constitution, with the objective of the protection of their Constitutional Rights and financial sustainability.

THE LEGAL AND CONSTITUTIONAL PRINCIPLES INVOLVED

34. The Constitution provides that the Republic of South Africa is a sovereign, democratic state founded, inter alia, on the following values: Life, Human dignity, the achievement of equality and the advancement of human rights and freedoms and the Rule of Law.

35. The Constitution, provides that "All spheres of government and all organs of state within each sphere must be loyal to the Constitution, the Republic and its people;

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respect the constitutional status and not assume any power or function except those conferred on them in terms of the Constitution."

36. The Bill of Rights applies to all law, and binds the legislature, the executive, the judiciary and all organs of state.

37. Everyone has inherent dignity and the right to have their dignity respected and protected.

38. Everyone has the right to life, bodily and psychological integrity; To make decisions concerning the security and control over their body; Freedom to practice their trade, Freedom of movement, occupation and profession; Not to be treated in a cruel, inhuman or degrading way; Their right to have access to health care services; Just administrative action.

39. Every citizen has the right to administrative action that is lawful, reasonable, and procedurally fair.

40. These abovementioned rights may be limited only in terms of law of general application to the extent that the limitation is reasonable and justifiable in an open and democratic society based on human dignity, equality, and freedom, taking into account all relevant factors, including the nature of the right; the importance of the purpose of the limitation; the nature and extent of the limitation; the relation between the limitation and its purpose; and less restrictive means to achieve the purpose.

RM

41. No law including the DMA, may limit any right entrenched in the Bill of Rights.

42. It is therefore submitted that, in so far as the Regulations or any Direction Purportedly issued pursuant thereto, that will violate the above-mentioned fundamental rights will be inconsistent with the Constitution, and therefore illegal and void if the SARS-CoV-2-virus is not proven to exist.

43. Furthermore, the rights in the Bill of Rights cannot be infringed upon or limited in any way save in terms of the provisions of section 36 or 37.

44. The national state of disaster, announced in terms of the DMA, has been called on the mere allegation of the existence of the SARS-CoV-2-virus, and the applicant stands on his Fundamental right to test whether the violation of his and the entire nation's Constitutional rights have been based on the existence of the SARS-CoV-2-virus

THE STATE MAY NOT INTERFERE WITH THOSE FREEDOMS, EXCEPT UNDER SECTION 36 OF THE CONSTITUTION.

45. My respectful submission is that until the Respondent has produced the SARS-CoV-2-virus to be tested by independent experts in the appropriate circumstances that the Limitation of the rights of the Applicant and the Nation's rights to freedom of movement is not justified in terms of Section 36. (1) of the Constitution.

46. According to Section 36. (1) The rights in the Bill of Rights may be limited only in terms of law of general application to the extent that the limitation is reasonable

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and justifiable in an open and democratic society based on human dignity, equality and freedom, taking into account all relevant factors.

47. We are not asking this honourable Court to do the Section 36 test in this matter, or to decide on the existence of the SARS-CoV-2-virus we are simply asking that the respondent produces the isolated and purified physical SARS-CoV-2-virus (not a culture isolate or any mixture within in which the supposed virus is, nor a photograph or the RNA-sequence only), to the applicant at the place of his choice and under the security measures as preferred by the respondent, within 7 days, in order for us to test whether these extremely harsh disaster enforced on the nation is in fact based on the existence of the SARS-CoV-2-virus.

48. The nature of the rights here being limited are fundamental rights in terms of chapter two; the right to bodily and psychological integrity; The right to make decisions concerning the security and control over their own bodies; Freedom to practice their trade, freedom of movement, occupation, and profession; Not to be treated in a cruel, inhuman or degrading way; Their right to have access to health care services; the right to just administrative action.

49. These are fundamental rights that cannot be limited if there are no evidence of the existence of the SARS-CoV-2-virus.

RULE 16 A

50. A Rule 16 A notice will be issued together with the issuing of this application ***(See Attached copy of the notice marked RM5).***

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BACKGROUND.

51. During January 2020, the world became aware of the so-called Corona Virus.

52. At the writing of this affidavit the reported South African statistical information of the so-called Virus are as follows; 1 404 839 cases have been reported. Attached hereto and marked ***RM6***, see the latest coronavirus world report.

53. Of the 1 404 839 reported South African cases 1 217 492 have recovered.

54. Currently 150 800 people in South Africa have the so-called Virus of which namely 546 are in a serious or critical condition thus 0.31% of infected people are in a serious condition.

55. 40 574 out of 1 404 839 who contracted the so-called Virus in South Africa to date has died, namely 1.38%.

56. On 15 March 2020, Dr Mmaphaka Tau, the Head of the National Disaster Management Centre in the Department of Cooperative Governance gave notice that the Covid-19 pandemic was declared as a National Disaster.

57. Also, on 15 March 2020, the respondent issued a declaration of a National State of Disaster and published the declaration in the Government Gazette of that date and on subsequently monthly declarations continued with the declaration and publications of the regulations relating to the National disaster. Attach hereto as Annexure ***RM7*** a copy of the notice to that effect in the Government Gazette.

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RATIONALITY

58. To pass the rational basis test, the statute or ordinance must have a legitimate state interest, and there must be a rational connection between the regulations means and goals.

59. The national lockdown severely restricts the movement and choices of people. The result is a severe disruption of business and wellbeing and freedom of movement.

60. This is done under the over broad provision in s 27(2)(n) of the DMA the question that arises is whether this disruption meets the rationality and constitutionality test in terms of South African law.

61. Some disruption of life may be necessary to save lives if we are assured beyond doubt of the existence of the SARS-CoV-2-virus on which the Restrictions are based.

62. This applicant has a reasonable suspicion about the existence of SARS-CoV-2-virus.

63. It is respectfully submitted that this Honourable Court must at least agree that the South African nation is at least entitled to know beyond any doubt that all the damages and restrictions and violations of their rights is based on a virus that is proven to exist.

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64. To date it has simply been assumed that the SARS-CoV-2-virus does exist, without question.

65. The respondent has alleged that the SARS-CoV-2-virus does exist as such, she needs to prove it.

66. This can easily be done by the respondent since it should already be in possession of the SARS-CoV-2 virus.

67. The supposed existence of **SARS-CoV-2 virus** has not been established, an RNA-sequence obtained through an RNA-sequencing device RT-PCR test, a DNA or RNA-sequence, does not prove anything without a standard to measure it against, that standard can only be the physical virus.

68. If the virus has not been proven to exist then it follows that no link can be established between the supposed non-existent virus and a disease, no experiments have been presented in which the virus is isolated without any cultures or other substances, and then injected into healthy organisms producing a particular disease, and repeated, without this there can be no link between a virus and a disease.

69. If the virus does not exist, thus no link to a disease can be proven and then no reasonable and justifiable remedy or countermeasures can be devised.

70. There is no evidence existence of the SARS-CoV-2 virus.

70. There is no evidence of the existence of the SARS-Cov-2 virus, its link to Coviid-19 disease.

71. The PCR test are unreliability.

SECTION 39 OF THE CONSTITUTION AND ITS RELEVANCE TO THE FACTS PRESENTED

72. With regards to the nature of the matter, Section 39 (1)(a) and (b) respectively, have to be cited, as it is part and parcel of the fabric of our society, that this section be included here, which states that:

(1) When interpreting the Bill of Rights, a court, tribunal or forum-

(a) must promote the values that underlie an open and democratic society Based on human dignity , equality and freedom;

(b), must consider international law; and

(c), must consider a foreign law

73. Its relevance, that the court should in accordance with the above be open the facts presented below, which in turn sheds light on the Portuguese Judgment (***please find attached hereto marked RM8***), The Court here concludes that:

"Any diagnostic test must be interpreted in the context of the actual possibility of the disease, which existed before its realization. For Covid-19, this decision to perform the test depends on the previous assessment of the existence of symptoms, previous medical history of Covid 19 or presence of antibodies, any potential exposure to this disease and no likelihood of another possible diagnosis." "One of the potential reasons for presenting positive results may lie in the prolonged shedding of viral RNA, which is known to extend for weeks after recovery, in those who were previously exposed to SARS-CoV-2. However, and more relevantly, there is no scientific data to suggest that low levels of viral RNA by RT-PCR equate to infection, unless the presence of

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infectious viral particles have been confirmed by a laboratory. In summary, Covid-19 tests that show false positives are increasingly likely, in the current epidemiological climate panorama in the United Kingdom, with substantial personal, health and social system consequences."

74. To prove the existence of something especially when it is mixed or incorporated with other things is to first separate or isolate it, then to measure it, to determine its parameters and to determine its qualities. An RNA or DNA sequence is not proof of existence, e.g., having the DNA sequence of a person does not mean that the person exist, to prove the person exists the DNA sequence must be matched to a DNA sequence obtained verifiably directly from the physical person.

75. Here follows explanations regarding the supposed isolation of SARS-CoV-2: as described in an article entitled ***The Genetic Sequence, Origin, Diagnosis of SARS-CoV-2,*** written by Huihui Wang et al.***RM9***

- "Confirmed cases with SARS-CoV-2 were identified as a positive result of a high-throughput sequencing or an RT-PCR assay for respiratory specimens including nasal and pharyngeal swab"

- "Airway epithelial cells from infected patients were used to isolate a novel coronavirus, temporarily named 2019-nCoV, but later, the Coronavirus Research Group of the International Committee for the Classification of viruses found that the new coronavirus is related to the SARS-virus" The International Committee for the Classification of viruses is affiliated to the International

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Council of Sciences, which in turn has a formal relationship with UNESCO since 1947, which in turn is a specialised agency of the UN.

- "In addition, the World Health Organisation has named the disease caused by SARS-CoV-2 as coronavirus disease 2019 (Covid-19)".

- "After the SARS-CoV-2 was isolated from the lower respiratory tract specimen, a diagnostic RT-PCR test was developed. RT-PCR tests based on the RNA-dependent RNA polymerase (RdRp) gene of the ORF1ab sequence, E gene, N gene and S gene of the SARS-CoV-2 genome"

- "The genome of coronaviruses, ranging from 26 to 32 kilobases in length, includes a variable number"

- "The SARS-CoV-2 genome was reported to possess 14 ORF's encoding 27 proteins"

76. From scientific article: ***SARS-CoV-2 isolation and propagation from Turkish Covid-19 patients***, as published in the Turkish journal of Biology 44 (3) 192, 2020:

- "Samples were collected from the nasopharyngeal and oropharyngeal cavity of Covid-19 positive diagnosed patients according to their real-time PRC analysis"
- "Next, SARS-CoV-2 specific RT-PCR was performed"

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77. From: CDC website in the US, ***Sever Acute Respiratory Syndrome Coronavirus 2 from Patient with Coronavirus Disease***, *United States of America* (viewed on the 16 February 2021):***RM10***

- "We isolated virus from nasopharyngeal and oropharyngeal specimens from this patient and characterised the viral sequence, replication properties, and cell culture tropism"

- "Confirmed PCR-positive specimens were aliquoted and frozen until virus isolation was initiated"

- "we performed confirmatory testing by using real-time reverse transcription PCR (CDC) and full-genome sequencing"

- "We extracted nucleic acid from the isolates and amplified by using the 37 individual nested PCRs"

- "A nearly full-length viral contig obtained in each sample had 100% identity to the 2019-nCoV/USA-WA1/2020 strain (GeneBank accession no. MN985325.1)"

78. From the Australian claim of isolation of the virus, ***Isolation and rapid sharing of the 2019 novel coronavirus (SARS-CoV-2) from the first patient diagnosed with COVID-19 in Australia***, we get the following telling statement:***RM11***

- "In consultation with the World Health Organization, the viral isolate was shared with domestic and international reference laboratories within 24 hours, and lodgement with major North American and European culture collections for further distribution is underway".

79. These claims of isolation at best are based on the matching of one sequence of RNA with another sequence, without producing the actual virus. The NCID of SA on its website has a picture of what it calls the virus, "culture isolate" this is highly deceptive wording, a culture is a soup or a mixture of biological material, they admit it is green monkey cells, within which the virus supposedly is mixed, yet they claim a photo of the virus "culture isolate". It is the responsibility of those who make the claim to produce the proof, the government claims the existence of the SARS-CoV-2 virus, there is reasonable suspicion of this claim, therefore it is reasonable that they be ordered to provide adequate proof.

A REASONABLE SUSPICION THAT THE VIRUS CANNOT BE LINKED TO THE DISEASE

80. To link the virus to the disease, the virus must first be shown to exist, then it must be purified from other elements and then introduced to a healthy organism and it must be shown to cause a disease or illness. This experiment must be conducted several times over a period of time. Lastly, these experiments must be independently reviewed, only then can it be said that a link has been established between a virus and a disease.

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81. This is the timeline of events, source, article **SARS-CoV-2: an Emerging coronavirus that causes a global threat**, by Zeng, published on 2020/03/15, in the *International Journal of Biological Sciences*:**RM16**

a. 29th December 2019 the first cases linked to the Huanan Seafood marketplace emerge.
b. 30th December 2019 China CDC was reported to about the pneumonia of unknown ethology.
c. 31st December 2019 WHO CDC was informed of the pneumonia of unknown ethology by China CDC.
d. 6th January 2020 Chinese CDC activated Level 2 emergency response.
e. 7th January 2020, SARS-CoV-2 was isolated by China.
f. 10th January 2020, first genome sequence of SARS-CoV-2 was released.
g. 23rd January 2020 Wuhan City was locked down.
h. 30th January 2020, WHO declared a "public health emergency of international concern".

82. The entire processes of isolating the virus, linking the virus to a disease and then imposing countermeasures occurred within one month and the World Health Organisation was instrumental and co-ordinating matters from the very beginning of the process, even before the Chinese supposedly isolated the virus. The processes of linking the virus to the disease has not been

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demonstrated by the Chinese and by WHO, in fact the Chinese say it is WHO that linked the SARS-CoV-2 with the Covid-19 disease.

83. It is generally known that the symptoms of Covid-19 are virtually indistinguishable from cold and or flu symptoms, which is another cause for concern.

84. It can be argued that reasonable suspicion persists whether the SARS-CoV-2 virus can be linked to the Covid-19 disease, those who make the claim must produce the proof. The Court should therefore grant the order, that would compel the government to provide such proof to the satisfaction of the Court.

THE SUSPICIOUS AND FLAWED EPIDEMIOLOGICAL-MATHEMATICAL MODELS, INFECTION RATES AND DEATHS ATTRIBUTED TO COVID-19

85. The epidemiological models have been challenged and proven to be inaccurate and had to be revised, modelling in itself cannot form the cornerstone of any reasonable decision to impose such harsh and devastating measures such as the lockdown, especially not in the case of a novel virus and new disease, for which there would not exist much data to do adequate modelling.

RM

86. The infection rates were determined purely by a NON-VALIDATED RT-PCR test which selects a particular RNA-sequence amongst many that appear.

87. Higher test frequency would inevitably also lead to higher positive tests thus increase in cases.

88. The policy that all people testing positive and subsequently dying, should be classified as death as a result of Covid-19, without conducting autopsies is also wrong and completely unreliable, in addition the media reports these deaths, as "deaths due to Covid related complications" which is meaningless. This even in cases where there exist co-morbidities. This would not have been possible if public health officials, the Executive and the Legislature did not allow and put through such changes in protocol.

89. The PCR tests is at the heart of the reasoning and justification of the Lockdown and there is ample clear proof that these tests are unreliable. Modelling has been a great part of the reasoning and justifications to impose the Lockdown measures as well, even though not much previous data exists, the models have been refuted and modelling is inherently flawed and cannot be the sole arbiter of reasonable justification.

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SARS-COV-2 IS SUPPOSEDLY A NOVEL VIRUS AND COVID-19 A NOVEL DISEASE

90. In the face of a novel virus and a novel disease sufficient time should have been allowed to isolate the virus, link it to a disease, to conduct experimentations to determine effective treatments and cures. There is no proof that this has been done.

91. Without the abovementioned having been done over a reasonable time period and with independent reviews, any treatment is nothing other than a medical experiment, the difference is that these experiments are being conducted on the entire human-race.

92. This request should be easily accomplished considering that there are over a million reported Covid-19 cases and a new variant in South Africa.

93. Lockdowns have never been done in the history of South Africa and by extension never in the entire globe, it is unprecedented, hence a bio-medical experiment.

94. It amounts to an unconscionable experiment with human life, if the virus has never been isolated and linked to a disease, and therefore no treatment related to the disease can be claimed, except as a mass scientific fraud.

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95. This arguably presents clear evidence of the conduct of a bio-medical experiment upon the entire population of South Africa.

THE LOCKDOWN MEASURES ARE UNREASONABLE, HARMFUL AND DEADLY

96. If there is no virus and no link to a disease, then these measures are unreasonable, unjustifiable, and extremely dangerous.

97. Declaring the pandemic itself is traumatizing and greatly imposes on the rights and freedoms of people.

98. The restrictions on trade and movement, is devastating to the economy, to social life, education et cetera.

99. In the absence of a physically verifiable virus, there is no way to determine the effectiveness of the mandatory masks policies, there is a vast body of science that proves that masks are not effective and that they are potentially deadly.

100. The policy of not treating "non-urgent" matters in public health facilities and prioritising Covid-19, is potentially fatal.

101. The policy of prescribing diagnostic techniques to medical professionals and then a subsequent treatment protocol from which they cannot veer, is potentially deadly, as misdiagnosis and wrong treatments could be fatal.

100. The Lockdown measures whether reasonable and justified or not, pose an existential threat and harm to the entire nation of South Africa.

THE WEARING OF CLOTH FACE-MASKS ARE PARTICULARLY HARMFUL

101. The following is extracted from a book written by Dr Vernon Coleman MB ChB DSc FRSA (Title: ***Proof That Face Masks Do More Harm Than Good) RM13***

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102. Wearing a mask for hours at a time could cause pulmonary fibrosis.

103. People who cough and sneeze into their mask increase the risk of a build-up of fungi and bacteria – which can lead to dangerous chest infections.

104. Moisture retention, reuse of cloth masks and poor filtration may result in increased risk of infection as a precautionary measure, cloth masks should not be recommended for health care workers, particularly in high-risk situation. *British Medical Journal* published a paper entitled, *A Cluster Randomised Trial of Cloth Masks Compared with Medical Masks in Healthcare Workers*, 2015

105. Pregnant women should not wear a mask, this is risky both to not themselves and to their unborn child. There is a real risk that the baby will be stillborn or in some way damaged or poorly developed at birth.

106. According to a dentist, Marc Sclafani, (told the New York Post) 'gum disease, or periodontal disease, will eventually lead to strokes and an increased risk of heart attacks.' The fact that face coverings increase mouth dryness and contribute to a build-up of bad bacteria as people tend to breathe through their mouth instead of nose when wearing a mask.

107. A man suffered a collapsed lung after running 2.5 miles while wearing a face mask due to high pressure in his lungs.

108. Wearing masks reduce oxygen levels and increase levels of carbon dioxide. The side effects of excess carbon dioxide (hypercapnia) are headaches, dizziness, drowsiness, nausea, vomiting and a tight feeling in the chest.

109. According to Dr Margarite Griesz-Brisson MD PhD is a leading European neurologist and neurophysiologist, masks causes brain damage due to lower oxygen levels. When the oxygen deprivation becomes chronic, the symptoms

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disappear because the body gets used to them. However, efficiency remains impaired and the damage to the brain continues.

110. In March 2020, Dr Jenny Harries, Deputy Chief Medical Officer in the UK, warned that it is possible to trap the virus in a mask and start breathing it in. She said that wearing a mask was not a good idea.

111. Face mask use was found not to be protective against the common cold. *Use of surgical face masks to reduce the incidence of the common cold among health workers in Japan: a randomized clinical trial* was published in the *American Journal of Infection Control* in June 2009.

112. Neither surgical nor cotton masks effectively filtered SARS-CoV-2 during coughs by infected patients'. *Annals Internal Medicine* 2020. The title of their paper was, *Effectiveness of surgical and cotton masks in blocking SARS CoV 2: A controlled comparison in 4 patients.*

113. It is likely that anyone who wears a face mask for long periods will have a damaged immune system – and be more susceptible to infection.

114. There is increase in dry eye symptoms among mask wearers. *Ophthalmology and Therapy* (published in September 2020), written by Majid Moshirfar, William B. West Jr and Douglas P. Marx .

115. The World Health Organisation recommends that disposable masks should be discarded after one use. However few people can afford this, so masks are frequently worn more than once. This massively increases the risk of a chest infection developing.

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116. Reports are suggesting that the bacterial pneumonias are on the rise due to face masks. Dr James Meehan.

117. If mask wearing were a science, the rules would be constant – but they are not. It is clear, therefore, that there is no science behind mask wearing.

118. Small children are more likely to develop a weakened immune system if they wear a mask. I would strongly advise parents not to use any form of face covering for their baby,' said Dr Rebecca Fletcher, chair of Bury, Rochdale and Oldham Child Death Overview Panel.

119. Masks have no significant preventative impact against any known pathogenic microbes, specifically, regarding covid-19, we have shown...that mask use is not correlated with lower death rates nor with lower positive PCR tests. Masks have also been demonstrated historically to contribute to increased infections within the respiratory tract' ...'the use of face masks will contribute to far more morbidity and mortality than has occurred due to covid-19.' *Masks, false safety and real dangers, Part 2: Microbial challenges from masks.* Boris Borovoy, Colleen Huber and Maris Crisler.

120. The wearing of cloth-masks over the mouth and nose, is extremely harmful and even deadly.

THE SUPPOSED COVID-19 VACCINES

121. If the virus has not been isolated nor a link established to a disease, then there can't be any remedy, much less a vaccine.

122. Not only has multiple vaccines been developed in the absence of proving the above-mentioned but these vaccines have been developed in unprecedented short period of time, even skipping animal trials.

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123. These vaccines possess so-called new vaccine technology that have never been tried on humans before and some of them contain foetal tissue and chimpanzee cells, which many people would find objectionable.

124. Not only are these vaccines unprecedented but the idea of vaccinating the entire human-race has also never been done.

125. The early rollouts of vaccines in other countries have not only seen fatalities and injuries, but the process has not been stopped at all.

126. The CDC website cites a number of vaccine recipients who have reported some adverse reactions within 0 to 7 days of having been ***RM14*** vaccinated. Reactions and Adverse Events of the Pfizer-BioNTech COVID-19 Vaccine | CDC and https://www.cdc.gov/vaccines/covid-19/info-by-product/pfizer/reactogenicity.html

127. In the United Kingdom, various Covid 19 Vaccine Adverse Reactions per type of vaccine (e.g. Pfizer, Astrazeneca etc) are recorded in the weekly report Coronavirus vaccine - weekly summary of Yellow Card reporting . They include Blindness, Lymphadenopathy, Death, Diarrhoea, Pyrexia, Hepatic, Myalgia Bell's palsy etc. Vaccine Analysis Profile - Pfizer/BioNTech Vaccine Analysis Profile - Oxford University/AstraZeneca Vaccine Analytics Profile - brand unspecified

128. The vaccines have never been developed at such a fast pace, some of these technologies are new untested, never before have we vaccinated the greater part of our entire population with such a new technology, the vaccines contain objectionable ingredients and many injuries and deaths have already been reported linked to these new vaccines. Arguably this constitutes, bio-

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medical experimentation on an entire population, using a harmful bio-chemical compound with known risks to health and life.

PRIMA FACIE RIGHT.

129. The applicant, and the public have the following undisputable prima facie rights.

a. To Human dignity.

b. Life.

c. Bodily and psychological integrity.

d. To make decisions concerning the security and control over their body.

e. Freedom to practice their trade, occupation and profession.

f. Not to be treated in a cruel, inhuman or degrading way.

g. The right to have access to health care services.

h. Freedom of movement.

i. Just administrative action.

130. Not to have limitations imposed on their rights entrenched in the Bill of Rights and if so that it must be restrictively interpreted, so as to impose a minimum limitation on those rights, in accordance with section 36 of the Constitution.

131. That the Bill of Rights be applied to all law including the DMA.

132. The Applicant has a right to access to information in terms of Section 32 of our Constitution, and that is what he is essentially requesting here.

133. From the above it is clear that a strong case has been made by the applicant and those it is acting on behalf of, have at least one prima facie right.

REASONABLE APPREHENSION OF IRREPARABLE AND IMMINENT HARM.

134. I submit that harm is apparent in this instance, as set out throughout this founding affidavit.

135. Without the relief sought to prevent further harm the applicant and the rest of South Africa will continue to suffer irreparable financial, material, physical and psychological harm.

136. The public further stands to be severely prejudiced with the arbitrary infringements of their fundamental rights should the respondents continue to ignore their rights.

137. At the current rate the South African Government will run out of money to pay the salaries of state employees, it is submitted that If South Africa's present economically restrictive lockdown measures are not discontinued immediately, the respondents may cause 29 times more deaths with the measures aim to prevent the spread than the virus itself.

138. From the above it is clear that a strong case has been made by the applicant and those it is acting on behalf of the existence of the reasonable apprehension of irreparable and imminent harm.

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BALANCE OF CONVENIENCE.

139. The balance of convenience favours the granting of the interdict.

140. I submit that on weighing up the consequences of the prejudice that each party would suffer if this Interdict is not granted, it would be immeasurably more detrimental towards the applicant than it would be for the respondent if it is not granted.

RESPONDENTS PREJUDICE.

141. None, I am simply asking and praying to this Honourable Court that the respondents produce to me on its terms and merits, a mere sample or prototypical example that it has in its possession in terms of my rights, for me to verify its existence.

THE RISKS INVOLVED

142. The respondents are welcome to provide the purified physical SARS-CoV-2-virus to me for verification under whatever security measures they prefer, and I am willing to indemnify them from any damages or risk during the period of verification.

NO OTHER REMEDY.

143. We have written to the respondent in this regard which has simply been ignored. ***(See Annexure RM15).***

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KM 147 At this stage in time the public has no other adequate remedy available, to prevent imminent and irreparable harm befalling them.

IN THESE PREMISES, I respectfully pray for an Order in terms of the Notice of Motion prefixed hereto.

D E P O N E N T

RICARDO MAARMAN

820531 5257 086

I CERTIFY that the deponent has acknowledged that he knows and understands the contents of this affidavit which was signed and sworn to before me at Cape Town on this the 21 day of March 2021.

Malvleke ks
CST
266915

COMMISSIONER OF OATHS

FULL NAMES: Katekani Malvleke

BUSINESS ADDRESS: 263 Royal park Drive Mondeor

DESIGNATION: CST

SOUTH AFRICAN POLICE SERVICE
MONDEOR SAPS
21 MAR 2021
CLIENT SERVICE CENTRE
SOUTH AFRICAN POLICE SERVICE

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— 35

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NEWS / POLITICS

National Minister of Health Zwelini Mkhize Photograph :Phando Jikelo/african News Agency (ANA)

Mkhize says move to level 2 during Easter will prevent super spreader events

By Se-Anne Rall Mar 25, 2021

DURBAN – Health Minister Dr Zweli Mkhize has warned that strict precautionary measures will be undertaken during the Easter weekend to prevent potential super spreader events.

Mkhize's warning comes in the wake of experts' advice for the government to upgrade the country to level 2 in anticipation of the third wave which is set to hit South Africa next month.

"This is a sensitive period of the Easter period where there is the vulnerability and the chance of the risk that we could have a super spreading event, with all the festivities and activities that go with the Easter long weekend. So the advisory was for a temporary increase in restrictions over this period of time," he said.

Harder lockdown looms for Easter weekend eNCA

With the Easter weekend coming up, and the temperatures dipping, A COVID-19 infection surge seems inevitable. But will we slip into another lockdown for that weekend? Courtesy #DStv403

Speaking to the SABC, Mkhize said discussions on the implementation of stricter lockdown regulations were still in progress.

"There have been recommendations given about imposing a stricter lockdown but others are calling for some regulations to be relaxed so there is still consultation around the matter. The consultation process takes into account the advice given the ministerial advisory committee as well as the concerns of the various sectors of the economy including social, churches and business sectors," he said.

Mkhize said the decision is also guided by scientific research.

"We have to balance the MAC's advice and look at hunger, unemployment and economic activities and we expect that after the consultation we will come up with something. This is not an easy

As per the latest from the Health Ministry, SA has a cumulative count of 1 540 009 Covid cases. The total death count is at 52 372.

Related Video:

'No indication of COVID-19 third wave' eNCA

The former co-chair of the Ministerial Advisory Committee on COVID-19 says he'll still work on the virus. But his priority is HIV research and other commitments. Professor Salim Abdool Karim is stepping down a year after serving on the committee. He says there are no indications yet that we're heading for a third...

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COVID-19 3RD WAVE LOCKDOWN

The Vaccine Adverse Event Reporting System (VAERS) Results

MODERNA

Messages:

- **VAERS data in CDC WONDER are updated every Friday. Hence, results for the same query can change from week to week.**
- **These results are for 645 total events.**
- **When grouped by VAERS ID, results initially don't show Events Reported, Percent, or totals. Use Quick or More Options to restore them, if you wish.**
- **Click on a VAERS ID to see a report containing detailed information for the event.**

Some measures are hidden, use Quick or More Options above to restore them.

Serious	Vaccine Type	VAERS ID	Adverse Event Description
Yes	COVID19 VACCINE (COVID19)	0909095-1	on 12/24/2020 the resident was sleepy and stayed in bed most of the shift. He stated he was doing okay but requested pain medication for his legs at 250PM. At 255AM on 12/25/2020 the resident was observed in bed lying still, pale, eyes half open and foam coming from mouth and unresponsive. He was not breathing and with no pulse
Yes	COVID19 VACCINE (COVID19)	0910363-1	Patient had mild hypotension, decreased oral intake, somnolence starting 3 days after vaccination and death 5 days after administration. He did have advanced dementia and was hospice eligible based on history of aspiration pneumonia.
Yes	COVID19 VACCINE (COVID19)	0913733-1	My grandmother died a few hours after receiving the moderna covid vaccine booster 1. While I don?t expect that the events are related, the treating hospital did not acknowledge this and I wanted to be sure a report was made.
Yes	COVID19 VACCINE (COVID19)	0914621-1	Resident in our long term care facility who received first dose of Moderna COVID-19 Vaccine on 12/22/2020, only documented side effect was mild fatigue after receiving. She passed away on 12/27/2020 of natural causes per report. Has previously been in & out of hospice care, resided in nursing home for 9+ years, elderly with dementia. Due to proximity of vaccination we felt we should report the death, even though it is not believed to be related.
Yes	COVID19 VACCINE (COVID19)	0915880-1	Patient died within 12 hours of receiving the vaccine.
Yes	COVID19 VACCINE (COVID19)	0917117-1	After vaccination, patient tested positive for COVID-19. Patient was very ill and had numerous chronic health issues prior to vaccination. Facility had a number of patients who had already tested positive for COVID-19. Vaccination continued in an effort to prevent this patient from contracting the virus or to mitigate his risk. This was unsuccessful and patient died.
Yes	COVID19 VACCINE (COVID19)	0917790-1	At the time of vaccination, there was an outbreak of residents who had already tested positive for COVID 19 at the nursing home where patient was a resident. About a week later, patient tested positive for COVID 19. She had a number of chronic, underlying health conditions. The vaccine did not have enough time to prevent COVID 19. There is no evidence that the vaccination caused patient's death. It simply didn't have time to save her life.
Yes	COVID19 VACCINE (COVID19)	0917793-1	Prior to the administration of the COVID 19 vaccine, the nursing home had an outbreak of COVID-19. Patient was vaccinated and about a week later she tested positive for COVID-19. She had underlying thyroid and diabetes disease. She died as a result of COVID-19 and her underlying health conditions and not as a result of the vaccine.
Yes	COVID19 VACCINE (COVID19)	0918065-1	1/1/2020: Residents was found unresponsive. Pronounced deceased at 6:02pm
Yes	COVID19 VACCINE (COVID19)	0918487-1	Two days post vaccine patient went into cardiac arrest and passed away.
Yes	COVID19 VACCINE (COVID19)	0918518-1	syncopal episode - arrested - CPR - death
Yes	COVID19 VACCINE (COVID19)	0919537-1	Resident exhibited no adverse events during 30 minute monitoring following vaccine administration. Resident found without pulse at 1900.
Yes	COVID19 VACCINE (COVID19)	0920326-1	Redness and warmth with edema to right side of neck and under chin. Resident was on Hospice services and expired on 1.1.21
Yes	COVID19 VACCINE (COVID19)	0920368-1	12/30/2020 07:02 AM Resident noted to have some redness in face and respiration were fast. Resident vital signs were abnormal except blood pressure. Temp at the time was 102.0 F taken temporal. Resident respirations were 22 labored at times. Pulse is 105 and pulse ox 94% on room air. Resident is made comfortable in bed. Notified triage of change in condition also made triage aware of resident receiving Covid vaccination yesterday morning. Resident appetite and fluid consumption has been poor for few days. 12/30/2020 07:32 AM Received order from agency to administer Acetaminophen 650mg suppos rectally due to resident not wanting to swallow anything including fluids, medications and food. This writer administered medication as NP ordered. Will monitor for effectiveness and adverse effects if any. 12/30/2020 08:41 AM Received new orders to obtain Flu swab, obtain CBC and BMP, and Chest Xray all to be obtained today. Notified family of resident having temperature and vital signs excluding b/p that was abnormal. Family was thankful for call and inierated to nurse that family does not want resident sent to hospital. Did educate family on benefits of Hospice services, but family persistant on continued daily care provided by nursing staff. Requests visits if decline continues. Family assured if resident continues to decline, facility will accomandate resident family to be able to be at bedside when time comes to do so. NP ordered IVF and IV Levaquin on 12/31/20. Family chose at that time to sign for Hospice services and not have resident provided with IVF or IV Antibiotics
Yes	COVID19 VACCINE (COVID19)	0920815-1	Found deceased in her home, unknown cause, 6 days after vaccine.
Yes	COVID19 VACCINE	0921547-1	DEATH ON 1/4/2021, RESIDENT RECIEVED VACCINE ON 1/2/20

			Moderna COVID-19 Vaccine.; Reporter's Comments: This case concerns a 91-year old female patient. The medical history and concomitant medication is not provided. The patient experienced Death. The event occurred approximately one day after receiving their first of two planned doses of mRNA-1273 (Lot unknown). Very limited information regarding this event has been provided at this time. Based on temporal association between the use of the product and the onset of the event, a causal relationship cannot be excluded and the event is considered possibly related to the vaccine.; Reported Cause(s) of Death: Unknown Cause of Death
Yes	COVID19 VACCINE (COVID19)	1002187-1	PATIENT WAS IN CLINIC FOR 1ST CLINIC. WAS DISCHARGED BEFORE OUR 2ND CLINIC. HE CAME BACK TO OBTAIN HIS 2ND SHOT. WE WENT OUT TO THE CAR GAVE SHOT. THE NEXT DAY TO MY KNOWLEDGE, HE STARTED CODING AT HOME. AMBULANCE WAS CALLED AND HE CONTINUED TO CODE. THE AMBULANCE CREW TRIED CPR FOR 30 MINS WITH NO LUCK. PATIENT PASSED 2-3-21.
Yes	COVID19 VACCINE (COVID19)	1002229-1	spontaneous death, found unresponsive in cell after normal morning activities
Yes	COVID19 VACCINE (COVID19)	1002813-1	Patient was seen at 0710 he was sleeping but at normal cognitive behavior Patient was again assessed at 0720 where he was noted to be unresponsive, BP 180/100s, HR 230s, he was a DNR therefore not CPR was administered. EMS arrived at facility patient was noted to be in full cardiac and respiratory arrest. Time of death 0735
Yes	COVID19 VACCINE (COVID19)	1002840-1	Client lives alone and had dinner at his home with family members after the 4:40 appointment. Client stated that in general he did not feel well but did not give any specific symptom. Family states they asked the client to go to the ER and the client refused. Family states they helped the client to his chair in the living room and then left to go home. Family states that the client was found in his bedroom the next morning at 7:54 a.m. deceased.
Yes	COVID19 VACCINE (COVID19)	1002931-1	CARDIAC ARREST, DEATH Narrative: The patient presents to the emergency department in cardiopulmonary arrest. CPR was continued upon arrival. The Combi tube was removed and an endotracheal tube was placed without complications. ROSC was obtained multiple times but the patient continued to go into PEA. The patient was seen in the emergency department by both critical care and Cardiology. EKG shows ST elevations, but the patient was unstable to go to catheterization. The patient had 1 episode of asystole. Despite best efforts and multiple attempts we were unable to resuscitate the patient. Time of death 1253 on 1/24/21.
Yes	COVID19 VACCINE (COVID19)	1003390-1	On 2/1/2021, the patients daughter, who claims is a nurse, reported this incident to me. She stated that the evening after the patient received the vaccine, she felt some mild injection site pain. The morning after, the patient reported severe abdominal pain, diarrhea and vomiting. The patients daughter then called her physician to report these symptoms and attributed them as an adverse reaction to the vaccine at that time. These symptoms were intermittent for one week and no other adverse reactions were noted. In the early morning hours of 1/27/2021, the patient was toileting and had expired while doing so. An ambulance was called and cause of death was not found. An autopsy was not performed.
Yes	COVID19 VACCINE (COVID19)	1004206-1	"Death; A spontaneous report was received from a nurse concerning a 91-year-old, female patient who received Moderna's COVID-19 Vaccine (mRNA-1273) and died two days later. The patient's medical history included dementia. Concomitant medications reported included paracetamol. On 21 Jan 2021, approximately two days prior to her death, the patient received the first of two planned doses of mRNA-1273, intramuscularly for prophylaxis of COVID-19 infection. On 23 Jan 2021, the patient died. The nurse reporting the event stated that the patient's death was considered as due to ""natural causes"" and that she was not aware of any new-onset symptoms of illness prior to the patient's death. The patient was described as ""fragile"" and was under hospice care at the time of her death. An autopsy was not performed. Action taken with the drug in response to the event is not applicable. The patient died on 23 Jan 2021. The cause of death was natural cause of death related to dementia. Autopsy was not performed.; Reporter's Comments: This case concerns a 91-years-old female patient, with medical history of dementia, who experienced a serious unexpected event of death. This event occurred 2 days after first dose of mRNA-1273, lot # unknown. At the time of death, the subject was very fragile and was in hospice care. Concomitant medication included Tylenol. Treatment details were not provided. The doctor considered that the death was due to natural causes. However, autopsy was not performed. Very limited information regarding this event has been provided at this time. Based on the limited information available, it is difficult to assess a cause and effect relationship. The benefit-risk relationship of Moderna's COVID-19 vaccine is not affected by this report.; Reported Cause(s) of Death: Natural cause of death related to dementia"
Yes	COVID19 VACCINE (COVID19)	1004811-1	On 1/23/21 the patient had a single-car accident, slid off icy road into snowbank. She was seen in our ER, diagnosed w/ trauma and L4 compression fracture. She was transported to Hospital for further trauma workup. We believe she was treated and released. On 1/31/21 the patient had a headache but did not seek medical attention. In the morning of 2/1 she became unresponsive and was pronounced dead on the scene when EMS arrived. Autopsy showed a left temporal subdural hematoma.
Yes	COVID19 VACCINE (COVID19)	1004956-1	Wife reported patient expired on 2/3/2021
Yes	COVID19 VACCINE (COVID19)	1005130-1	Report of patient expired on 2/3/2021
Yes	COVID19 VACCINE (COVID19)	1005217-1	Nursing home called 911 for decline in condition. Patient transported to ER where she was admitted to inpatient care and expired 1/30 at 16:13
Yes	COVID19 VACCINE (COVID19)	1005276-1	chills 1 day after vaccine administration; found dead by family 1/18/2021 Narrative: Per patient family report, patient said the next day after vaccination that he didn't feel well because of chills. Patient was found dead at home by his family on January 18th. He was a 74yo man with castrate resistant prostate cancer and liver and bone metastases with rising PSA, status post intravenous chemotherapy 1/7/21
Yes	COVID19 VACCINE (COVID19)	1005377-1	"Significant other reported patient expired ""a week before 2nd vaccine was due""."
Yes	COVID19 VACCINE (COVID19)	1005455-1	We don't know what happened. 25 hours after the shot, he started gagging and stopped breathing. He was pronounced at OSF at 8:07pm after we took him off life support.
Yes	COVID19 VACCINE (COVID19)	1005568-1	Pt. deceased.
Yes	COVID19 VACCINE (COVID19)	1006216-1	Notes of the checks/events with resident: 18:36 2/2/21 Resident had no complaint of pain, swelling, redness or warmth to vaccine site. No signs and symptoms of fever, chills, tiredness or headache. T 97.2 02:50 2/3/2021 Resident received 2nd COVID vaccine. No complaint of pain, swelling, redness or warmth to vaccine site. No signs and symptoms of fever, chills, tiredness or headache. T 98.1 07:15 2/3/2021 Resident was observed not breathing. 911 was contacted along with the doctor. Resident was confirmed having passed away.
Yes	COVID19 VACCINE (COVID19)	1006228-1	2/2/21-1000-patient presented to the local emergency room with complains of fever, shortness of breath and decreased oxygen sats. temp 101.7, pulse 102, respirations 36, BP 141/92, oxygen 94%. Lung sounds crackles bilaterally with rhonchi on the left. patient worked up for sepsis, CXR shows mild atelectasis. blood pressure dropped, and continued to drop through treatment requiring levophed drop to be initiated. Patient POA determined that this would not be her sister's wishes and made the decision to make patient comfort care status. 2/3/21- patient lethargic throughout night. 0640-patient demise.
Yes	COVID19 VACCINE (COVID19)	1006289-1	death- 2/1/2021
Yes	COVID19 VACCINE (COVID19)	1006303-1	death- 2/1/2021
Yes	COVID19 VACCINE	1006316-1	death- 2/2/2021

	(COVID19)		
Yes	COVID19 VACCINE (COVID19)	1046613-1	patient passed away within 60 days of receiving a COVID vaccine
Yes	COVID19 VACCINE (COVID19)	1046698-1	patient passed away within 60 days of receiving a COVID vaccine
Yes	COVID19 VACCINE (COVID19)	1046795-1	Per ED note: Brought in ED by EMS at 1945 for acute shortness of breath and hypotension. Patient was placed on supplemental oxygen and covid test completed. Patient was placed on BiPAP to maintain oxygen greater than 90%. Found to be in metabolic acidosis. Patient became unresponsive and pulse could not be palpated. Chest compressions were initiated. ACLS medications given and pulses regained. Patient lost pulse 30 mins later and never regained pulse. Per ED noted; likely developed a PE. Passed away at 2127
Yes	COVID19 VACCINE (COVID19)	1046845-1	Deceased 02/18/2021 with an unknown cause of death
Yes	COVID19 VACCINE (COVID19)	1046881-1	Code blue called at 11:00pm. Patient had code status of Do Not Resuscitate.
Yes	COVID19 VACCINE (COVID19)	1047183-1	Pt had expired before second dose was delivered.
Yes	COVID19 VACCINE (COVID19)	1047197-1	death
Yes	COVID19 VACCINE (COVID19)	1047282-1	Patient felt fine on Friday afternoon and evening after shot. Felt fine on Saturday until the afternoon when she started feeling fatigued and chilled. Decided to take a warm bath at about 6pm. Was found dead in bathtub at approximately 7pm with blisters on arms, legs, and face.
Yes	COVID19 VACCINE (COVID19)	1047326-1	According to patient's caregiver, patient presented with symptoms of fever (101.6 F) and purple blotches all over the body within an hour. Since patient was in hospice , caregiver called Hospice and a pharmacy and was told to give patient Benadryl and Tylenol. Patient was given both medications and the fever subsided in a few days but the purple blotches never went away. Patient passed away at the facility a week later.
Yes	COVID19 VACCINE (COVID19)	1048786-1	"Was given vaccine around 1:30Pm on 2-11-2021. He and his wife waited in the building for 15 minutes and then left. he denied complaint. (He was waiting to have both Covid shots before he went to cardiologist Re: CAD.) He had an alarm going off in his house, was going to basement to check it out. Police officer heard alarm, came into house, & heard a thud when Doc fell. He was in PEA (Pulseless Electrical Activity) when brought into ER. Given 5 ""rounds of Epinephrine with no response."
Yes	COVID19 VACCINE (COVID19)	1048882-1	Vaccine was administered 2/1/2021 at approximately 9am. Due to self reporting of allergic reaction (hives) to Augmentin, patient was monitored on site for 30 minutes. After the monitoring period, she was cleared to go with no issues reported at the time. We were later informed that the patient passed away from a pulmonary embolism on 2/12/2021.
Yes	COVID19 VACCINE (COVID19)	1048947-1	Patient experienced an episode of emesis and loss of consciousness several hours after vaccine on 2/16/21. He was taken by EMS to the hospital and was noted to be hypoxic and hypotensive. He was admitted to the hospital and subsequently intubated. He was also found to have a small bowel obstruction and a nasogastric tube was placed to decompress the bowel. He required pressor support as well. He expired on 2/17/21.
Yes	COVID19 VACCINE (COVID19)	1049012-1	Patient was given vaccine on friday, one week later she passed away. The family called the pharmacy to inform us on Saturday, Feb 20, 2021. After the phone call was over, we saw in her pharmacy profile that she had received the vaccine one week prior
Yes	COVID19 VACCINE (COVID19)	1049389-1	Patient passed away Saturday at 14:04pm. Patient's wife reports his death was sudden, he passed away sitting in his chair his heart just stopped she said. They tried to perform CPR, 911 was called and paramedics arrived at the scene and he was given medication but never had any return of vital signs and so his death was called at the scene. Wife reports he was not ill, did not have any symptoms prior to the event. They are not going to be doing a autopsy. She wanted us to know based on timing that there may be some possible correlation with his COVID19 vaccine. He obtained the vaccine on 02/09/2021 - wife reports he had no symptoms, not even arm soreness after the vaccine. Had no fever, shortness of breath. Did not complain of chest pain. We can update chart to reflect the patient is deceased and lets make a card for the family.
Yes	COVID19 VACCINE (COVID19)	1049406-1	Patient rcvd 1st covid 19 vaccine on 1/26/2021. Patient had house guests on 1/30/21. Those house guests tested positive for covid on 2/1/2021. Patient started getting symptoms on 02/2/2021. Patient tested postivie on 2/4/2021. Patient was hospitalized 2/7/2021. Patient passed away on 2/21/21.
Yes	COVID19 VACCINE (COVID19)	1049648-1	I was notified on 2/22/21 that this patient passed away over the weekend. I do not know the details, nor can I confirm anything beyond what I was told. I believe the death occurred on 2/20/21 due to a massive stroke.
Yes	COVID19 VACCINE (COVID19)	1049852-1	When calling to get billing information we were notified that patient had passed away. Patient's daughter said patient was having cvd a/s on 2.1.2021 got vaccine 2.2.2021 and passed away 2.5.2021. Cardiologist said not related
Yes	COVID19 VACCINE (COVID19)	1049963-1	Found lying face down without respiration or pulse, believed to be within 5 minutes of event. ACLS procedures unsuccessful. Unable to get autopsy. Believed to be heart attack secondary to COVID infection, but unconfirmed. Relative contribution of recent vaccination unknown.
Yes	COVID19 VACCINE (COVID19)	1049997-1	Vaccine was administered at Nursing Facility. Patient is an 89-year-old female with prior medical history of CVA with dysphagia, history of possible dementia, GERD, hyperlipidemia, and a pacemaker. She is a resident from town. She was sent for hypotension with a blood pressure of 90/52, tachypnea respirations of 54, possible aspiration pneumonia. Status post Covid vaccine earlier today. History is limited as patient is nonverbal on my exam. Death within 24 hours of vaccination
Yes	COVID19 VACCINE (COVID19)	1050137-1	Pt received second Moderna Vaccination on 2/21/21 at 1:00 pm at Pharmacy. Pt present on 2/22/21 to ER via ambulance at 1940. Upon presentation C/C hypotension Post COVID vaccine. Nurse notes states that Home Health nurse sent patient to ER secondary to hypotension and hyperglycemia. Pt states back ached and was holding his head. Nurse noted pt had random petechiae over body and bruising to abdomen following injections received during recent hospitalization. (unknown hospitalization). Patient was treated with IVF bolus in addition to initiating Dopamine for hypotension, patient became agonal and daughter at bedside presented Adv. Directive, pt was DNR. Pt pronounced time of death was 2110pm. (Pt only reported a sore shoulder secondary to vaccine).
Yes	COVID19 VACCINE (COVID19)	1050172-1	Individual developed severe body aches, severe shoulder discomfort, high fevers (documented max temp. 103.7 F). Daughter reported that she became non-responsive with high fevers, and when the fevers decreased she was more lucid. Her condition rapidly progressed to nausea vomiting, diarrhea and patient died on 2/9/2021.
Yes	COVID19 VACCINE (COVID19)	1050201-1	Died 7 days after receiving 2nd dose of Moderna vaccine. Had underlying hx Lung CA w/mets.
Yes	COVID19 VACCINE (COVID19)	1050281-1	Per family, patient has been feeling sick since he was vaccinated, patient went to ER on 02/15/2021, and after few hours at ER patient passed away.
Yes	COVID19 VACCINE (COVID19)	1050431-1	Since I was not with my husband I can only tell you what was told to me. He walked out of the store toward our car. Someone watched him, concerned, because he was walking very slowly (normally has a slow gait because of leg braces and toe amputations so I don't know if it was unusually slow). The woman saw him fall and she ran to help- administered CPR immediately-and told me he died instantly. Medics tried to resuscitate and failed to bring a pulse. (My husband left our home around 11:15 to drop a package off at store. The store is one mile from our home. At around 12:30 a deputy came to my door and when I saw him my knees buckled. I knew something horrible

Yes	COVID19 VACCINE (COVID19)	1078246-1	Death. Ruptured myocardial infarct.
Yes	COVID19 VACCINE (COVID19)	1078352-1	Developed fatigue, body aches, headache 1 day after vaccination on 3/3. The morning of 3/5 complained of chest pain. Took Tylenol at 8:30 am. At 10:30 am his family found him unresponsive. EMS was called and he was pronounced dead in the home.
Yes	COVID19 VACCINE (COVID19)	1079251-1	Patient died the day after she received her vaccine
Yes	COVID19 VACCINE (COVID19)	1079904-1	SUBJECT WAS FOUND DECEASED ON 22 FEB 2021 AT AROUND 11:30 PM
Yes	COVID19 VACCINE (COVID19)	1079958-1	Pt found down and pulseless in home by husband. EMS called, Pt found to be in PEA arrest. Pt achieved ROSC with CPR and Epinephrin. Pt Passed away on 09/07/2021 at 1330. Pt was in multisystem organ failure.
Yes	COVID19 VACCINE (COVID19)	1079976-1	12/23/20 (Moderna #1) - Malaise, cough on 12/24, went to walk-in on 12/25 c/o cough, malaise, rx'd Augmentin x14d, Rapid covid negative (and PCR resulted negative). 12/27 slept all day, 12/28 back to work. 1/12/21 metallic taste in mouth, severe GI sx, malaise, aches, headache. 1/14 seen at walk-in and covid swabbed Negative. 1/21/21 exposed to parents who found out they were covid + on 1/22/21. 1/25/21 (Moderna #2) - Continued with persistent cough and GI sx. Then also developed urinary frequency and urgency. Seen at urgent care 2/1 c/o cough, dx URI, rx'd augmenting. Woke up morning of 2/2/21 abruptly, stood up, said something was wrong, and collapsed. CPR attempted immediately, EMS brought him to ER where he was pronounced dead.
Yes	COVID19 VACCINE (COVID19)	1080425-1	Narrative: Patient with h/o ESRD on HD MWF, HTN presented to ER on 2/20/21 with worsening dyspnea and GI symptoms; tested positive for COVID-19. Patient had received first COVID vaccination approx. 9 days prior. Patient admitted to ICU for treatment of COVID+ PNA. During admission, patient often could not tolerate removal of fluid during HD d/t tachycardia. He received dexamethasone, convalescent plasma for COVID. Patient underwent TTE which was notable for septal wall motion abnormalities and grossly reduced EF. Admission also c/b acute liver injury, possible cholecystitis, thrombocytopenia, SVT, encephalopathy. Patient then developed progressive shock and hemodynamic instability on 3/2 and passed away on 3/2/21.
Yes	COVID19 VACCINE (COVID19)	1080429-1	DEATH Narrative: no documentation regarding any immediate reaction after vaccine administration. 83 y.o. male with pmh severe pulmonary hypertension, s/p TAVR last year, severe asbestos related lung disease on chronic oxygen, recently started on palliative care. Was found by daugher deceased on the morning of 2/11/2021. Autopsy declined by family.
Yes	COVID19 VACCINE (COVID19)	1080430-1	Death Narrative: Death was not determined to be related to COVID vaccination. COVID vaccination (dose 1) occurred on 1/27/21 with no noted side effects. Death occurred on 2/14/21.
Yes	COVID19 VACCINE (COVID19)	1080431-1	Narrative: 67 year-old male received his 1st COVID vaccine dose at a clinic on 2/25/21 at ~ 11:45am. No known prior COVID infection. No history of vaccine allergies or allergies to any component of the COVID vaccine. Does have history of allergic reactions including hives, angioedema or anaphylaxis to some medications (neomycin, Neosporin, bacitracin) and environmental allergens (yellow jackets, fir trees). Patient reported previously daily use of diphenhydramine (2 caps every morning) and kept an epi-pen on hand. The afternoon of 2/26/21, patient presented to his neighbor's house requesting assistance with an epi-pen. Neighbor reported significant swelling around tongue and lips, and ability to faintly speak. Neighbor administered epi-pen, but unsure if it worked, so administered a 2nd epi-pen. Within a minute or two after the 2nd dose, patient slumped over and became non-responsive. EMS was called and neighbor began CPR. EMS reported that patient was non-responsive upon arrival. A King airway was placed and a Lucas device used for chest compressions. Three rounds of epinephrine were administered during transport to the local emergency room. Patient remained unresponsive with evidence of PEA during transport. Arrival at the ER occurred ~ 4:25pm. On arrival patient noted to be unresponsive with CPR in progress. Dose of epinephrine administered ~ 3 minutes after arrival in ER. No femoral pulse palpable, cardiac monitor did show some electrical activity. Evaluation of oral cavity showed significant swelling of tongue. Additional dose of epinephrine given. Patient remained with no palpable central pulse and showed continued evidence of PEA. Patient was estimated to have been down > 45 minutes. Patient pronounced deceased at 4:59pm.
Yes	COVID19 VACCINE (COVID19)	1080433-1	unknown cardiovascular event
Yes	COVID19 VACCINE (COVID19)	1080434-1	Death Narrative: Patient passed away on 3-2-21, patient received the vaccine on 2-24-21. Patient was obese and had several co-morbid conditions.
Yes	COVID19 VACCINE (COVID19)	1080671-1	Patient received vaccine 1/26/2021, complained of fever and chills post vaccine. Daughter reported worsening symptoms to confusion, decreased appetite, N/V and chest pain. Dry cough and SOB. Patient admitted to facility for Chest pain, AMS on 2/2/2021. Expired 2/2/2021.
Yes	COVID19 VACCINE (COVID19)	1081009-1	there were no signs of adverse reaction at the time of injections and she waited 15 minutes at the site to watch for side effects. and none were evident or reported. We were notified that she passed away on Saturday, March 6.
Yes	COVID19 VACCINE (COVID19)	1081033-1	Patient expired 2 days after receiving the vaccination. Patient had other signs of deterioration over the course of the previous month with worsening edema and difficulty breathing. Unlikely to be related according to our assessments, but wanted to err on the side of caution.
Yes	COVID19 VACCINE (COVID19)	1081155-1	Pt died on 3/6/2021. Received Vaccine on 2/12/2021. Unknown cause of death.
Yes	COVID19 VACCINE (COVID19)	1081304-1	patient passed away within 60 days of receiving a COVID vaccine
Yes	COVID19 VACCINE (COVID19)	1081305-1	Sudden death approximately 24 hours after receiving 2nd COVID vaccine - symptoms unknown - autopsy revealed cardiac disease as the cause of death
Yes	COVID19 VACCINE (COVID19)	1081547-1	NO IMMEDIATE ADVERSE EVENTS PRESENT FOLLOWING IMMUNIZATION. RESIDENT WAS ALERT, RESPONSIVE, TALKATIVE, WITHOUT COMPLAINTS, AND ENGAGING IN NORMAL ACTIVITIES AFTER IMMUNIZATION, AS WELL AS THE FOLLOWING DAY. HE WAS FOUND IN BED THE SECOND MORNING AFTER VACCINATION (AT 6:25AM) WITHOUT VITAL SIGNS AND HAD EXPIRED PEACEFULLY IN HIS SLEEP. HE WAS A DNR, NO LIFE SUSTAINING MEASURES WERE PERFORMED.
Yes	COVID19 VACCINE (COVID19)	1082467-1	Pt passed away on 3/6/21.
Yes	COVID19 VACCINE (COVID19)	1082707-1	death
Yes	COVID19 VACCINE (COVID19)	1082717-1	Patient dropped dead 24 hours after receiving the vaccine. The vaccine killed her. She received the vaccine 2/16/2021 and died 2/17/2021
Yes	COVID19 VACCINE (COVID19)	1082759-1	Death
Yes	COVID19 VACCINE	1082787-1	Death on 3/7/21

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COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Data Lock Date: 07-Mar-2021 19:00:03

All UK spontaneous reports received up to and including 07/03/21 for COVID-19 vaccines where the brand has not been specified.

Rm
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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Blood disorders		
Lymphatic system disorders NEC		
Lymphadenopathy	3	0
Blood disorders SOC TOTAL	3	0

Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Cardiac disorders		
Cardiac signs and symptoms NEC		
Palpitations	2	0
Ischaemic coronary artery disorders		
Myocardial infarction	1	1
Supraventricular arrhythmias		
Atrial fibrillation	1	0
Cardiac disorders SOC TOTAL	4	1

Rm 2

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Ear disorders		
Ear disorders NEC		
Ear discomfort	1	0
Ear pain	2	0
Inner ear signs and symptoms		
Tinnitus	2	0
Vertigo	4	0
Ear disorders SOC TOTAL	9	0

RM2

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Eye disorders		
Lacrimation disorders		
Lacrimation increased	1	0
Lid, lash and lacrimal infections, irritations and inflammations		
Swelling of eyelid	1	0
Ocular disorders NEC		
Eye pain	2	0
Eye swelling	1	0
Ocular infections, inflammations and associated manifestations		
Eye pruritus	1	0
Retinal bleeding and vascular disorders (excl retinopathy)		
Retinal haemorrhage	1	0
Retinal structural change, deposit and degeneration		
Retinal toxicity	1	0
Visual disorders NEC		
Diplopia	2	0
Vision blurred	1	0
Visual impairment and blindness (excl colour blindness)		
Blindness transient	1	0
Visual impairment	1	0
Eye disorders SOC TOTAL	13	0

Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Gastrointestinal disorders		
Anal and rectal pains		
Proctalgia	1	0
Dental pain and sensation disorders		
Toothache	1	0
Diarrhoea (excl infective)		
Diarrhoea	9	0
Dyspeptic signs and symptoms		
Dyspepsia	1	0
Faecal abnormalities NEC		
Abnormal faeces	1	0
Faeces discoloured	1	0
Gastritis (excl infective)		
Gastritis	1	0
Gastrointestinal and abdominal pains (excl oral and throat)		
Abdominal pain upper	6	0
Gastrointestinal signs and symptoms NEC		
Abdominal discomfort	4	0
Nausea and vomiting symptoms		
Nausea	35	0
Vomiting	20	0
Vomiting projectile	1	0
Oral dryness and saliva altered		
Dry mouth	1	0
Oral soft tissue signs and symptoms		
Hypoaesthesia oral	1	0
Lip pain	1	0
Oral pain	1	0
Oral soft tissue swelling and oedema		
Lip swelling	2	0
Stomatitis and ulceration		
Mouth ulceration	2	0
Gastrointestinal disorders SOC TOTAL	89	0

Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020
MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
General disorders		
Application and instillation site reactions		
Application site burn	1	0
Asthenic conditions		
Asthenia	10	0
Fatigue	55	0
Malaise	21	0
Death and sudden death		
Death	4	4
Febrile disorders		
Pyrexia	54	0
Feelings and sensations NEC		
Chills	43	0
Feeling abnormal	3	0
Feeling cold	12	0
Feeling hot	4	0
Feeling of body temperature change	4	0
Thirst	1	0
Gait disturbances		
Gait disturbance	4	0
Gait inability	1	0
General signs and symptoms NEC		
Condition aggravated	2	0
Illness	3	0
Influenza like illness	8	0
Peripheral swelling	6	0
Swelling	8	0
Swelling face	5	0
Injection site reactions		
Injection site inflammation	1	0
Injection site mass	1	0
Injection site pain	1	0
Pain and discomfort NEC		
Axillary pain	1	0
Chest discomfort	4	0
Chest pain	3	0
Discomfort	1	0
Facial pain	1	0
Pain	27	0
Therapeutic and nontherapeutic responses		
Adverse drug reaction	2	0
Vaccination site reactions		
Vaccination site bruising	2	0
Vaccination site erythema	7	0
Vaccination site induration	1	0
Vaccination site inflammation	2	0
Vaccination site mass	1	0
Vaccination site pain	8	0
Vaccination site papule	1	0
Vaccination site pruritus	2	0
Vaccination site rash	1	0
Vaccination site swelling	5	0
Vaccination site vesicles	1	0
Vaccination site warmth	2	0

RMC

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03

Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name		Total	Fatal
General disorders	General disorders cont'd		
General disorders SOC TOTAL		324	4

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020
MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Hepatic disorders		
Bile duct infections and inflammations		
Biliary colic	1	0
Hepatic disorders SOC TOTAL	1	0

Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Immune system disorders		
Allergic conditions NEC		
Hypersensitivity	1	0
Allergies to foods, food additives, drugs and other chemicals		
Drug hypersensitivity	1	0
Immune system disorders SOC TOTAL	2	0

RM2
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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Earliest Reaction Date: 06-Feb-2020
Data Lock Date: 07-Mar-2021 19:00:03
MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Infections		
Coronavirus infections		
COVID-19	1	0
Herpes viral infections		
Herpes zoster	1	0
Oral herpes	1	0
Influenza viral infections		
Influenza	4	0
Lower respiratory tract and lung infections		
Pneumonia	2	1
Sepsis, bacteraemia, viraemia and fungaemia NEC		
Sepsis	1	0
Urinary tract infections		
Cystitis	1	0
Viral infections NEC		
Gastroenteritis viral	1	0
Sweating fever	1	0
Infections SOC TOTAL	13	1

RM2

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03

Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Injuries		
Exposures associated with pregnancy, delivery and lactation		
Exposure via breast milk	1	0
Medication errors, product use errors and issues NEC		
Wrong technique in product usage process	1	0
Non-site specific injuries NEC		
Fall	2	0
Non-site specific procedural complications		
Incision site pain	1	0
Injection related reaction	1	0
Skin injuries NEC		
Contusion	1	0
Injuries SOC TOTAL	7	0

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020
MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Investigations		
Coagulation and bleeding analyses		
Fibrin D dimer increased	1	0
International normalised ratio increased	1	0
Heart rate and pulse investigations		
Heart rate increased	1	0
Physical examination procedures and organ system status		
Body temperature abnormal	1	0
Body temperature decreased	2	0
Body temperature increased	1	0
Therapeutic drug monitoring analyses		
Anticoagulation drug level below therapeutic	1	0
Vascular tests NEC (incl blood pressure)		
Blood pressure increased	4	0
Investigations SOC TOTAL	**12**	**0**

RML

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020
MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Metabolic disorders		
Appetite disorders		
Decreased appetite	27	0
Hypophagia	2	0
Hyperglycaemic conditions NEC		
Hyperglycaemia	1	0
Metabolic disorders SOC TOTAL	**30**	**0**

Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Muscle & tissue disorders		
Bone related signs and symptoms		
Bone pain	1	0
Cartilage disorders		
Costochondritis	1	0
Joint related signs and symptoms		
Arthralgia	18	0
Joint stiffness	1	0
Joint swelling	1	0
Muscle pains		
Myalgia	23	0
Muscle related signs and symptoms NEC		
Muscle fatigue	1	0
Muscle spasms	2	0
Muscle tightness	2	0
Muscle twitching	1	0
Muscle weakness conditions		
Muscular weakness	3	0
Musculoskeletal and connective tissue conditions NEC		
Mobility decreased	1	0
Musculoskeletal stiffness	4	0
Musculoskeletal and connective tissue pain and discomfort		
Back pain	3	0
Neck pain	1	0
Pain in extremity	24	0
Muscle & tissue disorders SOC TOTAL	87	0

AML
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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Nervous system disorders		
Acute polyneuropathies		
Guillain-Barre syndrome	2	0
Coordination and balance disturbances		
Balance disorder	3	0
Dysstasia	2	0
Disturbances in consciousness NEC		
Lethargy	9	0
Somnolence	7	0
Syncope	1	0
Dyskinesias and movement disorders NEC		
Bradykinesia	1	0
Hypokinesia	2	0
Eye movement disorders		
VIth nerve paralysis	1	0
Facial cranial nerve disorders		
Facial paresis	1	0
Headaches NEC		
Headache	87	0
Memory loss (excl dementia)		
Amnesia	2	0
Mental impairment (excl dementia and memory loss)		
Disturbance in attention	2	0
Migraine headaches		
Migraine	8	0
Retinal migraine	1	0
Neurological signs and symptoms NEC		
Dizziness	26	0
Dizziness postural	3	0
Neurological symptom	1	0
Paraesthesias and dysaesthesias		
Burning sensation	2	0
Hypoaesthesia	1	0
Paraesthesia	8	0
Paralysis and paresis (excl cranial nerve)		
Paralysis	1	0
Seizures and seizure disorders NEC		
Convulsions local	1	0
Seizure	1	0
Sensory abnormalities NEC		
Dysgeusia	2	0
Sensory disturbance	1	0
Sleep disturbances NEC		
Poor quality sleep	1	0
Transient cerebrovascular events		
Transient ischaemic attack	1	0
Tremor (excl congenital)		
Tremor	21	0
Nervous system disorders SOC TOTAL	199	0

Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Psychiatric disorders		
Abnormal behaviour NEC		
Abnormal behaviour	1	0
Anxiety symptoms		
Anxiety	1	0
Nervousness	1	0
Stress	1	0
Confusion and disorientation		
Confusional state	7	0
Disorientation	4	0
Disturbances in initiating and maintaining sleep		
Insomnia	1	0
Emotional and mood disturbances NEC		
Irritability	1	0
Hallucinations (excl sleep-related)		
Hallucination	1	0
Mood alterations with depressive symptoms		
Depressed mood	1	0
Panic attacks and disorders		
Panic attack	1	0
Perception disturbances NEC		
Autoscopy	1	0
Sleep disorders NEC		
Sleep disorder	2	0
Thinking disturbances		
Bradyphrenia	1	0
Psychiatric disorders SOC TOTAL	24	0

Rm 2
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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Renal & urinary disorders		
Bladder and urethral symptoms		
Dysuria	1	0
Urinary incontinence	2	0
Renal lithiasis		
Nephrolithiasis	1	0
Urinary abnormalities		
Haematuria	1	0
Urine odour abnormal	1	0
Urinary tract signs and symptoms NEC		
Renal pain	2	0
Renal & urinary disorders SOC TOTAL	8	0

RML

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03

Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Reproductive & breast disorders		
Menstruation with increased bleeding		
Polymenorrhoea	1	0
Reproductive & breast disorders SOC TOTAL	1	0

RML

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Earliest Reaction Date: 06-Feb-2020
Data Lock Date: 07-Mar-2021 19:00:03
MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Respiratory disorders		
Breathing abnormalities		
Dyspnoea	9	1
Bronchospasm and obstruction		
Asthma	1	0
Chronic obstructive pulmonary disease	1	0
Coughing and associated symptoms		
Cough	5	0
Haemoptysis	1	0
Nasal congestion and inflammations		
Nasal congestion	1	0
Nasal disorders NEC		
Epistaxis	2	0
Pulmonary thrombotic and embolic conditions		
Pulmonary embolism	1	1
Respiratory tract disorders NEC		
Lung disorder	1	0
Upper respiratory tract signs and symptoms		
Oropharyngeal pain	2	0
Rhinorrhoea	2	0
Respiratory disorders SOC TOTAL	26	2

RM1

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021
Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020
MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Skin disorders		
Apocrine and eccrine gland disorders		
Cold sweat	2	0
Hyperhidrosis	9	0
Night sweats	2	0
Dermal and epidermal conditions NEC		
Dry skin	1	0
Skin burning sensation	1	0
Skin discolouration	2	0
Skin swelling	1	0
Erythemas		
Erythema	8	0
Exfoliative conditions		
Skin exfoliation	1	0
Photosensitivity and photodermatosis conditions		
Photosensitivity reaction	1	0
Pruritus NEC		
Pruritus	11	0
Rashes, eruptions and exanthems NEC		
Rash	9	0
Rash erythematous	2	0
Rash pruritic	4	0
Urticarias		
Urticaria	3	0
Skin disorders SOC TOTAL	57	0

Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Social circumstances		
Disability issues		
Bedridden	1	0
Social circumstances SOC TOTAL	1	0

RM2

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Case Series Drug Analysis Print

Name: COVID-19 vaccine brand unspecified analysis print

Report Run Date: 16-Mar-2021 Data Lock Date: 07-Mar-2021 19:00:03
Earliest Reaction Date: 06-Feb-2020 MedDRA Version: MedDRA 23.1

Reaction Name	Total	Fatal
Vascular disorders		
Haemorrhages NEC		
Haematoma	1	0
Non-site specific vascular disorders NEC		
Vascular rupture	1	0
Peripheral vascular disorders NEC		
Flushing	1	0
Peripheral vasoconstriction, necrosis and vascular insufficiency		
Peripheral coldness	1	0
Vascular hypertensive disorders NEC		
Hypertension	3	0
Vascular disorders SOC TOTAL	7	0
TOTAL REACTIONS FOR DRUG	**917**	**8**
TOTAL REPORTS	**281**	
TOTAL FATAL OUTCOME REPORTS		8

MEDICAL Brief
Africa's Medical Media Digest

Deaths may top 88,000 but lockdown disaster dwarfs CO\ SA actuaries

MAY 6TH, 2020 SOUTH AFRICA

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Actuarial analysis could help provide "improved, data-led" decision-making. This would go beyond quantifying the virus, and look at the impact of a longer-term humanitarian disaster: this would require the "next best acti

*The death toll from **South Africa**'s coronavirus outbreak this year could range between 46,000 and 88,000,* acco model from the **Actuarial Society of SA (Assa)**. ***Business Day*** reports that the outputs vary depending on the about the percentage of people who are asymptomatic, how infectious people are, and how effective the lock

The Assa model's output is broadly in line with government projections, and has been provided to Assa's men actuaries in their work advising clients in the insurance industry. Life assurance companies in particular, need projections to assess their mortality expectations and stress test capital requirements, said Assa president L

The report says the model itself is still a work in progress and will only be provided to actuaries at a later stag local data at present, because South Africa's epidemic was still in its early stages, and new information was c about SARS-CoV-2, the coronavirus that causes **COVID-19**.

Assa has provided the industry with a range of scenarios that predict the number of symptomatic patients wi and September, at between 588,000 and 2.3m people. The demand for hospital beds when the outbreak is at between 69,400 and 125,000, while intensive care unit bed demand ranges between 10,700 and 19,200, accor

Full Daily Maverick report

Letter

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Statement on Virus Isolation (SOVI)

***Isolation**: "The action of isolating; the fact or condition of being isolated or standing alone; separation from other things or persons; solitariness."*
—From the Oxford English Dictionary

The controversy over whether the SARS-CoV-2 virus has ever been isolated or purified continues. However, using the above definition, common sense, the laws of logic and the dictates of science, any unbiased person must come to the conclusion that the SARS-CoV-2 virus has *never* been isolated or purified. As a result, no confirmation of the virus' existence can be found. The logical, common sense, and scientific consequences of this fact are:

- the structure and composition of something not shown to exist can't be known, including the presence, structure, and function of any hypothetical spike or other proteins;
- the genetic sequence of something that has never been found can't be known;
- "variants" of something that hasn't been shown to exist can't be known;
- it's impossible to demonstrate that SARS-CoV-2 causes a disease called Covid-19.

In as concise terms as possible, here's the proper way to isolate, characterize and demonstrate a new virus. First, one takes samples (blood, sputum, secretions) from many people (e.g. 500) with symptoms which are unique and specific enough to characterize an illness. Without mixing these samples with ANY tissue or products that also contain genetic material, the virologist macerates, filters and ultracentrifuges i.e. *purifies* the specimen. This common virology technique, done for decades to isolate

bacteriophages[1] and so-called giant viruses in every virology lab, then allows the virologist to demonstrate with electron microscopy thousands of identically sized and shaped particles. These particles are the isolated and purified virus.

These identical particles are then checked for uniformity by physical and/or microscopic techniques. Once the purity is determined, the particles may be further characterized. This would include examining the structure, morphology, and chemical composition of the particles. Next, their genetic makeup is characterized by extracting the genetic material directly from the purified particles and using genetic-sequencing techniques, such as Sanger sequencing, that have also been around for decades. Then one does an analysis to confirm that these uniform particles are exogenous (outside) in origin as a virus is conceptualized to be, and not the normal breakdown products of dead and dying tissues.[2] (As of May 2020, we know that virologists have no way to determine whether the particles they're seeing are viruses or just normal break-down products of dead and dying tissues.)[3]

If we have come this far then we have fully isolated, characterized, and genetically sequenced an exogenous virus particle. However, we still have to show it is causally related to a disease. This is carried out by exposing a group of healthy subjects (animals are usually used) to this isolated, purified virus in the manner in which the disease is thought to be transmitted. If the animals get sick with the same disease, as confirmed by clinical and autopsy findings, one has now shown that the virus actually causes a disease. This demonstrates infectivity and transmission of an infectious agent.

None of these steps has even been attempted with the SARS-CoV-2 virus, nor have all these steps been successfully performed for any so-called

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[1] Isolation, characterization and analysis of bacteriophages from the haloalkaline lake Elmenteita, KenyaJuliah Khayeli Akhwale et al, PLOS One, Published: April 25, 2019.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0215734 -- accessed 2/15/21

[2] "Extracellular Vesicles Derived From Apoptotic Cells: An Essential Link Between Death and Regeneration," Maojiao Li1 et al, Frontiers in Cell and Developmental Biology, 2020 October 2.
https://www.frontiersin.org/articles/10.3389/fcell.2020.573511/full -- accessed 2/15/21

[3] "The Role of Extraellular Vesicles as Allies of HIV, HCV and SARS Viruses," Flavia Giannessi, et al, Viruses, 2020 May

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pathogenic virus. Our research indicates that a single study showing these steps does not exist in the medical literature.

Instead, since 1954, virologists have taken unpurified samples from a relatively few people, often less than ten, with a similar disease. They then minimally process this sample and inoculate this unpurified sample onto tissue culture containing usually four to six other types of material — **all of which contain identical genetic material as to what is called a "virus."** The tissue culture is starved and poisoned and naturally disintegrates into many types of particles, some of which contain genetic material. Against all common sense, logic, use of the English language and scientific integrity, this process is called "virus isolation." This brew containing fragments of genetic material from many sources is then subjected to genetic analysis, which then creates in a computer-simulation process the alleged sequence of the alleged virus, a so called *in silico genome*. At no time is an actual virus confirmed by electron microscopy. At no time is a genome extracted and sequenced from an actual virus. This is scientific fraud.

The observation that the unpurified specimen — inoculated onto tissue culture along with toxic antibiotics, bovine fetal tissue, amniotic fluid and other tissues — destroys the kidney tissue onto which it is inoculated is given as evidence of the virus' existence and pathogenicity. This is scientific fraud.

From now on, when anyone gives you a paper that suggests the SARS-CoV-2 virus has been isolated, please check the methods sections. If the researchers used Vero cells or any other culture method, you know that their process was not isolation. You will hear the following excuses for why actual isolation isn't done:

1. There were not enough virus particles found in samples from patients to analyze.

2. Viruses are intracellular parasites; they can't be found outside the cell in this manner.

If No. 1 is correct, and we can't find the virus in the sputum of sick people, then on what evidence do we think the virus is dangerous or even lethal? If No. 2 is correct, then how is the virus spread from person to person? We are told it emerges from the cell to infect others. Then why isn't it possible to find it?

Finally, questioning these virology techniques and conclusions is not some distraction or divisive issue. Shining the light on this truth is essential to stop this terrible fraud that humanity is confronting. For, as we now know, if the virus has never been isolated, sequenced or shown to cause illness, if the virus is imaginary, then why are we wearing masks, social distancing and putting the whole world into prison?

Finally, if pathogenic viruses don't exist, then what is going into those injectable devices erroneously called "vaccines," and what is their purpose? This scientific question is the most urgent and relevant one of our time.

We are correct. The SARS-CoV2 virus does not exist.

Sally Fallon Morell, MA

Dr. Thomas Cowan, MD

Dr. Andrew Kaufman, MD

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RESEARCH

Severe Acute Respiratory Syndrome Coronavirus 2 from Patient with Coronavirus Disease, United States

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The etiologic agent of an outbreak of pneumonia in Wuhan, China, was identified as severe acute respiratory syndrome coronavirus 2 in January 2020. A patient in the United States was given a diagnosis of infection with this virus by the state of Washington and the US Centers for Disease Control and Prevention on January 20, 2020. We isolated virus from nasopharyngeal and oropharyngeal specimens from this patient and characterized the viral sequence, replication properties, and cell culture tropism. We found that the virus replicates to high titer in Vero-CCL81 cells and Vero E6 cells in the absence of trypsin. We also deposited the virus into 2 virus repositories, making it broadly available to the public health and research communities. We hope that open access to this reagent will expedite development of medical countermeasures.

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A novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has been identified as the source of a pneumonia outbreak in Wuhan, China, in late 2019 (*1*,*2*). The virus was found to be a member of the β coronavirus family, in the same species as SARS-CoV and SARS-related bat CoVs (*3*,*4*). Patterns of spread indicate that SARS-CoV-2 can be transmitted person-to-person, and may be more transmissible than SARS-CoV (*5*–*7*). The spike protein of coronaviruses mediates virus binding and cell entry. Initial characterization of SARS-CoV-2 spike indicates that it binds the same receptor as SARS-CoV angiotensin-converting enzyme, which is expressed in both upper and lower human respiratory tracts (*8*).

The unprecedented rapidity of spread of this outbreak represents a critical need for reference reagents. The public health community requires viral lysates to serve as diagnostic references, and the research community needs virus isolates to test antiviral compounds, develop new vaccines, and perform basic research. In this article, we describe isolation of SARS-CoV-2 from a patient who had coronavirus disease (COVID-19) in the United States and described its genomic sequence and replication characteristics. We have made the virus isolate available to the public health community by depositing it into 2 virus reagent repositories.

[1]These authors contributed equally to this article.

[2]These senior authors contributed equally to this article.

Methods

Specimen Collection

Virus isolation from patient samples was deemed not to be human subjects research by the National Center for Immunizations and Respiratory Diseases, Centers for Disease Control and Prevention (CDC) (research determination no. 0900f3eb81ab4b6e). Clinical specimens from a case-patient who had acquired COVID-19 during travel to China and who was identified in Washington, USA, were collected as described (*1*). Nasopharyngeal (NP) and oropharyngeal (OP) swab specimens were collected on day 3 postsymptom onset, placed in 2–3 mL of viral transport medium, used for molecular diagnosis, and frozen. Confirmed PCR-positive specimens were aliquoted and refrozen until virus isolation was initiated.

Cell Culture, Limiting Dilution, and Virus Isolation

We used Vero CCL-81 cells for isolation and initial passage. We cultured Vero E6, Vero CCL-81, HUH 7.0, 293T, A549, and EFKB3 cells in Dulbecco minimal essential medium (DMEM) supplemented with heat-inactivated fetal bovine serum (5% or 10%) and antibiotics/antimycotics (GIBCO, https://www.thermofisher.com). We used both NP and OP swab specimens for virus isolation. For isolation, limiting dilution, and passage 1 of the virus, we pipetted 50 μL of serum-free DMEM into columns 2–12 of a 96-well tissue culture plate, then pipetted 100 μL of clinical specimens into column 1 and serially diluted 2-fold across the plate. We then trypsinized and resuspended Vero cells in DMEM containing 10% fetal bovine serum, 2× penicillin/streptomycin, 2× antibiotics/antimycotics, and 2× amphotericin B at a concentration of 2.5×10^5 cells/mL. We added 100 μL of cell suspension directly to the clinical specimen dilutions and mixed gently by pipetting. We then grew the inoculated cultures in a humidified 37°C incubator in an atmosphere of 5% CO_2 and observed for cytopathic effects (CPEs) daily. We used standard plaque assays for SARS-CoV-2, which were based on SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV) protocols (*9*,*10*).

When CPEs were observed, we scraped cell monolayers with the back of a pipette tip. We used 50 μL of viral lysate for total nucleic acid extraction for confirmatory testing and sequencing. We also used 50 μL of virus lysate to inoculate a well of a 90% confluent 24-well plate.

Inclusivity/Exclusivity Testing

From the wells in which CPEs were observed, we performed confirmatory testing by using real-time reverse transcription PCR (CDC) and full-genome sequencing (*1*). The CDC molecular diagnostic assay targets 3 portions of the nucleocapsid gene, and results for all 3 portions must be positive for a sample to be considered positive (https://www.cdc.gov/coronavirus/2019-ncov/lab/rt-pcr-detection-instructions.html and https://www.cdc.gov/coronavirus/2019-ncov/lab/rt-pcr-panel-primer-probes.html). To confirm that no other respiratory viruses were present, we performed Fast Track Respiratory Pathogens 33 Testing (FTD Diagnostics, http://www.fast-trackdiagnostics.com).

Whole-Genome Sequencing

We designed 37 pairs of nested PCRs spanning the genome on the basis of the coronavirus reference sequence (GenBank accession no. NC045512). We extracted nucleic acid from isolates and amplified by using the 37 individual nested PCRs. We used positive PCR amplicons individually for subsequent Sanger sequencing and also pooled them for library preparation by using a ligation sequencing kit (Oxford Nanopore Technologies, https://nanoporetech.com), subsequently for Oxford Nanopore MinION sequencing. We generated consensus nanopore sequences by using Minimap version 2.17 (https://github.com) and Samtools version 1.9 (http://www.htslib.org). We generated consensus sequences by Sanger sequencing from both directions by using Sequencher version 5.4.6 (https://www.genecodes.com), and further confirmed them by using consensus sequences generated from nanopore sequencing.

To sequence passage 4 stock, we prepared libraries for sequencing by using the Next Ultra II RNA Prep Kit (New England Biolabs, https://www.neb.com) according to the manufacturer's protocol. In brief, we fragmented ≈70–100 ng of RNA for 15 min, followed by cDNA synthesis, end repair, and adaptor ligation. After 6 rounds of PCR, we analyzed libraries by using an Agilent Bioanalyzer (https://www.agilent.com) and quantified them by using a quantitative PCR. We pooled samples and sequenced samples by using a paired-end 75-base protocol on an Illumina (Illumina, Inc., https://www.illumina.com) MiniSeq instrument and using the High-Output Kit and then processed reads by using Trimmomatic version 0.36 (*11*) to remove low-quality base calls and any adaptor sequences. We used the de novo assembly program ABySS (*12*) to assemble the reads into contigs by using several different sets of reads and kmer values ranging from 20 to 40. We compared contigs >400 bases against the National Center for Biotechnology Information (Bethesda, MD, USA) nucleotide collection using BLAST

(https://blast.ncbi.nlm.nih.gov). A nearly full-length viral contig obtained in each sample had 100% identity to the 2019-nCoV/USA-WA1/2020 strain (GenBank accession no. MN985325.1). All the remaining contigs mapped to either host cell rRNA or mitochondria. We mapped the trimmed reads to the reference sequence by using BWA version 0.7.17 (*13*) and visualized these reads by using the Integrated Genomics Viewer (*14*) to confirm the identity with the USA-WA1/2020 strain.

Electron Microscopy

We scraped infected Vero cells from the flask, pelleted by low-speed centrifugation, rinsed with 0.1 mol/L phosphate buffer, pelleted again, and fixed for 2 h in 2.5% buffered glutaraldehyde. We then postfixed specimens with 1% osmium tetroxide, en bloc stained with 4% uranyl acetate, dehydrated, and embedded in epoxy resin. We cut ultrathin sections, stained them with 4% uranyl acetate and lead citrate, and examined them by using a Thermo Fisher/FEI Tecnai Spirit electron microscope (https://www.fei.com).

Protein Analysis and Western Blotting

We harvested cell lysates by using Laemmli sodium dodecyl sulfate–polyacrylamide gel electrophoresis sample buffer (Bio-Rad, https://www.bio-rad.com) containing 2% SDS and 5% β-mercaptoethanol. We removed the cell lysates from a Biosafety Level 3 Laboratory, boiled them, and loaded them onto a polyacrylamide gel. We subjected the lysates to sodium dodecyl sulfate–polyacrylamide gel electrophoresis, followed by transfer to a polyvinylidene difluoride polyvinylidene fluoride membrane. We then blocked the membrane in 5% nonfat dry milk dissolved in Tris-buffered saline containing 0.1% Tween-20 (TBS-T) for 1 h, followed by a short wash with TBS-T. We incubated the membrane overnight with primary antibody, either rabbit polyclonal serum against the SARS-CoV spike protein (#40150-T52; Sino Biological, https://www.sinobiological.com), β-actin antibody (#4970; Cell Signaling Technology, https://www.cellsignal.com), or a custom rabbit polyclonal serum against SARS-CoV nucleocapsid. We then washed the membrane with 3 times with TBS-T and applied horseradish peroxidase-conjugated secondary antibody for 1 h. Subsequently, we washed the membrane 3 times with TBS-T, incubated with Clarity Western ECL Substrate (#1705060S; Bio-Rad), and imaged with a multipurpose imaging system.

Generation of SARS-CoV Nucleocapsid Antibodies

We used the plasmid pBM302 (*15*) to express SARS-CoV nucleocapsid protein, with a C-terminal His6 tag, to high levels within the inclusion bodies of *Escherichia coli* and the recombinant protein was purified from the inclusion bodies by using nickel-affinity column chromatography under denaturing conditions. We used stepwise dialysis against Tris/phosphate buffer to refold the recombinant SARS-CoV nucleocapsid protein with decreasing concentrations of urea to renature the protein. We then immunized rabbits with the renatured, full-length, SARS-CoV nucleocapsid protein to generate an affinity-purified rabbit anti–SARS-CoV nucleocapsid protein polyclonal antibody.

Results

A patient was identified with confirmed COVID-19 in Washington State on January 22, 2020. CPE was not observed in mock infected cells (Figure 1, panel A). Cycle threshold (C_t) values were 18–20 for NP specimens and 21–22 for OP specimens (*1*). The positive clinical specimens were aliquoted and refrozen inoculated into cell culture on January 22, 2020. We observed CPE 2 days postinoculation and harvested viral lysate on day 3 postinoculation (Figure 1, panels B, C). We used 50 μL of passage 1 viral lysates for nucleic acid extraction to confirm the presence of SARS-CoV-2 by using the CDC molecular diagnostic assay (*1*). The C_t values of 3 nucleic acid extractions were 16.0–17.1 for nucleocapsid portion 1, 15.9–17.1 for nucleocapsid portion 2, and 16.2–17.3 for nucleocapsid portion 3, which confirmed isolation of SARS-CoV-2 (C_t <40 is considered a positive result). We also tested extracts for 33 additional different respiratory pathogens by using the Fast Track 33 Assay. No other pathogens were detected. Identity was additionally supported by thin-section electron microscopy (Figure 1, panel D). We observed a morphology and morphogenesis characteristic of coronaviruses.

We used isolates from the first passage of an OP and an NP specimen for whole-genome sequencing. The genomes from the NP specimen (GenBank accession MT020880) and OP specimen (GenBank accession no. MT020881) showed 100% identity with each other. The isolates also showed 100% identity with the corresponding clinical specimen (GenBank accession no. MN985325).

After the second passage, we did not culture OP and NP specimens separately. We passaged virus isolate 2 more times in Vero CCL-81 cells and titrated by determining the 50% tissue culture infectious dose ($TCID_{50}$). Titers were 8.65×10^6 $TCID_{50}$/mL for the third passage and 7.65×10^6 $TCID_{50}$/mL for the fourth passage.

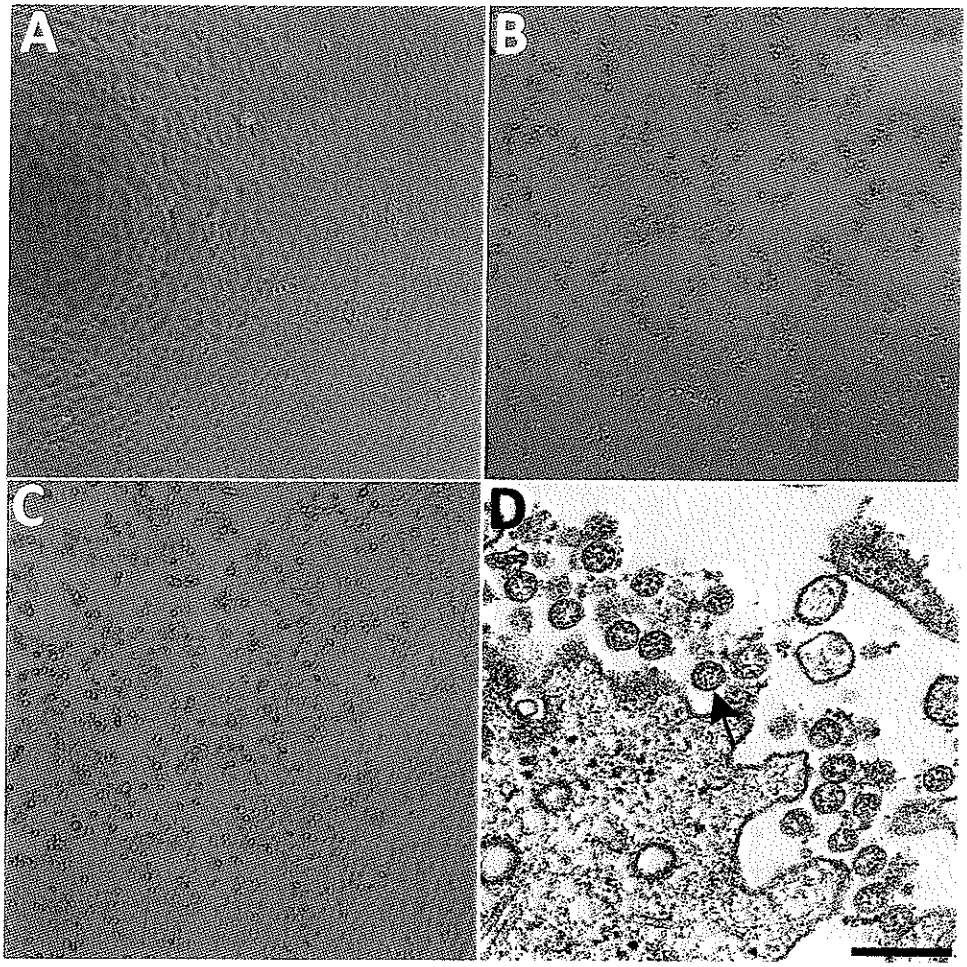

Figure 1. Cytopathic effect caused by severe acute respiratory syndrome coronavirus 2 from patient with coronavirus disease, United States, 2020. A–C) Phase-contrast microscopy of Vero cell monolayers at 3 days postinoculation: A) Mock, B) nasopharyngeal specimen, C) oropharyngeal specimen. Original magnifications ×10). D) Electron microscopy of virus isolate showing extracellular spherical particles with cross-sections through the nucleocapsids (black dots). Arrow indicates a coronavirus virion budding from a cell. Scale bar indicates 200 nm.

We passaged this virus in the absence of trypsin. The spike protein sequence of SARS-CoV-2 has an RRAR insertion at the S1-S2 interface that might be cleaved by furin (*16*). Highly pathogenic avian influenza viruses have highly basic furin cleavage sites at the hemagglutinin protein HA1-HA2 interface that permit intracellular maturation of virions and more efficient viral replication (*17*). The RRAR insertion in SARS-CoV-2 might serve a similar function.

We subsequently generated a fourth passage stock of SARS-CoV-2 on VeroE6 cells, another fetal rhesus monkey kidney cell line. We sequenced viral RNA from SARS-CoV-2 passage 4 stock and confirmed it to have no nucleotide mutations compared with the original reference sequence (GenBank accession no. MN985325). SARS-CoV has been found to grow well on VeroE6 cells and MERS-CoV on Vero CCL81 cells (*18,19*). To establish a plaque assay and determine the preferred Vero cell type for quantification, we titered our passage 4 stock on VeroE6 and VeroCCL81 cells. After infection with a dilution series, SARS-CoV-2 replicated in both Vero cell types; however, the viral titers were slightly higher in VeroE6 cells than in Vero CCL81 cells (Figure 2, panel A). In addition, plaques were more distinct and visible on Vero E6 cells (Figure 2, panel B). As early as 2 days postinoculation, VeroE6 cells produced distinct plaques visible by staining with neutral red. In contrast, Vero CCL81 cells produced less clear plaques and was most easily quantitated by staining with neutral red 3 days postinoculation. On the individual plaque monolayers, SARS-CoV-2 infection of Vero E6 cells produced CPE with areas of cell clearance (Figure 2, panel C). In contrast, Vero CCL81 cells had areas of dead cells that had fused to form plaques, but the cells did not clear. Together, these results suggest that VeroE6 cells might be the best choice for amplification and quantification, but both Vero cell types support amplification and replication of SARS-CoV-2.

Because research has been initiated to study and respond to SARS-CoV-2, information about cell lines and types susceptible to infection is needed. Therefore, we examined the capacity of SARS-CoV-2 to infect and replicate in several common primate and human cell lines, including human adenocarcinoma

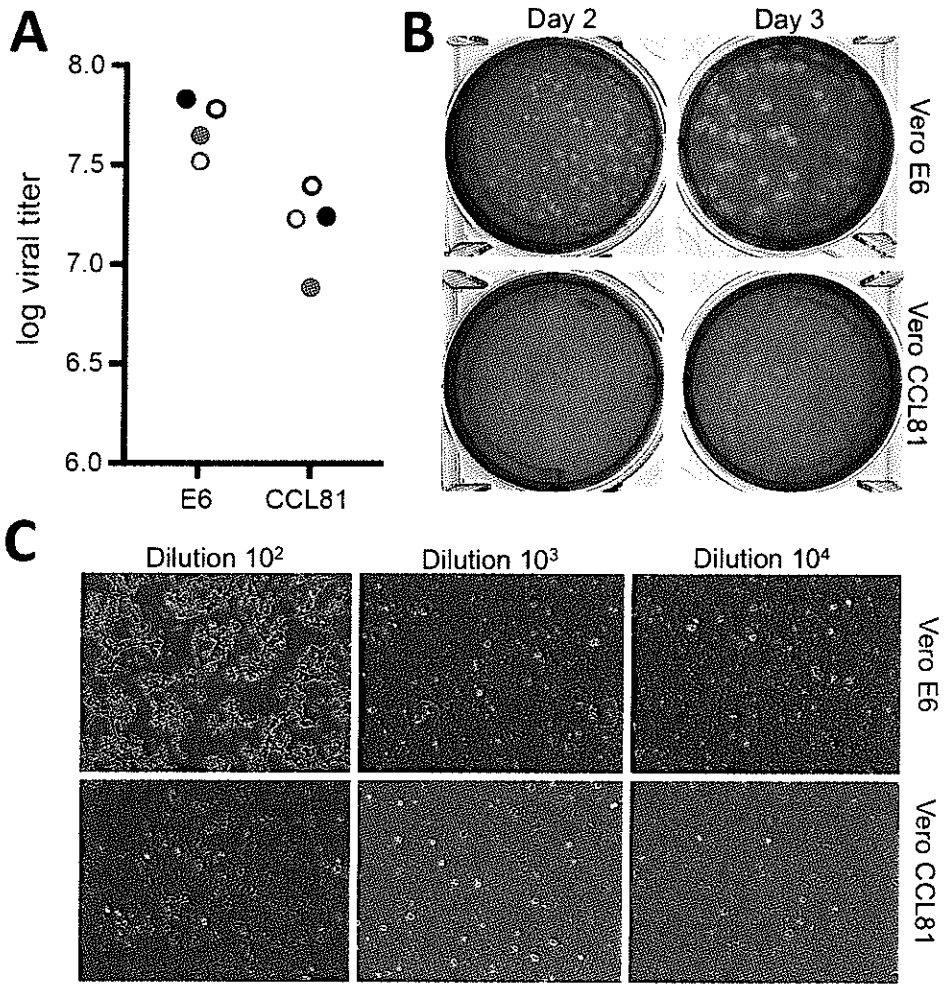

Figure 2. Viral propagation and quantitation of severe acute respiratory syndrome coronavirus 2 from patient with coronavirus disease, United States, 2020. A) Two virus passage 4 stocks (black and gray circles) were quantified by using plaque assay at day 2 (solid circles) and day 3 (open circles) postinfection of Vero E6 and Vero CCL81 cells. B) Plaque morphology for virus on Vero E6 and Vero CCL81 at day 2 and day 3 postinoculation. C) Cell monolayers 2 days postinfection of Vero E6 (top) and Vero CCL81 (bottom) at 3 dilutions. Original magnifications ×40.

cells (A549), human liver cells (HUH7.0), and human embryonic kidney cells (HEK-293T), in addition to Vero E6 and Vero CCL81 cells. We also examined an available big brown bat kidney cell line (EFK3B) for SARS-CoV-2 replication capacity. Each cell line was inoculated at high multiplicity of infection and examined 24 h postinfection (Figure 3, panel A). No CPE was observed in any of the cell lines except in Vero cells, which grew to >10^7 PFU at 24 h postinfection. In contrast, HUH7.0 and 293T cells showed only modest viral replication, and A549 cells were incompatible with SARS-CoV-2 infection. These results are consistent with previous susceptibility findings for SARS-CoV and suggest other common culture systems, including MDCK, HeLa, HEP-2, MRC-5 cells, and embryonated eggs, are unlikely to support SARS-CoV-2 replication (*20*–*22*). In addition, SARS-CoV-2 did not replicate in bat EFK3B cells, which are susceptible to MERS-CoV. Together, the results indicate that SARS-CoV-2 maintains a similar profile to SARS-CoV in terms of susceptible cell lines.

Having established robust infection with SARS-CoV-2 in several cell types, we next evaluated the cross-reactivity of SARS-CoV antibodies against the SARS-CoV-2. Cell lysates from infected cell lines were probed for protein analysis; we found that polyclonal serum against the SARS-CoV spike protein and nucleocapsid proteins recognize SARS-CoV-2 (Figure 3, panels B, C). The nucleocapsid protein, which is highly conserved across the group 2B family, retains >90% amino acid identity between SARS-CoV and SARS-CoV-2. Consistent with the replication results (Figure 3, panel A), SARS-CoV-2 showed robust nucleocapsid protein in both Vero cell types, less protein in HUH7.0 and 293T cells, and minimal protein in A549 and EFK3B cells (Figure 3, panel B). The SARS-CoV spike protein antibody also recognized SARS-CoV-2 spike protein, indicating cross-reactivity (Figure 3, panel C). Consistent with SARS CoV, several cleaved and uncleaved forms of the SARS-CoV-2 spike protein were observed. The cleavage pattern of the SARS spike positive control from Calu3 cells, a respiratory

cell line, varies slightly and could indicate differences between proteolytic cleavage of the spike proteins between the 2 viruses because of a predicted insertion of a furin cleavage site in SARS-CoV-2 (*16*). However, differences in cell type and conditions complicate this interpretation and indicate the need for further study in equivalent systems. Overall, the protein expression data from SARS-CoV nucleocapsid and spike protein antibodies recapitulate replication findings and indicate that SARS-CoV reagents can be used to characterize SARS-CoV-2 infection.

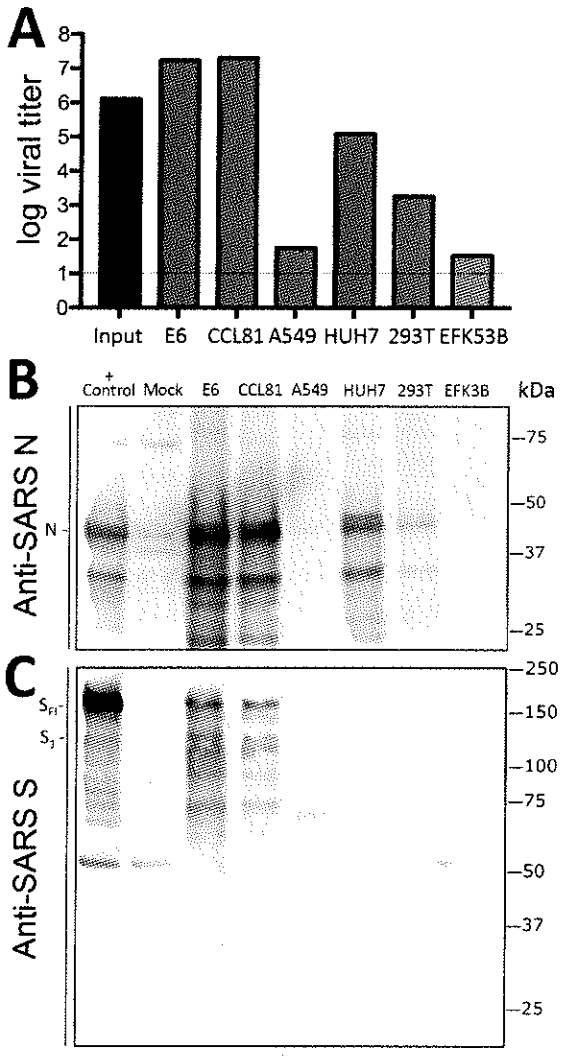

Figure 3. Cell lines from patient with coronavirus disease, United States, 2020, susceptible to SARS coronavirus 2 (SARS-CoV-2). Cell lines were infected with a high multiplicity of infection (>5), washed after adsorption, and subsequently harvested 24 h postinfection for viral titer and protein lysates. A) Viral titer for SARS-CoV-2 quantitated by plaque assay on Vero E6 cells 2 days postinoculation. Infected cell protein lysates were probed by using Western blotting with B) rabbit polyclonal anti-SARS N antibody or C) anti–SARS-CoV S protein antibody. Full-length spike protein (S_{FL}) and spike protein S1 (S_1) are indicated. N, nucleocapsid; S, spike protein; SARS, severe acute respiratory syndrome.

Finally, we evaluated the replication kinetics of SARS-CoV-2 in a multistep growth curve. In brief, we infected Vero CCL-81 and HUH7.0 cells with SARS-CoV-2 at a low multiplicity of infection (0.1) and evaluated viral replication every 6 h for 72 h postinoculation, with separate harvests in the cell-associated and supernatant compartments (Figure 4). Similar to SARS-CoV, SARS-CoV-2 replicated rapidly in Vero cells after an initial eclipse phase, achieving 10^5 $TCID_{50}$/mL by 24 h postinfection and peaking at >10^6 $TCID_{50}$/mL. We observed similar titers in cell-associated and supernatant compartments, which indicated efficient egress. Despite peak viral titers by 48 h postinoculation, major CPE was not observed until 60 h postinoculation and peaked at 72 h postinoculation, indicating that infected monolayers should be harvested before peak CPE is observed. Replication in HUH7.0 cells also increased quickly after an initial eclipse phase but plateaued by 24 h postinoculation in the intracellular compartment at 2 × 10^5 $TCID_{50}$/mL and decreased after 66 h postinoculation. Virus was not detected in the supernatant of infected HUH7 cells until 36 h postinoculation and exhibited lower titers at all timepoints (Figure 4). Major CPE was never observed in HUH7.0 cells. These results are consistent with previous reports for SARS-CoV and MERS-CoV, which suggested similar replication dynamics between the zoonotic CoV strains (*23*,*24*).

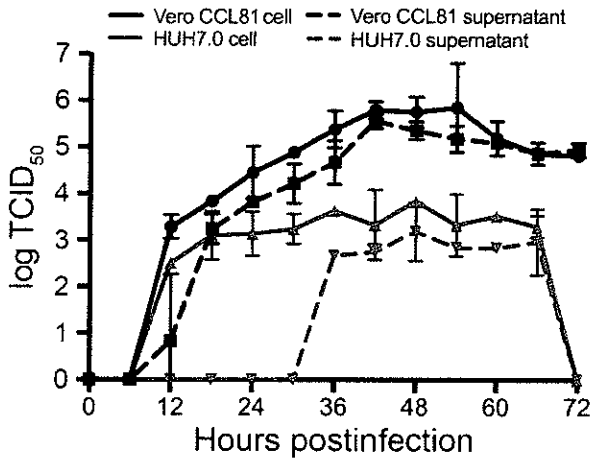

Figure 4. Multistep growth curve for severe acute respiratory syndrome coronavirus 2 from patient with coronavirus disease, United States, 2020. Vero CCL81 (black) and HUH7.0 cells (green) were infected at a multiplicity of infection of 0.1, and cells (solid line) and supernatants (dashed line) were harvested and assayed for viral replication by using $TCID_{50}$. Circles, Vero CCL81 cells; squares, Vero CCL81 supernatants; triangles, HUH7.0 cells; inverted triangles, HUH7.0 supernatants. Error bars indicate SEM. $TCID_{50}$, 50% tissue culture infectious dose.

Discussion

We have deposited information on the SARS-CoV-2 USA-WA1/2020 viral strain described here into the Biodefense and Emerging Infections Research Resources Repository (https://www.beiresources.org) reagent resources (American Type Culture Collection, https://www.atcc.org) and the World Reference Center for Emerging Viruses and Arboviruses, University of Texas Medical Branch (https://www.utmb.edu/wrceva), to serve as the SARS-CoV-2 reference strain for the United States. The SARS-CoV-2 fourth passage virus has been sequenced and maintains a nucleotide sequence identical to that of the original clinical strain from the United States. These deposits make this virus strain available to the domestic and international public health, academic, and pharmaceutical sectors for basic research, diagnostic development, antiviral testing, and vaccine development. We hope broad access will expedite countermeasure development and testing and enable a better understanding of the transmissibility and pathogenesis of this novel emerging virus.

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The reagent described is available through the Biodefense and Emerging Infections Research Resources Repository, National Institutes of Allergy and Infectious Diseases, National Institutes of Health: SARS-related coronavirus 2, isolate USA-WA1/2020, NR-52281.

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REVIEW

The genetic sequence, origin, and diagnosis of SARS-CoV-2

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Abstract
Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a new infectious disease that first emerged in Hubei province, China, in December 2019, which was found to be associated with a large seafood and animal market in Wuhan. Airway epithelial cells from infected patients were used to isolate a novel coronavirus, named the SARS-CoV-2, on January 12, 2020, which is the seventh member of the coronavirus family to infect humans. Phylogenetic analysis of full-length genome sequences obtained from infected patients showed that SARS-CoV-2 is similar to severe acute respiratory syndrome coronavirus (SARS-CoV) and uses the same cell entry receptor, angiotensin-converting enzyme 2 (ACE2), as SARS-CoV. The possible person-to-person disease rapidly spread to many provinces in China as well as other countries. Without a therapeutic vaccine or specific antiviral drugs, early detection and isolation become essential against novel Coronavirus. In this review, we introduced current diagnostic methods and criteria for the SARS-CoV-2 in China and discuss the advantages and limitations of the current diagnostic methods, including chest imaging and laboratory detection.

Keywords SARS-CoV-2 · COVID-19 · Origin · Diagnosis

Introduction

Coronaviruses are unsegmented single-stranded RNA viruses ranging from 26 to 32 kilobases in length, belonging to the subfamily *Coronavirinae* of the family *Coronaviridae* of the order *Nidovirales* [1]. According to the serotype and genomic characteristics, the *Coronavirinae* subfamily is divided into four major genera: *Alphacoronavirus*, *Betacoronavirus*, *Gammacoronavirus*, and *Deltacoronavirus* [2]. The former two genera primarily infect mammals, whereas the latter two predominantly infect birds [3]. Coronaviruses mainly cause respiratory and gastrointestinal tract infections; six kinds of human CoVs have been previously identified, including the HCoV-NL63 and the HCoV-229E, which belong to the *Alphacoronavirus* genus, and the HCoV-OC43, the HCoVHKU1, the severe acute respiratory syndrome coronavirus (SARS-CoV), and the Middle East respiratory syndrome coronavirus (MERS-CoV), which belong to the *Betacoronavirus* genus [4]. Given the high prevalence and wide distribution of coronaviruses in animals, the large genetic diversity and frequent recombination of their genomes, and increasing human-animal interface activities and frequent cross-species infections, novel coronaviruses are likely to emerge periodically in humans [5].

In December 2019, a group of pneumonia cases was reported at a wholesale seafood market in Wuhan, Hubei province, which was found to be caused by previously unknown Coronaviruses [6]. On December 29, 2019, the local hospitals using a surveillance mechanism for "pneumonia of an unknown etiology," which was established in the wake of the 2003 severe acute respiratory syndrome (SARS) outbreak, identified the first 4 cases which were all associated with the Huanan (Southern China) Seafood Wholesale Market. On December 31, 2019, the Chinese Center for Disease Control and Prevention (China CDC) dispatched a rapid response team to accompany Hubei provincial and Wuhan city health authorities and to conduct an epidemiologic and etiologic investigation. Similar cases were subsequently reported in Wuhan, and many of these patients did not have contacts with the Huanan Seafood Wholesale Markets or animals. Epidemiological investigation showed that about only 1% of

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the patients had direct contact with the live-animal market trade, while more than three quarters were local residents of Wuhan or had made contact with people from Wuhan, suggesting a person-to-person transmission of this novel coronavirus was possible [7]. Airway epithelial cells from infected patients were used to isolate a novel coronavirus, temporarily named 2019-nCoV [8], but later, the Coronavirus Research Group (CSG) of the International Committee for the classification of viruses found that the new coronavirus is related to the SARS virus (SARS-CoV) that swept China in 2003. Both belong to a "species" category called severe acute respiratory syndrome-related coronavirus. Therefore, on February 11, 2020, the International Committee for the classification of viruses designated the name of this coronavirus as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [9]. In addition, the World Health Organization has named the disease caused by the SARS-CoV-2 as coronavirus disease 2019 (COVID-19). The possible person-to-person transmission rapidly spreads to many provinces in China as well as other countries. By February 27, 2020, 78.824 cases were laboratory-confirmed, and 2788 died in China [10]. The current public health emergency is partially similar to the SARS outbreak in southern China in 2002. The two cases share similarities. Both occurred during the winter with initial cases related to an exposure to live animals sold at animal markets, and the amino acid sequence identity between the SARS-CoV-2 and the SARS-CoV S-proteins is 76.47% [11]. The current knowledge of the physical and chemical properties of Coronaviruses is mainly derived from the study of the SARS-CoV and the MERS-CoV. The Coronaviruses are sensitive to exposure to heat (56 °C for 30 min), as well as solvents including ether, 75% ethanol, chlorine-containing disinfectant, peroxyacetic acid, and chloroform. Other lipid solvents can also effectively inactivate the virus except for chlorhexidine [12]. According to Zhong's latest pilot experiment, 4 out of the 62 stool specimens tested positive to the SARS-CoV-2, suggesting oral-fecal route might have played a role in the rapid transmission of SARS-CoV-2 [7]. However, no cases of transmission via the fecal-oral route have yet been reported for SARS-CoV-2. Contamination of fomite is more likely to be caused by airway/hands. At present, respiratory transmission and direct contact transmission are the main routes for SARS-CoV-2.

Genetic sequence and origin of the SARS-CoV-2

The genome of Coronaviruses, ranging from 26 to 32 kilobases in length, includes a variable number of open reading frames (ORFs) [13]. The SARS-CoV-2 genome was reported to possess 14 ORFs encoding 27 proteins [14]. The spike surface glycoprotein plays an essential role in binding to receptors on the host cell and is crucial for determining host tropism and transmission capacity, mediating receptor binding and membrane fusion [15]. Generally, the spike protein of Coronaviruses is functionally divided into the S1 domain, responsible for receptor binding, and the S2 domain, responsible for cell membrane fusion [16]. The eight accessory proteins (3a, 3b, p6, 7a, 7b, 8b, 9b, and orf14) and four major structural proteins, including the spike surface glycoprotein (S), small envelope protein (E), matrix protein (M), and nucleocapsid protein (N), are located in the 3′-terminus of the SARS-CoV-2 genome [14]. When researchers compare the SARS-CoV-2 with the SARS-CoV at the amino acid level, they found the SARS-CoV-2 was quite similar to the SARS-CoV, but there were some notable differences in the 8a, 8b, and 3b protein [14]. When researchers compared the SARS-CoV-2 with the MERS-CoV, they found that the SARS-CoV-2 was distant from and less related to the MERS-CoVs. From the phylogenetic tree based on whole genomes, the SARS-CoV-2 is parallel to the SARS-like bat CoVs, while the SARS-CoV has descended from the SARS-like bat CoV lineage, indicating that SARS-CoV-2 is closer to the SARS-like bat CoVs than the SARS-CoVs based on of the whole-genome sequence [14]. Analysis of the genome from nine patients' samples also confirmed that the SARS-CoV-2 was more similar to two SARS-like bat CoVs from Zhoushan in eastern China, bat-SL-CoVZC45 and bat-SL-CoVZXC21, than to the SARS-CoV and the MERS-CoV [17]. At the whole-genome level, the SARS-CoV-2 shares an 87.99% sequence identity with the bat-SL-CoVZC45 and 87.23% sequence identity with the bat-SL-CoVZXC2, less genetically similar to the SARS-CoV (about 79%) and MERS-CoV (about 50%) [17]. At the protein level, the lengths of most of the proteins encoded by the SARS-CoV-2, the bat-SL-CoVZC45, and the bat-SL-CoVZXC21 were similar, with only a few minor insertions or deletions [17]. Although the SARS-CoV-2 was closer to the bat-SL-CoVZC45 and the bat-SL-CoVZXC21 at the whole-genome level, the receptor-binding domain of the SARS-CoV-2 located in lineage B was closer to that of the SARS-CoV [17]. Given the close relationship between the SARS-CoV-2 and the SARS-CoVs or the SARS-like bat CoVs, further studies of the amino acid substitutions in different proteins could explain how the SARS-CoV-2 differs structurally and functionally from the SARS-CoVs and how these differences affect the functionality and pathogenesis of the SARS-CoV-2.

It was reported that 27 of the first 41 infected patients had been exposed to the Huanan Seafood Market [18]. Thus, it was believed that the new coronavirus originated from the Huanan Seafood Market in Wuhan and spread from animal hosts to humans in the process of wildlife trade, transportation, slaughter, and trade. Bats have the most variety of coronaviruses in their bodies and are the hosts of many kinds of coronaviruses, such as the SARS-CoV and the MERS-CoV

[19]. The SARS-CoV and the MERS-CoV are considered highly pathogenic, and it is very likely that the SARS-CoV was transmitted from bats to palm civets and the MERS-CoV was transmitted from bats to dromedary camels and finally to humans [20, 21]. Given the high sequence similarity between the SARS-CoV-2 and the SARS-like bat CoVs from *Hipposideros* bats in China, the natural host of the SARS-CoV-2 may be the *Hipposideros* bat. The discovery that pangolin coronavirus genomes have 85.5% to 92.4% sequence similarity to SARS-CoV-2 suggests pangolins should be considered as possible hosts in the emergence of SARS-CoV-2 [22].

Diagnosis

According to the seventh edition of Pneumonia Diagnosis and Treatment program for novel coronavirus infection reported by the National Health Commission of the People's Republic of China, suspected cases were defined as patients having fever or respiratory symptoms, a typical ground-glass opacity chest imaging as well as a history of exposure to wildlife in the Wuhan seafood market, and a travel history or contact with people from Wuhan within 2 weeks of diagnosis [12]. Confirmed cases with the SARS-CoV-2 were identified as a positive result of a high-throughput sequencing or an RT-PCR assay for respiratory specimens including nasal and pharyngeal swab specimens, bronchoalveolar lavage fluid, sputum, or bronchial aspirates or a positive result of anti-SARS-CoV-2 IgM/IgG or the titer of anti-SARS-CoV-2 IgG antibody in the recovery period was four times or more higher than in the acute period [12]. At present, the diagnosis of the COVID-19 is mainly based on clinical characteristics, epidemiological history, chest imaging, and laboratory detection.

Clinical characteristics and epidemiological history

The most common symptoms of confirmed patients were fever, cough, and myalgia or fatigue, whereas sputum production, headache, diarrhea, and vomiting were rare [23–26]. Mild cases only have a low fever and mild fatigue, without pneumonia. Severe and moderate cases had clinical manifestations of dyspnea, lymphopenia, and hypoalbuminemia, which mainly occurred in elderly patients [23]. It is worth noting that patients with severe or critical illness may have a moderate or low fever, or even no significant fever [12]. The elderly and those with chronic diseases, including diabetes, hypertension, and cardiovascular disease, have poor prognoses [12]. Most severe patient died of severe pneumonia, severe respiratory failure, and multiple organ failure [26]. Epidemiological investigations indicate that most patients were local residents of Wuhan or had direct exposure to the Huanan Seafood Market, a travel history to Wuhan, or contact with confirmed cases [7]. In addition, outbreaks within family clusters have been reported from several provinces in China [27]. An increasing number of cluster cases including family cluster cases are occurring [24, 25].

Chest imaging

The most common patterns seen on chest CT were bilateral, peripheral, and ground-glass opacity [28, 29]. Less common CT findings were nodules, cystic changes, bronchiolectasis, pleural effusion, and lymphadenopathy [28, 29]. Chest CT images of an early-stage COVID-19 patients showed multiple small plaques and interstitial changes. The findings of a progressive stage chest CT images included a bilateral multiple ground-glass opacity and an infiltrating opacity with consolidation, interstitial thickening or fibrous stripes [29–31]. The diffuse lesions in bilateral lungs could be seen in the most seriously affected patients, whose CT showed as "white lungs" [31].

Laboratory detection

Specific laboratory detection

Isolation of the causal agent and determination of its partial genome sequence provided the basis for next-generation sequencing or real-time reverse transcriptase-polymerase chain reaction (RT-PCR) methods for the SARS-CoV-2 [14, 17]. After the SARS-CoV-2 was isolated from a lower respiratory tract specimen, a diagnostic RT-PCR test was developed. RT-PCR tests were based on the RNA-dependent RNA polymerase (RdRp) gene of the ORF1ab sequence, E gene, N gene, and S gene of the SARS-CoV-2 genome [32–35]. Among these assays, RT-PCR assays targeting the RdRp assay had the highest analytical sensitivity [32]. The SARS-CoV-2 nucleic acid can be detected in nasal and pharyngeal swab specimens, bronchoalveolar lavage fluid, sputum, bronchial aspirates, blood, anal swab, and other samples by an RT-PCR [36, 37]. In a case with severe peptic ulcers after the onset of symptoms, the SARS-CoV-2 was directly detected in the esophageal erosion and at the bleeding site [7]. Some patients infected with the SARS-CoV-2 also displayed gastrointestinal symptoms such as diarrhea [23, 38] because some viruses may enter the digestive tract through the throat, infecting the intestinal epithelial cells and activating the intestinal immune response. Thus, the SARS-CoV-2 nucleic acid can also be detected in the stool samples of some patients [7, 36, 37]. High-throughput sequencing or an RT-PCR assay has become a standard and formative assessment for the diagnosis of the COVID-19 [12]. However, nucleic acid amplification kits sometimes produced false-negative results among patients whose clinical features, chest imaging, and laboratory detection accorded with the COVID-19 [30, 39]. There are several

possible reasons for the false-negative results from the nucleic acid kit. Firstly, although older age was correlated with higher viral load [40], it is not clear whether the viral load in body fluids has a positive linear correlation with the severity of symptoms after infection. If the virus in the suspected patients remains to be rapidly replicated and released in the lungs, the nasal and pharyngeal swabs sampling may not collect enough virus for diagnosis. Secondly, the current common sampling method is to collect nasal and pharyngeal swabs, sputum, or the alveolar lavage fluid [36, 40, 41]. Few patients with the SARS-CoV-2 infection had prominent signs and symptoms of the respiratory tract, indicating that the target cells may be located in the lower airway [18]. The viral nucleic acid is most easily detected in the alveolar lavage fluid, followed by sputum, nasal, and pharyngeal swabs [41–43]. A study of 4880 cases showed that the alveolar lavage fluid exhibited the most highest positive rate of 100% for SARS-CoV-2 ORF1ab gene; the sputum exhibited a 49.12% positive rate, and the nasal and pharyngeal swabs samples showed a poor positive rate of 38.25% [41]. Alveolar lavage fluid collection is generally suitable for patients with a severe or critical illness, not mild cases. Sputum specimens are also more difficult to obtain because few patients with the SARS-CoV-2 infection had sputum production [7, 18]. Due to the limitations associated with operations and patient acceptance, the most common sampling method in clinical practice is nasal and pharyngeal swab collection. However, respiratory samples collected from 80 individuals at different stages of infection showed a median of $7{\cdot}99 \times 10^4$ in nasal and pharyngeal swab samples and $7{\cdot}52 \times 10^5$ in sputum samples [36]. Sputum samples generally showed higher viral loads than throat swab samples [36, 43]. The low viral load in nasal and pharyngeal swab makes the diagnosis of the SARS-CoV-2 more difficult. On the other hand, RT-PCR test results of pharyngeal swab specimens were variable and potentially unstable [44]. It was reported that patients with initial non-positive results were eventually confirmed with COVID-19 by 3~5 repeated swab PCR tests [44]. The phenomenon of SARS-CoV-2 positive in the stool samples but negative nucleic acid in throat swab specimens indicated that selecting fecal samples for a nucleic acid test may be an alternative strategy [45]. Considering that the SARS-CoV-2 nucleic acid can be detected in nasal and pharyngeal swab specimens, bronchoalveolar lavage fluid, sputum, bronchial aspirates, blood, and anal swab [36, 37], it is suggested to collect samples from multiple site of the same patient at different stages and combine them for detection to improve the positive rate. Thirdly, the SARS-CoV-2 is an RNA virus with low stability, which is easily degraded by RNA enzymes released after exogenous or cellular destruction, affecting the final detection efficiency. Improper sampling location, insufficient sampling strength, and irregular sample delivery process account for the false-negative results of the nucleic acid kit test [39]. Besides, in order to improve the sensitivity of detection, most manufacturers choose two or more regions of viral nucleic acid sequence for detection, including the ORF1ab sequence, E gene, N gene, and S gene of the SARS-CoV-2 genome [32–35]. In actual tests, there is a certain proportion of positive results of a single target gene locus indicating that the sensitivity of the reagent to different gene regions is indeed different [41], which may also be caused by the competition between the loci of two or three target genes. Furthermore, reagent reaction conditions, reaction system, and nucleic acid addition amount may affect the sensitivity of detection and analysis [46]. It is an effective measure for the clinical laboratory to carry out quality control for each batch of reagents by using the confirmed negative and positive samples before routine work.

Based on the above reasons, detection of the viral RNA using RT-PCR can only achieve a sensitivity of 30~60% [41, 47, 48], depending on the course and condition of the patient, the type and number of clinical specimens collected, and the protocol used. The older had higher positive rate than the young [41] which may be explained by the finding that the older was correlated with higher viral load [40]. Supplement serum IgM/IgG antibody detection against the SARS-CoV-2 internal nucleoprotein (NP) and surface spike protein receptor-binding domain (RBD) can make up for the shortcomings of RT-PCR in some cases [40, 49]. The antibody is the product of a humoral immune response after infection with the virus. Generally, IgM antibodies rise within a few days after a viral infection and can be detected as soon as a week of incubation, and IgG antibodies appear in the middle and late stages of the infection. There is a process of a continuous increase in the antibody titer, and it remains in the blood circulation for a long time. At the moment, the most widely used methods for serodiagnosis of the SARS-CoV-2 infection in clinical microbiology laboratories are antibody detection in acute- and convalescent-phase sera by colloidal gold immunochromatography and enzyme-linked immunosorbent assay (ELISA) [40]. In short, a test for IgM/IgG antibodies can also determine whether a patient has been infected with the SARS-CoV-2 recently or previously and act as a supplementary detection to identify patients with high clinical suspicion of the SARS-CoV-2 infection but negative RT-PCR findings [40, 49]. The new serological diagnostic kits for IgM and IgG antibodies for SARS-CoV-2 have the advantages of high sensitivity and early diagnosis. In addition, the operational requirements of antibody detection in clinical microbiology laboratories are relatively low, fast, capable of large quantities, and can be completed in basic laboratories compared with the nucleic acid test. Anti-SARS-CoV-2 IgM antibody was positive at 3~5 days after onset, and the titer of anti-SARS-CoV-2 IgG antibody in the recovery period was four times or more higher than in the acute period [12]. Although the supplementary antibody test can make up for the missed diagnosis of RT-PCR, it still cannot diagnose all infected patients. The

detection of IgM and IgG antibodies can only achieve a sensitivity of 70% at 4~6 days after admission for COVID-19 patients (unpublished data from our group). The detection of IgM and IgG antibodies may be futile for the elderly, because of hypoimmunity and a weak antibody production capacity.

Nonspecific laboratory detection

The laboratory examination of patients at an early stage showed leucopenia, lymphopenia, high level of aspartate aminotransferase, C-reactive protein (CRP), and erythrocyte sedimentation rate [18]. Most patients had normal serum levels of procalcitonin. Compared with moderate cases, severe cases more frequently had lymphopenia, with higher levels of alanine aminotransferase, lactate dehydrogenase, C-reactive protein, ferritin, and D-dimer as well as markedly higher levels of IL-2R, IL-6, IL-10, and TNF-α [23]. Typical abnormal laboratory findings in pediatric patients were elevated creatine kinase MB, decreased lymphocytes, leucopenia, and elevated procalcitonin [24]. Recent studies have also shown another potential diagnostic biomarker for the SARS-CoV-2 diagnosis. Renin cleaves liver-derived angiotensinogen (AGT) into angiotensin I, which is then further processed by the angiotensin-converting enzyme (ACE) into the octapeptide angiotensin II. The abnormal increase of angiotensin II has been reported to be associated with hypertension, heart failure, and lung and kidney dysfunction as well as several pathophysiological features, including inflammation, metabolic dysfunction, and aging [50, 51]. Xu et al. performed structural modeling of the S-protein of the SARS-CoV-2 to evaluate its ability to interact with human angiotensin-converting enzyme 2 (ACE2) molecules. Because of the loss of hydrogen bond interactions due to replacing Arg426 with Asn426 in the SARS-CoV-2 S-protein, the binding free energy for the SARS-CoV-2 S-protein increased by 28 kcal mol^{-1} when compared with the SARS-CoV S-protein binding. The results revealed that the SARS-CoV-2 S-protein has a strong binding affinity to human ACE2 [11]. A study discovered the markedly increased level of angiotensin II in the plasma samples from SARS-CoV-2-infected patients was linearly correlated with viral load and lung injury [52]. It is suggested that the imbalance of the renin-angiotensin-aldosterone system is caused by the SARS-CoV-2, and angiotensin receptor blocker (ARB) drugs may be used as a potential repurposing treatment of the SARS-CoV-2 infection. Similar studies have demonstrated that the SARS-CoV could bind to its receptor ACE2, downregulating its expressions, resulting in increased angiotensin II levels in mouse blood samples, signaling through angiotensin II receptor 1, leading to an acute lung injury [53]. Besides, markedly, elevation of angiotensin II level in the H7N9-infected patients was associated with the disease severity and outcomes [54].

Discussion

Chest CT imaging showed that 76.4% of infected patients manifested as pneumonia on admission, which was mainly ground-glass opacity (50%) and bilateral patchy shadowing (46.4%). The majority of severe patients could be diagnosed by chest X-ray and chest CT imaging. Despite these predominant manifestations, it was reported that 221 out of the 926 (23.87%) in severe cases compared with 9 out of the 173 non-severe cases (5.20%) who had no abnormal radiological findings were diagnosed by symptoms plus RT-PCR positive findings, suggesting that not all patients had abnormal chest radiological findings of pneumonia. Chest CT images of the early-stage COVID-19 patients showed unilateral or bilateral ground-glass opacity, which was similar to some non-COVID-19 images of patients with the respiratory syncytial viral (RSV), mycoplasma, and parainfluenza virus, suggesting that chest CT scans cannot the identify COVID-19 patients and the non-COVID-19 patients in some cases. Co-infection with other viruses such as influenza A/B, rhino/enterovirus, respiratory syncytial virus, other atypical pathogens, fungi, and bacteria has been reported in the COVID-19 patients [49, 55]. Mixed infection among COVID-19 patients makes the diagnosis of chest CT images more difficult. Besides, positive respiratory pathogen results cannot serve as evidence for the exclusion of SARS-COV-2 infection. Methods of pathogen-specific detection are mainly divided into four types, including virus culture, nucleic acid detection, antigen detection, and antibody detection. In terms of virus culture, the cultivation of the SARS-CoV-2 requires biosafety level 3 laboratory facilities, which are not available in most clinical microbiology laboratories. Thus, the cultivation of the SARS-CoV-2 is mainly used for scientific research. Commercial antigen detection kits require the preparation of monoclonal antibodies and polyclonal antibodies, whereas it costs a long time from production to extraction during antibody preparation, and the preparation process is complicated. Detection of the viral nucleic acid using an RT-PCR assay has become a standard and formative assessment for the diagnosis of COVID-19. However, detection of viral RNA using RT-PCR can only achieve a sensitivity of 30~60%, depending on the course and condition of the patient, the type and number of clinical specimens collected, and the protocol used. In order to improve the positive rate of detection, it is suggested to collect multiple site samples of the same patient at different stages repeatedly and combine them for detection. The phenomenon of SARS-CoV-2 positive in the stool samples but negative nucleic acid in throat swab specimens should be taken seriously. Patients with early or mild illness may have a low viral load in nasal and pharyngeal swabs, resulting in false-negative nucleic acid tests. Thus, selecting fecal samples for a nucleic acid test may be an alternative strategy, regardless of the presence or absence of gastrointestinal symptoms such as

diarrhea. In addition, a fecal-oral transmission might exist in the transmission of 2019-nCoV; thus, the transmission via gastrointestinal secretions should be fully considered to control the rapid spread worldwide. Whole genome sequencing (WGS) method can overcome the mutation problems which cause false-negative results in RT-PCR [55, 56], whereas it is not applicable to clinical practice considering the economic status of patients. For individuals with high clinical suspicion of the SARS-CoV-2 infection but negative RT-PCR findings, the detection of IgM/IgG antibodies should be considered. We recommend IgM antibody testing 1 week after infection and IgG antibody testing 4 weeks after infection. Although the supplementary antibody test can make up for the missed diagnosis of RT-PCR, it cannot diagnose all the infected patients. Collectively, for chest CT scans, RT-PCR assays, and the detection of IgM/IgG antibodies, multiple and repetitive tests should be considered during different stages of the COVID-19. Further research of SARS-CoV-2 and the development of more sensitive detection methods will facilitate the diagnosis of COVID-19. In addition, the development of broad-spectrum antiviral drugs and vaccines will enhance the ability to manage future outbreaks caused by this cluster of viruses.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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Review

SARS-CoV-2: an Emerging Coronavirus that Causes a Global Threat

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Abstract

An ongoing outbreak of pneumonia caused by a novel coronavirus, currently designated as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), was reported recently. However, as SARS-CoV-2 is an emerging virus, we know little about it. In this review, we summarize the key events occurred during the early stage of SARS-CoV-2 outbreak, the basic characteristics of the pathogen, the signs and symptoms of the infected patients as well as the possible transmission pathways of the virus. Furthermore, we also review the current knowledge on the origin and evolution of the SARS-CoV-2. We highlight bats as the potential natural reservoir and pangolins as the possible intermediate host of the virus, but their roles are waiting for further investigation. Finally, the advances in the development of chemotherapeutic options are also briefly summarized.

Key words: Coronavirus, Novel coronavirus, pneumonia, SARS-CoV-2, COVID-19

Introduction

On 23 Feb 2020, the lock-down of Wuhan, a central city in China, has alarmed people all over the world of an emerging novel coronavirus that is posing a major public health and governance challenges. The novel virus, previously called the 2019-novel coronavirus (2019-nCoV), is currently designated as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). As of 27 Feb, this emerging infection has been reported in 47 countries, causing over 82,294 infections with 2,804 deaths (Fig. 1) [1]. This novel virus is also becoming a mounting threat to Chinese and global economies.

Coronaviruses (CoVs) are members of the family Coronaviridae, the enveloped viruses that possess extraordinarily large single-stranded RNA genomes ranging from 26 to 32 kilobases in length [2]. CoVs have been identified in both avian hosts and various mammals, including bat, camels, dogs and masked palm civets, and are previously regarded as pathogens that only cause mild diseases in the immunocompetent people until the emergence of the coronavirus causing severe acute respiratory syndrome (SARS-CoV) in late of 2002 [3-6]. Currently, at least seven coronavirus species are known to cause diseases in humans. The viruses of 229E, OC43, NL63 and HKU1 only cause common cold symptoms, which are mild. Severe illness can be caused by the remaining three viruses, namely SARS-CoV, which resulted in the outbreak of SARS in 2002 and 2003 [3,4]; the coronaviruses that are responsible the Middle East respiratory syndrome (MERS-CoV), which emerged in 2012 and remains in the circulation in camels [7]; and SARS-CoV-2, the viruses emerged in December 2019 in Wuhan of China and a great effort is being undertaken to contain its spreading [8]. In this review, we will briefly introduce the outbreak history of SARS-CoV-2, the signs and symptoms of the infected patients, its transmission dynamics, the advances in the understanding on its evolutional origin and the chemotherapeutic options being developed for the treatment of its infection.

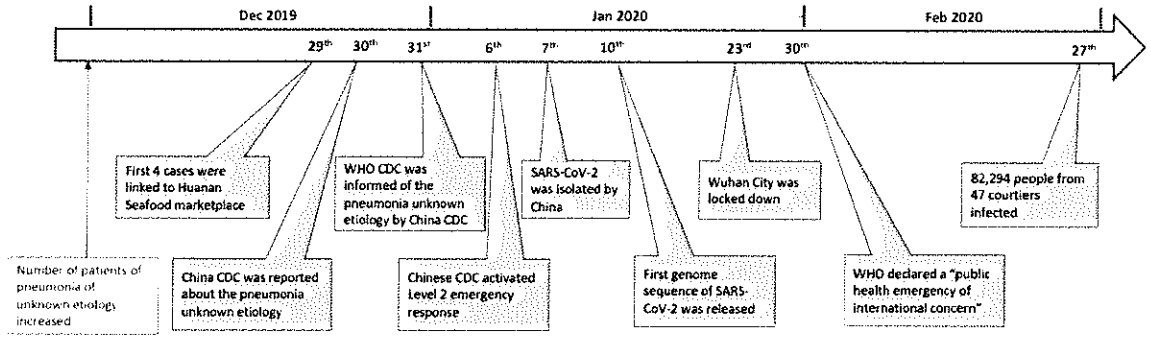

Figure 1. Key events in the early stage of SARS-CoV-2 outbreak.

The key events of SARS-CoV-2 outbreak and the pathogen characteristics

Since December 2019, an increasing number of patients with pneumonia of unknown etiology in Wuhan, a city with 11 million people, have alarmed the local hospital. On 29 December 4 cases were linked to Huanan Seafood wholesale market [9], where non-aquatic live animals, including several kinds of wild animals, were also on the sales. The local Center for Disease Control (CDC) then found additional patients linked to the same market after investigation, and reported to China CDC on 30 Dec 2019 [9]. The second day, World Health Organization (WHO) was informed of the cases of pneumonia of unknown etiology by China CDC [10]. On 6 Jan 2020, a level 2 emergency response was launched by China CDC [11].

The causal agent was not identified until 7 Jan 2020; a new type of coronavirus was isolated by Chinese authority [10]. The genome sequence of SARS-CoV-2 (WH-Human_1) was first released and shared by China on 10 Jan [12]. The isolation and identification of SARS-CoV-2 apparently facilitated the development of molecular diagnostic methods and the confirmation of the infected patients. As of 21 Jan, there are 270 cases were confirmed from Wuhan [13]. On 23 Jan, Wuhan city was locked down by local government. On 30 Jan, WHO declared a "public health emergency of international concern" (Fig. 1).

Subsequently, the viruses were successfully isolated from several laboratories [8,14,15]. The virion of SARS-CoV-2 looks like a solar corona by transmission electron microscopy imaging: the virus particle is in a spherical shape with some pleomorphism; the diameter of the virus particles range from 60 to 140 nm with distinctive spikes about 8 to 12 nm in length [8]. The observed morphology of SARS-CoV-2 is consistent with the typical characteristics of the Coronaviridae family. The genome sequence of SARS-CoV-2 from clinical samples has been obtained by several laboratories with deep sequencing [8,14-18]. The viral genome of SARS-CoV-2 is around 29.8 kilobase, with a G+C content of 38%, in total consisting of six major open reading frames (ORFs) common to coronaviruses and a number of other accessory genes [14,16]. The sequences analysis showed that the genome sequences of viruses from different patients are very conserved [14,15,19], implying that the human virus evolves recently.

Signs and symptoms of patients infected by SARS-CoV-2

A typical characteristic of the SARS-CoV-2 infected patient is pneumonia, now termed as Coronavirus Disease 2019 (COVID-19), demonstrated by computer tomographic (CT) scan or chest X -ray [3,8,18]. In the early stages, the patients showed the acute respiratory infection symptoms, with some that quickly developed acute respiratory failure and other serious complications [20]. The first three patients reported by the China Novel Coronavirus Investigating and Research Team all developed severe pneumonia and two of these three patients with available clinical profiles showed a common feature of fever and cough [8]. A subsequent investigation of a family of six patients in the University of Hong Kong-Shenzhen Hospital demonstrated that all of them had pulmonary infiltrates, with a variety of other symptoms [18]. The chest X-ray and CT imaging in a study showed that 75% of 99 patients demonstrated bilateral pneumonia and the remaining 25% unilateral pneumonia [21]. Overall, 14% of the patients showed multiple mottling and ground-glass opacity [21]. The first cases of coronavirus infection in the United States also showed basilar streaky opacities in both lungs by chest radiography. However, the pneumonia for this patient was only detected on the day 10 of his illness [22]. It is also of note that one of patients among the family of six patients did not present any other symptoms and signs, but had ground-glass lung opacities identified by CT scan [18].

Table 1. Common signs and symptoms of SARS-CoV-2 infected patients from four reports

Signs or Symptoms	Number of patients with signs or symptoms from each report				Number of patients with signs or symptoms	Total number of patients	Percentage
	Report 1 [21]	Report 2 [23]	Report 3 [24]	Report 4 [25]			
Fever	82 (n=99)	40 (n=41)	136 (n=138)	975 (n=1099)	1233	1377	90%
Cough	81 (n=99)	31 (n=41)	82 (n=138)	745 (n=1099)	939	1377	68%
Sputum production/ Expectoration	NR	11 (n=39)	37 (n=138)	370 (n=1099)	418	1276	33%
Shortness of breath/ Dyspnoea	31 (n=99)	22 (n=40)	43 (n=138)	205 (n=1099)	301	1376	22%
Headache	8 (n=99)	3 (n=38)	9 (n=138)	150 (n=1099)	170	1374	12%
Sore throat/Pharyngalgia	5 (n=99)	NR	24 (n=138)	153 (n=1099)	182	1336	14%
Diarrhoea	2 (n=99)	1 (n=38)	14 (n=138)	42 (n=1099)	59	1374	4%

NR: Not Recorded.

At least four comprehensive studies on the epidemiological and clinical characteristics of SARS-CoV-2 infected patients have been performed [21, 23-25]. The most common signs and symptoms of patients are fever and cough [21,23-25]. Fatigue was complained by 96% of patients (n=138) in one study [24], but was less outstanding (18%, n=44) in another report [23]. A combinational analysis of the common recorded signs or symptoms of the reported cases found that fever was observed in around 90% of the SARS-CoV-2 infected patients; the number of patients with cough is relatively less (68%) compared to fever (Table 1). In addition, shortness of breath or dyspnea, muscle ache, headache, chest pain, diarrhea, haemoptysis, sputum production, rhinorrhoea, nausea and vomiting, sore throat, confusion, and anorexia were also observed in a proportion of the patients [21,23-25] (Table 1).

A common feature of patients of SARS, MERS or COVID-19 is the presence of severe acute respiratory syndrome; however, the estimated fatality rate of COVID-19 (2.3%) is much lower than SARS (~10%) and MERS (~36%) [26,27]. Furthermore, the viruses responsible for above three diseases are evolutionary distinct (See below for details) [19].

Transmission of the virus

It is clear now that SARS-CoV-2 can be transmitted by human-to-human despite the majority of the early cases had contact history with the Huanan Seafood market [11,18,28]. Analysis of 425 patients with confirmed COVID-19 showed that the incubation period is 3 to 7 days. The mean was 5.2 days (95% CI: 4.1 to 7.0), and the 95th percentile of the distribution is 12.5 days (95% CI: 9.2 to 18) [11]. Notably, it was reported that the incubation period could be as long as 24 days in a rare case [25]. The basic reproductive number (R_0) up to the period of 4 Jan 2020 was estimated based on the study of 425 patients to be 2.2 (meaning that one patient has been spreading infection to 2.2 other people) [11], slightly smaller than the value of 2.68 by a modelling in another [29]. The R_0 of SARS-CoV-2 from both of these two studies is smaller than that of SRAS, which are 3 before public health measures were implemented [30]. However, subsequent investigation based on the analysis of high-resolution real-time human travel and infection data estimated that the R_0 is much larger, ranging from 4.7 to 6.6 before the control measures [31], implying that SARS-CoV-2 is highly contagious and more infectious than initially estimated. This conclusion is consistent with the wide spread of SARS-CoV-2 within a short period time and was also echoed by the finding that SARS-CoV-2 Spike (S) protein had 10- to 20-fold higher affinity to human angiotensin-converting enzyme 2 (ACE2) receptor than that of SARS-CoV based on the Cryo-EM structure analysis of S proteins [32]. Similar to SARS-CoV, the entry of SARS-CoV-2 into host cells depends on the recognition and binding of S protein to ACE2 receptor of the host cells [14,33]. The high affinity of S protein to ACE2 receptor likely contributes to the quick spreading of virus. The finding of ACE2 as the receptor of SARS-CoV-2 also indicates that human organs with high ACE2 expression level, such as lung alveolar epithelial cells and enterocytes of the small intestine, are potentially the target of SARS-CoV-2 [34].

As a new coronavirus, it is not known yet about how SARS-CoV-2 spreads. Current knowledge for SARS-CoV-2 transmission is largely based on what is known from the similar coronaviruses, particularly SARS-CoV and MERS-CoV, in which human-to-human transmission occurs through droplets, contact and fomites. SARS-CoV is predominantly transmitted through indirect or direct contact with mucous membranes in the mouth, eyes, or nose [35]. It has been shown that unprotected eyes and exposed mucous membranes are vulnerable to SARS-CoV transmission [36]. A member of the national expert panel on pneumonia was infected by SARS-CoV-2 after the inspection in Wuhan [37]. As he wore a N95 mask but not any eye protector, and experienced eye redness before the onset of pneumonia, it was thus suspected that unprotected exposure of the eyes to

SARS-CoV-2 might be another transmission pathway [37]. However, SARS-CoV-2 was not detected from the conjunctival swab sample in a confirmed COVID-19 patent with conjunctivitis [38], suggesting that more evidences are needed before concluding the conjunctival route as the transmission pathway of SARS-CoV-2. The mode of transmission by MERS-CoV is not well understood but is believed to spread largely via the respiratory close contact route [39,40].

Based on the transmission mode of SARS-CoV and MERS-CoV, a serial of preventive measures have been recommended, including avoiding close contact with people suffering from acute respiratory infections and frequent hand-washing [41]. The viruses of SARS-CoV-2 were also detected in the stool samples in some patients but not all [18,22], suggesting that a possible fecal-oral transmission occurs [42]. A systematic study showed that viruses could be detected in oral swabs, anal swabs and blood samples of the patients, and the anal swabs and blood could test positive when oral swab tested negative [43]. Furthermore, a trend of shift from more oral positive in the collected samples during the early period of patient infection to more anal positive during later period of infection was also found [43]. Therefore, a multiple shedding routes of SARS-CoV-2 might exist.

One of the challenges for preventive control of SARS-CoV-2 spreading is that the viruses are likely transmitted by asymptomatic contact. A German businessman was found infected by SARS-CoV-2 after attending a conference together with a colleague, who had no signs or symptoms of infection but had become ill due to the SARS-CoV-2 infection later [44]. This observation suggests that infected patients likely start to shed viruses before the onset of any symptom, which undoubtedly will bring great challenge to the current practice of preventive control by measuring body temperature. Despite the claim of the transmission by asymptomatic contact has been challenged [45], other asymptomatic carriers were also observed to transmit the viruses of SARS-CoV-2 [46,47]. Consistently, a study found that an asymptomatic patient had a similar vial loads in the samples of nasal and throat swabs to that of the symptomatic patients [48].

The origin and evolution of SARS-CoV-2

It is critical to identify the origin, native host(s) and evolution pathway of the virus that causes an outbreak of a pandemic. This information can help understand the molecular mechanism of its cross-species spread and implement a proper control measure to prevent it from further spreading. The association of initially confirmed SARS-CoV-2 cases with Huanan Seafood market suggested that the marketplace has played a role in the early spreading [11,23], however, whether it is the origin of the outbreak and what is the native host(s) of SARS-CoV-2 remain uncertain. In fact, the firstly documented patient was not linked to Huanan Seafood market [23].

The analysis of SARS-CoV-2 origin was firstly performed based on the genome sequence of virus isolates from six patients [19]. When compared with SARS-CoV and MERS-CoV, the nucleotide sequences of SARS-CoV-2 showed a higher homology with that of SARS-CoV while was relatively poor with that of MERS-CoV [19]. Despite some of the six major OFRs of SARS-CoV-2 genes share less than 80% identity in nucleotide acids to SARS-CoV, the seven conserved replicase domains in ORF1ab has 94.6% sequence identity in amino acids between SARS-CoV-2 and SARS-CoV [14], suggesting that these two viruses might belong to the same species. The origin of SARS-CoV has been extensively investigated. Masked palm civets were initially considered to transmit SARS-CoV to humans as a close variant of SARS-CoV was detected from palm civets [49]. This conclusion was supported by the fact that three of the four patients had the record of contact with palm civets during the two small-scale of SARS outbreaks occurred in late 2003 and early 2004 [50, 51]. However, a deep investigation based on the genome sequence of isolated viruses showed that SARS-CoV-like virus in civet had not been circulating for long [52]. Subsequently, coronaviruses with high similarity to the human SARS-CoV or civet SARS-CoV-like virus were isolated from horseshoe bats, concluding the bats as the potential natural reservoir of SARS-CoV whereas masked palm civets are the intermediate host [53-56].

It is thus reasonable to suspect that bat is the natural host of SARS-CoV-2 considering its similarity with SARS-CoV. The phylogenetic analysis of SARS-CoV-2 against a collection of coronavirus sequences from various sources found that SARS-CoV-2 belonged to the *Betacoronavirus* genera and was closer to SARS-like coronavirus in bat [19]. By analyzing genome sequence of SARS-CoV-2, it was found that SARS-CoV-2 felled within the subgenus *Sarbecovirus* of the genus Betacoronavirus and was closely related to two bat-derived SARS-like coronaviruses, bat-SL-CoVZC45 and bat-SL-CoVZXC21, but were relatively distant from SARS-CoV [15, 18, 57-59]. Meanwhile, Zhou and colleagues showed that SARS-CoV-2 had 96.2% overall genome sequence identity throughout the genome to BatCoV RaTG13, a bat coronavirus detected in *Rhinolophus affinis* from Yunnan province [14]. Furthermore, the phylogenetic

analysis of full-length genome, the receptor binding protein spike (S) gene, and RNA-dependent RNA polymerase (RdRp) gene respectively all demonstrated that RaTG13 was the closest relative of the SARS-CoV-2 [14]. However, despite SARS-CoV-2 showed high similarity to coronavirus from bat, SARS-CoV-2 changed topological position within the subgenus *Sarbecovirus* when different gene was used for phylogenetic analysis: SARS-CoV-2 was closer to bat-SL-CoVZC45 in the S gene phylogeny but felled in a basal position within the subgenus *Sarbecovirus* in the ORF1b tree [57]. This finding implies a possible recombination event in this group of viruses. Of note, the receptor-binding domain of SARS-CoV-2 demonstrates a similar structure to that of SARS-CoV by homology modelling but a few variations in the key residues exist at amino acid level [15, 19].

Despite current evidences are pointing to the evolutional origin of SARS-CoV-2 from bat virus [15, 57], an intermediate host between bats and human might exist. Lu et. al. raised four reasons for such speculation [15]: First, most bat species in Wuhan are hibernating in late December; Second, no bats in Huanan Seafood market were sold or found; Third, the sequence identity between SARS-CoV-2 and bat-SL-CoVZC45 or bat-SL-CoVZXC21, the closest relatives in their analyses, is lower than 90%; Fourth, there is an intermediate host for other human-infecting coronaviruses that origin from bat. For example, masked palm civet and dromedary camels are the intermediate hosts for SARS-CoV [49] and MERS-CoV respectively [60]. A study of the relative synonymous codon usage (RSCU) found that SARS-CoV-2, bat-SL-CoVZC45, and snakes had similar synonymous codon usage bias, and speculated that snake might be the intermediate host [61]. However, no SARS-CoV-2 has been isolated from snake yet.

Pangolin was later found to be a potential intermediate host for SARS-CoV-2. The analysis of samples from Malytan pangolins obtained during anti-smuggling operations from Guangdong and Guangxi Customs of China respectively found novel coronaviruses representing two sub-lineages related to SARS-CoV-2 [62]. The similarity of SARS-CoV-2 to these identified coronaviruses from pangolins is approximately 85.5% to 92.4% in genomes, lower than that to the bat coronavirus RaTG13 (96.2%) [14,62]. However, the receptor-binding domain of S protein from one sub-lineage of the pangolin coronaviruses shows 97.4% similarity in amino acid sequences to that of SARS-CoV-2, even higher than that to RaTG13 (89.2%) [62]. Interestingly, the pangolin coronavirus and SARS-CoV-2 share identical amino acids at the five critical residues of RBD of S protein, while RaTG13 only possesses one [62]. The discovery of coronavirus close to SARS-CoV-2 from pangolin suggests that pangolin is a potential intermediate host. However, the roles of bat and pangolin as respective natural reservoir and intermediate host still need further investigation.

Chemotherapeutic options for SARS-CoV-2 infection

As an emerging virus, there is no effective drug or vaccine approved for the treatment of SARS-CoV-2 infection yet. Currently, supportive care is provided to the patients, including oxygen therapy, antibiotic treatment, and antifungal treatment, extra-corporeal membrane oxygenation (ECMO) etc. [21,22]. To search for an antiviral drug effective in treating SARS-CoV-2 infection, Wang and colleagues evaluated seven drugs, namely, ribavirin, penciclovir, nitazoxanide, nafamostat, chloroquine, remdesivir (GS-5734) and favipiravir (T-750) against the infection of SARS-CoV-2 on Vero E6 cells *in vitro* [63]. Among these seven drugs, chloroquine and remdesivir demonstrated the most powerful antiviral activities with low cytotoxicity. The effective concentration (EC_{50}) for chloroquine and remdesivir were 0.77μM and 1.13μM respectively. Chloroquine functions at both viral entry and post-entry stages of the SARS-CoV-2 infection in Vero E6 cells whereas remdesivir does at post-entry stage only. Chloroquine is a drug used for an autoimmune disease and malarial infection with potential broad-spectrum antiviral activities [64,65]. An EC_{90} (6.90 μM) against the SARS-CoV-2 in Vero E6 cells is clinically achievable *in vivo* according to a previous clinical trial [66]. Remdesivir is a drug currently under the development for Ebola virus infection and is effective to a broad range of viruses including SARS-CoV and MERS-CoV [67,68]. Functioning as an adenosine analogue targeting RdRp, Remdesivir can result in premature termination during the virus transcription [69,70]. The EC_{90} of remdesivir against SARS-CoV-2 in Vero E6 cells is 1.76 μM, which is achievable *in vivo* based on a trial in nonhuman primate experiment [63, 69]. Encouragingly, in the first case of SARS-CoV-2 infection in the United States, treatment with remdesivir was provided intravenously to the patient on the day 7 without any adverse events observed. The patient's clinical condition was improved on day 8 and the previous bilateral lower-lobe rales disappeared, implying the remdesivir might be effective to the treatment of SARS-CoV-2 infection [22]. This result, however, should be interpreted with caution as this is only single case study and a proper trial control was lacking. In addition, baricitinib, a Janus kinase inhibitor, was also predicted to reduce

the ability of virus to infect lung cell by an analysis of BenevolentAI [71].

Currently, chloroquine and remdesivir are under phase 3 clinical trial and open-label trial for treatment of SARS-CoV-2 infection respectively (Table 2) [72]. Preliminary results showed that chloroquine phosphate had apparent efficacy in treatment of COVID-19 [73]. However, caution must be taken during clinical use of chloroquine as its overdose is highly fatal without known antidote [74]. Despite the lack of documented *in vitro* data supporting the antiviral efficacy on SARS-CoV-2, several antiviral chemotherapeutic agents have been registered for the clinical trials for the treatment of COVID-19 (Table 2) [72].

Conclusion remarks

SARS-CoV-2 is an emerging pathogen, without any effective drug available for treatment at the moment. It spreads quickly and can result in death of the infected patients. Despite the current mortality rate is 2.3% [26], the emergence of large number of infected patients within short period of time could result in the collapse of health care system, and thus the mortality rate might be elevated. Effective preventive measures must be implemented to control it from global spreading. In addition, great effort should be made on the development of vaccine and antiviral drugs. Meanwhile, the intermediate host and the molecular mechanism of its cross-species spread should be further investigated. Legislation should be employed to prohibit the trade of wild animals, the potential intermediate host(s) of various viruses, to prevent the outbreak of this and other novel viruses in future.

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Table 2. Summary of chemotherapeutic drugs under clinical trial for COVID-19

Name of Drug	Target and Mode of Action in other Viruses	*In Vitro* Antiviral Activity to SARS-CoV-2	Clinical Trial Status for COVID-19	Clinical Trial Registration Number
Remdesivir (GS-5734)	Inhibits RdRp [70]	Tested [63]	Phase 3	NCT04252664; NCT04257656
Favipiravir	Inhibits RdRp [75]	Tested [63]	Randomized trial	ChiCTR2000029544; ChiCTR2000029600
Ribavirin	Inhibits viral RNA synthesis and mRNA capping [76]	Tested [63]	Randomized trial, in combination a pegylated interferon	ChiCTR2000029387
Lopinavir	Inhibits 3C like protease (3Clpro) [77]	Not tested	Phase 3	NCT04252274; NCT04251871; NCT04255017; ChiCTR2000029539
Ritonavir	Inhibits 3Clpro [77]	Not tested	Phase 3	NCT04251871; NCT04255017; NCT04261270
Darunavir and Cobicistat	Inhibits HIV protease [78]	Not tested	Phase 3	NCT04252274
ASC09F (HIV protease inhibitor)	Inhibits HIV protease [79]	Not tested	Phase 3, in combination with oseltamivir	NCT04261270
Chloroquine	A lysosomatropic base that appears to disrupt intracellular trafficking and viral fusion events [80]	Tested [63]	Open-label trial	ChiCTR2000030054; ChiCTR2000029939; ChiCTR2000029935; ChiCTR2000029899; ChiCTR2000029898; ChiCTR2000029837; ChiCTR2000029803; ChiCTR2000029761; ChiCTR2000029740; ChiCTR2000029559; ChiCTR2000029542; ChiCTR2000029868; ChiCTR2000029826; ChiCTR2000029762; ChiCTR2000029760; ChiCTR2000029609
Arbidol (Umifenovir)	Block viral fusion [81]	Not tested	Phase 4	NCT04260594; NCT04254874; NCT04255017
Oseltamivir	Inhibit neuaminidase [82]	Not tested	Phase 3 and Phase 4	NCT04255017; NCT04261270

Competing Interests

The authors have declared that no competing interest exists.

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Isolation and rapid sharing of the 2019 novel coronavirus (SARS-CoV-2) from the first patient diagnosed with COVID-19 in Australia

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The known: By 12 March 2020, 140 cases of COVID-19 (the illness caused by SARS-CoV-2) had been confirmed in Australia; three patients had died. At the end of January, the sequence of the virus had been shared but no laboratory outside China had grown the virus or had access to live virus.

The new: We describe the clinical course and laboratory features of the first reported case of COVID-19 in Australia, as well as the isolation, sequencing, imaging, and rapid global sharing of virus isolated from the patient.

The implications: Rapid identification, propagation and international sharing of SARS-CoV-2 is an important step in collaborative scientific efforts and diagnostic test validation in response to this public health emergency.

Abstract

Objectives: To describe the first isolation and sequencing of SARS-CoV-2 in Australia and rapid sharing of the isolate.

Setting: SARS-CoV-2 was isolated from a 58-year-old man from Wuhan, China who arrived in Melbourne on 19 January 2020 and was admitted to the Monash Medical Centre, Melbourne from the emergency department on 24 January 2020 with fever, cough, and progressive dyspnoea.

Major outcomes: Clinical course and laboratory features of the first reported case of COVID-19 (the illness caused by SARS-CoV-2) in Australia; isolation, whole genome sequencing, imaging, and rapid sharing of virus from the patient.

Results: A nasopharyngeal swab and sputum collected when the patient presented to hospital were each positive for SARS-CoV-2 (reverse transcription polymerase chain reaction). Inoculation of Vero/hSLAM cells with material from the nasopharyngeal swab led to the isolation of SARS-CoV-2 virus in culture. Electron microscopy of the supernatant confirmed the presence of virus particles with morphology characteristic of viruses of the family *Coronaviridae*. Whole genome sequencing of the viral isolate and phylogenetic analysis indicated the isolate exhibited greater than 99.99% sequence identity with other publicly available SARS-CoV-2 genomes. Within 24 hours of isolation, the first Australian SARS-CoV-2 isolate was shared with local and overseas reference laboratories and major North American and European culture collections.

Conclusions: The ability to rapidly identify, propagate, and internationally share our SARS-CoV-2 isolate is an important step in collaborative scientific efforts to deal effectively with this international public health emergency by developing better diagnostic procedures, vaccine candidates, and antiviral agents.

The recognition in 2019 of the first outbreak in Wuhan, China, of a respiratory disease (COVID-19) associated with a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) triggered an international response unparalleled in its scale and tempo.[1-3] In particular, the rapid sharing and integration of clinical and epidemiological data has facilitated understanding of the spectrum of clinical disease caused by SARS-CoV-2 and the extent of its global spread, although there are still many unanswered questions. Further, rapid genomic analyses have corroborated epidemiological investigations, suggesting a global point source outbreak of a novel betacoronavirus originating in Wuhan.[4,5]

The fundamental pillars of the control of any infectious disease are effective prevention, diagnostic, and treatment strategies. For viral pathogens, the propagation of live virus and the timely dissemination of the viral isolate to domestic and international scientific and public health agencies are critical. Rapid sharing of material has allowed laboratories to validate their diagnostic assays and to confirm their ability to detect SARS-CoV-2. In this report we describe the clinical course and laboratory features of the first reported case of COVID-19 in Australia, together with the isolation, sequencing, and imaging of the virus.

Case report and clinical course

A 58-year-old man from Wuhan, China, felt unwell on the day of his arrival in Melbourne (19 January 2020). In China, he had had no contact with live food markets, people known to have COVID-19, or hospitals. His medical history included type 2 diabetes mellitus, and he had ceased smoking four years previously. He developed fever on 20 January and a cough with sputum production on 23 January; on 24 January, he was admitted to the Monash Medical Centre, Melbourne, from its emergency department with progressive dyspnoea. His temperature was 38.1°C, his heart rate 95 beats/min, and O_2 saturation 94% on room air. A chest x-ray showed subtle ill-defined opacities in the middle zones bilaterally and in the left lower zone. A thoracic computed tomography scan on admission day four identified extensive ground glass opacities with a peribronchovascular and peripheral distribution in the middle to upper zones of the lungs (Box 1). Full blood examination results included a lymphocyte count of 0.80×10^9/L (reference range, $1.0–4.0 \times 10^9$/L). C-reactive protein concentration peaked on admission day 6 at 182 mg/L (reference range, 0–5 mg/L). Liver function test abnormalities peaked on admission day 12 — alkaline phosphatase, 210 U/L (reference range, 30–110 U/L); γ-glutamyltransferase, 416 U/L (reference range, 30–110 U/L); alanine aminotransferase, 183 U/L (reference range, 5–40 U/L) — and hepatic steatosis was evident on liver ultrasound. Intravenous ceftriaxone (2 g/day)

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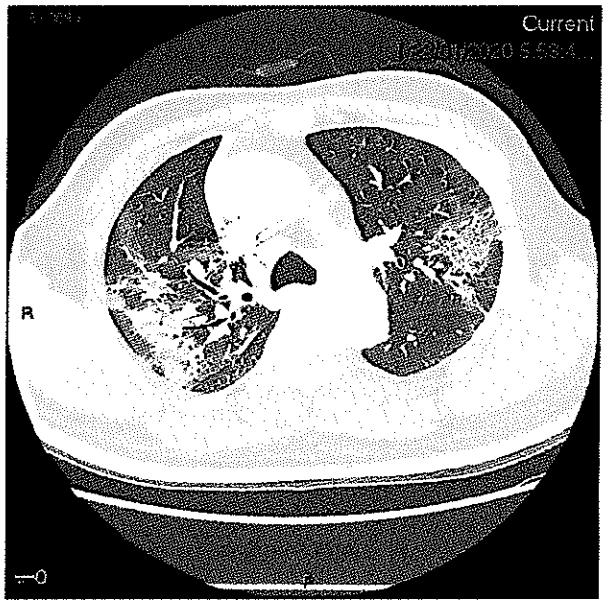
1 Thoracic computed tomography (CT) image of patient on admission day 4



and azithromycin (500 mg/day) were commenced on admission day 4 to treat potential secondary bacterial pneumonia, although no bacterial pathogen was identified. Low-flow oxygen (maximum 3 L/min via nasal prongs) was administered until admission day 10. The patient gradually improved; fever, productive cough and dyspnoea resolved by admission day 12, and he was discharged from hospital on 7 February (admission day 15).

Methods

Diagnostic testing for SARS-CoV-2

Real time reverse transcription (RT) polymerase chain reaction (PCR) testing for SARS-CoV-2 was performed on material from an initial nasopharyngeal swab in 200 µL viral transport medium, and separately for sputum, urine, faeces, and serum samples. Briefly, an in-house real time RT-PCR assay was developed, and all positive tests confirmed by nested RT-PCR, using previously described methods.[7] PCR products underwent in-house Sanger sequencing, which confirmed the presence of SARS-CoV-2 (online Supporting Information, 1.1–1.3).

Virus culture and electron microscopy

Material from the initial nasopharyngeal swab was used to inoculate a Vero/hSLAM cell line (European Collection of Authenticated Cell Cultures [ECACC] #04091501). Flasks were monitored for the development of viral cytopathic effect and 140 µL aliquots removed every 48 hours to assess virus burden by real time RT-PCR.

For electron microscopy, a 4 mL aliquot of supernatant from cell cultures grown in the presence of 4 µg/mL trypsin was inactivated with 0.5% glutaraldehyde for 12 h and clarified by centrifugation at 1000 g for 3 min. Supernatant was negatively stained with 3% phosphotungstic acid (pH 7.0) and examined with an FEI Tecnai T12 electron microscope at 80kV. The remaining pellet was stained *en bloc* and embedded in resin; 70 nm sections were examined with an FEI Tecnai F30 electron microscope at 200kV (Supporting Information, 2.1–2.2).

Whole genome sequencing of SARS-CoV-2 and bioinformatic analysis

We extracted RNA for whole genome sequencing of the viral isolate. Briefly, RNA was extracted from clarified cell culture supernatant and randomly amplified cDNA prepared by sequence-independent single-primer amplification (SISPA).[8] Sequencing was performed with a combination of Oxford Nanopore Technologies and Illumina short-read sequencing. Genomic assembly of the BetaCoV/Australia/VIC/01/2020 genome was confirmed by parallel *de novo* and reference-guided methods (Supporting Information, 3.1–3.4).

Results

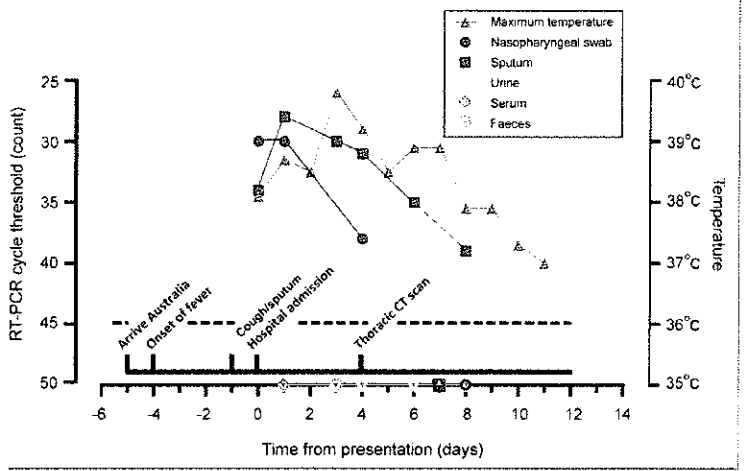
Detection of SARS-CoV-2 in clinical samples

A nasopharyngeal swab and sputum collected on presentation were positive for SARS-CoV-2 on real time RT-PCR assay. Serial daily RT-PCR testing of nasopharyngeal swabs and sputum from the patient indicated a gradual decline in viral load in sputum between admission days 1 and 8, and a decline in viral load and disappearance from nasopharyngeal swabs by admission day 7. No virus was detected in urine samples, nor in single faecal (admission day 3) or plasma samples (admission day 1) (Box 2).

Growth, visualisation, and global sharing of SARS-CoV-2 virus

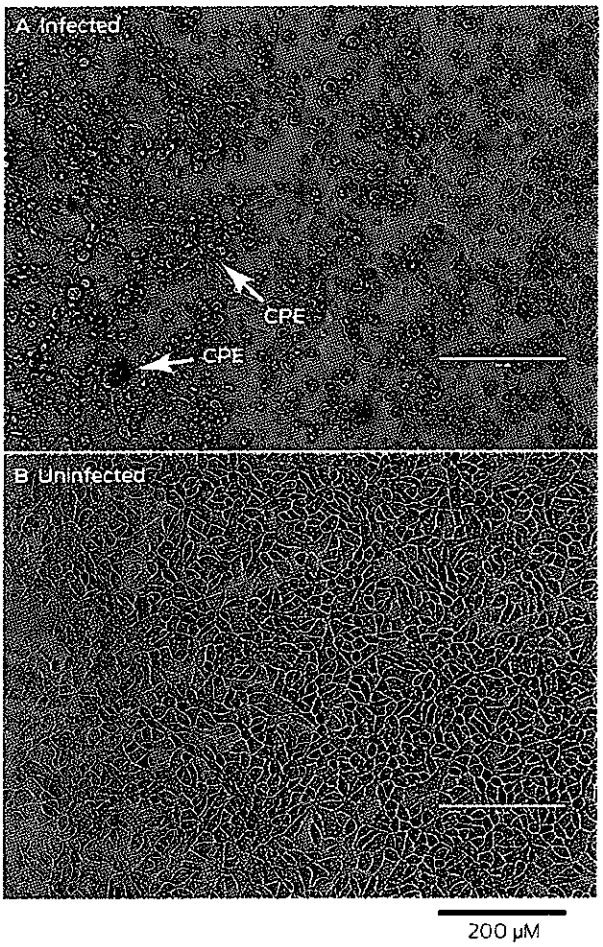
Two days after inoculation of the VERO/hSLAM cell line, a subtle viral cytopathic effect was observed, and was distinct at day 6 compared with an uninfected control cell line (Box 3). RT-PCR testing of the cell line supernatant confirmed a high viral load, suggesting productive viral infection (Box 4). Electron micrographs of the negatively stained supernatant showed spherical

2 Clinical course of first Australian case of COVID-19, including laboratory investigations

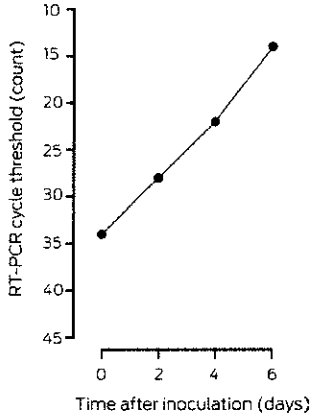


SARS-CoV-2 was quantified by real time RT-PCR. The cycle threshold count is shown for each specimen type; an increase in count value is consistent with reduced viral load. The assay limit of detection (dashed line) threshold is a count of 45; open symbols beneath the threshold indicate null detection of virus. ◆

3 Light microscopy of Vero/hSLAM cells. A. Cells infected with material from patient, with viral cytopathic effect (CPE) evident six days after inoculation. B. Uninfected (control) cells



4 SARS-CoV-2 viral load, quantified by real time polymerase chain reaction (RT-PCR) of supernatant from virus-infected Vero/hSLAM cell culture*



* Lower threshold cycle count values indicate higher viral loads ◆

and pleomorphic virus-like particles of 90–110 nm diameter; the particles displayed prominent spikes (9–12 nm), characteristic of viruses from the family *Coronaviridae* (Box 5, A). Electron micrographs of sectioned VERO/hSLAM cells showed cytoplasmic membrane-bound vesicles containing coronavirus particles (Box 5, B) Following several failures to recover virions with the characteristic fringe of surface spike proteins, it was found that adding trypsin to the cell culture medium immediately improved virion morphology.

In consultation with the World Health Organization, the viral isolate was shared with domestic and international reference laboratories within 24 hours, and lodgement with major North American and European culture collections for further distribution is underway.

Phylogenetic analysis

Phylogenetic analysis indicated that the genome sequence of our isolate (BetaCoV/Australia/VIC01/2020) exhibited greater than 99.99% sequence identity with other publicly available SARS-CoV-2 genomes (online Supporting Information, 3.4), consistent with the epidemiological features of this case originating in Wuhan.[10] Compared with the National Center for Biotechnology Information (NCBI) SARS-CoV-2 reference sequence (NC_045512.3), there were three previously described single nucleotide polymorphisms and a 10 base pair deletion in the 3′ untranslated region (3′UTR) (Supporting Information, 3.4). Our sequences are available at GenBank (accession number, MT007544.1), and the genome was rapidly uploaded to the Global Initiative of Sharing All Influenza (GISAID) (accession number, EPI_ISL_406844).

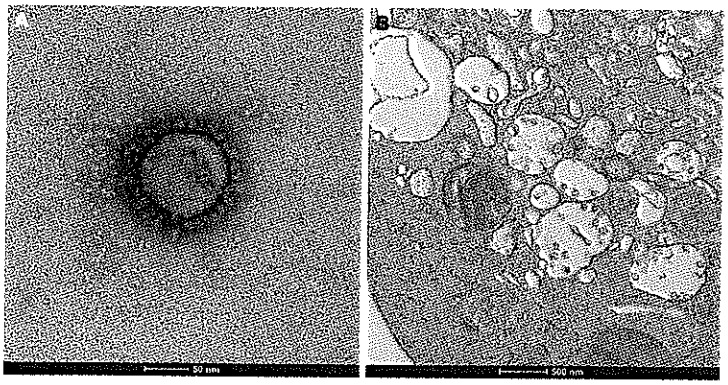
Discussion

We have described the first reported case of COVID-19 in Australia, with rapid diagnosis, and isolation, imaging, and sharing of the causative agent, SARS-CoV-2. By 12 March 2020, there had been 140 confirmed cases in Australia; three patients had died.[1] Although 65% of confirmed cases around the world have been reported from China, an increasing number are being reported in South Korea, Italy, and Iran, and limited human-to-human transmission has been described.[9,11,12] Although the number of cases in Australia is relatively small, the political and societal effects (as in other countries) have already been considerable, including travel restrictions to and from mainland China, the Republic of Korea, Italy, and Iran.[13] The sustainability of these measures and their effects on local and global control remain to be established, but the consequences of the outbreak will probably be felt for many months, if not longer.

The clinical features in our case were consistent with other recent reports, including the initial presentation of fever, cough, and progressive dyspnoea.[14] It is notable that the viral burden was greatest in sputum specimens, which remained positive for SARS-CoV-2 for eight days after initial presentation, compared with four days for nasopharyngeal swabs (Box 2). The decline in viral load was correlated with the resolution of fever and, ultimately, clinical improvement. One unresolved question is whether patients who are clinically stable and deemed fit to be discharged from hospital but have PCR-detectable virus are infectious, or whether this indicates only the persistence of non-infectious, residual viral RNA.

We applied standard techniques to isolate the virus, but we were the first group to isolate it outside China during the early stages of the epidemic. Potential reasons for our success could be the

5 Electron micrographs of cell culture supernatant. A. 100 nm spherical virion displaying the characteristic crown-like fringe of spike proteins. B. Infected VERO/hSLAM sections with membrane-bound vesicles containing virus



viral burden of the collected specimens and the extensive clinical experience in our reference laboratory.

An important aspect of the scientific response to the COVID-19 outbreak has been the rapid sharing of information about diagnostic assays and genomic data, enabling rapid elucidation of the emergence and spread of the novel virus. In addition, a major principle of our laboratory response in Australia was to immediately share the viral isolate with the WHO and other laboratories to facilitate rapid validation of diagnostic testing. We continue to share live virus with other agencies, both locally and overseas, involved in the development and testing of therapeutic agents and vaccines. This is an essential function of public health reference and research laboratories, and we strongly encourage others to apply a similarly collaborative approach to streamlining efforts to diagnose, prevent, and treat COVID-19 during this public health emergency.

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Competing interests: No relevant disclosures. ■

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Supporting Information

Additional Supporting Information is included with the online version of this article.

IN THE HIGH COURT OF SOUTH AFRICA
(WESTERN CAPE DIVISION)

CASE NO:5852/2021

In the Matter between:

RICARDO MAARMAN	APPLICANT
AND	
THE PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA	FIRST RESPONDENT
AND	
THE MINISTER OF CO-OPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS	SECOND RESPONDENT
AND	
PROFESSOR SALIM ABDOOL KARIM on behalf of the GOVERNMENTAL COVID 19 ADVISORY COMMITTEE	THRID RESPONDENT

NOTICE IN TERMS OF RULE 16A
SUBMISSIONS BY AMICUS CURIAE

TAKE NOTICE THAT;

The applicant herein is raising Constitutional issues in an application on ***20 April 2021.***

THE CONSTITUTIONAL PRINCIPLES INVOLVED

1. The Constitution provides that the Republic of South Africa is a sovereign, democratic state founded, inter alia, on the following values: Life, Human dignity, the achievement of equality and the advancement of human rights and freedoms and the Rule of Law.

2. The Constitution provides that "All spheres of government and all organs of state within each sphere must be loyal to the Constitution, the Republic and its people; respect the constitutional status and not assume any power or function except those conferred on them in terms of the Constitution.

3. The Bill of Rights applies to all law, and binds the legislature, the executive, the judiciary and all organs of state.

4. Everyone has inherent dignity and the right to have their dignity respected and protected.

5. Everyone has the right to life, bodily and psychological integrity; To make decisions concerning the security and control over their body; Freedom to practice their trade, Freedom of movement, occupation and profession; Not to be treated in a cruel, inhuman or degrading way; Their right to have access to health care services; Just administrative action.

6. Every citizen has the right to administrative action that is lawful, reasonable, and procedurally fair.

7. These abovementioned rights may be limited only in terms of law of general application to the extent that the limitation is reasonable and justifiable in an open and democratic society based on human dignity, equality, and freedom, taking into account all relevant factors, including the nature of the right; the importance of the purpose of the limitation;

the nature and extent of the limitation; the relation between the limitation and its purpose; and less restrictive means to achieve the purpose.

8. No law including the DMA, may limit any right entrenched in the Bill of Rights.

9. It is therefore submitted that, in so far as the Regulations or any Direction Purportedly issued pursuant thereto, that will violate the above-mentioned fundamental rights will be inconsistent with the Constitution, and therefore illegal and void if the SARS-CoV-2-virus is not proven to exist.

10. Furthermore, the rights in the Bill of Rights cannot be infringed upon or limited in any way save in terms of the provisions of section 36 or 37.

11. The national state of disaster, announced in terms of the DMA, has been called on the mere allegation of the existence of the SARS-CoV-2-virus, and the applicant stands on his Fundamental right to test whether the violation of his and the entire nation's Constitutional rights have been based on the existence of the SARS-CoV-2-virus.

THE STATE MAY NOT INTERFERE WITH THOSE FREEDOMS, EXCEPT UNDER SECTION 36 OF THE CONSTITUTION.

1. My respectful submission is that until the Respondent has produced the SARS-CoV-2-virus to be tested by independent experts in the

appropriate circumstances that the Limitation of the rights of the Applicant and the Nation's rights to freedom of movement is not justified in terms of Section 36. (1) of the Constitution.

2. According to Section 36. (1) The rights in the Bill of Rights may be limited only in terms of law of general application to the extent that the limitation is reasonable and justifiable in an open and democratic society based on human dignity, equality and freedom, taking into account all relevant factors.

3. We are not asking this honourable Court to do the Section 36 test in this matter, or to decide on the existence of the SARS-CoV-2-virus we are simply asking that the respondent produces the isolated and purified physical SARS-CoV-2-virus (not a culture isolate or any mixture within in which the supposed virus is, nor a photograph or the RNA-sequence only), to the applicant at the place of his choice and under the security measures as preferred by the respondent, within 7 days, in order for us to test whether these extremely harsh disaster enforced on the nation is in fact based on the existence of the SARS-CoV-2-virus.

4. The nature of the rights here being limited are fundamental rights in terms of chapter two; the right to bodily and psychological integrity; The right to make decisions concerning the security and control over their own bodies; Freedom to practice their trade, freedom of movement, occupation, and profession; Not to be treated in a cruel, inhuman or

degrading way; Their right to have access to health care services; the right to just administrative action.

5. These are fundamental rights that cannot be limited if there are no evidence of the existence of the SARS-CoV-2-virus.

SECTION 39 OF THE CONSTITUTION AND ITS RELEVANCE TO THE FACTS PRESENTED

1. With regards to the nature of the matter, Section 39 (1)(a) and (b) respectively, have to be cited, as it is part and parcel of the fabric of our society, that this section be included here, which states that:

2. When interpreting the Bill of Rights, a court, tribunal or forum-
   (a) must promote the values that underlie an open and democratic society Based on human dignity , equality and freedom;
   (b), must consider international law; and
   (c), must consider a foreign law.

3. Its relevance, that the court should in accordance with the above be open the facts presented below, which in turn sheds light on the Portuguese Judgment, The Court here concludes that:

"Any diagnostic test must be interpreted in the context of the actual possibility of the disease, which existed before its realization. For Covid-19, this decision to perform the test depends on the previous assessment of the existence of

symptoms, previous medical history of Covid 19 or presence of antibodies, any potential exposure to this disease and no likelihood of another possible diagnosis." "One of the potential reasons for presenting positive results may lie in the prolonged shedding of viral RNA, which is known to extend for weeks after recovery, in those who were previously exposed to SARS-CoV-2. However, and more relevantly, there is no scientific data to suggest that low levels of viral RNA by RT-PCR equate to infection, unless the presence of infectious viral particles have been confirmed by a laboratory. In summary, Covid-19 tests that show false positives are increasingly likely, in the current epidemiological climate panorama in the United Kingdom, with substantial personal, health and social system consequences."

4. To prove the existence of something especially when it is mixed or incorporated with other things is to first separate or isolate it, then to measure it, to determine its parameters and to determine its qualities. An RNA or DNA sequence is not proof of existence, e.g., having the DNA sequence of a person does not mean that the person exist, to prove the person exists the DNA sequence must be matched to a DNA sequence obtained verifiably directly from the physical person.

5. Here follows explanations regarding the supposed isolation of SARS-CoV-2: as described in an article entitled The Genetic Sequence, Origin, Diagnosis of SARS-CoV-2, written by Huihui Wang et al.RM9

Ans 105-
7

- "Confirmed cases with SARS-CoV-2 were identified as a positive result of a high-throughput sequencing or an RT-PCR assay for respiratory specimens including nasal and pharyngeal swab"

- "Airway epithelial cells from infected patients were used to isolate a novel coronavirus, temporarily named 2019-nCoV, but later, the Coronavirus Research Group of the International Committee for the Classification of viruses found that the new coronavirus is related to the SARS-virus" The International Committee for the Classification of viruses is affiliated to the International Council of Sciences, which in turn has a formal relationship with UNESCO since 1947, which in turn is a specialised agency of the UN.

- "In addition, the World Health Organisation has named the disease caused by SARS-CoV-2 as coronavirus disease 2019 (Covid-19)".

- "After the SARS-CoV-2 was isolated from the lower respiratory tract specimen, a diagnostic RT-PCR test was developed. RT-PCR tests based on the RNA-dependent RNA polymerase (RdRp) gene of the ORF1ab sequence, E gene, N gene and S gene of the SARS-CoV-2 genome"

- "The genome of coronaviruses, ranging from 26 to 32 kilobases in length, includes a variable number"

- "The SARS-CoV-2 genome was reported to possess 14 ORF's encoding 27 proteins"

WHEREIN IT WILL ASK FOR AN ORDER AS FOLLOWS.

1. That this Application is heard as a matter of urgency and that the Applicant's failure to comply with the time limits imposed by the Rules of this Honourable Court be condoned in terms of Rule 6 (12).

2. That the respondents produce the isolated and purified physical SARS-CoV-2-virus (not a culture isolate or any mixture within in which the supposed virus is, nor a photograph or the RNA-sequence only), to the applicant at the place and in terms of their security measures of choice, within 7 days.

3. Further or alternative relief.

4. Cost of the application if opposed.

REGISTRAR

Kindly stamp this notice and then place it on the notice board designated for that purpose for a period of 20 days.

ANY INTERESTED PARTY;

In these proceedings may be admitted therein as amicus curiae upon such terms and conditions as may be agreed upon in writing by the parties in terms of the Rules of Court.

TAKE NOTICE FURTHER; that the Applicant has appointed ***VICTOR AND ASSOCIATES, 24*** Viola Road, Bloubergstrand, Cape Town, ***C/O ROB GREEN*** Attorneys, Room 305 Benzal House, 3 Barrack Street, Cape Town as its attorney of record and his service address as the address at which the Applicant will accept service of all process in these proceedings.

KINDLY PLACE THE MATTER ON THE NOTICE BOARD ACCORDINGLY.

DATED AT CAPE TOWN ON THIS THE 28th DAY OF MARCH 2021.

_____

T VICTOR AND ASSOCIATES

24 Viola Road

Bloubergstrand

Cape Town

TEL 074 707 8168

FAX 086 294 5204

EMAIL victorlegalinfo@gmail.com

C/O

ROB GREEN Attorneys,

Room 305 Benzal House, 3 Barrack Street, Cape Town)

TO: **THE REGISTRAR CAPE TOWN HIGH COURT**

AND TO; **THE RESPONDENTS**

ALL RESPONDENTS SERVED AT THE OFFICE OF THE STATE ADVOCATE CAPE TOWN

Rg6 109

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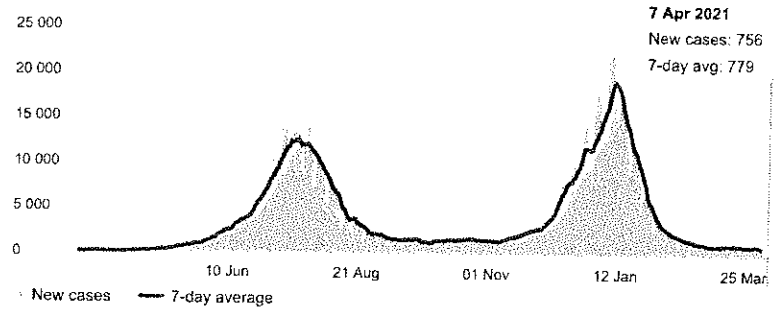


Each day shows new cases reported since the previous day · Last updated: 2 days ago · Source: JHU CSSE COVID-19 Data · About this data

Cases

Total South Africa

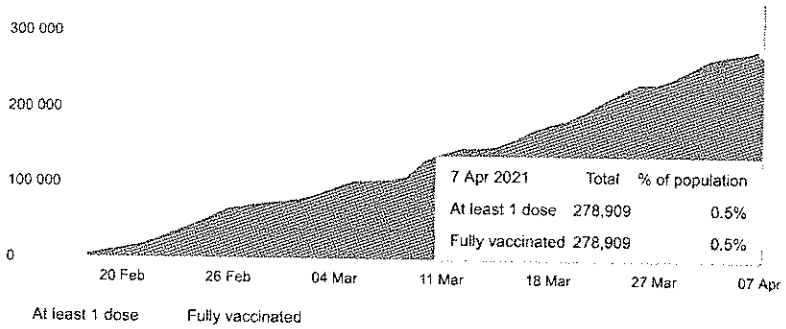
Cases	Recovered	Deaths
1,55M	1,48M	53 111
+756	+1 001	+79

'+' shows new cases reported yesterday · Last updated: 2 days ago · Source: JHU CSSE COVID-19 Data · About this data

Vaccinations

From Our World in Data · Last updated: 2 days ago

Total South Africa All time



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https://www.worldometers.info › coronavirus

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COVID-19 vacc
See updates and

Map of cases (last 14 da

Angola Za
South Afr
Total cases 1
(25 March – 7 A
South Afr

Sources: Wikipedia and others

Cases overview

South Africa

Total cases	Recove
1,55M	1,48M
+756	+1 001

Worldwide

Total cases	Recove
133M	75,4I

→ More location

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Coronavirus disease (COV disease caused by a newly

Most people who fall sick w experience mild to modera without special treatment.

HOW IT SPREADS

The virus that causes COV through droplets generatec coughs, sneezes, or exhale heavy to hang in the air, ar surfaces.

You can be infected by bre are within close proximity c

RM6 110

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Coronavirus Update (Live)

Live statistics and coronavirus news tracking the number of ...

The United Kingdom

United Kingdom Coronavirus update with statistics and ...

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https://sacoronavirus.co.za

COVID-19 South African Coronavirus News And Information.

South Africa's official **Coronavirus** (**Covid**-19)online news and information portal. In association with The Department of Health and the NHI.

⚠ Common questions

Can the COVID-19 survive in drinking water?

How dangerous is the coronavirus disease?

Can I get the coronavirus disease from swimming in a swimming pool?

Can the coronavirus spread via feces?

For informational purposes only. Consult your local medical authority for health advice.

Top stories

https://coronavirus.westerncape.gov.za › covid-19-dash...

Covid-19 Dashboard | Covid-19 Response

View area-specific cases by downloading the suburb and town cases document. Download suburb and town cases Disclaimer: This is the best available data at ...

https://www.capetown.gov.za › general › coronavirus-u...

The City of Cape Town - Coronavirus Updates

... 20and%20lists/**COVID**-19_Lockdown_Operations_Service_Notifications.pdf" target="_blank">See ... **statistics**

Weekly **Covid**-19 dashboard.

http://www.sabcnews.com › tracking-the-coronavirus

CORONAVIRUS: Your daily update - SABC News - Breaking ...

1 day ago — The country also recorded 37 new **COVID**-19-related fatalities on Tuesday, bringing the total number of deaths to 53 032. Latest SA **stats**:.

https://www.statista.com › ... › State of Health

• South Africa: coronavirus cases per province | Statista

Gauteng's **COVID**-19 cases were 5 times less than figures found in the Western Cape ...

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DEPARTMENT OF CO-OPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS

NO. 313

15 MARCH 2020

DISASTER MANAGEMENT ACT, 2002

DECLARATION OF A NATIONAL STATE OF DISASTER

Considering the magnitude and severity of the COVID-19 outbreak which has been declared a global pandemic by the World Health Organisation (WHO) and classified as a national disaster by the Head of the National Disaster Management Centre, and taking into account the need to augment the existing measures undertaken by organs of state to deal with the pandemic, I, Dr Nkosazana Dlamini Zuma, the Minister of Cooperative Governance and Traditional Affairs, as designated under Section 3 of the Disaster Management Act, 2002 (Act No. 57 of 2002) ("the Act"), in terms of -

1) Section 27(1) of the Act, hereby declare a national state of disaster having recognised that special circumstances exist to warrant the declaration of a national state of disaster; and

2) Section 27(2) of the Act may, when required, make regulations or issue directions or authorise the issue of directions concerning the matters listed therein, only to the extent that it is necessary for the purpose of —

   (a) assisting and protecting the public;

   (b) providing relief to the public;

   (c) protecting property;

   (d) preventing or combatting disruption; or

   (e) dealing with the destructive and other effects of the disaster.

NC Zuma

DR NKOSAZANA DLAMINI ZUMA, MP

MINISTER OF COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS

DATE: 15. 03. 2020.

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CONCLUSION - 11-11-2020

(*Electronic Judgment prepared by Law Clerk Maria do Carmo Martins Loureiro*)

Case No. 1783 / 20. 7T8PDL.L1

Judicial Court of the District of Azores - Criminal Court of Ponta Delgada

Held at the 3rd Criminal Section of the Lisbon Court of Appeal

*

I - REPORT

1. On 08/26-2020, the request for *habeas corpus* was granted, as the confinement/detention was illegal, determining thereafter the immediate release of Respondents in the main action A., B ..., C...and D ....hereinafter referred to as the "Respondents".

2. Then appeared the **REGIONAL HEALTH AUTHORITY**, represented by the Regional Health Directorate of the Autonomous Region of the Azores, to appeal this decision, requesting for an order to validate the mandatory confinement of the Respondents, as they are carriers of the SARS-CoV-2 virus (C....) and for being under active surveillance, due to high risk exposure, as declared by the health authorities (A., B ... and D.).

4. The application for leave to appeal was granted.

5. The Mº Pº (Public Ministry), in their reply, contended that the present appeal must be dismissed as it has no legal basis.

6. Appeared before this Court the General Public Prosecutor.

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II - PREVIOUS POINT.

As the argument filed by the Appellant must be rejected, the Court will limit itself under the terms of paragraphs 1, a), and 2 of article 420 of the Penal Code, to briefly specify the basis of its decision.

III - GROUNDS.

1. The decision rendered by the Court "*a quo*" reads as follows:

Proven facts:

1. *On 08/01/2020, the Respondents arrived on the island of São Miguel, by plane from the Federal Republic of Germany, where, 72 (seventy-two) hours prior to their arrival, they had carried out a COVID-19 test, with a negative result, and which results were presented and delivered to the Regional Health Authority, upon arrival at the airport, in Ponta Delgada.*

2. *On 07/08/2020 and already during their stay on the island of São Miguel, Respondents C... and D.... did a second COVID-19 test.*

3. *On 10/08/2020 and still during their stay on the island of São Miguel, Respondents A... and B.... did a second COVID-19 test.*

4. *On 08/08/2020, Respondent C... was informed via a telephone call that her COVID-19 test which was conducted the previous day showed a positive result of the COVID-19 virus.*

5. *From 08/08/2020, Respondent C.... stopped residing with the remaining three Respondents, and proceeded to always maintain a distance of no less than 2 (two) meters from the other Respondents.*

6. *On 10/08/2020, Respondents A..., B... and D... were informed via a telephone call that their tests had a "negative" result.*

7. *On 10/08/2020, a separate document was sent to each Respondents respectively via email, signed by the Delegate of the Health Department of the Municipality of Lagoa, F..., reference is made to paragraphs 25 and 26 which states as follows:*

...Notification of Prophylactic Isolation - Coronavirus SARS-CoV-2 / Disease COVID - 19, and two attachments (only one sent in English) stating the

following (the content of the notification was the same for each Respondent, save for each Respondent's details):

"Isolation (...)

Notification of Prophylactic Isolation

Coronavirus SARS- CoV-2 / COVID disease - 19

Mário Viveiros Silva Lagoa Health Authority

Under the terms of the Normative Circulars nr DRSCINF / 2020/22 of 2020/03/25 and DRS CNORM2020 / 39B of 2020/08/04 of the REGIONAL HEALTH AUTHORITY (in annex) and Norm no. 015/2020, of 24 / 07/2020 of the General Health Directorate (attached) I determine the

PROPHYLACTIC ISOLATION

OF

(...)

Holder of the Citizen Card / PASSPORT No. (...), valid ... until ... with the social security identification number for the period from 08/08/2020 to 22/08/2020 due to contagion hazard and as a preventative measure for COVID 19 (SARS-Cov-2)

Date 2020/08/10 (...)

8. *The Respondents requested that the test results be forwarded to them. The test reports conducted by Respondents C... and D... were forwarded to them via e-mail on 13/08/2020 and Respondents A... and B... received on the day before yesterday, 08/24/2020, via e-mail. Said reports were provided to the Respondents in Portuguese.*

9. *Between the 1st and the 14th of August the Respondents were staying in the accommodation Marina Mar II, in Vila Franca do Campo.*

10. *From August 14th onwards, the Respondents have been staying at "THE LINCE AZORES GREAT HOTEL, CONFERENCE & SPA", in Ponta Delgada (where they are currently staying), by order of the Health Delegate as described in 7 as follows:*

- In room 502 are Respondents A... and B....

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- In room 501 is Respondent C....

- In room 506 is Respondent D....

11. *The Respondents tried at least 3 times to contact the COVID19 helpline (296 249 220) in their own language or, at least, in English, to no avail, since the agents only answer and respond in Portuguese, a language that the Respondents cannot understand.*

12. *At the hotel, meals are delivered to the room, by room services, at predetermined times and according to a choice made by a third party, except during the first 3 days at Hotel Lynce where breakfast was served, and the remaining meals through room service.*

13. *On August 15, while fulfilling the prophylactic isolation established by the Health Delegate, Respondent C... started suffering from an inflammation in the mouth, apparently caused by the dental device she uses.*

14. *Respondent C attempted to contact the COVID-19 helpline in order to shared this situation with the Regional Health Authority, to whom she requested the necessary medical support.*

15. *This request was ignored by the aforementioned helpline, that did not provide Respondent C... the necessary support and assistance.*

16. *Not having had any support, two days later, on August 17th, properly protected by a mask and gloves, Respondent B... left her room, travelled to the closest pharmacy to the hotel, where she acquired an ointment to temporarily quell the inflammation, having returned immediately to the hotel and to her room.*

17. *On 19/08/2020 an email was sent by the Health Delegate, G...., To the Respondents, stating the following:*

> *"(...) C will only be considered cured after having a negative test result and a 2nd negative test, whereafter, the Health Delegation will contact you (...) (sic).*

18. *On 21/08/2020 it was transmitted to the four Respondents, by the Health Delegate G...., via e-mail, the following message: "When the quarantine is over, you have to do a test and if the test is negative you may leave the house" (sic).*

19. *On that same day, Respondent A.... wrote an e-mail to the aforementioned doctor and Health Delegate, Dr. João Martins Sousa (translated into Portuguese in free regime):*

> *"Dear Dr. G....,*
>
> *We have already done two COVID-19 / person tests, all of which were negative (A..., B.... And D....))...and after that we spent 2 weeks in isolation, and none of us have any symptoms !!*
>
> *Do you have Dr. G's documents...., please confirm.*
>
> *Nobody told us anything about the new tests after the isolation time?! We have already rescheduled our flights and plan to leave the island.*
>
> *Explain the reason for your statement.*
>
> *Why was the COVID test of C... not done yesterday."*

20. *The Respondents did not receive any response to the aforementioned email, with the exception of Respondent C.... who was notified of the scheduling of the new screening test for 29/08/2020.*

21. *On 20/08/2020, Respondent C.... carried out a third COVID-19 test, and the following day (21/08/2020), only via a telephone call, she was informed that the result was positive.*

22. *Respondent C.... requested that documentary evidence indicating the positive result be sent to her, which was then indeed forwarded to her via e-mail yesterday, 08/24/2020.*

23. *The Respondents questioned the reception staff at the hotel where they are staying and were told that none of the four Respondents, without exception, will be able to leave their rooms.*

24. *The Respondents do not have, nor have they ever presented, any symptom of the virus (fever, cough, muscle pain, sneezing, lack of smell or palate).*

25. *The Respondents were not advised of the content of the two documents sent to them as reflected in paragraph 7 above.*

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26. *The Respondents are habitually resident in the Federal Republic of Germany, as reflected in these pleadings.*

Rationale:

The question that arises herein is based on the fact that the Respondents are deprived of their freedom (from the 10th of August until the present date, as shown by the proven facts) and, consequently, being able to use the present *habeas corpus* institution. - as we will now explain -, the question is whether or not there is a legal basis for this deprivation of their freedom.

Indeed, without even questioning the organic constitutionality of the Resolution of the Council of the Regional Government No. 207/2020, of July 31, 2020, currently in force within the scope of the procedures approved by the Government of Azores in containing the spread of the SARS-COV- 2 in this Autonomous Region, in the present situation, the detention / confinement of the Respondents since 10 August is materialized by a communication made via e-mail, in Portuguese, in the terms given as proven under point 7.

Now, as is clear from point 7 of the proven facts, the regional health authority, through the respective Health Delegate of the territorial area where the Respondents were staying, determined their prophylactic isolation under the Normative Circulars No. **DRSCINF / 2020 / 22 of 2020/03/2025 and DRS CNORM2020 / 39B of 2020/08/04 of the REGIONAL HEALTH AUTHORITY** and Norm no. 015/2020, of 24/07/2020 of the General Directorate of Health. It was through a communication with the aforementioned, as is emphasized, in normative circulars and a norm of the General Directorate of Health, that the Regional Health Authority deprived the Respondents of their freedom, because of the proven facts it derives to the satiety that, in the rigor of the concepts, were detained from the 10th to the 14th of August 2020 in a hotel in Vila Franca do Campo and from the 14th of August 2020 until the present date confined, and therefore detained, in a hotel room in this city of Ponta Delgada. We cannot ignore the facts proven herein because as it stands out, the Respondents' power of movement and right of mobility - or of any other individual who is in the same situation - are so limited that the first time they went out of their rooms was to attend this court and make statements (with the exception of the visit of Respondent B to the pharmacy.... in clear despair to help her daughter's pain in the proven facts).

In short, after analysing the factuality of the matter, it is inexorable to conclude that we are facing a true deprivation of the personal and physical freedom of the Respondents, which prevents them not only from moving, but also from being with their families, having been separated for about 16 days (Respondents A... and B... and her daughter, Respondent C...) and, in the case of Respondent D.... completely alone, without any physical contact with

anyone. To say that there is no deprivation of freedom because at any time they may be absent from their respective rooms, in which they find themselves is a fallacy, just look at the communications that were made after the 10th of August, none of them being in German language, and the conditions in which they have lived (keeping in mind that they are foreign citizens with the inherent linguistic barrier) or requesting their return to their country of origin is a fallacy, and for this conclusion, the latest communications transmitted in Portuguese, underlining of which the one given as proven under point 8 stands out, in particular "*Namely, when the quarantine is over, you have to do a COVID19 test and if the result is negative, you can leave your rooms.*"

Therefore, if the Respondents are deprived of their freedom, in the face of proven circumstances, it is necessary to trace the path in which we move, initiating the procedure through the Portuguese legislative system: The Constitution of the Republic of Portugal (CRP).

Thus, at the level of the hierarchy of norms, it is necessary to remember that, according to article 1 of the CRP, "Portugal is a sovereign Republic, based on the dignity of the human person and on the popular will and committed to the construction of a free, fair and supportive society." Hence, it is clear that the meaning of the unity in which our system of fundamental rights is created, is based on human dignity - the principle of the dignity of the human person is the essential reference of the entire system of fundamental rights.

One of them, the most relevant in view of its structuring nature of the democratic state itself, is the principle of equality, provided for in article 13 of the CRP, which states, in its paragraph 1, that "*All citizens have the same social dignity and are equal before the law*", adding paragraph 2, that "*No one can be privileged, benefited, harmed, deprived of any right or exempted from any duty due to ancestry, sex, race, language, territory of origin, religion, political or ideological beliefs, education, economic situation, social status or sexual orientation.*"

And, in light of the facts hereto, under the heading "*right to freedom and security*", article 27, no. 1 of the CRP provides, "*Everyone has the right to freedom and security*", referring José Lobo Moutinho, in an annotation to that article, that freedom is an absolute decisive and essential moment - not to say, the very constitutive way of being - of the human person (Ac. n ° 607/03: "ontic demand"), which lends him that dignity in which the legal order finds its granitic foundation (and, above all, legal-constitutional) Portuguese (Article 1 of the Constitution). In this sense, one can say the cornerstone of the social building" (Ac. N ° 1166/96)" (aut.cit., In op. Cit., P. 637).

Since human freedom is not one-dimensional, and can take on multiple dimensions, as exemplified in articles 37 and 41 of the CRP, the freedom in question in article 27, is physical freedom, understood as freedom of bodily movement, of coming and going, freedom of

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movement, stipulating in paragraph 2 of this last article that "*No one may be totally or partially deprived of freedom, unless as a result of a condemnatory judicial sentence for the practice of an act punishable by law with imprisonment or judicial application of a security measure.*" underline.

The exceptions to this principle are typed in paragraph 3, which provides that: An exception for this principle is deprivation of freedom, for the time and under the conditions determined by law, in the following cases:

a) Arrest in serious offenses;

b) Detention or preventive detention for strong indications of a wilful crime that corresponds to imprisonment exceeding more than three years;

c) Arrest, detention or other coercive measure subject to judicial control, of a person who has entered or remains illegally in national territory or against whom extradition or expulsion proceedings are underway;

d) Disciplinary imprisonment imposed on military personnel, with guaranteed appeal at a competent court;

e) Subjecting a minor to protection, assistance or educational measures in an appropriate establishment, ordered by the competent judicial court;

f) Detention by judicial decision in virtue of disobedience of an order made by a court or to ensure appearance before the competent judicial authority;

g) Detention of suspects, for the purpose of identification, in cases and for the time strictly necessary;

h) Admission of a patient with a psychic anomaly in an appropriate therapeutic establishment, ordered or confirmed by the competent judicial authority."

Finally, it should be reminded that, in case of deprivation of freedom against the provisions of the Constitution and the Law, the State has the duty to indemnify the injured party under the terms established by the law, as follows under paragraph 5 of article 27, emphasizing, in line with article 3 of the CRP:

(...) 2. *The State is subordinate to the Constitution and is based on democratic legality.*

3. *The validity of laws and other acts of the State, autonomous regions, local authorities and any other public entities depend on their compliance with the Constitution.*

Wherefore, having drawn up the legal territory, we must carefully analyse the facts under which the Regional Health Authority proceeded in *casu*.

Respondents A., B ... and D ... performed a screening test for the SARS-CoV-2 virus, the result of which was negative for all, with the same test being positive for Respondent C...., which led to the aforementioned order of prophylactic isolation and consequent permanence in the terms exposed and proven.

Therefore, given the content of the notification made to the Respondents, this court cannot fail to express, *ab initio*, its perplexity at the determination of prophylactic isolation to the four Respondents.

As is clear from the definition given by the General Directorate of Health, *"Quarantine and isolation are measures of social isolation essential in public health. They are especially used in response to an epidemic and are intended to protect the population from transmission of a virus. The difference between quarantine and isolation stems from the state of illness of the person who wishes to isolate. That is:*

Quarantine is used in people who are assumed to be healthy, but may have been in contact with an infected patient;

Isolation is the measure used for people with a disease, so that through social distance they do not infect other citizens."

(em https://www.sns24.gov.pt/tema/doencas-19/isolamento/?fbclid=IwAR34hD77oLCpxUVYJ9Ol4ttgwo4tsTOvPfIa3Uyoh0EJEbCs3jEihkaEPAY#sec-0).

In light of the present matter, the Regional Health Authority decided to make a blank slate of essential concepts, because they delimit differentiated treatment (as distinct pleonasm), the position of infected people and of those who were in contact with infected people, in the face of the order of prophylactic isolation to all the Respondents, although only one of them tested positive to the aforementioned screening test. Furthermore, they decided to ignore the Resolution of the Government Council no. 207/2020 of 31 of July, prohibiting the mandatory submission of the judicial validation of the competent court, confirming that it is mandatory quarantine, when it derives to the satiety of the facts that Respondents A., B ... and D ..., at most, are subject to mandatory quarantine.

It was not done so within the 24 hours as provided for in paragraph 6 of the aforementioned Resolution, not even within a broader period - as in the 48 hours provided for in article 254, paragraph 1, point a), of the Penal Code, or in article 26, no. 2, of the LSM (Law of Mental

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Health) - continuing to effect any communication and, therefore, the evident restriction of the freedom of the Respondents A., B ... and D ... will always be illegal.

Accordingly, the aforementioned Government Council Resolution no. 207/2020, of July 31, 2020, provides in point 4 that in cases where the SARS-CoV-2 virus test result is positive, the local health, within the scope of its competences, will determine the procedures to be followed. Respondent C ... positive in the screening test for the virus in question, was notified, in the same terms as the other Respondents, of the order of prophylactic isolation between 08/10/2020 to 08/22/2020.

At this point, it is necessary to make it clear that the notification made as proven under point 7, is brought from what is contained in the DGS015 / 2020 Standard (Covid-19 Decree), a rule referred to in it in addition to the normative circulars (available in https://www.dgs.pt/directrizes-da-dgs/normas-e-circulares-normativas/norma-n-0152020-de-24072020-pdf.aspx), in the subject matter here:

(...) High Risk Exposure Contacts

15. A person classified as having high risk exposure, in accordance with Annexure I is subject to:

    a. Active surveillance for 14 days, since the date of the last exposure;

    b. Determination of prophylactic isolation, at home or other place defined at the local level, by the Health Authority, until the end of the period of active surveillance, according to the model of Dispatch nº 2836-A / 2020 and / or n 3103-A / 20202 (model accessible in http://www.seg-social.pt/documents/10152/16819997/GIT_70.docx/e6940795-8bd0-4fad-b850-ce9e05d80283)

Following this norm of the General Directorate of Health, one reads, amongst others, in the normative circular No. DRSCNORM / 2020 / 39B, of 2020-08-04 (available on http://www.azores.gov.pt/NR/rdonlyres/25F80DC1-51E6-4447-8A38-19529975760/1125135/CN39B_signed1.pdf),

(...)

a. Having contact with high risk cases

High risk cases are treated as suspect cases until the laboratory result comes out. These people should be screened for SARS-CoV-2. High risk cases are considered to be

i. People residing with a confirmed case of COVID-19; (...)

ii. Surveillance and Control of Nearby Contacts

3. With high risk cases, it is estimated that the incubation period of the disease (time elapsed from exposure to the virus to the appearance of symptoms) is between 1 and 14 days. They must comply with 14 prophylactic isolation days, even if they have negative screening tests during that period, and a test should be performed on the 14th day. If the 14th day test result is negative, they are discharged. If high risk cases cohabit with the positive case, they should only be discharged when determining the cure of the positive case, and, therefore, the respective prophylactic isolation should be extended.

(...)

13. Compliance with prophylactic isolation

All persons identified as suspected cases, until the negative results are known, must comply with prophylactic isolation.

All persons who tested positive for Covid-19 and who are discharged after a cure test (admitted in a hospital or home), do not need to undergo a new isolation period of 14 days or repeat a new test on the 14th day.

All passengers disembarking at airports in the Region from airports located in areas considered to be zones of active community transmission or with transmission chains for the SARS-CoV-2 virus must comply with the procedures in force in the Region at the time.

Wherefore, we shall analyse the legal value of norms / guidelines from the General Health Directorate and normative circular 39B, from 04/08/2020, of the Regional Health Directorate, leaving no doubt that we have entered the sphere of administrative guidelines.

In this regard, with the requirement of reporting to the Tax Authority - which has the same administrative legal position as the National Health Authority in the *ius imperium* of the State-, CASALTA NABAIS (Tax Law, 6th ed., Almedina, p. 197), **"the so-called administrative guidelines, traditionally presented in the most diverse forms such as instructions, circulars, circular-letters, normative orders, regulations, opinions, etc."**, which are very frequent in tax law, constitute internal regulations that they only

have the tax administration as their recipient, they must only comply with this, being, therefore, mandatory only for the bodies hierarchically situated below the agency that originated them.

That is precisely the reason as to why they are not binding on individuals or courts. Whether they are organizational regulations, which defines rules applicable to the internal functioning of the tax administration, creating working methods of action, or whether they are interpretative regulations, which proceed to the interpretation of legal (or regulatory) precepts.

It is true that they densify, make explicit or develop the legal precepts, previously defining the content of the acts to be performed by the administration when they are applied. But that does not make them the standard of validity for the acts they support. In fact, the assessment of legality of the actions of the tax administration must be carried out through direct confrontation with the corresponding legal norm and not with the internal regulation, which interposed between the norm and the act".

The problem of the normative relevance of the Circulars for Administration (Tax) was already raised and considered in the Constitutional Court Judgments nº 583/2009 and 42/14, of 11/18/2009 and 9/09/12, respectively, having been decided, which decision we agree, that the prescriptions contained in the Circulars for Tax Administration, regardless of their persuasive irradiation in the practice of citizens, do not constitute norms for the purposes of the constitutionality of the control system committed to the Constitutional Court.

As underlined in the aforementioned judgment (Judgment 583/2009) "(...) These acts, in which the "circulars" are prominent, emanate from the power of self-organization and the hierarchical power of the Administration. They contain generic service orders and it is for this reason and only within the respective subjective scope (of the hierarchical relationship) that theymust be complied with. They incorporate guidelines for future action, transmitted in writing to all subordinates of the administrative authority that issued them. These are standardized decision-making modes, assumed to rationalize and simplify the operation of services. This is worth saying that, although they can indirectly protect legal certainty and ensure equal treatment through uniform application of the law, they do not regulate the matter which they deal with, in relation to individuals, nor do they constitute a decision rule for the courts. "

Consequently, lacking a heteronomous binding force for individuals, and imposing themselves on the judge only because of the doctrinal value they may have, the rules contained in the "circulars" do not constitute rules for the purposes of the constitutionality of the control system within the jurisdiction of the Constitutional Court.

With that being said, it allows us to conclude that the administrative guidelines conveyed in the form of normative circulars, as in the present case, do not constitute provisions of legislative value that can be the subject to a declaration of formal unconstitutionality - see Judgment of the Supreme Administrative Court, of 06/21/2017, available for consultation at www.dgsi.pt.

It should be clear that the norms invoked by the Regional Health Authority, that supported the deprivation of freedom imposed on the Respondents, through notification of prophylactic isolation, are non-binding administrative guidelines to the Respondents. Reference is made hereto below:

Normative Circular No. DRSCNORM / 2020 / 39B: "For: Health Service Units

Regional Health Council, Municipal Health Delegates (C / c Regional Civil Protection Service and

Azores Firefighters, Azores Health Line) Subject: Screening for SARS-CoV-2 and addressing suspected or confirmed cases of SARS-CoV-2 infection Source: Regional Health Directorate (...)

Norm 015/2020, of 7/24/2020: "SUBJECT: COVID-19: Tracking Contacts KEYWORDS: Coronavirus, SARS-CoV-2, COVID-19, Tracking Contacts (Contact Tracing), Epidemiological Investigation

FOR: Health System (...).

In this sequence, and, in summary form, this court cannot fail to underline that in the present case, deprivation of freedom of persons, absolutely lacks any legal basis, and a defense that the public health is as stake cannot stand, since the court always acts in the same way, that is, in accordance with the law, moreover, hence the need for judicial confirmation enshrined in the Mental Health Law in the case of compulsory confinement, given the factuality found above, results as follows:

- The Respondents have been confined to a room for about 16 days, based on a notification of "prophylactic isolation" until 22/08/2020, a period that has already passed, which in any case it is illegal as a means of detaining people for the reasons already explained (reference is made to the constitutional rules set out above);

- there has never been any information, communication or notification given to the Respondents, as it should, in their mother tongue, nor have they been provided with an interpreter. From the outset, in violation of the European Convention on Human Rights (art. 5º, no. 2 and 6, paragraph 3, paragraph a) and the Penal Code (see article 92 of the Penal Code),

that is, in our legal system, when a foreign person is detained and cannot speak Portuguese, an interpreter is immediately appointed, and, in the case of the Respondents, who limited themselves to travel to this island and enjoy its beauty, they were never granted such an opportunity;

- Since 22/08/2020, the Respondents have been confined to a room based on the following communications:

- On 19/08/2020, the Respondents received an e-mail correspondence from the Health Delegate, Dr. G..., , stating the following:

> *"(...) C... will only be considered cured after having a negative test result and a 2nd negative test result, when this takes place, the health delegation will contact you (...) (sic).*

- On 21/08/2020, the following message was transmitted to the four Respondents, by the Health Delegate Dr. G..., via e-mail: *"When the quarantine is over, you have to do a test and if it is negative you may leave the room"(sic);*

- The Respondents' deprivation of freedom was not subject to any judicial scrutiny.

As stated initially, we could still consider the organic constitutionality of the Resolution of the Government Council No. 1207/2020, of June 31, however, we believe it is an unimportant question for the object of the decision to be made, which is to be swift, because with such a resolution, the decision cannot be different, based on the decision of the Constitutional Court, of 07/31/2020, in the scope of the process no. 424/2020, and, because the position of the Regional Health Authority in the present circumstances leads to the application of normative circulars, with the value explained above.

Finally, and because this court has been recently successively ruling within the scope of this institution of "*habeas corpus*" in the face of the orders issued by the Regional Health Authority, we allow ourselves to subscribe and underline the following excerpt from the first decision of this Criminal Investigative Court:

"The issue of compulsory confinement in the case of contagious diseases, and the terms under which it must occur, is a pressing issue, and which is not supported by article 27, paragraph 3, of the CRP, namely in its paragraph h), where it only foresees the admission of a patient with a psychic anomaly in an appropriate therapeutic establishment, decreed or confirmed by a competent judicial authority. It is urgent to legislate on this matter, establishing, in a clear way, the fundamental principles which it must obey, leaving the detailed aspects to the derived law - and only these".

As stated by Professor Gian Luigi Gatta, which we quote here in a free translation, "*right now, the country's energies are focused on an emergency. But the need to protect fundamental rights, also and above all in an emergency, the Courts are required to do their part. Because, in addition to medicine and science, law - and human rights law in the first place - must be at the forefront: not to prohibit and sanction - as is being emphasized too much today - but to guarantee and protect everyone. Today the emergency is called a coronavirus. We don't know tomorrow. And what we do or don't do today, to maintain compliance with the fundamental principles of the system, can condition our future.*" (in "I diritti fondamentali alla evidence of the coronavirus. Perché a legge sulla quarantena is necessary",) ".

It will not be difficult to admit and accept that the legislative turmoil generated around the prevention of the spread of COVID-19 will continue– being itself the protection of public health, but this turmoil can never harm the right to freedom and security and, ultimately, the absolute right to human dignity.

A decision must be made. (...)

Therefore, in light of the above, the confinement of Respondents A., B ..., C ... and D ... is illegal, I decide to uphold the present request for *habeas corpus* and, consequently, determine the immediate restitution of their freedom.

2. The Respondent made the following statements, based on its arguments:

1. The present appeal is directed against the decision issued by the honourable Court to which understood that "the confinement of Respondents A., B ..., C ... and D ... is illegal" and decided "to uphold the present request for *habeas corpus* and, consequently, to determine their immediate restitution to freedom."
2. Just for the sake of procedural economy, that is, because it is of little relevance for the assessment of the merits of the case, the factuality that has been proven is not appealed, however, it should be noted that it was based solely on the statements of the Respondents themselves.
3. The contested decision on the grounds that the Respondent did not comply with point 6 of the Resolution of the Council of the Regional Government of the Azores No. 207/2020, of July 31, 2020, violated the scope of application of the same Resolution, defined in point I of the same Resolution;

4. The judicial validation of mandatory quarantine, provided for in point 6 of the said resolution, only applies to the mandatory quarantine for passengers who do not accept, alternatively, any of the procedures provided for in point I of the aforementioned Resolution.
5. The Respondents complied with the procedure provided for in point a) of point 1 of Resolution No. 207/2020, of July 31, 2020, so they could never be subject to mandatory quarantine under that Resolution and, consequently, there is no place for judicial validation, provided for in point 6 of Resolution No. 207/2020, of 31 July 2020.
6. Contrary to what is defended in the contested decision, the Portuguese legal system allows the adoption of exceptional measures, including separation of persons, subject mandatory confinement of infected persons and with a high probability of being infected, through the mechanism provided for in article 17 Of Law no. 81/2009, of 21 August.
7. The Council of Ministers legitimately made use of the exceptional regulatory power, provided for in Article 17 of Law No. 81/2009, through the Resolutions of the Council of Ministers No. 55- A / 2020, of July 31, 2020 and No. 63-A / 2020, of August 14.
8. Paragraph 2 of the Resolution of the Council of Ministers no. 55-A / 2020, of July 31, 2020, ordered measures of an exceptional nature, necessary to prevent COVID -19, to be applied throughout the national territory, namely those provided for in the regime attached to the resolution.
9. Article 2 of the regulation attached hereto, reads as follows:

   "Article 2

   Mandatory confinement

   1 – Compulsory confinement in a health establishment, at their home or in another place defined by health authorities is applicable to:

      a) Patients with COVID -19 and those infected with SARS -CoV-2;

      b) Citizens to whom the health authority or other health professionals have determined to be active surveillance.

   2 - (...)"

10. Respondent C ... when infected with the SARS-CoV-2 virus, in compliance with article 2, paragraph 1, point a) of Annex I of the Resolution of the Council of Minister No. 55A / 2020, had to be in mandatory confinement.

11. The Court *a quo*, by ordering the *habeas corpus* of C ... and allowing her freedom of movement violated Article 17 of Law No. 81/2009, of 21 August, by reference to Article 2, paragraph 1, point a) of Annex I of the Resolution of the Council of Minister No. 55-A / 2020;

12. Respondents A., B ... and D ... according to the rules stipulated by the National Health Authority, contained in Norm 015/2020, of 07/24/2020, are parties with High Risk Exposure, and should be subject to:

    a. Active surveillance for 14 days, since the date of the last exposure.

    b. Determination of prophylactic isolation, at home or other place defined at local level, by the Health Authority, until the end of the period of active surveillance, according to the model of Dispatch no. 2836-A / 2020 and / or n. ° 3103-A / 20202"

13. Respondents A., B ... and D ... when subject to active surveillance, in compliance with article 2, paragraph 1, point b) of Annexure 1 of the Resolution of the Council of Minister no. ° 55-A / 2020, had to be in mandatory confinement.

14. The Court *a quo*, by ordering the *habeas corpus* of A., B ... and D ... and allowing their freedom of movement, violated Article 17 of Law No. 81/2009, of 21 August, by reference to Article 2 (1) (b) of Annexure I of Resolution of the Council of Minister No. 55-A / 2020.

15. It is imperative that the contested decision be revoked and replaced by one that validates the Respondents' mandatory confinement, as they are carriers of the SARS -CoV-2 virus (C...) and because they are under active surveillance, for high risk exposure , decreed by the health authorities (A., B ... and D ...).

3. In his reply, the M°P° concluded as follows:

1 - The Constitutional Court ruling of 7/31-2020 (Proc. 403/2020; 1. 'Section; Cons. José António Teles Pereira), after concluding that the mandatory confinement, either through quarantine or through prophylactic isolation , constitutes a true deprivation of freedom, not provided for in art. 27 (2) of the CRP, and that all deprivations of freedom require prior authorization from the Assembly of the Republic, which was not the case with the Resolutions of the Regional Government of the Azores, which imposed a mandatory quarantine, considered verified the organic unconstitutionality of the referred standards.

2 - These rules, declared unconstitutional by the Constitutional Court, are identical to those contained in the Resolutions of the Council of Ministers no. 55A / 2020, of 31-07, 63-A / 2020, of 14-08, and 70-A / 2020, 11-09, and no. 88-A / 2020, 14-10, insofar as they provide for deprivation of freedom not provided for in an appropriate legal document emanating from the competent entity, as well as not found in the exceptions provided for in art. 27, paragraph 3, of the C.R.P., for which reason they must also be disapplied for violation of art. 27. No. 1 of the C.R.P ..

3 - Provided for art. 5, paragraph 1, al. e), the European Convention on Human Rights (Convention for the Protection of Human Rights and Fundamental Freedoms - Rome, 0411-1950), concerning the Right to Freedom and Security, that "*Everyone has the right to freedom and security* "and that" *No one can be deprived of their freedom, except in the following cases and in accordance with legal procedure: (...) "If it concerns the legal confinement of a person liable to spread a contagious disease, of a mentally unstable person, an alcoholic, a drug addict or a criminal*", we can conclude that the deprivation of freedom of a person liable to spread a contagious disease is a form of confinement and that, according to the Convention, it is possible for States to provide in their national legislation the detention of these people.

4 - Bearing in mind the constitutional principle of the normality of the measures of deprivation of freedom, and not provided for art. 27, of the C.R.P., in none of the clauses of its paragraph 3, the deprivation of freedom of a person "liable to spread a contagious disease".

5 - And having the subparagraph h) - which foresees the admission of a patient with a psychic anomaly to an appropriate therapeutic establishment - added by art. 11.0, no. 6, of Constitutional Law no. 1/97, of 20 September (4. 'constitutional revision), at a time when the European Convention on Human Rights already expressly provided for the arrest of a person liable to spread contagious disease,

6 - And that the constitutional legislator, neither in said constitutional revision nor in a subsequent one, added another clause to paragraph 3 of art. 27 to foresee this possibility, as it did with the confinement of a patient with a psychic anomaly, we can conclude that we are facing a conscious decision by the constitutional legislator not to allow the deprivation of the freedom of a person liable to spread a contagious disease, just for that fact.

7 – From the analysis of the constitutional regime of the right to freedom and security provided for in art. 27, no. 1, of the CRP, we can conclude, therefore, that it is not possible for the legislator, even through the Assembly of the Republic or the Government authorized by it, to create deprivations of freedom that are not provided

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for in no. 3 of the aforementioned constitutional norm, namely with regards to persons with infectious and contagious diseases, whether these deprivations of freedom are confinements, quarantines or prophylactic isolations, without incurring any rules created for that purpose in a material unconstitutionality for violation of said constitutional norm.

8 - With reference again to the legal regime for the confinement of people with contagious diseases, Law No. 2036 of 09-08-1949 provided for the possibility of promoting the isolation or confinement of people with infectious diseases, but only, in situations where there was a serious danger of contagion (spreading), with recourse to an authority of the isolation or confinement decision.

9 - Art. 17 of Law no. 81/2009, of 21-08 in turn, which revoked Law no. 2036 of 9/8/1949, allows the member of the Government responsible for health to have a special regulatory power, according to the stipulated by base XX of Law no. 48/90, of 24-08 (Basic Law of Health), namely, "to take necessary measures of exception in case of emergency in public health, including the restriction, suspension or the closure of activities or the separation of people who are not sick, means of transport or goods, who have been exposed, in order to avoid the possible spread of infection or contamination ».

10 – In light of the above, it is clear that the possibility of promoting the isolation or confinement of people with infectious and contagious diseases is not provided for in this law, as provided for in Law No. 2036 of 09/08/1949. On the other hand, since the measures taken by the health authorities respect the Constitution does not provide for the deprivation of freedom of persons with infectious and contagious diseases.

«Separation of people who are not sick, means of transport or goods, who have been exposed», must be in accordance with the Constitution of the Republic of Portugal and cannot reach the core of the right to freedom, that is, they must not constitute total deprivation of freedom.

11 - On the other hand, the current Basic Law on Health - Law No. 95/2019, of 04-09 - provides in Base 34, regarding the defence of public health, that the public health authority can «b) Allow , according to the Constitution and the law, confinement or compulsory health care for people who would otherwise be a danger to public health ».

12 - Law no. 82/2009, of 02-04, which regulates the legal regime for the designation, competence and functioning of the entities that exercise the power of health authorities, provides in its art. 5 ° the powers of the health authority, namely, "c) To trigger, in

accordance with the Constitution and the law, the confinement or compulsory provision of health care to individuals who may be a threat to public health".

13 - It follows that, the measures taken by the health authorities must be in line with the Constitution and Legislation and should not provide for the deprivation of freedom of persons with infectious and contagious diseases. If the interpretation to be given to the expression "confinement or compulsory provision of health care to individuals in a situation of harm to public health" is in the sense that health authorities may order confinement, or other restrictive measure of freedom of movement, or compulsory provision of people with infectious and contagious diseases. Such an interpretation of the law is materially unconstitutional as it violates of art. 27. No. 1 of the C.R.P ..

14 - Defining Law No. 27/2006, of 03-07 (Basic Law for Civil Protection) "Serious accident" as an unusual event with relatively limited effects in time and space, capable of affecting people and other beings living, goods or the environment, but establishing in art. 5, paragraph 1, al. a) as the principle of priority of public interest, relative to civil protection, over the interests of national defence, internal security and public health, we can conclude that serious public health situations, such as the current pandemic, are not included in the public interest regarding civil protection, therefore, are not included in the concepts of "major accident" and "catastrophe" referred to in art. 3 of the Civil Protection Law.

15 - It can also be concluded that the Resolutions of the Council of Ministers - and the Resolutions of the Council of the Regional Government - which were based on the Basic Law of Civil Protection to declare "the alert situation, within the scope of the COVID-19 pandemic", namely Resolutions of the Council of Ministers no. 55-A / 2020, of 31-07, 63-A / 2020, of 14-08, 68-A / 2020, of 28-08, and 70-A / 2020, of 11-09 - revoked by Resolution of the Council of Ministers no. 88-A / 2020, of 14-10, currently in force-, which foresee in point 2 the "mandatory confinement, in establishment of health, in their home or in another place defined by the health authorities: (...) "*a) Patients with COVID19 and those infected with SARS-CoV-2; (...) "b) Citizens whom the health authority or other health professionals have determined that must be under active surveillance*" have no legal basis, as the Civil Protection Law does not apply to situations of danger to health public.

16 - We can thus conclude that the Resolutions of the Council of Ministers no. 55A / 2020, of 31-07, 63-A / 2020, of 14-08, 68-A / 2020, of 28-08, 81 / 2020, 29-09 - the latter was revoked by Resolution of the Council of Ministers no. 88 -A / 2020, 14-10, currently in force -, and its Annexure, which were issued by the Government, created a regime that restricts the freedom of citizens with infectious and contagious diseases (quarantines,

prophylactic isolation, etc.). In order to reinforce the application of a deprivation of freedom that not allowed by the Constitution or provided for in an enabling law, in cases of people with infectious disease or a danger to public health, they established the combination of a crime of disobedience for such violations and the penalty provided for such a crime, directly violates art. 27 (1) of the C.R.P., therefore, due to it being unconstitutional, they should not be applicable in this specific case, as its contrary to the Respondent's request,

17 - Leave the decision *sub judice*.

4. The Appellant is the REGIONAL HEALTH AUTHORITY, represented by the Regional Health Directorate of the Autonomous Region of the Azores.

Decree-Law no. 11/93, of 1993-01-15, in its current version (Statute of the National Health Service) determines that (emphasis added):

Article 1

The National Health Service, hereinafter referred to as NHS, is a hierarchical and set group of institutions and official services that provide health care, operating under the management or supervision of the Minister of Health.

Article 3

1 - The NHS is organized in health regions.

2 – The health regions are divided into health sub-regions, integrated by health areas.

Article 6

1 - In each health region there is a regional health administration, hereinafter referred to as ARS.

2 - The ARS has legal personality, administrative and financial autonomy and their own assets.

3- The ARS has the functions of planning, allocating resources, guiding and coordinating activities, managing human resources, technical and administrative support, and also assessing the functioning of institutions and services providing healthcare.

4 - (...).

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Decree-Law No. 22/2012 stipulates as follows:

Article 1

1 - The Regional Health Administrations, I. P., for short referred to as ARS, I.P., are public institutions integrated in the indirect administration of the State, endowed with administrative, financial and own assets.

2 - The ARS, I. P., proceeds with their duties, under the supervision of the members of the Government responsible for the health department.

3 - The ARS, I.P., is governed by the rules contained in the present decree-law, by the provisions of the framework law of public institutions and the Statute of the National Health Service and by the other rules applicable thereto.

Article 3

1 - The ARS, I. P., has the mission of guaranteeing the population of the respective geographical area of intervention, access to the provisions of health care, adapting the available resources to the needs of the people and complying with and enforcing health policies and programs in their area of intervention.

2 - It is the responsibility of each ARS, I. P., within the scope of the territorial circumscription to proceed with the following:

a) Execute the national health policy, in accordance with the global policies and sectors, aiming at their rational organization and the optimization of resources;

b) Participate in the definition of intersectoral planning coordination measures, with the objective of improving healthcare provision;

c) Collaborate in the preparation of the National Health Plan and monitor the respective execution at regional level;

d) Develop and encourage activities in the field of public health, in order to guarantee the protection and promotion of the health of the population;

e) Ensure the execution of local intervention programs with a view to reducing the consumption of psychoactive substances, preventing addictive behaviours and reducing dependencies;

f) Develop, consolidate and participate in the management of the National Integrated Continuing Care Network according to the defined guidelines;

g) Ensure the regional planning of human, financial and material resources, including the execution of the necessary investment projects, of the institutions and services providing health care, supervising their allocation;

h) To prepare, in accordance with the guidelines defined at national level, the list of facilities and equipment;

i) To allocate, in accordance with the guidelines defined by the Central Administration of the Health System, I. P., financial resources to institutions and services providing health care integrated or financed by the National Health Service and private entities with or without profit making, providing health care or acting within the scope of the areas referred to in paragraphs e) and f);

j) To enter into, monitor and review contracts within the scope of public-private partnerships, in accordance with the guidelines defined by the Central Administration of the Health System, I. P., and allocate the respective financial resources;

l) Negotiate, conclude and monitor, in accordance with the guidelines defined at national level, contracts, protocols and conventions of a regional scope, as well as carry out the respective assessment and review, in the scope of healthcare provision as well as in the areas referred to in points e) and f);

m) Guide, provide technical support and evaluate the performance of health care institutions and services, in accordance with the defined policies and guidelines and regulations issued by the competent central services and bodies in the different areas of intervention;

n) To ensure the adequate articulation between the health care services in order to guarantee compliance with the referral network;

o) To allocate financial resources, through the signing, monitoring and review of contracts within the scope of integrated continuous care;

p) Elaborate functional programs of health establishments;

q) Licensing private units providing health care and units in the area of addictions and addictive behaviours in the social and private sector;

r) Issue opinions on master plans for health units, as well as on the creation, modification and fusion of services;

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s) Issue opinions on the acquisition and expropriation of land and buildings for the installation of health services, as well as on projects of the facilities of health care providers.

3 - In order to carry out their duties, the ARS, I. P., may collaborate with each other and with other entities in the public or private sector, with or without profit, under the terms of the legislation in force.

5. The required *habeas corpus* is part of the provisions of article 220 of the Penal Code, which reads as follows:

Habeas corpus due to illegal confinement

1 - Those detained under the order of any authority, may request from the judge of the area where such order was granted, for leave to appeal, on any of the following grounds:

a) The period upon which leave to appeal should be applied has lapsed;

b) Confinement is not on places legally permitted;

c) The confinement was carried out or ordered by an incompetent entity;

d) The confinement is motivated by a factor not allowed by law.

2 - The request can be signed by the detainee or by any citizen in the exercise of their political rights.

3 - Any authority that raises an unlawful obstacle to the submission of the application referred to in the preceding paragraphs or to its referral to the competent judge is punishable with the penalty provided for in article 382 of the Penal Code.

6. Evaluation

Article 401 of the Penal Code stipulates the following:

1 - Entitled to appeal:

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a) The Public Ministry, regarding any decisions, even if in the exclusive interest of the Respondent

b) The Respondent, in light of judgment granted against them;

c) Parties to a civil matter, in light of judgment granted against each one of them;

d) Those who have been ordered to pay any amounts, in accordance with terms of this Code, or have to defend a right affected by the decision.

2 - Anyone who has no interest in the action cannot appeal.

7. The first question that arises here is that of the Respondent's legitimacy, in the context of an appeal in criminal proceedings.

i. We are within the scope of a criminal jurisdiction, the purpose of which is to ensure the effective exercise of the *jus puniendi* of the State, that is, which is dedicated to investigating and deciding on behaviour that constitutes a crime or administrative offense. It is in this context and with such purpose in mind that the Law determines who has the legitimacy to be able to discuss the legality of a judgment granted by a criminal court.

ii. In this case, we note that the Appellant is not a Respondent and has not made any request of a civil nature that, given the principle of accession, would determine her position as Plaintiff or Defendant.

iii. Thus, before the Law and taking into account the list of interveners that the legislator understood may have the legitimacy to intervene in a process in this type of jurisdiction, on appeal, we must immediately conclude that the Appellant lacks legitimacy to be able to come and discuss the content of a judicial decision in this context.

iv. In fact, the practice of any crime, or any offense of an administrative nature, is not discussed here, being certain that the question of possible consequences at criminal level, of the recognition of the existence of an illegal detention/confinement, is a matter that will have to be discussed in its own - that is, in an investigation that may be opened for this purpose, being completely unrelated to the decision of the present case.

v. We conclude, therefore, that the Appellant lacks *locus standi* to bring an appeal against the decision rendered by the court "*a quo*".

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8. Regardless of the question of *locus standi*, it appears that, likewise, the Appellant lacks interest in taking action.

i. As is clear from peaceful jurisprudence and doctrine in this regard, the interest in taking action means the need for someone to have to use the appeal mechanism as a way of reacting against a decision that disadvantages the interests that he/she defends or that has frustrated his/her legitimate expectation or benefit.

ii. Now, in the present case, the question is - did the decision give rise to any disadvantage for an interests that the ARS defends? Or a legitimate expectation or benefit?

The answer is manifestly negative.

iii. ARS continues its duties, under the supervision of the Government responsible for the health area.

Thus, and immediately, either in view of the functions that are committed to it, or in view of their manifest hierarchy, in the face of guardianship, it will have to be concluded that no ARS pursues its own and autonomous interest, which it must defend. Whoever will continue, eventually, will be the respective Minister or the Government, since the "interests" of the ARS will not be theirs, but will be included in the health policy of the ministry that oversees such an entity.

Note, moreover, that in the definition of its duties, they are not assigned any specific defence function, autonomously and in their own name, in judicial terms, of any interests that fall within its functions, which, with regard to criminal or administrative offenses, are none ...

iv. For its part, the interest that the Appellant itself intends to defend and that appears in the request, at the end of this appeal - the validation of the mandatory confinement of the Respondents, for being carriers of the SARS -CoV-2 virus (Angelique Hörner) and for being in active surveillance, for high-risk exposure, decreed by health authorities (A., B ... and D ...) - is in itself contradictory and goes beyond the purpose and scope of a criminal court. Contradictory because the Appellant does not admit that the confinement corresponds to deprivation of freedom. If that is the case, there is no glimpse of where the Appellant's jurisdiction is based in the jurisdiction of a criminal court to validate "confinements". Outside the scope of a criminal court, because it is not

up to the court to make declarative decisions to validate infections or diseases ...

v. Finally, it is not seen that a legitimate expectation or benefit has an entity that falls under a Government body, seen frustrated by the decision now being appealled.

vi. It follows that the Appellant does not have an interest in taking action, which is why, under the provisions of paragraph 2 of article 401 of the Criminal Penal Code, it cannot appeal the decision.

9. The decision granted by the court "*a quo*" to receive the present appeal does not bind this court (article 414 of the C.P.Penal), so there is nothing to prevent its rejection.

10. Nevertheless, to further clarify the aspects mentioned hereto, we state the following:

Even if this were not understood, the appeal presented would prove to be manifestly unfounded, for the following succinct reasons:

i. First of all, due to the exhaustive and correct reasoning set out in the decision by the "*a quo*" court, the content of which is fully subscribed.

In fact, under the Constitution and the Law, health authorities do not have the power or legitimacy to deprive anyone of their freedom - even under the label of "confinement", which effectively corresponds to detention - since such a decision can only be determined or validated by judicial authority, that is, the exclusive competence, in face of the Law that still governs us, to order or validate such deprivation of freedom, is exclusively affected by an autonomous power, the Judiciary.

Hence it follows that any person or entity that issues an order, the content of which leads to the deprivation of physical, ambulatory, freedom of others (whatever the order may be: confinement, isolation, quarantine, prophylactic protection, etc.), that does not fit the legal provisions, namely in the provisions of article 27 of the CRP and without such decision-making power having been conferred, by virtue of Law - from the RA, within the strict scope of the declaration of state of emergency or site, respecting the principle of proportionality - to specify the terms and conditions of such deprivation, will be proceeding to an illegal detention/confinement, because ordered by an incompetent entity and because motivated by a fact for which the law does not allow (this matter has been dealt with previously, with regards to other phenomenon of public health, namely with regard to HIV and tuberculosis infection, for example. And, as far as anyone knows, no one has ever been deprived of their freedom, due

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to suspicion or certainty of suffering from such diseases, precisely because the Law does not allow).

It is in this scope that, without any shadow of doubt, the situation under consideration in this case, being certain that the adequate means of defence, against illegal confinement, is subsumed to the appeal at the request of *habeas corpus*, provided for in art. c) and d) of the Penal Code.

And rightly, the court "*a quo*" ordered the immediate release of four people who were illegally deprived of their freedom.

ii. Secondly, because the request made in the appeal, proves to be impossible.

Alternatively:

11. In fact, it is requested to validate "the mandatory confinement of the Respondents, as they are carriers of the SARS-CoV-2 virus (C...) and because they are under active surveillance, due to high risk exposure, decreed by health authorities (A., B ... and D ...). "

12. It is with great astonishment that this court is faced with such a request, especially if we take into account that the Appellant is active in the health sector.

Since when is it up to a court to make clinical diagnoses, on its own initiative and based on possible test results? Or the ARS? Since when is the diagnosis of a disease made by decree or by law?

13. As the Appellant has more than an obligation to know, a diagnosis is a medical act, the sole responsibility of a doctor.

This is what results unequivocally and peremptorily from Regulation No. 698/2019, of 5.9 (regulation that defines the doctors' own acts), published in DR.

There it is determined, in an imperative way (which requires its compliance by all, including the Appellant) that (emphasis added):

Article 1

Purpose

This regulation defines the professional acts specific to doctors, their responsibility, autonomy and limits, within the scope of their performance.

Article 3

Object

1 - The doctor is the professional, legally qualified to practice medicine, capable of diagnosing, treating, preventing or recovering from diseases and other health problems, and able to provide care and intervene on individuals, groups of individuals or population groups, whether sick or healthy, with a view to protecting, improving or maintaining your state and health level.

2 - Doctors who have a current registration with the Portuguese Medical Association are the only professionals who can practice as doctors, under the terms of the Portuguese Medical Association's Statute, approved by Decree-Law No. 282/77, of 5 July, with the changes introduced by Law 117/2015, of 31 August and these regulations.

Article 6

General medical act

1 - The medical act consists of diagnostic, prognostic, surveillance, investigation, medical-legal expertise, clinical coding, clinical audit, prescription and execution of pharmacological and non-pharmacological therapeutic measures, medical, surgical and rehabilitation, health promotion and disease prevention in all its dimensions, namely physical, mental and social of people, population groups or communities, respecting the ethical values of the medical profession.

Article 7

The act of diagnostic

The identification of a disorder, disease or the state of a disease by studying its symptoms and signs and analysing the tests performed is a basic health procedure that must be performed by a doctor and, in each specific area, by a specialist doctor and aims to institution of the best preventive, surgical, pharmacological, non-pharmacological or rehabilitation therapy.

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14. Even under the Mental Health Law, Law no. 36/98, of 24 July, the diagnosis of the pathology that can lead to compulsory internment is mandatorily performed by specialist doctors and their technical and scientific judgment - inherent clinical-psychiatric evaluation - it is subtracted from the judge's free assessment (see articles 13, 3, 16 and 17 of the said Law).

15. Thus, any diagnosis or any act of health surveillance (as is the case of determining the existence of viral infection and high risk of exposure, which are shown to be covered by these concepts) made without prior medical observation to Respondents, without the intervention of a doctor enrolled in the OM (that proceeded to the evaluation of its signs and symptoms, as well as the examinations that it deemed appropriate to its condition), violates such Regulation, as well as the provisions of article 97 of the Statute of the Portuguese Medical Association, and configure crime p. and p. by article 358 al.b) (Usurpation of functions) of C. Penal (Penal Code), if dictated by someone who does not have this quality, that is, who is not a doctor enrolled in the Professional Health Body Council.

It also violates Article 6 (1) of the Universal Declaration on Bioethics and Human Rights, which Portugal subscribed to and is internally and externally obliged to respect.

It is thus clear that the prescription of auxiliary diagnostic methods (as is the case with tests for the detection of viral infection), as well as the diagnosis of the existence of a disease, in relation to each and every person, is a matter that cannot be carried out by Law, Resolution, Decree, Regulation or any other normative way, as these are acts that our legal system reserves to the exclusive competence of a doctor, being sure that, in advising his patient, he should always try to obtain the your informed consent.

16. In *casu*, there is no indication or proof, that such diagnosis was actually carried out by a professional qualified under the Law and who had acted in accordance with good medical practices.

In fact, what follows from the facts taken for granted, is that none of the Respondents were seen by a doctor, which is frankly inexplicable, given the alleged seriousness of the infection.

17. In fact, the only element that appears in the proven facts in this regard is the performance of RT-PCR tests, one of which presented a positive result in relation to one of the Respondents.

i. However, in view of the current scientific evidence, this test is, in itself, incapable of determining, beyond reasonable doubt, that such positivity corresponds, in fact, to the infection of a person by the SARS-CoV-2 virus, by various reasons, of which we highlighted (to which is added the issue of gold standard which, due to its specificity, we will not even address):

This reliability depends on the number of cycles that make up the test;

This reliability depends on the amount of viral load present.

ii. Indeed, the RT-PCR (polymerase chain reaction) tests, molecular biology tests that detect the RNA of the virus, commonly used in Portugal to test and list the number of infected persons (after nasopharyngeal collection), are performed by amplifying samples, through repetitive cycles.

The number of cycles of such amplification results in the greater or lesser reliability of such tests.

iii. The problem is that this reliability is shown, in terms of scientific evidence (and in this field, the judge will have to rely on the knowledge of experts in the field), more than debatable.

This is the result, amongst others, of the very recent and comprehensive Correlation study between 3790 qPCR positives samples and positive cell cultures including 1941 SARS-CoV-2 isolates, by Rita Jaafar, Sarah Aherfi, Nathalie Wurtz, Clio Grimaldier, Van Thuan Hoang, Philippe Colson, Didier Raoult, Bernard La Scola, Clinical Infectious Diseases, ciaa1491, https: //doi.org/10.1093/cid/ciaa149 https://academic.oup.com/cid/advance- article / doi / 10.1093/cid/ciaa1491/5912603, published at the end of September this year, by Oxford Academic, carried out by a group that brings together some of the greatest European and world experts in the field.

This study concludes, in *free translation*:

"*At a cycle threshold (ct) of 25, about 70% of the samples remained positive in the cell culture (i.e. they were infected): in a ct of 30, 20% of the samples remained positive; in a ct of 35, 3%*

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of the samples remained positive; and at a ct above 35, no sample remained positive (infectious) in cell culture (see diagram).

This means that if a person has a positive PCR test at a cycle threshold of 35 or higher (as in most laboratories in the USA and Europe), the chances of a person being infected are less than 3%. The probability of a person receiving a false positive is 97% or higher".

iv. What follows from these studies is simple - the possible reliability of the PCR tests carried out depends, from the outset, on the threshold of amplification cycles that they carry, in such a way that, up to the limit of 25 cycles, the test reliability will be about 70%; if 30 cycles are carried out, the degree of reliability drops to 20%; if 35 cycles are reached, the degree of reliability will be 3%.

v. However, in the present case, the number of amplification cycles with which PCR tests are carried out in Portugal, including the Azores and Madeira, is unknown, since we were unable to find any recommendation or limit in this regard.

vi. In a very recent study by Elena Surkova, Vladyslav Nikolayevskyy and Francis Drobniewski, accessible at https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(20)30453-7/fulltext, published in the equally prestigious *The Lancet, Respiratory Medicine*, it is mentioned (in addition to the multiple questions that the accuracy of the test itself raises, regarding the specific detection of the sars-cov virus 2, due to strong doubts about the fulfilment of the so-called gold standard) that (*free translation*):

"*Any diagnostic test must be interpreted in the context of the actual possibility of the disease, which existed before its realization. For Covid-19, this decision to perform the test depends on the previous assessment of the existence of symptoms, previous medical history of Covid 19 or presence of antibodies, any potential exposure to this disease and no likelihood of another possible diagnosis.*"

"*One of the potential reasons for presenting positive results may lie in the prolonged shedding of viral RNA, which is known to extend for weeks after recovery, in those who were previously exposed to SARS-CoV-2. However, and more relevantly, there is no scientific data to suggest*

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that low levels of viral RNA by RT-PCR equate to infection, unless the presence of infectious viral particles have been confirmed by a laboratory.

In summary, Covid-19 tests that show false positives are increasingly likely, in the current epidemiological climate panorama in the United Kingdom, with substantial personal, health and social system consequences."

18. Thus, with so many scientific doubts, expressed by experts in the field, which are the ones that matter here, as to the reliability of such tests, ignoring the parameters of their performance and there being no diagnosis made by a doctor, in the sense of existence of infection and risk, it would never be possible for this court to determine that C ... was a carrier of SARS-CoV-2 virus, even if A., B ... and D ... had high-risk exposure.

19. In summary, it will be said that, since the appeal is inadmissible, due to lack of *locus standi* and lack of interest in acting by the Appellant, as well as manifestly unfounded, it will have to be rejected, under of the provisions of articles 401 nº1 par. a), 417 nº6 par. b) and artº420 nº1 par. a) and b), all of the Penal Code.

IV – DECISION

In view of the above, and under the provisions of articles 417, paragraph 6, al. b) and 420 nº1 als. a) and b), both of the Penal Code, the appeal filed by REGIONAL HEALTH AUTHORITY, represented by the Regional Health Directorate of the Autonomous Region of the Azores, is rejected.

Under the terms of paragraph 3 of article 420 of the Penal Code, the Judgment is granted against the Appellant in the procedural sanction of 4 UCs, as well as in the T.J of 4 UCs with costs.

Immediately inform the court "*a quo*" of this judgment.

Lisbon, November 11, 2020

Digital Signatures: Margarida Ramos de Almeida (rapporteur) Ana Paramés

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REVIEW

The genetic sequence, origin, and diagnosis of SARS-CoV-2

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Abstract
Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a new infectious disease that first emerged in Hubei province, China, in December 2019, which was found to be associated with a large seafood and animal market in Wuhan. Airway epithelial cells from infected patients were used to isolate a novel coronavirus, named the SARS-CoV-2, on January 12, 2020, which is the seventh member of the coronavirus family to infect humans. Phylogenetic analysis of full-length genome sequences obtained from infected patients showed that SARS-CoV-2 is similar to severe acute respiratory syndrome coronavirus (SARS-CoV) and uses the same cell entry receptor, angiotensin-converting enzyme 2 (ACE2), as SARS-CoV. The possible person-to-person disease rapidly spread to many provinces in China as well as other countries. Without a therapeutic vaccine or specific antiviral drugs, early detection and isolation become essential against novel Coronavirus. In this review, we introduced current diagnostic methods and criteria for the SARS-CoV-2 in China and discuss the advantages and limitations of the current diagnostic methods, including chest imaging and laboratory detection.

Keywords SARS-CoV-2 · COVID-19 · Origin · Diagnosis

Introduction

Coronaviruses are unsegmented single-stranded RNA viruses ranging from 26 to 32 kilobases in length, belonging to the subfamily *Coronavirinae* of the family *Coronaviridae* of the order *Nidovirales* [1]. According to the serotype and genomic characteristics, the *Coronavirinae* subfamily is divided into four major genera: *Alphacoronavirus*, *Betacoronavirus*, *Gammacoronavirus*, and *Deltacoronavirus* [2]. The former two genera primarily infect mammals, whereas the latter two predominantly infect birds [3]. Coronaviruses mainly cause respiratory and gastrointestinal tract infections; six kinds of human CoVs have been previously identified, including the HCoV-NL63 and the HCoV-229E, which belong to the *Alphacoronavirus* genus, and the HCoV-OC43, the HCoVHKU1, the severe acute respiratory syndrome coronavirus (SARS-CoV), and the Middle East respiratory syndrome coronavirus (MERS-CoV), which belong to the *Betacoronavirus* genus [4]. Given the high prevalence and wide distribution of coronaviruses in animals, the large genetic diversity and frequent recombination of their genomes, and increasing human-animal interface activities and frequent cross-species infections, novel coronaviruses are likely to emerge periodically in humans [5].

In December 2019, a group of pneumonia cases was reported at a wholesale seafood market in Wuhan, Hubei province, which was found to be caused by previously unknown Coronaviruses [6]. On December 29, 2019, the local hospitals using a surveillance mechanism for "pneumonia of an unknown etiology," which was established in the wake of the 2003 severe acute respiratory syndrome (SARS) outbreak, identified the first 4 cases which were all associated with the Huanan (Southern China) Seafood Wholesale Market. On December 31, 2019, the Chinese Center for Disease Control and Prevention (China CDC) dispatched a rapid response team to accompany Hubei provincial and Wuhan city health authorities and to conduct an epidemiologic and etiologic investigation. Similar cases were subsequently reported in Wuhan, and many of these patients did not have contacts with the Huanan Seafood Wholesale Markets or animals. Epidemiological investigation showed that about only 1% of

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the patients had direct contact with the live-animal market trade, while more than three quarters were local residents of Wuhan or had made contact with people from Wuhan, suggesting a person-to-person transmission of this novel coronavirus was possible [7]. Airway epithelial cells from infected patients were used to isolate a novel coronavirus, temporarily named 2019-nCoV [8], but later, the Coronavirus Research Group (CSG) of the International Committee for the classification of viruses found that the new coronavirus is related to the SARS virus (SARS-CoV) that swept China in 2003. Both belong to a "species" category called severe acute respiratory syndrome-related coronavirus. Therefore, on February 11, 2020, the International Committee for the classification of viruses designated the name of this coronavirus as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [9]. In addition, the World Health Organization has named the disease caused by the SARS-CoV-2 as coronavirus disease 2019 (COVID-19). The possible person-to-person transmission rapidly spreads to many provinces in China as well as other countries. By February 27, 2020, 78,824 cases were laboratory-confirmed, and 2788 died in China [10]. The current public health emergency is partially similar to the SARS outbreak in southern China in 2002. The two cases share similarities. Both occurred during the winter with initial cases related to an exposure to live animals sold at animal markets, and the amino acid sequence identity between the SARS-CoV-2 and the SARS-CoV S-proteins is 76.47% [11]. The current knowledge of the physical and chemical properties of Coronaviruses is mainly derived from the study of the SARS-CoV and the MERS-CoV. The Coronaviruses are sensitive to exposure to heat (56 °C for 30 min), as well as solvents including ether, 75% ethanol, chlorine-containing disinfectant, peroxyacetic acid, and chloroform. Other lipid solvents can also effectively inactivate the virus except for chlorhexidine [12]. According to Zhong's latest pilot experiment, 4 out of the 62 stool specimens tested positive to the SARS-CoV-2, suggesting oral-fecal route might have played a role in the rapid transmission of SARS-CoV-2 [7]. However, no cases of transmission via the fecal-oral route have yet been reported for SARS-CoV-2. Contamination of fomite is more likely to be caused by airway/hands. At present, respiratory transmission and direct contact transmission are the main routes for SARS-CoV-2.

Genetic sequence and origin of the SARS-CoV-2

The genome of Coronaviruses, ranging from 26 to 32 kilobases in length, includes a variable number of open reading frames (ORFs) [13]. The SARS-CoV-2 genome was reported to possess 14 ORFs encoding 27 proteins [14]. The spike surface glycoprotein plays an essential role in binding to receptors on the host cell and is crucial for determining host tropism and transmission capacity, mediating receptor binding and membrane fusion [15]. Generally, the spike protein of Coronaviruses is functionally divided into the S1 domain, responsible for receptor binding, and the S2 domain, responsible for cell membrane fusion [16]. The eight accessory proteins (3a, 3b, p6, 7a, 7b, 8b, 9b, and orf14) and four major structural proteins, including the spike surface glycoprotein (S), small envelope protein (E), matrix protein (M), and nucleocapsid protein (N), are located in the 3′-terminus of the SARS-CoV-2 genome [14]. When researchers compare the SARS-CoV-2 with the SARS-CoV at the amino acid level, they found the SARS-CoV-2 was quite similar to the SARS-CoV, but there were some notable differences in the 8a, 8b, and 3b protein [14]. When researchers compared the SARS-CoV-2 with the MERS-CoV, they found that the SARS-CoV-2 was distant from and less related to the MERS-CoVs. From the phylogenetic tree based on whole genomes, the SARS-CoV-2 is parallel to the SARS-like bat CoVs, while the SARS-CoV has descended from the SARS-like bat CoV lineage, indicating that SARS-CoV-2 is closer to the SARS-like bat CoVs than the SARS-CoVs based on of the whole-genome sequence [14]. Analysis of the genome from nine patients' samples also confirmed that the SARS-CoV-2 was more similar to two SARS-like bat CoVs from Zhoushan in eastern China, bat-SL-CoVZC45 and bat-SL-CoVZXC21, than to the SARS-CoV and the MERS-CoV [17]. At the whole-genome level, the SARS-CoV-2 shares an 87.99% sequence identity with the bat-SL-CoVZC45 and 87.23% sequence identity with the bat-SL-CoVZXC2, less genetically similar to the SARS-CoV (about 79%) and MERS-CoV (about 50%) [17]. At the protein level, the lengths of most of the proteins encoded by the SARS-CoV-2, the bat-SL-CoVZC45, and the bat-SL-CoVZXC21 were similar, with only a few minor insertions or deletions [17]. Although the SARS-CoV-2 was closer to the bat-SL-CoVZC45 and the bat-SL-CoVZXC21 at the whole-genome level, the receptor-binding domain of the SARS-CoV-2 located in lineage B was closer to that of the SARS-CoV [17]. Given the close relationship between the SARS-CoV-2 and the SARS-CoVs or the SARS-like bat CoVs, further studies of the amino acid substitutions in different proteins could explain how the SARS-CoV-2 differs structurally and functionally from the SARS-CoVs and how these differences affect the functionality and pathogenesis of the SARS-CoV-2.

It was reported that 27 of the first 41 infected patients had been exposed to the Huanan Seafood Market [18]. Thus, it was believed that the new coronavirus originated from the Huanan Seafood Market in Wuhan and spread from animal hosts to humans in the process of wildlife trade, transportation, slaughter, and trade. Bats have the most variety of coronaviruses in their bodies and are the hosts of many kinds of coronaviruses, such as the SARS-CoV and the MERS-CoV

[19]. The SARS-CoV and the MERS-CoV are considered highly pathogenic, and it is very likely that the SARS-CoV was transmitted from bats to palm civets and the MERS-CoV was transmitted from bats to dromedary camels and finally to humans [20, 21]. Given the high sequence similarity between the SARS-CoV-2 and the SARS-like bat CoVs from *Hipposideros* bats in China, the natural host of the SARS-CoV-2 may be the *Hipposideros* bat. The discovery that pangolin coronavirus genomes have 85.5% to 92.4% sequence similarity to SARS-CoV-2 suggests pangolins should be considered as possible hosts in the emergence of SARS-CoV-2 [22].

Diagnosis

According to the seventh edition of Pneumonia Diagnosis and Treatment program for novel coronavirus infection reported by the National Health Commission of the People's Republic of China, suspected cases were defined as patients having fever or respiratory symptoms, a typical ground-glass opacity chest imaging as well as a history of exposure to wildlife in the Wuhan seafood market, and a travel history or contact with people from Wuhan within 2 weeks of diagnosis [12]. Confirmed cases with the SARS-CoV-2 were identified as a positive result of a high-throughput sequencing or an RT-PCR assay for respiratory specimens including nasal and pharyngeal swab specimens, bronchoalveolar lavage fluid, sputum, or bronchial aspirates or a positive result of anti-SARS-CoV-2 IgM/IgG or the titer of anti-SARS-CoV-2 IgG antibody in the recovery period was four times or more higher than in the acute period [12]. At present, the diagnosis of the COVID-19 is mainly based on clinical characteristics, epidemiological history, chest imaging, and laboratory detection.

Clinical characteristics and epidemiological history

The most common symptoms of confirmed patients were fever, cough, and myalgia or fatigue, whereas sputum production, headache, diarrhea, and vomiting were rare [23–26]. Mild cases only have a low fever and mild fatigue, without pneumonia. Severe and moderate cases had clinical manifestations of dyspnea, lymphopenia, and hypoalbuminemia, which mainly occurred in elderly patients [23]. It is worth noting that patients with severe or critical illness may have a moderate or low fever, or even no significant fever [12]. The elderly and those with chronic diseases, including diabetes, hypertension, and cardiovascular disease, have poor prognoses [12]. Most severe patient died of severe pneumonia, severe respiratory failure, and multiple organ failure [26]. Epidemiological investigations indicate that most patients were local residents of Wuhan or had direct exposure to the Huanan Seafood Market, a travel history to Wuhan, or contact with confirmed cases [7]. In addition, outbreaks within family clusters have been reported from several provinces in China [27]. An increasing number of cluster cases including family cluster cases are occurring [24, 25].

Chest imaging

The most common patterns seen on chest CT were bilateral, peripheral, and ground-glass opacity [28, 29]. Less common CT findings were nodules, cystic changes, bronchiolectasis, pleural effusion, and lymphadenopathy [28, 29]. Chest CT images of an early-stage COVID-19 patients showed multiple small plaques and interstitial changes. The findings of a progressive stage chest CT images included a bilateral multiple ground-glass opacity and an infiltrating opacity with consolidation, interstitial thickening or fibrous stripes [29–31]. The diffuse lesions in bilateral lungs could be seen in the most seriously affected patients, whose CT showed as "white lungs" [31].

Laboratory detection

Specific laboratory detection

Isolation of the causal agent and determination of its partial genome sequence provided the basis for next-generation sequencing or real-time reverse transcriptase-polymerase chain reaction (RT-PCR) methods for the SARS-CoV-2 [14, 17]. After the SARS-CoV-2 was isolated from a lower respiratory tract specimen, a diagnostic RT-PCR test was developed. RT-PCR tests were based on the RNA-dependent RNA polymerase (RdRp) gene of the ORF1ab sequence, E gene, N gene, and S gene of the SARS-CoV-2 genome [32–35]. Among these assays, RT-PCR assays targeting the RdRp assay had the highest analytical sensitivity [32]. The SARS-CoV-2 nucleic acid can be detected in nasal and pharyngeal swab specimens, bronchoalveolar lavage fluid, sputum, bronchial aspirates, blood, anal swab, and other samples by an RT-PCR [36, 37]. In a case with severe peptic ulcers after the onset of symptoms, the SARS-CoV-2 was directly detected in the esophageal erosion and at the bleeding site [7]. Some patients infected with the SARS-CoV-2 also displayed gastrointestinal symptoms such as diarrhea [23, 38] because some viruses may enter the digestive tract through the throat, infecting the intestinal epithelial cells and activating the intestinal immune response. Thus, the SARS-CoV-2 nucleic acid can also be detected in the stool samples of some patients [7, 36, 37]. High-throughput sequencing or an RT-PCR assay has become a standard and formative assessment for the diagnosis of the COVID-19 [12]. However, nucleic acid amplification kits sometimes produced false-negative results among patients whose clinical features, chest imaging, and laboratory detection accorded with the COVID-19 [30, 39]. There are several

possible reasons for the false-negative results from the nucleic acid kit. Firstly, although older age was correlated with higher viral load [40], it is not clear whether the viral load in body fluids has a positive linear correlation with the severity of symptoms after infection. If the virus in the suspected patients remains to be rapidly replicated and released in the lungs, the nasal and pharyngeal swabs sampling may not collect enough virus for diagnosis. Secondly, the current common sampling method is to collect nasal and pharyngeal swabs, sputum, or the alveolar lavage fluid [36, 40, 41]. Few patients with the SARS-CoV-2 infection had prominent signs and symptoms of the respiratory tract, indicating that the target cells may be located in the lower airway [18]. The viral nucleic acid is most easily detected in the alveolar lavage fluid, followed by sputum, nasal, and pharyngeal swabs [41–43]. A study of 4880 cases showed that the alveolar lavage fluid exhibited the most highest positive rate of 100% for SARS-CoV-2 ORF1ab gene; the sputum exhibited a 49.12% positive rate, and the nasal and pharyngeal swabs samples showed a poor positive rate of 38.25% [41]. Alveolar lavage fluid collection is generally suitable for patients with a severe or critical illness, not mild cases. Sputum specimens are also more difficult to obtain because few patients with the SARS-CoV-2 infection had sputum production [7, 18]. Due to the limitations associated with operations and patient acceptance, the most common sampling method in clinical practice is nasal and pharyngeal swab collection. However, respiratory samples collected from 80 individuals at different stages of infection showed a median of $7{\cdot}99 \times 10^4$ in nasal and pharyngeal swab samples and $7{\cdot}52 \times 10^5$ in sputum samples [36]. Sputum samples generally showed higher viral loads than throat swab samples [36, 43]. The low viral load in nasal and pharyngeal swab makes the diagnosis of the SARS-CoV-2 more difficult. On the other hand, RT-PCR test results of pharyngeal swab specimens were variable and potentially unstable [44]. It was reported that patients with initial non-positive results were eventually confirmed with COVID-19 by 3~5 repeated swab PCR tests [44]. The phenomenon of SARS-CoV-2 positive in the stool samples but negative nucleic acid in throat swab specimens indicated that selecting fecal samples for a nucleic acid test may be an alternative strategy [45]. Considering that the SARS-CoV-2 nucleic acid can be detected in nasal and pharyngeal swab specimens, bronchoalveolar lavage fluid, sputum, bronchial aspirates, blood, and anal swab [36, 37], it is suggested to collect samples from multiple site of the same patient at different stages and combine them for detection to improve the positive rate. Thirdly, the SARS-CoV-2 is an RNA virus with low stability, which is easily degraded by RNA enzymes released after exogenous or cellular destruction, affecting the final detection efficiency. Improper sampling location, insufficient sampling strength, and irregular sample delivery process account for the false-negative results of the nucleic acid kit test [39]. Besides, in order to improve the sensitivity of detection, most manufacturers choose two or more regions of viral nucleic acid sequence for detection, including the ORF1ab sequence, E gene, N gene, and S gene of the SARS-CoV-2 genome [32–35]. In actual tests, there is a certain proportion of positive results of a single target gene locus indicating that the sensitivity of the reagent to different gene regions is indeed different [41], which may also be caused by the competition between the loci of two or three target genes. Furthermore, reagent reaction conditions, reaction system, and nucleic acid addition amount may affect the sensitivity of detection and analysis [46]. It is an effective measure for the clinical laboratory to carry out quality control for each batch of reagents by using the confirmed negative and positive samples before routine work.

Based on the above reasons, detection of the viral RNA using RT-PCR can only achieve a sensitivity of 30~60% [41, 47, 48], depending on the course and condition of the patient, the type and number of clinical specimens collected, and the protocol used. The older had higher positive rate than the young [41] which may be explained by the finding that the older was correlated with higher viral load [40]. Supplement serum IgM/IgG antibody detection against the SARS-CoV-2 internal nucleoprotein (NP) and surface spike protein receptor-binding domain (RBD) can make up for the shortcomings of RT-PCR in some cases [40, 49]. The antibody is the product of a humoral immune response after infection with the virus. Generally, IgM antibodies rise within a few days after a viral infection and can be detected as soon as a week of incubation, and IgG antibodies appear in the middle and late stages of the infection. There is a process of a continuous increase in the antibody titer, and it remains in the blood circulation for a long time. At the moment, the most widely used methods for serodiagnosis of the SARS-CoV-2 infection in clinical microbiology laboratories are antibody detection in acute- and convalescent-phase sera by colloidal gold immunochromatography and enzyme-linked immunosorbent assay (ELISA) [40]. In short, a test for IgM/IgG antibodies can also determine whether a patient has been infected with the SARS-CoV-2 recently or previously and act as a supplementary detection to identify patients with high clinical suspicion of the SARS-CoV-2 infection but negative RT-PCR findings [40, 49]. The new serological diagnostic kits for IgM and IgG antibodies for SARS-CoV-2 have the advantages of high sensitivity and early diagnosis. In addition, the operational requirements of antibody detection in clinical microbiology laboratories are relatively low, fast, capable of large quantities, and can be completed in basic laboratories compared with the nucleic acid test. Anti-SARS-CoV-2 IgM antibody was positive at 3~5 days after onset, and the titer of anti-SARS-CoV-2 IgG antibody in the recovery period was four times or more higher than in the acute period [12]. Although the supplementary antibody test can make up for the missed diagnosis of RT-PCR, it still cannot diagnose all infected patients. The

detection of IgM and IgG antibodies can only achieve a sensitivity of 70% at 4~6 days after admission for COVID-19 patients (unpublished data from our group). The detection of IgM and IgG antibodies may be futile for the elderly, because of hypoimmunity and a weak antibody production capacity.

Nonspecific laboratory detection

The laboratory examination of patients at an early stage showed leucopenia, lymphopenia, high level of aspartate aminotransferase, C-reactive protein (CRP), and erythrocyte sedimentation rate [18]. Most patients had normal serum levels of procalcitonin. Compared with moderate cases, severe cases more frequently had lymphopenia, with higher levels of alanine aminotransferase, lactate dehydrogenase, C-reactive protein, ferritin, and D-dimer as well as markedly higher levels of IL-2R, IL-6, IL-10, and TNF-α [23]. Typical abnormal laboratory findings in pediatric patients were elevated creatine kinase MB, decreased lymphocytes, leucopenia, and elevated procalcitonin [24]. Recent studies have also shown another potential diagnostic biomarker for the SARS-CoV-2 diagnosis. Renin cleaves liver-derived angiotensinogen (AGT) into angiotensin I, which is then further processed by the angiotensin-converting enzyme (ACE) into the octapeptide angiotensin II. The abnormal increase of angiotensin II has been reported to be associated with hypertension, heart failure, and lung and kidney dysfunction as well as several pathophysiological features, including inflammation, metabolic dysfunction, and aging [50, 51]. Xu et al. performed structural modeling of the S-protein of the SARS-CoV-2 to evaluate its ability to interact with human angiotensin-converting enzyme 2 (ACE2) molecules. Because of the loss of hydrogen bond interactions due to replacing Arg426 with Asn426 in the SARS-CoV-2 S-protein, the binding free energy for the SARS-CoV-2 S-protein increased by 28 kcal mol^{-1} when compared with the SARS-CoV S-protein binding. The results revealed that the SARS-CoV-2 S-protein has a strong binding affinity to human ACE2 [11]. A study discovered the markedly increased level of angiotensin II in the plasma samples from SARS-CoV-2-infected patients was linearly correlated with viral load and lung injury [52]. It is suggested that the imbalance of the renin-angiotensin-aldosterone system is caused by the SARS-CoV-2, and angiotensin receptor blocker (ARB) drugs may be used as a potential repurposing treatment of the SARS-CoV-2 infection. Similar studies have demonstrated that the SARS-CoV could bind to its receptor ACE2, downregulating its expressions, resulting in increased angiotensin II levels in mouse blood samples, signaling through angiotensin II receptor 1, leading to an acute lung injury [53]. Besides, markedly, elevation of angiotensin II level in the H7N9-infected patients was associated with the disease severity and outcomes [54].

Discussion

Chest CT imaging showed that 76.4% of infected patients manifested as pneumonia on admission, which was mainly ground-glass opacity (50%) and bilateral patchy shadowing (46.4%). The majority of severe patients could be diagnosed by chest X-ray and chest CT imaging. Despite these predominant manifestations, it was reported that 221 out of the 926 (23.87%) in severe cases compared with 9 out of the 173 non-severe cases (5.20%) who had no abnormal radiological findings were diagnosed by symptoms plus RT-PCR positive findings, suggesting that not all patients had abnormal chest radiological findings of pneumonia. Chest CT images of the early-stage COVID-19 patients showed unilateral or bilateral ground-glass opacity, which was similar to some non-COVID-19 images of patients with the respiratory syncytial viral (RSV), mycoplasma, and parainfluenza virus, suggesting that chest CT scans cannot the identify COVID-19 patients and the non-COVID-19 patients in some cases. Co-infection with other viruses such as influenza A/B, rhino/enterovirus, respiratory syncytial virus, other atypical pathogens, fungi, and bacteria has been reported in the COVID-19 patients [49, 55]. Mixed infection among COVID-19 patients makes the diagnosis of chest CT images more difficult. Besides, positive respiratory pathogen results cannot serve as evidence for the exclusion of SARS-COV-2 infection. Methods of pathogen-specific detection are mainly divided into four types, including virus culture, nucleic acid detection, antigen detection, and antibody detection. In terms of virus culture, the cultivation of the SARS-CoV-2 requires biosafety level 3 laboratory facilities, which are not available in most clinical microbiology laboratories. Thus, the cultivation of the SARS-CoV-2 is mainly used for scientific research. Commercial antigen detection kits require the preparation of monoclonal antibodies and polyclonal antibodies, whereas it costs a long time from production to extraction during antibody preparation, and the preparation process is complicated. Detection of the viral nucleic acid using an RT-PCR assay has become a standard and formative assessment for the diagnosis of COVID-19. However, detection of viral RNA using RT-PCR can only achieve a sensitivity of 30~60%, depending on the course and condition of the patient, the type and number of clinical specimens collected, and the protocol used. In order to improve the positive rate of detection, it is suggested to collect multiple site samples of the same patient at different stages repeatedly and combine them for detection. The phenomenon of SARS-CoV-2 positive in the stool samples but negative nucleic acid in throat swab specimens should be taken seriously. Patients with early or mild illness may have a low viral load in nasal and pharyngeal swabs, resulting in false-negative nucleic acid tests. Thus, selecting fecal samples for a nucleic acid test may be an alternative strategy, regardless of the presence or absence of gastrointestinal symptoms such as

diarrhea. In addition, a fecal-oral transmission might exist in the transmission of 2019-nCoV; thus, the transmission via gastrointestinal secretions should be fully considered to control the rapid spread worldwide. Whole genome sequencing (WGS) method can overcome the mutation problems which cause false-negative results in RT-PCR [55, 56], whereas it is not applicable to clinical practice considering the economic status of patients. For individuals with high clinical suspicion of the SARS-CoV-2 infection but negative RT-PCR findings, the detection of IgM/IgG antibodies should be considered. We recommend IgM antibody testing 1 week after infection and IgG antibody testing 4 weeks after infection. Although the supplementary antibody test can make up for the missed diagnosis of RT-PCR, it cannot diagnose all the infected patients. Collectively, for chest CT scans, RT-PCR assays, and the detection of IgM/IgG antibodies, multiple and repetitive tests should be considered during different stages of the COVID-19. Further research of SARS-CoV-2 and the development of more sensitive detection methods will facilitate the diagnosis of COVID-19. In addition, the development of broad-spectrum antiviral drugs and vaccines will enhance the ability to manage future outbreaks caused by this cluster of viruses.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethics approval Not applicable.

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Review

SARS-CoV-2: an Emerging Coronavirus that Causes a Global Threat

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Abstract

An ongoing outbreak of pneumonia caused by a novel coronavirus, currently designated as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), was reported recently. However, as SARS-CoV-2 is an emerging virus, we know little about it. In this review, we summarize the key events occurred during the early stage of SARS-CoV-2 outbreak, the basic characteristics of the pathogen, the signs and symptoms of the infected patients as well as the possible transmission pathways of the virus. Furthermore, we also review the current knowledge on the origin and evolution of the SARS-CoV-2. We highlight bats as the potential natural reservoir and pangolins as the possible intermediate host of the virus, but their roles are waiting for further investigation. Finally, the advances in the development of chemotherapeutic options are also briefly summarized.

Key words: Coronavirus, Novel coronavirus, pneumonia, SARS-CoV-2, COVID-19

Introduction

On 23 Feb 2020, the lock-down of Wuhan, a central city in China, has alarmed people all over the world of an emerging novel coronavirus that is posing a major public health and governance challenges. The novel virus, previously called the 2019-novel coronavirus (2019-nCoV), is currently designated as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). As of 27 Feb, this emerging infection has been reported in 47 countries, causing over 82,294 infections with 2,804 deaths (Fig. 1) [1]. This novel virus is also becoming a mounting threat to Chinese and global economies.

Coronaviruses (CoVs) are members of the family Coronaviridae, the enveloped viruses that possess extraordinarily large single-stranded RNA genomes ranging from 26 to 32 kilobases in length [2]. CoVs have been identified in both avian hosts and various mammals, including bat, camels, dogs and masked palm civets, and are previously regarded as pathogens that only cause mild diseases in the immunocompetent people until the emergence of the coronavirus causing severe acute respiratory syndrome (SARS-CoV) in late of 2002 [3-6]. Currently, at least seven coronavirus species are known to cause diseases in humans. The viruses of 229E, OC43, NL63 and HKU1 only cause common cold symptoms, which are mild. Severe illness can be caused by the remaining three viruses, namely SARS-CoV, which resulted in the outbreak of SARS in 2002 and 2003 [3,4]; the coronaviruses that are responsible the Middle East respiratory syndrome (MERS-CoV), which emerged in 2012 and remains in the circulation in camels [7]; and SARS-CoV-2, the viruses emerged in December 2019 in Wuhan of China and a great effort is being undertaken to contain its spreading [8]. In this review, we will briefly introduce the outbreak history of SARS-CoV-2, the signs and symptoms of the infected patients, its transmission dynamics, the advances in the understanding on its evolutional origin and the chemotherapeutic options being developed for the treatment of its infection.

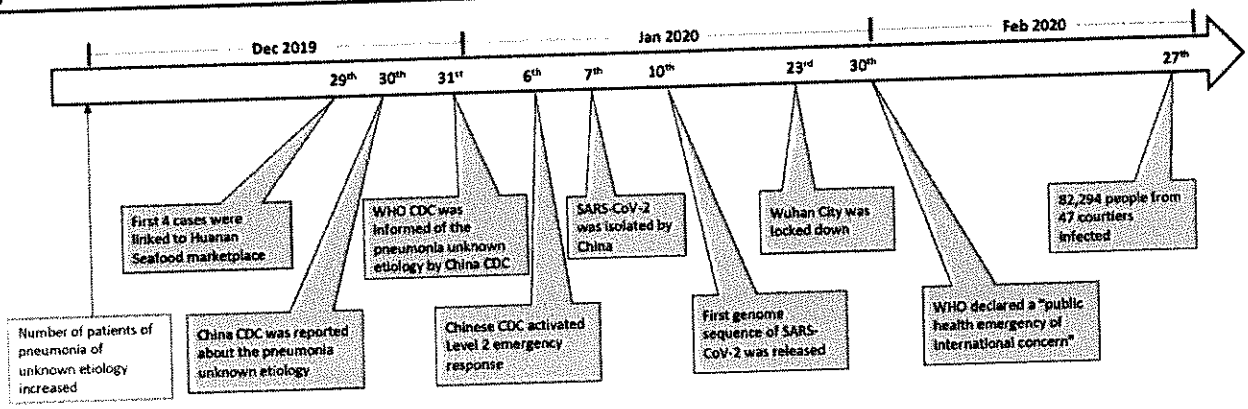

Figure 1. Key events in the early stage of SARS-CoV-2 outbreak.

The key events of SARS-CoV-2 outbreak and the pathogen characteristics

Since December 2019, an increasing number of patients with pneumonia of unknown etiology in Wuhan, a city with 11 million people, have alarmed the local hospital. On 29 December 4 cases were linked to Huanan Seafood wholesale market [9], where non-aquatic live animals, including several kinds of wild animals, were also on the sales. The local Center for Disease Control (CDC) then found additional patients linked to the same market after investigation, and reported to China CDC on 30 Dec 2019 [9]. The second day, World Health Organization (WHO) was informed of the cases of pneumonia of unknown etiology by China CDC [10]. On 6 Jan 2020, a level 2 emergency response was launched by China CDC [11].

The causal agent was not identified until 7 Jan 2020; a new type of coronavirus was isolated by Chinese authority [10]. The genome sequence of SARS-CoV-2 (WH-Human_1) was first released and shared by China on 10 Jan [12]. The isolation and identification of SARS-CoV-2 apparently facilitated the development of molecular diagnostic methods and the confirmation of the infected patients. As of 21 Jan, there are 270 cases were confirmed from Wuhan [13]. On 23 Jan, Wuhan city was locked down by local government. On 30 Jan, WHO declared a "public health emergency of international concern" (Fig. 1).

Subsequently, the viruses were successfully isolated from several laboratories [8,14,15]. The virion of SARS-CoV-2 looks like a solar corona by transmission electron microscopy imaging: the virus particle is in a spherical shape with some pleomorphism; the diameter of the virus particles range from 60 to 140 nm with distinctive spikes about 8 to 12 nm in length [8]. The observed morphology of SARS-CoV-2 is consistent with the typical characteristics of the Coronaviridae family. The genome sequence of SARS-CoV-2 from clinical samples has been obtained by several laboratories with deep sequencing [8,14-18]. The viral genome of SARS-CoV-2 is around 29.8 kilobase, with a G+C content of 38%, in total consisting of six major open reading frames (ORFs) common to coronaviruses and a number of other accessory genes [14,16]. The sequences analysis showed that the genome sequences of viruses from different patients are very conserved [14,15,19], implying that the human virus evolves recently.

Signs and symptoms of patients infected by SARS-CoV-2

A typical characteristic of the SARS-CoV-2 infected patient is pneumonia, now termed as Coronavirus Disease 2019 (COVID-19), demonstrated by computer tomographic (CT) scan or chest X -ray [3,8,18]. In the early stages, the patients showed the acute respiratory infection symptoms, with some that quickly developed acute respiratory failure and other serious complications [20]. The first three patients reported by the China Novel Coronavirus Investigating and Research Team all developed severe pneumonia and two of these three patients with available clinical profiles showed a common feature of fever and cough [8]. A subsequent investigation of a family of six patients in the University of Hong Kong-Shenzhen Hospital demonstrated that all of them had pulmonary infiltrates, with a variety of other symptoms [18]. The chest X-ray and CT imaging in a study showed that 75% of 99 patients demonstrated bilateral pneumonia and the remaining 25% unilateral pneumonia [21]. Overall, 14% of the patients showed multiple mottling and ground-glass opacity [21]. The first cases of coronavirus infection in the United States also showed basilar streaky opacities in both lungs by chest radiography. However, the pneumonia for this patient was only detected on the day 10 of his illness [22]. It is also of note that one of patients among the family of six patients did not present any other symptoms and signs, but had ground-glass lung opacities identified by CT scan [18].

Table 1. Common signs and symptoms of SARS-CoV-2 infected patients from four reports

Signs or Symptoms	Number of patients with signs or symptoms from each report				Number of patients with signs or symptoms	Total number of patients	Percentage
	Report 1 [21]	Report 2 [23]	Report 3 [24]	Report 4 [25]			
Fever	82 (n=99)	40 (n=41)	136 (n=138)	975 (n=1099)	1233	1377	90%
Cough	81 (n=99)	31 (n=41)	82 (n=138)	745 (n=1099)	939	1377	68%
Sputum production/ Expectoration	NR	11 (n=39)	37 (n=138)	370 (n=1099)	418	1276	33%
Shortness of breath/ Dyspnoea	31 (n=99)	22 (n=40)	43 (n=138)	205 (n=1099)	301	1376	22%
Headache	8 (n=99)	3 (n=38)	9 (n=138)	150 (n=1099)	170	1374	12%
Sore throat/Pharyngalgia	5 (n=99)	NR	24 (n=138)	153 (n=1099)	182	1336	14%
Diarrhoea	2 (n=99)	1 (n=38)	14 (n=138)	42 (n=1099)	59	1374	4%

NR: Not Recorded.

At least four comprehensive studies on the epidemiological and clinical characteristics of SARS-CoV-2 infected patients have been performed [21, 23-25]. The most common signs and symptoms of patients are fever and cough [21,23-25]. Fatigue was complained by 96% of patients (n=138) in one study [24], but was less outstanding (18%, n=44) in another report [23]. A combinational analysis of the common recorded signs or symptoms of the reported cases found that fever was observed in around 90% of the SARS-CoV-2 infected patients; the number of patients with cough is relatively less (68%) compared to fever (Table 1). In addition, shortness of breath or dyspnea, muscle ache, headache, chest pain, diarrhea, haemoptysis, sputum production, rhinorrhoea, nausea and vomiting, sore throat, confusion, and anorexia were also observed in a proportion of the patients [21,23-25] (Table 1).

A common feature of patients of SARS, MERS or COVID-19 is the presence of severe acute respiratory syndrome; however, the estimated fatality rate of COVID-19 (2.3%) is much lower than SARS (~10%) and MERS (~36%) [26,27]. Furthermore, the viruses responsible for above three diseases are evolutionary distinct (See below for details) [19].

Transmission of the virus

It is clear now that SARS-CoV-2 can be transmitted by human-to-human despite the majority of the early cases had contact history with the Huanan Seafood market [11,18,28]. Analysis of 425 patients with confirmed COVID-19 showed that the incubation period is 3 to 7 days. The mean was 5.2 days (95% CI: 4.1 to 7.0), and the 95th percentile of the distribution is 12.5 days (95% CI: 9.2 to 18) [11]. Notably, it was reported that the incubation period could be as long as 24 days in a rare case [25]. The basic reproductive number (R_0) up to the period of 4 Jan 2020 was estimated based on the study of 425 patients to be 2.2 (meaning that one patient has been spreading infection to 2.2 other people) [11], slightly smaller than the value of 2.68 by a modelling in another [29]. The R_0 of SARS-CoV-2 from both of these two studies is smaller than that of SRAS, which are 3 before public health measures were implemented [30]. However, subsequent investigation based on the analysis of high-resolution real-time human travel and infection data estimated that the R_0 is much larger, ranging from 4.7 to 6.6 before the control measures [31], implying that SARS-CoV-2 is highly contagious and more infectious than initially estimated. This conclusion is consistent with the wide spread of SARS-CoV-2 within a short period time and was also echoed by the finding that SARS-CoV-2 Spike (S) protein had 10- to 20-fold higher affinity to human angiotensin-converting enzyme 2 (ACE2) receptor than that of SARS-CoV based on the Cryo-EM structure analysis of S proteins [32]. Similar to SARS-CoV, the entry of SARS-CoV-2 into host cells depends on the recognition and binding of S protein to ACE2 receptor of the host cells [14,33]. The high affinity of S protein to ACE2 receptor likely contributes to the quick spreading of virus. The finding of ACE2 as the receptor of SARS-CoV-2 also indicates that human organs with high ACE2 expression level, such as lung alveolar epithelial cells and enterocytes of the small intestine, are potentially the target of SARS-CoV-2 [34].

As a new coronavirus, it is not known yet about how SARS-CoV-2 spreads. Current knowledge for SARS-CoV-2 transmission is largely based on what is known from the similar coronaviruses, particularly SARS-CoV and MERS-CoV, in which human-to-human transmission occurs through droplets, contact and fomites. SARS-CoV is predominantly transmitted through indirect or direct contact with mucous membranes in the mouth, eyes, or nose [35]. It has been shown that unprotected eyes and exposed mucous membranes are vulnerable to SARS-CoV transmission [36]. A member of the national expert panel on pneumonia was infected by SARS-CoV-2 after the inspection in Wuhan [37]. As he wore a N95 mask but not any eye protector, and experienced eye redness before the onset of pneumonia, it was thus suspected that unprotected exposure of the eyes to

SARS-CoV-2 might be another transmission pathway [37]. However, SARS-CoV-2 was not detected from the conjunctival swab sample in a confirmed COVID-19 patent with conjunctivitis [38], suggesting that more evidences are needed before concluding the conjunctival route as the transmission pathway of SARS-CoV-2. The mode of transmission by MERS-CoV is not well understood but is believed to spread largely via the respiratory close contact route [39,40].

Based on the transmission mode of SARS-CoV and MERS-CoV, a serial of preventive measures have been recommended, including avoiding close contact with people suffering from acute respiratory infections and frequent hand-washing [41]. The viruses of SARS-CoV-2 were also detected in the stool samples in some patients but not all [18,22], suggesting that a possible fecal-oral transmission occurs [42]. A systematic study showed that viruses could be detected in oral swabs, anal swabs and blood samples of the patients, and the anal swabs and blood could test positive when oral swab tested negative [43]. Furthermore, a trend of shift from more oral positive in the collected samples during the early period of patient infection to more anal positive during later period of infection was also found [43]. Therefore, a multiple shedding routes of SARS-CoV-2 might exist.

One of the challenges for preventive control of SARS-CoV-2 spreading is that the viruses are likely transmitted by asymptomatic contact. A German businessman was found infected by SARS-CoV-2 after attending a conference together with a colleague, who had no signs or symptoms of infection but had become ill due to the SARS-CoV-2 infection later [44]. This observation suggests that infected patients likely start to shed viruses before the onset of any symptom, which undoubtedly will bring great challenge to the current practice of preventive control by measuring body temperature. Despite the claim of the transmission by asymptomatic contact has been challenged [45], other asymptomatic carriers were also observed to transmit the viruses of SARS-CoV-2 [46,47]. Consistently, a study found that an asymptomatic patient had a similar vial loads in the samples of nasal and throat swabs to that of the symptomatic patients [48].

The origin and evolution of SARS-CoV-2

It is critical to identify the origin, native host(s) and evolution pathway of the virus that causes an outbreak of a pandemic. This information can help understand the molecular mechanism of its cross-species spread and implement a proper control measure to prevent it from further spreading. The association of initially confirmed SARS-CoV-2 cases with Huanan Seafood market suggested that the marketplace has played a role in the early spreading [11,23], however, whether it is the origin of the outbreak and what is the native host(s) of SARS-CoV-2 remain uncertain. In fact, the firstly documented patient was not linked to Huanan Seafood market [23].

The analysis of SARS-CoV-2 origin was firstly performed based on the genome sequence of virus isolates from six patients [19]. When compared with SARS-CoV and MERS-CoV, the nucleotide sequences of SARS-CoV-2 showed a higher homology with that of SARS-CoV while was relatively poor with that of MERS-CoV [19]. Despite some of the six major OFRs of SARS-CoV-2 genes share less than 80% identity in nucleotide acids to SARS-CoV, the seven conserved replicase domains in ORF1ab has 94.6% sequence identity in amino acids between SARS-CoV-2 and SARS-CoV [14], suggesting that these two viruses might belong to the same species. The origin of SARS-CoV has been extensively investigated. Masked palm civets were initially considered to transmit SARS-CoV to humans as a close variant of SARS-CoV was detected from palm civets [49]. This conclusion was supported by the fact that three of the four patients had the record of contact with palm civets during the two small-scale of SARS outbreaks occurred in late 2003 and early 2004 [50, 51]. However, a deep investigation based on the genome sequence of isolated viruses showed that SARS-CoV-like virus in civet had not been circulating for long [52]. Subsequently, coronaviruses with high similarity to the human SARS-CoV or civet SARS-CoV-like virus were isolated from horseshoe bats, concluding the bats as the potential natural reservoir of SARS-CoV whereas masked palm civets are the intermediate host [53-56].

It is thus reasonable to suspect that bat is the natural host of SARS-CoV-2 considering its similarity with SARS-CoV. The phylogenetic analysis of SARS-CoV-2 against a collection of coronavirus sequences from various sources found that SARS-CoV-2 belonged to the *Betacoronavirus* genera and was closer to SARS-like coronavirus in bat [19]. By analyzing genome sequence of SARS-CoV-2, it was found that SARS-CoV-2 felled within the subgenus *Sarbecovirus* of the genus Betacoronavirus and was closely related to two bat-derived SARS-like coronaviruses, bat-SL-CoVZC45 and bat-SL-CoVZXC21, but were relatively distant from SARS-CoV [15, 18, 57-59]. Meanwhile, Zhou and colleagues showed that SARS-CoV-2 had 96.2% overall genome sequence identity throughout the genome to BatCoV RaTG13, a bat coronavirus detected in *Rhinolophus affinis* from Yunnan province [14]. Furthermore, the phylogenetic

analysis of full-length genome, the receptor binding protein spike (S) gene, and RNA-dependent RNA polymerase (RdRp) gene respectively all demonstrated that RaTG13 was the closest relative of the SARS-CoV-2 [14]. However, despite SARS-CoV-2 showed high similarity to coronavirus from bat, SARS-CoV-2 changed topological position within the subgenus *Sarbecovirus* when different gene was used for phylogenetic analysis: SARS-CoV-2 was closer to bat-SL-CoVZC45 in the S gene phylogeny but felled in a basal position within the subgenus *Sarbecovirus* in the ORF1b tree [57]. This finding implies a possible recombination event in this group of viruses. Of note, the receptor-binding domain of SARS-CoV-2 demonstrates a similar structure to that of SARS-CoV by homology modelling but a few variations in the key residues exist at amino acid level [15, 19].

Despite current evidences are pointing to the evolutional origin of SARS-CoV-2 from bat virus [15, 57], an intermediate host between bats and human might exist. Lu et. al. raised four reasons for such speculation [15]: First, most bat species in Wuhan are hibernating in late December; Second, no bats in Huanan Seafood market were sold or found; Third, the sequence identity between SARS-CoV-2 and bat-SL-CoVZC45 or bat-SL-CoVZXC21, the closest relatives in their analyses, is lower than 90%; Fourth, there is an intermediate host for other human-infecting coronaviruses that origin from bat. For example, masked palm civet and dromedary camels are the intermediate hosts for SARS-CoV [49] and MERS-CoV respectively [60]. A study of the relative synonymous codon usage (RSCU) found that SARS-CoV-2, bat-SL-CoVZC45, and snakes had similar synonymous codon usage bias, and speculated that snake might be the intermediate host [61]. However, no SARS-CoV-2 has been isolated from snake yet.

Pangolin was later found to be a potential intermediate host for SARS-CoV-2. The analysis of samples from Malytan pangolins obtained during anti-smuggling operations from Guangdong and Guangxi Customs of China respectively found novel coronaviruses representing two sub-lineages related to SARS-CoV-2 [62]. The similarity of SARS-CoV-2 to these identified coronaviruses from pangolins is approximately 85.5% to 92.4% in genomes, lower than that to the bat coronavirus RaTG13 (96.2%) [14,62]. However, the receptor-binding domain of S protein from one sub-lineage of the pangolin coronaviruses shows 97.4% similarity in amino acid sequences to that of SARS-CoV-2, even higher than that to RaTG13 (89.2%) [62]. Interestingly, the pangolin coronavirus and SARS-CoV-2 share identical amino acids at the five critical residues of RBD of S protein, while RaTG13 only possesses one [62]. The discovery of coronavirus close to SARS-CoV-2 from pangolin suggests that pangolin is a potential intermediate host. However, the roles of bat and pangolin as respective natural reservoir and intermediate host still need further investigation.

Chemotherapeutic options for SARS-CoV-2 infection

As an emerging virus, there is no effective drug or vaccine approved for the treatment of SARS-CoV-2 infection yet. Currently, supportive care is provided to the patients, including oxygen therapy, antibiotic treatment, and antifungal treatment, extra-corporeal membrane oxygenation (ECMO) etc. [21,22]. To search for an antiviral drug effective in treating SARS-CoV-2 infection, Wang and colleagues evaluated seven drugs, namely, ribavirin, penciclovir, nitazoxanide, nafamostat, chloroquine, remdesivir (GS-5734) and favipiravir (T-750) against the infection of SARS-CoV-2 on Vero E6 cells *in vitro* [63]. Among these seven drugs, chloroquine and remdesivir demonstrated the most powerful antiviral activities with low cytotoxicity. The effective concentration (EC_{50}) for chloroquine and remdesivir were 0.77μM and 1.13μM respectively. Chloroquine functions at both viral entry and post-entry stages of the SARS-CoV-2 infection in Vero E6 cells whereas remdesivir does at post-entry stage only. Chloroquine is a drug used for an autoimmune disease and malarial infection with potential broad-spectrum antiviral activities [64,65]. An EC_{90} (6.90 μM) against the SARS-CoV-2 in Vero E6 cells is clinically achievable *in vivo* according to a previous clinical trial [66]. Remdesivir is a drug currently under the development for Ebola virus infection and is effective to a broad range of viruses including SARS-CoV and MERS-CoV [67,68]. Functioning as an adenosine analogue targeting RdRp, Remdesivir can result in premature termination during the virus transcription [69,70]. The EC_{90} of remdesivir against SARS-CoV-2 in Vero E6 cells is 1.76 μM, which is achievable *in vivo* based on a trial in nonhuman primate experiment [63, 69]. Encouragingly, in the first case of SARS-CoV-2 infection in the United States, treatment with remdesivir was provided intravenously to the patient on the day 7 without any adverse events observed. The patient's clinical condition was improved on day 8 and the previous bilateral lower-lobe rales disappeared, implying the remdesivir might be effective to the treatment of SARS-CoV-2 infection [22]. This result, however, should be interpreted with caution as this is only single case study and a proper trial control was lacking. In addition, baricitinib, a Janus kinase inhibitor, was also predicted to reduce

the ability of virus to infect lung cell by an analysis of BenevolentAI [71].

Currently, chloroquine and remdesivir are under phase 3 clinical trial and open-label trial for treatment of SARS-CoV-2 infection respectively (Table 2) [72]. Preliminary results showed that chloroquine phosphate had apparent efficacy in treatment of COVID-19 [73]. However, caution must be taken during clinical use of chloroquine as its overdose is highly fatal without known antidote [74]. Despite the lack of documented *in vitro* data supporting the antiviral efficacy on SARS-CoV-2, several antiviral chemotherapeutic agents have been registered for the clinical trials for the treatment of COVID-19 (Table 2) [72].

Conclusion remarks

SARS-CoV-2 is an emerging pathogen, without any effective drug available for treatment at the moment. It spreads quickly and can result in death of the infected patients. Despite the current mortality rate is 2.3% [26], the emergence of large number of infected patients within short period of time could result in the collapse of health care system, and thus the mortality rate might be elevated. Effective preventive measures must be implemented to control it from global spreading. In addition, great effort should be made on the development of vaccine and antiviral drugs. Meanwhile, the intermediate host and the molecular mechanism of its cross-species spread should be further investigated. Legislation should be employed to prohibit the trade of wild animals, the potential intermediate host(s) of various viruses, to prevent the outbreak of this and other novel viruses in future.

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Table 2. Summary of chemotherapeutic drugs under clinical trial for COVID-19

Name of Drug	Target and Mode of Action in other Viruses	*In Vitro* Antiviral Activity to SARS-CoV-2	Clinical Trial Status for COVID-19	Clinical Trial Registration Number
Remdesivir (GS-5734)	Inhibits RdRp [70]	Tested [63]	Phase 3	NCT04252664; NCT04257656
Favipiravir	Inhibits RdRp [75]	Tested [63]	Randomized trial	ChiCTR2000029544; ChiCTR2000029600
Ribavirin	Inhibits viral RNA synthesis and mRNA capping [76]	Tested [63]	Randomized trial, in combination a pegylated interferon	ChiCTR2000029387
Lopinavir	Inhibits 3C like protease (3Clpro) [77]	Not tested	Phase 3	NCT04252274; NCT04251871; NCT04255017; ChiCTR2000029539
Ritonavir	Inhibits 3Clpro [77]	Not tested	Phase 3	NCT04251871; NCT04255017; NCT04261270
Darunavir and Cobicistat	Inhibits HIV protease [78]	Not tested	Phase 3	NCT04252274
ASC09F (HIV protease inhibitor)	Inhibits HIV protease [79]	Not tested	Phase 3, in combination with oseltamivir	NCT04261270
Chloroquine	A lysosomatropic base that appears to disrupt intracellular trafficking and viral fusion events [80]	Tested [63]	Open-label trial	ChiCTR2000030054; ChiCTR2000029939; ChiCTR2000029935; ChiCTR2000029899; ChiCTR2000029898; ChiCTR2000029837; ChiCTR2000029803; ChiCTR2000029761; ChiCTR2000029740; ChiCTR2000029559; ChiCTR2000029542; ChiCTR2000029868; ChiCTR2000029826; ChiCTR2000029762; ChiCTR2000029760; ChiCTR2000029609
Arbidol (Umifenovir)	Block viral fusion [81]	Not tested	Phase 4	NCT04260594; NCT04254874; NCT04255017
Oseltamivir	Inhibit neuaminidase [82]	Not tested	Phase 3 and Phase 4	NCT04255017; NCT04261270

Competing Interests

The authors have declared that no competing interest exists.

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Proof That Face Masks Do More Harm Than Good

Dr Vernon Coleman MB ChB DSc FRSA
Sunday Times Bestselling Author

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This short monograph contains conclusive proof that face masks do more harm than good, and being forced to wear them is a form of oppression designed to have adverse physical and psychological effects upon the wearers rather than having any protective value.

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The Author

Dr Vernon Coleman MB ChB DSc FRSA was the first qualified medical practitioner in the UK to question the significance of the 'crisis' now described as covid-19, telling readers of his website www.vernoncoleman.com at the end of February that he felt that the team advising the Government had been unduly pessimistic and had exaggerated the danger of the virus. At the beginning of March, he explained how and why the mortality figures had been distorted. And on March 14th, he warned that the Government's policies would result in far more deaths than the disease itself. In a YouTube video recorded on 18th March, he explained his fear that the Government would use the 'crisis' to oppress the elderly and to introduce compulsory vaccination. And he revealed that the infection had been downgraded on March 19th when the public health bodies in the UK and the Advisory Committee on Dangerous Pathogens decided that the 'crisis' infection should no longer be classified as a 'high consequence infectious disease'. Just days after the significance of the infection had been officially downgraded, the Government published an Emergency Bill which gave the police extraordinary new powers and put millions of people under house arrest. Dr Coleman, a former GP principal, is a *Sunday Times* bestselling author. His books have sold over two million copies in the UK, been translated into 25 languages and sold all around the world. He has given evidence to the House of Commons and the House of Lords and his campaigning has changed Government policy. There is a short biography at the back of this book. Some references have been given in this book in view of the misleading information widely available online as part of the demonization process now being used to attack those questioning the 'official' line. Vernon Coleman's first book about the coronavirus, *Coming Apocalypse*, was only accepted for publication after all specific references to coronavirus and covid-19 were removed. (Careful editing worked in alternative words and phrases.) Vernon Coleman's second book about the coronavirus hoax (a collection of the transcripts of the videos broadcast between April and September) was titled, *Covid-19: The Greatest Hoax in History*. The book was banned within days of publication. A second version of the same book titled, *Old Man in a Chair* was banned within hours of publication. Vernon Coleman then succeeded in publishing an eBook version of *Old Man in a Chair* on Smashwords. This version can be downloaded free of charge by individuals and libraries.

Dedication

To Antoinette, the bravest person I know, have ever known or ever will know. If one per cent of the people had one per cent of your courage, your intuition, your imagination and your determination, this hoax would have never got off the ground, and those attempting to deceive and oppress the people of the world would by now be languishing in prison – where they belong. You can add my admiration to my love – all of which you already have, of course. You are my everyone and you mean everything to me.

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Introduction

To my horror and disappointment the shops, and indeed the streets, are full of mask-wearing muppets. In the shops everything takes an age as shopper and assistant struggle to make themselves heard through their masks. The muppets have become mumblies.

Many mask wearers keep their masks on even when out of doors, where it is not yet mandatory to do so. These over-compliant collaborators are making oppression easy for the totalitarians who will doubtless soon be demanding that we all wear our masks wherever we are and whatever we are doing – even in our own homes.

Most mask wearers have no idea of the harm they are doing by wearing masks. Indeed, many seem to understand very little about how to wear a mask. I have, on several occasions, seen people drop their mask onto the pavement – face side down of course – pick it up and put it on. Many people wear the same mask for more than two hours (which is dangerous), wear disposable masks more than once (which is dangerous), fail to wash cloth masks (which means they accumulate bacteria, fungi and viruses – all of which are breathed in) touch their mask while it is in position (which makes the mask even worse than useless), put masks into their pockets or handbags and then put them back on creased and grubby (a very dangerous thing to do since the wearer will then be breathing in whatever bugs have been transmitted to the mask. Scarves are often used as face coverings without ever being washed (an effective way to catch throat and lung infections). Nearly everyone constantly fiddles with their masks – not realising that touching a mask is something you should not do. The incidence of throat and chest infections is going to rocket. I wonder how many people will be killed by their masks. We'll never know.

What the hell has happened to people? I am appalled at how easily people have become so compliant and have accepted the Government lies. Many mask wearers now choose their masks as fashion items and wear masks designed to match their outfits. A few wear dark glasses and gloves as well as masks. I fear they probably think they look cool and well-dressed.

As I said earlier, it won't be long before the Government will order them to wear masks indoors. And they will. Some will sleep in them – and doubtless die in them.

Most mask wearers are clearly being made ill by their masks. Because their oxygen levels are low, their eyes are glazed, as though they are drugged.

When the covid-19 hoax began, authorities around the world announced that mask wearing was pointless, and it was widely agreed by experts that they could probably do more harm than good. Indeed, mask wearing was dismissed as 'virtue signalling' by Dr Fauci, the American coronavirus expert. The World Health Organisation supported this general view which was in accordance with the available scientific evidence. Medical advisors around the world agreed that there was no need to wear masks.

Later during the year the story changed.

Although there did not seem to be any scientific evidence supporting such a dramatic change, the World Health Organisation suddenly supported face mask wearing and almost instantly governments around the world, led by medical and scientific advisors, changed their views overnight and decided that we should all wear masks. The WHO's main financial supporter is the American software billionaire Bill Gates who has a number of powerful alliances with media organisations (such as the BBC), strong financial links with Monsanto and a number of drug companies and an enthusiasm for vaccination which, to put it politely, does not seem justified by the evidence.

Why, in the absence of a change in medical advice did the WHO change its mind?

Well, it seems that the campaign for masks to be worn worldwide was either founded by the World Economic Forum, which advocates a global reset and of which that well-known medical expert Prince Charles of England appears to be a leading member, or by an organisation called masks4all. The promotion of masks was supported by Goldman Sachs, the bank, in my view one of the most evil companies on earth (along with Google and Monsanto) which was once memorably described by Matt Taibbi as a vampire squid on the face of humanity. The bank is reported to have claimed that if everyone in America wore a mask, the American economy would be boosted.

I have no idea how they came to this conclusion or why they think their advice is better than medical research.

The masks4all website promotes the slogan, 'Anyone without a mask puts you and your family at risk', and masks4all is a fiscally sponsored project of something called Community Initiatives which seems to have links to a whole range of organisations I've never heard of.

As a result of the WHO's change of advice, media throughout the world also changed their advice. The well-known video sharing site called YouTube betrayed users by deleting videos made my doctors (such as myself) which offered scientific evidence proving that masks are of no value but are dangerous.

I could find no convincing scientific evidence supporting this change of heart but, as a result of the WHO's about-turn, populations everywhere were forced to wear masks – or to risk being fined. Only those prepared to self-certify that they could not wear a mask were allowed to travel on trains or buses or any other form of public transport without a face covering. And shortly afterwards, the rule was extended to cover shops and public buildings. Strangely, people in offices were not always forced to wear masks – as though the coronavirus were in some way inactive in a working environment but active in a shopping environment.

I have kept this book short and have resisted the mild temptation to include a history of mask wearing in all its various forms. The only thing that is important at the moment is whether mask wearing is useful and necessary or dangerous and being forced upon us as part of the new totalitarianism.

I repeat, I have yet to find any reliable scientific evidence proving that masks are useful, safe or worth wearing. Many doctors who are not employed by governments or public agencies, seem to agree that mask wearing is very likely to do far more harm than good.

The available scientific evidence shows that masks, whatever their form, provide a poor obstacle to infective organisms but do impede air intake and oxygen exchange.

Those who wear masks are collaborating in a massive conspiracy.

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RMG

Masks and Mask Wearing: 101 Facts You Must Know

1

Surgeons have been using surgical masks since their introduction in 1897. It has for some years been customary for surgeons and nurses to wear surgical masks in the operating theatre and to change masks part of the way through any procedure lasting more than a few hours.

The dangers associated with mask wearing were assessed by five doctors and published in the journal *Neurocirugia* in 2008.

Although it is customary for operating theatres to be fitted with air conditioning systems, the writers of the article, entitled, *Preliminary Report on Surgical Mask induced Deoxygenation During Major Surgery*, pointed out that it is known that heat and moisture are trapped beneath surgical masks and concluded that 'it seems reasonable that some of the exhaled carbon dioxide may also be trapped beneath them, inducing a decrease in blood oxygenation'.

A total of 53 surgeons, of both sexes, all employed at university hospitals and aged between 24 and 54 years of age were tested. All were non-smokers and none had any chronic lung disease. The test involved pulse oximetry before and after the course of an operation. The study showed that the longer a mask was worn the greater the fall in blood oxygen levels. This may lead to the individual passing out and it may also affect natural immunity – thereby increasing the risk of infection.

The masks used were disposable, sterile, one-way surgical paper masks. To eliminate the effect of dehydration over a several hour surgical operation, the surgeons were allowed after every hour to drink water through a straw.

The authors of the paper concluded that, 'When the values for oxygen saturation of haemoglobin were compared, there were statistically significant differences only between preoperational and post operational values. As the duration of the operation increases, oxygen saturation of haemoglobin decreases significantly.'

2.

This quote is taken from *New England Journal of Medicine*: 'We know that wearing a mask outside health care facilities offers little, if any, protection from infection. Public health authorities define a significant exposure to covid-19 as face to face contact within six feet with a patient with symptomatic covid-19 that is sustained for at least a few minutes (and some say more than 10 minutes or even 20 minutes). The chance of catching covid-19 from a passing interaction in a public space is therefore minimal. In many cases the desire for widespread masking is a reflexive reaction to anxiety over the pandemic.' The reference is: M.Klompas, C.Morris et al 'Universal Masking in hospitals in the covid-19 era' – *New England Journal of Medicine 2020*

3.

It is possible that wearing a mask for hours at a time could cause pulmonary fibrosis. In August 1988, the proceedings of the VIIth International Pneumoconioses Conference

included details of three cases of pulmonary fibrosis, thought to be due to exposure to synthetic textile fibres. The first was a woman of 52 who had a dry cough with increasing difficulty in breathing. Changes were visible on an X-ray. The woman had been working in a textile shop for 15 years where her job was measuring and cutting cloth – mainly synthetic materials. The second patient was a woman of 66 who also had difficulty in breathing. The lungs of this patient also showed X-ray changes. She was also involved in cutting and measuring synthetic fabrics. A third woman, aged 47, had bilateral pulmonary fibrosis. Studies have shown that loose fibres are seen on all types of masks and may be inhaled causing serious lung damage.

4.
People who cough and sneeze into their mask increase the risk of a build-up of fungi and bacteria – which can lead to dangerous chest infections.

5.
In 2015, the *British Medical Journal* published a paper entitled, *A Cluster Randomised Trial of Cloth Masks Compared with Medical Masks in Healthcare Workers*. The paper was written by nine authors from the University of New South Wales, the University of Sydney, the National Institute of Hygiene and Epidemiology in Vietnam and the Beijing Centers for Disease Control and Prevention in China. The aim of the study was to compare the efficacy of cloth masks to medical masks in hospital health care workers. The study, which was extensive, concluded that the results caution against the use of cloth masks.

'This is an important finding to inform occupational health and safety,' concluded the authors. 'Moisture retention, reuse of cloth masks and poor filtration may result in increased risk of infection.'

And the authors added: '...as a precautionary measure, cloth masks should not be recommended for health care workers, particularly in high risk situations, and guidelines need to be updated'.

6.
Many individuals have turned their masks into fashion items. I wonder how many wear the same mask day after day without washing them. If masks are unwashed then they become breeding grounds for bacteria, fungi and viruses. If they are washed then they become even more useless (if that is possible) than they were when new. The enthusiasm for 'fashion' masks, which match other items of clothing, is rising. But wearing a fashionable mask is akin to a slave painting their chains to look pretty.

7.
The word 'covering' is now often used in official propaganda material, having replaced the word 'mask'. It has clearly been decreed more acceptable than the more usual word 'mask' which carries worrying overtones.

8.
It is often difficult to hear what people say when they are wearing masks – particularly if the masks are close-fitting. Conversations are kept to a minimum and social interactions in shops

and other establishments are functional at best. (It is worth noting that hairdressers and others in service industries have been instructed to talk as little as possible – ostensibly to prevent the spread of the virus. Singing, a joyful activity for singers and listeners, has been banned.)

9.
Mask wearers have been encouraged by the psy-op specialists to show their hatred for mask wearers. This loathsome ploy was first promoted by Ms Dick of the Metropolitan police in London, and seems designed to make those who cannot or do not wear masks feel guilty and ashamed. The mentally and physically disabled will, therefore, be harassed and abused if they dare to go out of their homes.

10.
In October 2020, it was noticeable that when street photographs were published in the press or online, they invariably showed members of the public wearing masks – even though mask wearing out of doors was not compulsory. It was at that point clear that the public would soon be forced to wear masks out of doors – even when exercising.

11.
Symptoms caused by mask wearing are now being wrongly blamed on covid-19. It seems likely that when mask wearing starts to result in deaths (as it will do), those deaths will be blamed on covid-19 and used as a reason for politicians and advisors to demand that people wear masks for even longer hours. The vicious circle will be complete.

12.
The Occupational Safety and Health Administration in the US has decreed that any room where the carbon dioxide is present at a level or more than 5,000 parts per million is unsafe and has an environment which is toxic and dangerous. Carbon dioxide levels normally exist at between 350 and 450 parts per million. Acceptable indoor quality level is 600 to 800 ppm. Any employer who attempts to force employees to work in an environment where the carbon dioxide level is too high can be held to account. Similarly, any teacher who attempts to force children to study in such an environment would be legally responsible. If a nuclear submarine has a level of over 5,000 parts per million then it must surface because it is considered to have a threatening and dangerous environment. There is much dispute about the levels of carbon dioxide which may develop if a mask is worn. Generally, the tighter a mask fits the greater the risk that the level of carbon dioxide will rise to dangerous levels but it must be remembered that most members of the public have no training on how to wear a mask and there are few if any restrictions on mask manufacture. Indeed, members of the public are making their own masks and using bits of left over material to do so. A wide variety of masks are being designed and worn. Those dismissing the danger as non-existent might like to read HSE Contract Research Report no 27/1991, produced by the British Health and Safety Executive and entitled, *Dead space and inhaled carbon dioxide levels in respiratory protective equipment*. Those dismissing the risks associated with carbon dioxide levels should know that the amount of carbon dioxide in a small room can easily rise to levels which are dangerous enough to have a dramatic effect on decision making. At least eight studies in the last decade have studied carbon dioxide levels indoors and have found worrying levels above 1,200 parts per million.

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13.
Women giving birth in France have to wear face masks. In my opinion, this is dangerous and will put extra strain on the heart. Pregnant women should not wear a mask, not only because of the risk to themselves but because of the risk to their unborn child. There is a real risk that the baby will be stillborn or in some way damaged or poorly developed at birth.

14.
A number of those who have studied the science, regard mask wearers as collaborators – who will lead us all to damnation if we let them. Their philosophy is: 'If you've got a brain then you don't need a mask'.

15.
Research conducted by four French doctors in 2018 and reported in *Rev Mal Respir*, was designed to evaluate the effect of wearing a surgical mask during a six minute walking test. The authors of the study were E.Person, C.Lemercier, A.Royer and G.Reychler. (The six minutes walking test is regularly used in pulmonology.)

For this research, 44 health subjects were used. Each individual performed two six minute walking tests – one with a mask and one without a mask.

The researchers found that dyspnoea variation was significantly higher with a surgical mask, and concluded that the difference was clinically relevant.

The conclusion was that 'wearing a surgical mask modifies significantly and clinically dyspnoea.'

16.
Vital evidence outlining the dangers and ineffectiveness of mask wearing has been banned, blocked or deleted from the internet. Videos assessing the value of face mask wearing on the basis of the scientific evidence have been removed. Discussion and debate about the value of face masks are suppressed by politicians and the media. Research material outlining the dangers of mask wearing has been removed from the internet on the basis that 'it is no longer relevant in our current climate'. So-called 'fact-checkers' invariably dismiss medical reports published by doctors and scientists – however eminent those experts might be. The so-called 'fact-checkers' are often linked to commercial organisations or groups with commercial links. No one seems to check the 'fact-checkers' – though they should.

17.
Between 2004 and 2016, at least twelve articles appeared in medical and scientific journals showing that face masks do not prevent the transmission of infection.

18.
There are no strict rules about what constitutes a face mask, and the rules about when and where masks should be worn are constantly changing. This proves that there is no science supporting the wearing of masks. So, for example, it is clearly absurd that the coronavirus should ever be thought to spread from person to person in a shop but not in an office.

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19.
The tighter a mask fits the more likely it is to reduce blood oxygen levels and to increase the amount of carbon dioxide being inhaled. It should be noted that optimal oxygen intake in humans should, according to the US Occupational Safety and Health Administration, be between 19.5 and 23.5% and that any human-occupied airspace where oxygen measures less than 19.5% should be labelled as not safe for workers. However, the percentage of oxygen inside a masked airspace generally measures 17.4% within seconds of putting on the mask. A tighter fitting mask will result in lower oxygen levels and higher carbon dioxide levels. Lower oxygen levels and increased levels of carbon dioxide stimulate greater inspiratory flow – leading to a greater risk that loose fibres from the facemask will be inhaled.

20.
In Belgium, in September 2020, a group of 70 doctors sent an open letter to Ben Weyts, the Flemish Education Minister in which they claimed that children are badly affected by having to wear face masks. 'Mandatory face masks in schools are a major threat to their development,' they wrote. 'It ignores the essential need of the growing child. The well-being of children and young people is highly dependent on emotional attachment to others.'

(Observing facial expressions help a child's social development and so seeing those around them wearing masks must therefore delay a child's development.)

According to *The Brussels Times*, the doctors continued that 'there is no large-scale evidence that wearing face masks in a non-professional environment has any positive effect on the spread of viruses, let alone on general health. Nor is there any legal basis for implementing this requirement.'

'Meanwhile, it is clear that healthy children living through covid-19 heal without complications as standard and that they subsequently contribute to the protection of their fellow human beings by increasing group immunity.'

'The only sensible measure to prevent serious illness and mortality caused by covid-19 is to isolate individual teachers and individual children at increased risk,' they added. 'This risk assessment is not the task of the Ministry of Education but the task of the treating physicians in consultation with their patients.'

21.
Leading German virologist Professor Streeck has criticised the use of masks, which he has said are a wonderful breeding ground for bacteria and fungi. He has also criticised lockdowns.

22.
Two dentists in New York have reported seeing a number of patients with inflamed gums and other problems. The news story was reported in the *New York Post.*

'We're seeing inflammation in people's gums that have been healthy forever, and cavities in people who have never had them before,' said dentist Rob Ramondi. 'About 50% of our patients are being impacted by this, (so) we decided to name it 'mask mouth'.'

Another dentist, Marc Sclafani, told the *New York Post* that 'gum disease, or periodontal disease, will eventually lead to strokes and an increased risk of heart attacks.'

The dentists said that the problem is caused by the fact that face coverings increase mouth dryness and contribute to a build-up of bad bacteria.

'People tend to breathe through their mouth instead of through their nose while wearing a mask,' said Sclafani. 'The mouth breathing is causing the dry mouth, which leads to a decrease in saliva – and saliva is what fights the bacteria and cleanses your teeth.'

23.
Masks diminish the quality of our relationships with other people. We trust people less if they are wearing masks. We cannot see smiles and so we fear people more.

24.
When the truth finally comes out about the dangers of masks, teachers making children wear masks in schools will be sued. Bosses making their employees wear masks will also be sued. Ignorance is no defence. And as the Nuremburg defendants discovered the reply, 'I was obeying orders' is no defence.

25.
A 26-year-old man suffered a collapsed lung after running 2.5 miles while wearing a face mask. Doctors say his condition was caused by the high pressure on the man's lung, due to his intense breathing while wearing the face mask. When masks are made mandatory outdoors in the UK, joggers and cyclists will have no choice but to wear masks. Many will die.

26.
Never in history have so many people worn masks obstructing their intake of air. A considerable amount of research has been done into mask wearing. The research shows clearly that masks are ineffective in preventing the movement of infective organisms but that they reduce oxygen levels and increase levels of carbon dioxide. Most of those advocating mask wearing are either ignorant or are deliberately exposing mask wearers to danger for no reason. The side effects of excess carbon dioxide (hypercapnia) are headaches, dizziness, drowsiness, nausea, vomiting and a tight feeling in the chest. The risks are usually dismissed as irrelevant or non-existent by government spokesmen and fact checkers (many of whom are sponsored by industry) but I found it impossible to find reliable scientific evidence supporting this reassurance. It should be noted that the BBC, which claims to produce fact checking material, has financial links to the Bill and Melinda Gates Foundation (which itself has strong financial links to the vaccine industry among others) and is in my view entirely untrustworthy. The question, as always, is a simple one: who will check the 'fact checkers'?

Government defenders regard the removal of a video from YouTube as a sign that the advice in the video must have been 'wrong'. The reality, of course, is the exact opposite since YouTube takes down material which disagrees with advice from the World Health Organisation which is now heavily sponsored by the Bill and Melinda Gates Foundation.

27.

Streets are littered with discarded face masks which ought to have been incinerated as medical waste. If there really were a plague about, I can think of no better way to spread it than to litter the country with dirty face masks.

28.
In the UK, the rules seem to me to allow anyone to claim a mask wearing exemption if they have a physical or mental reason for not wearing a mask or if they feel anxious about wearing a mask. And that exemption should not be questioned.

29.
Does wearing a face mask reduce your immunity levels? No one seems to know the answer for sure but it seems possible that if people wear face masks for long periods (months or years) then the absence of contact with the real world might well have a harmful effect on immunity – if the face mask works. Do face masks prevent us developing immunity to particular diseases? This depends on many factors – mainly the effectiveness of the face mask. But if the mask isn't preventing the development of immunity then it probably isn't worth wearing anyway.

30.
Two widely acknowledged hazards of wearing a face mask are first that the mask may give a false sense of security and stop people taking other precautions – such as washing their hands. Secondly, if masks aren't worn properly (never touched and changed regularly) they can do much more harm than good.

31.
There is no doubt that face masks can be dangerous. In China, two school boys who were wearing face masks while running on a track both collapsed and died – possibly, I would surmise, because the strain on their hearts by the shortage of oxygen proved fatal. At least two other deaths due to mask wearing have been reported in Germany.

32.
A report published in the *British Medical Journal* summarised some other risks. First, when you wear a face mask some of the air you breathe out goes into your eyes. This can be annoying and uncomfortable and if, as a result, you touch your eyes you may infect yourself. Second, face masks make breathing more difficult and, as I have already pointed out, anyone who has a breathing problem will find that a mask makes it worse. Also, some of the carbon dioxide which is breathed out with each exhalation is then breathed in because it is trapped. Together these factors may mean that the mask wearer may breathe more frequently or more deeply, and if that happens then someone who has the coronavirus may end up breathing more of the virus into their lungs. If a mask is contaminated because it has been worn for too long then the risks are even greater. How long is too long? No one knows but two hours seems an accepted limit. No research has been done as far as I know. Third, there is a risk that the accumulation of the virus in the fabric of the mask may increase the amount of the virus being breathed in. This might then defeat the body's immune response and cause an increase in infections – other infections, not just the coronavirus.

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33.
Dr Russell Blaylock, a retired neurosurgeon, has reported that wearing a face mask can produce a number of problems varying from headaches to hypercapnia (a condition in which excess carbon dioxide accumulates in the body) and that the problems can include life threatening complications. Symptoms of hypercapnia include drowsiness, dizziness and fatigue. Some of the carbon dioxide exhaled with each breath is retained behind the mask and then breathed in again.

Dr Blaylock has also warned of neurological problems. 'By wearing a mask, the exhaled viruses will not be able to escape and will concentrate in the nasal passages, enter the olfactory nerves and travel into the brain,' he wrote.

And Dr Blaylock has warned of the danger to patients with cancer. 'People with cancer, especially if the cancer has spread, will be at a further risk from prolonged hypoxia as the cancer grows best in a microenvironment that is low in oxygen. Low oxygen also promotes inflammation which can promote the growth, invasion and spread of cancers. Repeated episodes of hypoxia have been proposed as a significant factor in atherosclerosis and hence increases (the risk of) all cardiovascular and cerebrovascular diseases.'

34.
The risk of side effects developing when wearing a mask depend to some extent on whether the mask is made of cloth or paper or is an N95 mask filtering out at least 95% of airborne particles. One study of 212 healthcare workers showed that a third of them developed headaches with 60% needing painkillers to relieve the headache. Some of the headaches were thought to be caused by an increase in the amount of carbon dioxide in the blood or a reduction in the amount of oxygen in the blood. Another study, this time of 159 young health workers, showed that 81% developed headaches after wearing face masks – so much so that their work was affected.

35.
An N95 mask can reduce blood oxygenation by as much as 20% and this can lead to a loss of consciousness. Naturally, this can be dangerous for vehicle drivers; masked bus drivers, for example, could be putting their passengers' lives at risk.

36.
Dr Blaylock has pointed to a study entitled, *The use of masks and respirators to prevent transmission of influenza: a systematic review of the scientific evidence*. This study looked at 17 separate studies and concluded that none of the studies established a conclusive relationship between the use of masks and protection against influenza infection. 'When a person has TB we have them wear a mask,' concluded Dr Blaylock, 'not the entire community of the non- infected.'

Dr Blaylock has also described how mask wearing can affect immunity. '...a drop in oxygen levels (hypoxia) is associated with an impairment in immunity,' he has written. 'Studies have shown that hypoxia can inhibit the type of main immune cells used to fight viral infections called the CD4+T- lymphocyte. This occurs because the hypoxia increases the level of a compound called hypoxia inducible factor-11 (HIF-1) which inhibits T-lymphocytes and stimulates a powerful immune inhibitor cell. This sets the stage for

contracting any infection, including covid-19, and making the consequences of that infection much graver. In essence, your mask may very well put you at an increased of infections and if so, having a much worse outcome.'

37.
Visors have one important advantage over masks. The evidence shows clearly that although masks are useless at preventing the spread of infection they are potentially extremely dangerous. On the other hand, although visors are just as useless as masks at preventing the spread of infection they are at least relatively free of danger and are, therefore, the face coverings of choice for those who feel the need to wear one. Although they have not been tested extensively, visors are probably just as useless as masks but they may be less dangerous to wearers. The fact that governments allow citizens to use visors proves beyond any shadow of doubt that the whole mask wearing scam is just that – a scam. The aim is to obtain psychological control rather than to control disease.

38.
Dr Margarite Griesz-Brisson MD PhD is a leading European neurologist and neurophysiologist. In October 2020, she warned that rebreathing our exhaled air, because of wearing masks, will create oxygen deficiency and an excess of carbon dioxide in the body. 'We know,' she said, 'that the human brain is very sensitive to oxygen deprivation. There are nerve cells in the hippocampus that cannot last longer than three minutes without oxygen.' Dr Griesz-Brisson pointed out that the acute warning symptoms of oxygen deprivation are headaches, drowsiness, dizziness, difficulty in concentration and slowing down of reaction times. The real danger is, however, that when the oxygen deprivation becomes chronic, the symptoms disappear because the body gets used to them. However, efficiency remains impaired and the damage to the brain continues. 'We know that neurodegenerative disease takes years to decades to develop. If today you forget your phone number, the breakdown in your brain would have already started two or three decades ago.'

Dr Griesz-Brisson explains that while the mask wearer thinks that they are becoming accustomed to re-breathing exhaled air, the problems within the brain are growing as the oxygen deprivation continues.

She also points out that brain cells which die, because of a shortage of oxygen, will never be replaced. They are gone for ever. She goes on to argue that everyone is entitled to claim exemption from mask wearing because oxygen deprivation is so dangerous – and masks don't work.

Finally, Dr Griesz-Brisson points out that children and teenagers must never wear masks, partly because they have extremely active and adaptive immune systems but also because their brains are especially active and vulnerable. The more active an organ is the more oxygen it needs. And so the damage to children's brains is huge and irreversible.

She warns that dementia is going to increase in ten years, and the younger generation will not be able to reach their potential because of the mask wearing.

Oxygen deprivation adversely affects the heart and the lungs but it also damages the brain. And the damage will be permanent.

'My conclusion has to be that no one has the right to force us to deprive our bodies of oxygen for absolutely no good reason. Depriving individuals of oxygen is a crime perpetrated by those demanding that we wear masks. Those who let it happen and those who collaborate are also guilty. And those who wear masks in situations where they are not legally required are cooperating in a criminal activity.'

Inevitably, Dr Griesz-Brisson's interview was removed from YouTube as part of the global suppression of medical information.

39.
The nasal flu vaccine, the one given to children, contains attenuated or weakened live viruses. It is possible that if a child has a weakened immune system – as would doubtless be the case if they'd been imprisoned and kept indoors a lot or had for absolutely no good reason been wearing a mask for a long time – then a vaccine virus might conceivably cause the flu. And because attenuated viruses aren't quite dead, they could change or even become live and they could mutate and they could result in other people being infected. So it is possible that a child who has the nasal flu vaccine could transmit the flu virus to Granny – who might die as a result.

40.
Many doctors now believe that masks are being used as a conditioning tool to make us more compliant. Most people dutifully wear them, wrongly believing that their masks will protect them from the coronavirus, and without any idea of the damage that is being done to their physical and mental health. All around the world citizens have proved to be extraordinarily obedient and gullible, pathetic even, accepting the lies and deceits quite freely. Social distancing and the wearing of masks are both likely to be long-term and possibly permanent, and the physical and mental damage done is also likely to be long-term and permanent.

41.
The rules about mask wearing change from time to time and from one area to another (proving that there is no science behind mask wearing) and we never quite know what punishments to expect. In one part of America you could be sent to prison for a year if you failed to wear a mask. In another part of America you had to pay a 2,000 dollar fine but there was no prison sentence. In Texas, some people have been told that they should wear masks in their own homes. In one shop a guard pulled a gun on a man who was not wearing a mask.

42.
The Chinese wear masks routinely – to protect themselves from pollution. But the masks appeared to make no difference to the spread of the coronavirus in China.

43.
Economists, professors of anything, engineers, bankers, teachers, company directors and golf course management executives are all of one mind: we must all wear our masks. Astonishingly, and inexplicably, the media is giving yards of print space and many broadcasting hours to these people but denying space or time to experienced, well-qualified doctors who simply want to provide truth, scientific evidence and common sense. The few doctors who toe the 'party line' on the covid-19 hoax are guaranteed huge amounts of publicity.

44.

Will masks become part of the new world religion (widely known to its supporters as Chrislam)? Masks are traditionally associated with a number of repressive rituals.

45.
In a paper published in *MedRxiv.2020* entitled, *Physical interventions to interrupt or reduce the spread of respiratory viruses*, T.Jefferson, M.Jones et al concluded that compared to not wearing a mask there was no reduction of influenza-like illnesses when health care workers or the general population wore masks.

In March 2020, Dr Jenny Harries, Deputy Chief Medical Officer in the UK, warned that it is possible to trap the virus in a mask and start breathing it in. She said that wearing a mask was not a good idea.

46.
A meta-analysis published in May in 2020 by the Centers for Disease Control was entitled, *Non-pharmaceutical measures for pandemic influenza in non-healthcare settings – personal protective and environment measures*. The authors concluded that the evidence from randomized controlled trials of face masks did not support a substantial effect on the transmission of laboratory-confirmed influenza, either when worn by infected persons or by persons in the general community to reduce their susceptibility.

47.
In May 2016, a meta-analysis written by J.Smith and C.MacDougall and published in the *Canadian Medical Association Journal* concluded that both randomised controlled trials and observational studies of N95respirators and surgical masks used by health care workers, did not show any benefit against the transmission of acute respiratory infections. The authors also concluded that acute respiratory infection transmission may have occurred via the contamination of provided respiratory protective equipment during storage and through the reuse of masks and respirators during the working day.

48.
In 2019, a scientific paper written by L.Radonovich and M.Simberkoff was published in the *Journal of the American Medical Association*. The paper was entitled, *N95 respirators vs medical masks for preventing influenza among health care personnel: a randomized clinical trial*. The study involved 2,862 volunteers and showed that both surgical masks and N95 respirators 'resulted in no significant difference in the incidence of laboratory confirmed influenza'.

49.
In 2011, a meta-analysis of 17 separate studies regarding masks and the effect on the transmission of influenza found that none of the 17 studies established a conclusive relationship between mask or respirator use and protection against influenza infection. The study was conducted by F bin-Reza, V.Lopez et al.

50.

It was proved in 1920 that cloth masks fail to impede or stop flu virus transmissions. It was concluded that the number of layers of fabric required to prevent pathogen penetration would require a suffocating number of layers and could not be used. It was also recognised that there was a problem of leakage around the edges of cloth masks.

51.
A paper entitled, *Use of surgical face masks to reduce the incidence of the common cold among health workers in Japan: a randomized clinical trial* was published in the *American Journal of Infection Control* in June 2009. The authors concluded that face mask use was found not to be protective against the common cold when compared to controls who did not wear face masks.

52.
In 2009, investigators studied masks for an article published in the *Journal of Occupational Environmental Hygiene*. The authors concluded that for both N95 masks and surgical masks, expelled particles were deflected around the edges of the masks and that there was measurable penetration of particles through the filter of each mask.

53.
A paper entitled, *Face coverings, aerosol dispersion and mitigation of virus transmission risk*, written by M.Viola, B.Peterson et al, was published in 2005. The authors concluded there have been farther transmissions of virus-laden fluid particles from masked individuals than from unmasked invididuals, by means of leakage jets, including backward and downward jets that may present major hazards. All masks were thought to reduce forward airflow by 90% or more over wearing no mask; however Schlieren imaging showed that surgical masks and cloth masks resulted in a greater upward airflow past the eyebrows than occurred in individuals not wearing masks at all. Backward unfiltered air flow was found to be strong with all the masks tested, compared to individuals not wearing masks. In other words, if a person wearing a mask has an infection then the risk of being infected is high for anyone standing behind the wearer.

54.
A paper by H.Jung and J.Kim, which was entitled, *Comparison of filtration efficiency and pressure drop in anti-yellow sand masks, quarantine masks, medical masks, general masks and handkerchiefs*, was published in *Aerosol Air Qual Res* in June 2013. The paper studied 44 mask brands and found that the average penetration was 35.6%. Even most medical masks had over 20% penetration. Most importantly, the study found that general masks and handkerchiefs had no protective function in terms of aerosol filtration efficiency.

55.
A study published in 2015 in the *British Medical Journal* by C.MacIntyre, H.Seal et al, entitled, *A cluster randomised trial of cloth masks compared with medical masks in healthcare workers* found that penetration of cloth masks by particles was almost 97% while penetration of medical masks was 44%. The authors showed healthcare workers wearing

cloth masks had significantly higher rates of influenza-like illness after four weeks of using masks at work – when compared to controls.

56.
It is widely assumed that surgeons and operating theatre staff must wear masks but a paper by N.Mitchell and S.Hunt entitled, *Surgical face masks in modern operating rooms – a costly and unnecessary ritual* which was published in the *Journal of Hospital Infection* in July 1991– found no difference in wound infection rates with and without surgical masks. Other scientific research papers have established similar conclusions. There was, for example, a paper published in 2015 in the *Journal of the Royal Society of Medicine* by C DaZhou, P Sivathondan et al. The paper was entitled, *Unmasking the surgeons: the evidence base behind the use of facemasks in surgery.*

57.
No one should wear a mask while exercising. There have been several reports of masked children dying while exercising. There is evidence showing that mask wearing reduces blood oxygen levels even when the wearer is standing still. Individuals who exercise are likely to sweat. Masks then become damp more quickly and the damp promotes the growth of microorganisms.

58.
S Bae and M.Kim et al published a paper in April 2020 in the journal *Annals Internal Medicine* 2020. The title of their paper was, *Effectiveness of surgical and cotton masks in blocking SARS CoV 2: A controlled comparison in 4 patients* and they concluded that 'neither surgical nor cotton masks effectively filtered SARS-CoV-2 during coughs by infected patients'.

59.
It is not just out of politeness that surgeons and dentists traditionally remove their masks when talking to patients. They do so because they know that patients and relatives find it more reassuring, and more comforting, to see a whole human face rather than just part of one. Moreover, it is often exceedingly difficult to understand what someone is saying when they are wearing a mask.

60.
'The face mask traps warm moisture that is produced when we exhale,' says dermatologist Dr Maggie Kober. 'For those with acne, this can lead to acne flares. For many others, this warm, moist environment surrounding skin creates the perfect condition for naturally occurring yeast and bacteria to flourish and grow more abundant. This overgrowth of yeast and bacteria can produce angular cheilitis, the cracking and sores at the corners of the mouth.'

Face masks can also present a risk of contact dermatitis and can increase the risk of staph infections.

61.

In June 2020, researchers suggested that the oxygen reduction and carbon dioxide build up (hypercapnia) might put a considerable strain on the heart, lungs, kidneys and immune system. This risk has not been disproven. The paper was written by B.Chandrasekaran, S.Fernandes and entitled, *Exercise with facemask: are we handling a devil's sword – a physiological hypothesis*.

62.
Research has shown that respirators and masks contained influenza bugs found on their outer surfaces. The risk was higher the longer the masks were worn. It has also been established that bacteria accumulate on masks – and those bacteria can cause lung infections.

63.
Mask wearers are more likely to develop infection than non-mask wearers. This may be due to the fact that masks reduce blood oxygen levels and adversely affect natural immunity. It is likely that anyone who wears a face mask for long periods will have a damaged immune system – and be more susceptible to infection. Studies have shown that hypoxia can inhibit immune cells used to fight viral infections. Wearing a mask may make the wearer more likely to develop an infection – and if an infection develops it is likely to be worse. Low oxygen levels reduce T cells and therefore reduce immunity levels.

64.
'Is a mask necessary in the operating theatre?' by N.Orr, published in *Annals Royal College of Surgeons England* in 1981, found no difference in wound infection rates whether or not surgeons wore surgical masks.

65.
Thousands of years ago, it was discovered that forcing people to wear masks covering much of their faces broke their will and made them subservient. The masks depersonalised the wearers and dehumanised them too.

66.
Dr Scott Atlas, White House coronavirus advisor, claimed that face coverings are not effective in stopping the virus's spread. He tweeted, 'Masks work? NO' alongside a link to an article that argued against the success of face coverings. Twitter removed his tweet.

67.
Children are now demanding to be allowed to wear masks (so that they look 'grown up') and some are even fitting masks onto their dolls. Parents do not seem aware that children are especially vulnerable to the brain damage which will inevitably be a result of the hypoxia that is induced by mask wearing.

68.

In some parts of the world (particularly parts of the United States of America) it is compulsory to wear a mask even while exercising. This is particularly dangerous and will lead to a dramatic increase in the number of people dying while exercising.

69.
CIA torture techniques include forcing people to remain isolated (as in lockdowns), to keep their distance from others (social distancing) and to wear masks.

70.
A paper in the journal, *Ophthalmology and Therapy* (published in September 2020), written by Majid Moshirfar, William B. West Jr and Douglas P. Marx warned of an increase in dry eye symptoms among mask wearers. Those using masks regularly for extended periods are more likely to show symptoms. The condition is caused by exhaled air blowing upwards from the mask into the eyes. The increased airflow causes irritation or inflammation. The authors conclude 'this mask-associated ocular irritation raises concerns about eye health and increased risk of disease transmission in prolonged mask users'. Their advice is that lubricant eye drops should be used and goggles should be worn.

Dry eyes lead to individuals rubbing their eyes which will lead to an increase in the risk of infection.

Doctors and opticians are also reporting an increase in the number of patients complaining of persistent headaches – because of mask wearing.

71.
Those who defend mask wearing claim that the practice must be safe because surgeons and operating theatre staff wear masks. But operating theatres have a controlled air temperature, masks are replaced every couple of hours, and those working in an operating theatre do not rush around doing their shopping. It is important to remember that surgeons who wear masks (and not all do) work while standing, rather than walking, and they work in a controlled, air conditioned environment. They do not touch their masks and they change them regularly.

72.
We are told that fines for not wearing masks are going up and the military will be brought in if the police cannot cope.

73.
Mask wearing is making shopping unpleasant, and thereby destroying thousands of small businesses. This is one of the changes in society which will lead to the global reset promoted by the United Nations and its Agenda 21 and the World Economic Forum. The plan is to force us to live in sterile cities and to do all our shopping online.

74.
Mask wearing, social distancing and testing will become a permanent part of our world. The end result will be the permanent closure of schools – and the moving of education online.

Teachers who insist that pupils wear masks and maintain social distancing rules are destroying their own jobs.

75.
Fabric masks may allow viruses to enter and are not considered to be anywhere near as protective as surgical masks. A study I have seen entitled, *Optical microscopic study of surface morphology and filtering efficiency of face masks* concluded that face masks made of cloth are not very good at filtering out viruses because the pores are much bigger than the particulate matter that needs to be kept out. One study showed that face masks may have pores five thousand times larger than virus particles. If this is accurate it means that the virus will wander through the face mask much like a mouse wandering through Marble Arch.

76.
The World Health Organisation recommends that disposable masks should be discarded after one use. Few people can afford to buy two or more disposable masks for every member of their family, and so masks are frequently worn more than once. This massively increases the risk of a chest infection developing.

77.
Professor Chris Whitty, the UK's Chief Medical Officer, said in March 2020 that wearing a face mask had almost no effect on reducing the risk of contracting covid-19, and that the Government did not advise healthy individuals to wear masks. Instead, he suggested that people should wash their hands for roughly 20 seconds.

78.
Surgical masks are worn to stop respiratory droplets and human debris from the surgeon or nurse from falling into a wound.

79.
Much of the air we breathe in and out, goes around the side of the mask unless it is very tight fitting. Loose fitting masks are therefore entirely useless. Tight fitting masks may provide some filtration protection but the tighter a mask is the greater the risk of serious hypoxia and hypercapnia developing.

80.
It is sometimes said that masks should be worn to protect the elderly, the sick and those with serious health problems. It would make far more sense to suggest to such individuals that they protected themselves from society, if they chose to do so. But they should have the choice. And there is absolutely no reason to force younger, healthy members of society to endure lockdowns (which will clearly kill far more people than covid-19), social distancing (which will create massive psychological problems) or to wear masks (which will do no good but which will cause physical and mental health problems).

81.
A paper published by Boris Borovoy, Collen Huber and Q.Makeeta investigated all types of masks and discovered that 'loose particulate was seen on each type of mask'. They also noted that 'tight and loose fibres were seen on each type of mask' and warned that 'if even a small portion of mask fibres is detachable by inspiratory inflow, or if there is debris in mask manufacture or packaging or handling, then there is the possibility of not only entry of foreign material to the airways but also entry to deep lung tissue, and potential pathological consequences of foreign bodies in the lungs'. The authors draw attention to a correlation between the inhalation of synthetic fibres and various bronchopulmonary diseases such as asthma, alveolitis, chronic bronchitis, bronchiectasis, fibrosis, spontaneous pneumothorax and chronic pneumonia. The authors warn that if widespread masking continues, then the potential for inhaling mask fibres and environmental and biological debris continues on a daily basis for hundreds of millions of people. This should be alarming for physicians and epidemiologists knowledgeable in occupational hazards.' The authors warn that pulmonary fibrosis, a risk of mask wearing, cannot be cured and has a 5 to 20 year survival rate of only 20%.

82.
A mask worn by a child in school was examined in a laboratory. Tests showed 82 bacterial colonies and 4 mould colonies growing on the mask.

83.
'I'm seeing patients that have facial rashes, fungal infections, bacterial infections,' said Dr James Meehan. 'Reports coming from my colleagues all over the world, are suggesting that the bacterial pneumonias are on the rise. Why might that be? Because untrained members of the public are wearing medical masks, repeatedly in a non-sterile fashion. They're becoming contaminated. They're pulling them off their car seat, off the rear-view mirror, out of their pocket, from their countertop, and they're reapplying a mask that should be worn fresh and sterile every single time.' Dr Meehan also reported an incident where one patient wearing a mask passed out due to low oxygen while at work and fell off a ladder, resulting in serious physical injuries.

84.
If mask wearing were a science, the rules would be constant – but they are not. It is clear, therefore, that there is no science behind mask wearing. Citizens are being forced to wear masks for political reasons.

85.
It is frequently argued that Sweden, which had no lockdown and no mask requirements, has had a very high death rate. If anyone in the media were interested in the facts they would see that the average age of Swedish citizens who died was well over 80, and the great majority of deaths occurred in care homes and nursing homes. The mortality level in Sweden remained below a bad flu season. The Swedish people now seem to have a high, natural immunity. Fact checkers around the world might like to look at the Imperial College projections, which were alarming, and the actual death rate which was not. Other countries which did not make masks

compulsory (such as Japan and some African countries) also had relatively low mortality rates.

86.
A study by M.Walker in 2020 (*MedPage Today* 2020 May 20) found that 624 out of 714 people wearing N95 masks left visible gaps when putting on their masks.

87.
N95 respirators (or masks) are made with a 0.3 micron filter. Their name comes from the fact that 95% of particles having a diameter of 0.3 microns are filtered by the mask. Unfortunately, coronaviruses are approximately 0.125 microns in diameter. Still, these masks will certainly prevent snowballs, flies and other objects getting through.

88.
T.Tunevall wrote a paper called, *Postoperative wound infections and surgical face masks: a controlled study* which was published in the *World Journal Surgery* in 1991. The author found the use of masks in surgery were found to slightly increase incidence of infection over not masking in a study of 3,088 surgeries. The surgeons' masks were found to give no protective effect to the patients.

89.
In the UK, if you don't wear a mask because you have decided you are exempt – and the Government says this is a personal choice – the official advice is that you should not routinely be required to produce any written evidence to justify the fact that you are not wearing a mask. And although I'm no lawyer, I rather doubt that busy bodies, whoever they are, have any right to ask you why you have decided that you are exempt. My website www.vernoncoleman.com includes a link to a section of the Government website which provides an exemption form which can be printed out and attached to a lanyard.

90.
Nine medical authors from Australia and Vietnam studied cloth face masks and concluded that cloth masks should not be recommended for health care workers.

91.
A meta-analysis published in May 2016 concluded that masks did not have any useful effect but that reuse of contaminated masks did transmit infection. Some packs of face masks states that masks do not protect the wearer from the coronavirus.

92.
There is a risk that viruses may accumulate in the fabric of a mask – thereby increasing the amount of the virus being inhaled.

93.
Putting a mask on a baby or an unconscious patient is dangerous. The mask may result in the wearer choking on vomit. In my view, masks on babies could increase the risk of sudden infant death syndrome. No baby should be forced to wear a mask, and yet there are plenty of pictures on the internet showing masks on babies. In some parts of the world, children as young as two are forced to wear masks. Small children are more likely than adults to touch their masks, thereby rendering them useless. Also, small children are more likely to develop a weakened immune system if they wear a mask. Making children wear masks is a form of child abuse.

'It is extremely dangerous to cover a baby's mouth and nose and the design of 'cute' baby face coverings that have been brought to our attention look like they would greatly increase the risk of suffocation. I would strongly advise parents not to use any form of face covering for their baby,' said Dr Rebecca Fletcher, chair of Bury, Rochdale and Oldham Child Death Overview Panel.

94.
Some people claim that face masks give them a sore throat, reports Dr Armando Meza an infectious disease specialist in Texas. 'Humidity will let bacteria continue to grow inside the mask so if you were growing bacteria in that area and you were breathing that inside, you can potentially get an infection, especially strep or any other bacteria that can cause infection.'

95.
In some countries, quite small children are forced to wear masks on transport and even in schools. The evidence supports the view that politicians, teachers and parents who force (or even allow) children to wear masks are guilty of child abuse.

96.
A mask can substantially reduce blood oxygenation – leading to a possible loss of consciousness. At least one road crash has been blamed on a driver wearing a mask. Police reported that the driver of a single car crash in New Jersey, U.S. is believed to have passed out behind the wheel after wearing a mask for too long. Passengers would be wise to avoid travelling in public service vehicles (buses, coaches, etc.) in which the driver is wearing a mask.

97.
Surgeons and nurses are trained never to touch any part of a mask except for the nose bridge and the ear loops. If any part of a mask is touched accidentally then the mask is discarded and replaced.

98.
Over 2,000 Belgian medical professions have urged that covid-19 be prevented by strengthening natural immunity. Their recommendations include specifically to exercise in fresh air without a mask.

99.
A report by Boris Borovoy, Colleen Huber and Maris Crisler reported: 'Masks have been shown through overwhelming clinical evidence to have no effect against transmission of viral pathogens. Penetration of cloth masks by viral particles was almost 97% and of surgical masks was 44%. Even bacteria, approximately ten times the volume of coronaviruses, have been poorly impeded by both cloth masks and disposable surgical masks. After 150 minutes of use, more bacteria were emitted through the disposable mask than from the same subject unmasked. A paper by these authors entitled, *Masks, false safety and real dangers, Part 2: Microbial challenges from masks* is available on the internet and contains a list of 62 scientific journal references showing that masks have no significant preventative impact against any known pathogenic microbes. These authors conclude, 'Specifically, regarding covid-19, we have shown...that mask use is not correlated with lower death rates nor with lower positive PCR tests.' The authors add that, 'Masks have also been demonstrated historically to contribute to increased infections within the respiratory tract' and they conclude that 'the use of face masks will contribute to far more morbidity and mortality than has occurred due to covid-19.'

100.
There is much more evidence supporting the fact that masks should not be worn. Over a dozen scientific papers show clearly that masks are ineffective in preventing the movement of infective organisms and/or reduce oxygen levels, and expose wearers to increased levels of carbon dioxide. Over a dozen studies failed to show that wearing a mask provides protection against infection. In 2011, a meta-analysis of 17 separate studies proved that none of the research showed masks to be useful in preventing influenza infection. The available medical evidence proves overwhelmingly that masks do no good in preventing the spread of infection but do a great deal of harm to those wearing them.

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Conclusion

At no previous time in history have large numbers of people been forced to wear masks. The long-term physical and psychological consequences are unknown though those ordering that masks be worn are no doubt aware of the extraordinary risks and of the way that masks can be used to oppress and subjugate a population. The evidence clearly shows that mask wearing is likely to do no good but a great deal of harm. The big lie, which the WHO, governments everywhere and YouTube want to disseminate, is that wearing masks is essential to control covid-19. But the medical and scientific evidence (banned by YouTube and most mass media) shows that masks have little or no useful effect but can increase the risk of infection and can make breathing difficult. There is little doubt that masks do far more harm than good. Cloth masks are permeable to 97% of viral particles. A study by the University of East Anglia concluded that wearing masks was of no benefit and could increase infection. Experts in respiratory disease and infection protection from the University of Illinois have explained that face masks have no use in everyday life – neither as self-protection nor to protect other people. A study published in the *Annals of Internal Medicine* concluded that neither fabric masks nor surgical masks can prevent the spread of covid-19 by coughing. An article in the *New England Journal of Medicine*, published in May 2020 concluded that masks offer little or no protection and that the call for masks to be compulsory was an irrational fear reflex. A German study showed that masks had no effect on infection rates. Dr Fauci, the American covid-19 supremo, expressed real doubts about masks. On May 28th 2020, he admitted masks are little more than symbolic. Virtue signalling. A meta study on influenza, published in May 2020 by the CDC in America, found that face masks were of no help. The available evidence shows clearly that masks do not work but do have the potential to cause a variety of health problems – including short-term problems such as breathlessness and long-term problems such as brain damage and death. And yet, despite all this, there have been suggestions from various authorities that mask wearing and social distancing will need to be permanent. It has also been suggested that masks should be worn in the home. The sceptical will find it impossible to avoid the conclusion that there is far more to masks (and compulsory mask wearing) than meets the eye.

Afterword

There is absolutely no scientific reason for mask wearing under any circumstances. The covid-19 hoax is an IQ test. Anyone who wears a mask after studying the evidence has clearly failed the test.

Dear Reader

If you found this book useful I would be enormously grateful if you would post a review on social media or your preferred online site. It would help a great deal more than I can tell. And please ask everyone you know to read this book. An eBook version can be downloaded free of charge from Smashwords. There is a link on my website www.vernoncoleman.com

Thank you

Vernon Coleman

The Author

Biography and reference articles

Vernon Coleman was educated at Queen Mary's Grammar School in Walsall, Staffs. He then spent a year as a Community Service Volunteer in Liverpool where he was the first of Alec Dickson's 'catalysts'. (Ref 1 below). He studied medicine at Birmingham Medical School and qualified as a doctor in 1970. He has worked both in hospitals and as a GP. He resigned from the health service on a matter of principle. (Ref 2 below).

Vernon Coleman has organised many campaigns concerning iatrogenesis, drug addiction and the abuse of animals, and has given evidence to committees at the House of Commons and the House of Lords. For example, he gave evidence to the House of Lords Select Committee on Animals in Scientific Procedures (2001-2) on Tuesday 12.2.02

Dr Coleman's campaigns have often proved successful. For example, after a 15 year campaign (which started in 1973) he eventually persuaded the British Government to introduce stricter controls governing the prescribing of benzodiazepine tranquillisers. ('Dr Vernon Coleman's articles, to which I refer with approval, raised concern about these important matters,' said the Parliamentary Secretary for Health in the House of Commons in 1988.) (Ref 3 below).

Dr Coleman has worked as a columnist for numerous national newspapers including The Sun, The Daily Star, The Sunday Express, Sunday Correspondent and The People. He once wrote three columns at the same time for national papers (he wrote them under three different names, Dr Duncan Scott in The Sunday People, Dr James in The Sun and Dr Vernon Coleman in the Daily Star). At the same time he was also writing weekly columns for the Evening Times in Glasgow and for the Sunday Scot. His syndicated columns have appeared in over 50 regional newspapers in the United Kingdom and his columns and articles have appeared in newspapers and magazines around the world. Dr Coleman resigned from The People in 2003 when the editor refused to print a column Dr Coleman had written criticising the Government's decision to start the Iraq War. (Ref 6 below)

He has contributed articles and stories to hundreds of other publications including The Sunday Times, Observer, Guardian, Daily Telegraph, Sunday Telegraph, Daily Express, Daily Mail, Mail on Sunday, Daily Mirror, Sunday Mirror, Punch, Woman, Woman's Own, The Lady, Spectator and British Medical Journal. He was the founding editor of the British Clinical Journal. For many years he wrote a monthly newsletter called Dr Vernon Coleman's Health Letter. He has worked with the Open University in the UK and has lectured doctors and nurses on a variety of medical matters.

Vernon Coleman has presented numerous programmes on television and radio and was the original breakfast television doctor on TV AM. He was television's first agony uncle (on BBC1's The Afternoon Show) and presented three TV series based on his bestselling book Bodypower. In the 1980s, he helped write the algorithms for the first computerised health programmes – which sold around the world to those far-sighted individuals who had bought the world's first home computers. (Ref 4 below). His books have been published in the UK by Arrow, Pan, Penguin, Corgi, Mandarin, Star, Piatkus, RKP, Thames and Hudson, Sidgwick and Jackson, Macmillan and many other leading publishing houses and translated into 25 languages. English language versions sell in the USA, Australia, Canada and South Africa as well as the UK. Several of his books have appeared on both the Sunday Times and Bookseller bestseller lists.

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Altogether, he has written over 100 books which have, together, sold over two million copies in the UK alone. His self-published novel, Mrs Caldicot's Cabbage War has been turned into an award winning film (starring Pauline Collins, John Alderton and Peter Capaldi) and the book is, like many of his other novels, available in an audio version.

Vernon Coleman has co-written five books with his wife, Donna Antoinette Coleman, and has, in addition, written numerous articles (and books) under a vast variety of pennames (many of which he has now forgotten). Donna Antoinette Coleman is a talented oil painter who specialises in landscapes. Her books include, My Quirky Cotswold Garden. She is a Fellow of the Royal Society of Arts. Vernon and Antoinette Coleman have been married for more than 20 years.

Vernon Coleman has received numerous awards and was for some time a Professor of Holistic Medical Sciences at the Open International University based in Sri Lanka.

Reference Articles referring to Vernon Coleman

Ref 1
'Volunteer for Kirkby' – The Guardian, 14.5.1965
(Article re VC's work in Kirkby, Liverpool as a Community Service Volunteer in 1964-5)
Ref 2
'Bumbledom forced me to leave the NHS' – Pulse, 28.11.1981
(Vernon Coleman resigns as a GP after refusing to disclose confidential information on sick note forms)
Ref 3
'I'm Addicted To The Star' – The Star, 10.3.1988
Ref 4
'Medicine Becomes Computerised: Plug In Your Doctor.' – The Times, 29.3.1983
Ref 5
'Computer aided decision making in medicine' – British Medical Journal, 8.9.1984 and 27.10.1984
Ref 6
'Conscientious Objectors' – Financial Times magazine, 9.8.2003

Major interviews with Vernon Coleman include

'Doctor with the Common Touch.' – Birmingham Post, 9.10.1984
'Sacred Cows Beware: Vernon Coleman publishing again.' – The Scotsman, 6.12.1984
'Our Doctor Coleman Is Mustard' – The Sun, 29.6.1988
'Reading the mind between the lines.' – BMA News Review, November 1991
'Doctors' Firsts' – BMA News Review, 21.2.1996
'The big league of self publishing.' – Daily Telegraph, 17.8.1996
'Doctoring the books' – Independent, 16.3.1999
'Sick Practices' – Ode Magazine, July/August 2003
'You have been warned, Mr Blair.' – Spectator, 6.3.2004 and 20.3.2004
'Food for thought with a real live Maverick.' – Western Daily Press, 5.9.2006
'The doctor will see you now' – Independent, 14.5.2008

There is a more comprehensive list of reference articles on www.vernoncoleman.com

The Vaccine Adverse Event Reporting System (VAERS) Results

Messages:

- **VAERS data in CDC WONDER are updated every Friday. Hence, results for the same query can change from week to week.**
- **These results are for 532 total events.**
- **When grouped by VAERS ID, results initially don't show Events Reported, Percent, or totals. Use Quick or More Options to restore them, if you wish.**
- **Click on a VAERS ID to see a report containing detailed information for the event.**

Some measures are hidden, use Quick or More Options above to restore them.

Serious	Vaccine Type	VAERS ID	Adverse Event Description
Yes	COVID19 VACCINE (COVID19)	0913143-1	Vaccine administered with no immediate adverse reaction at 11:29am. Vaccine screening questions were completed and resident was not feeling sick and temperature was 98F. At approximately 1:30pm the resident passed away.
Yes	COVID19 VACCINE (COVID19)	0914604-1	Spouse awoke 12/20 and found spouse dead. Client was not transferred to hospital.
Yes	COVID19 VACCINE (COVID19)	0914690-1	Within 24 hours of receiving the vaccine, fever and respiratory distress, and anxiety developed requiring oxygen, morphine and ativan. My Mom passed away on the evening of 12/26/2020.
Yes	COVID19 VACCINE (COVID19)	0914805-1	RESIDENT CODED AND EXPIRED
Yes	COVID19 VACCINE (COVID19)	0914895-1	Injection given on 12/28/20 - no adverse events and no issues yesterday; Death today, 12/30/20, approx.. 2am today (unknown if related - Administrator marked as natural causes)
Yes	COVID19 VACCINE (COVID19)	0914917-1	Death by massive heart attack. Pfizer-BioNTech COVID-19 Vaccine EUA
Yes	COVID19 VACCINE (COVID19)	0914961-1	pt passed away with an hour to hour and 1/2 of receiving vaccine. per nursing home staff they did not expect pt to make it many more days. pt was unresponsive in room when shot was given. per nursing home staff pt was 14 + days post covid
Yes	COVID19 VACCINE (COVID19)	0914994-1	pt was a nursing home pt. pt received first dose of covid vaccine. pt was monitored for 15 minutes after getting shot. staff reported that pt was 15 days post covid. Pt passed away with in 90 minutes of getting vaccine
Yes	COVID19 VACCINE (COVID19)	0915562-1	pt received vaccine at covid clinic on 12/30 at approximately 3:30, pt vomited 4 minutes after receiving shot--dark brown vomit, staff reported pt had vomited night before. Per staff report pt became short of breath between 6 and 7 pm that night. Pt had DNR on file. pt passed away at approximately 10pm. Staff reported pt was 14 + days post covid
Yes	COVID19 VACCINE (COVID19)	0915682-1	Resident received vaccine per pharmacy at the facility at 5 pm. Approximately 6:45 resident found unresponsive and EMS contacted. Upon EMS arrival at facility, resident went into cardiac arrest, code initiated by EMS and transported to hospital. Resident expired at hospital at approximately 8 pm
Yes	COVID19 VACCINE (COVID19)	0915920-1	Resident received vaccine in am and expired that afternoon.
Yes	COVID19 VACCINE (COVID19)	0918388-1	Resident found unresponsive without pulse, respirations at 04:30 CPR performed, expired at 04:52 by Rescue
Yes	COVID19 VACCINE (COVID19)	0918418-1	Resident became SOB, congested and hypoxic requiring oxygen, respiratory treatments and suctioning. Stabilized after treatment and for the next 72 hours with oxygen saturations in the 90s. On 1/3/2021 was found without pulse and respirations. Resident was a DNR on Hospice.
Yes	COVID19 VACCINE (COVID19)	0919108-1	Fever, Malaise
Yes	COVID19 VACCINE (COVID19)	0920545-1	"The resident received is vaccine around 11:00 am and tolerated it without any difficulty or immediate adverse effects. He was at therapy from 12:36 pm until 1:22 pm when he stated he was too tired and could not do anymore. The therapist took him back to his room at that time and he got into bed himself but stated his legs felt heavy. At 1:50 pm the CNA answered his call light and found he had taken himself to the bathroom. She stated that when he went to get back into the bed it was ""abnormal"" how he was getting into it so she assisted him. At that time he quit breathing and she called a RN into the room immediately. He was found without a pulse, respirations, or blood pressure at 1:54 pm. He was a DNR."
Yes	COVID19 VACCINE (COVID19)	0920832-1	Vaccine 12/30/2020 Screening PCR done 12/31/2020 Symptoms 1/1/2021 COVID test result came back positive 1/2/2021 Deceased 1/4/2021
Yes	COVID19 VACCINE (COVID19)	0921481-1	Vaccine given on 12/29/20 by Pharmacy. On 1/1/21, resident became lethargic and sluggish and developed a rash on forearms. He was a Hospice recipient and doctor and Hospice ordered no treatment, just to continue to monitor. When no improvement of codition reported, doctor and Hospice ordered comfort meds (Morphine, Ativan, Levsin). Resident expired on 1/4/2021
Yes	COVID19 VACCINE (COVID19)	0921667-1	LTCF Pfizer Vaccine clinic conducted 12/29/2020 Vaccine lead received a call indicating that a staff member deceased somewhere between 1/3/2021 and 1/4/2021. Cause of death is unknown, and an autopsy is being performed.
			Vaccine received at about 0900 on 01/04/2021 at her place of work, Medical Center, where she was employed as a housekeeper. About one hour after receiving the vaccine she [illegible]

Yes	COVID19 VACCINE (COVID19)	1078246-1	Death. Ruptured myocardial infarct. 178
Yes	COVID19 VACCINE (COVID19)	1078352-1	Developed fatigue, body aches, headache 1 day after vaccination on 3/3. The morning of 3/5 complained of chest pain. Took Tylenol at 8:30 am. At 10:30 am his family found him unresponsive. EMS was called and he was pronounced dead in the home.
Yes	COVID19 VACCINE (COVID19)	1079251-1	Patient died the day after she received her vaccine RM14
Yes	COVID19 VACCINE (COVID19)	1079904-1	SUBJECT WAS FOUND DECEASED ON 22 FEB 2021 AT AROUND 11:30 PM
Yes	COVID19 VACCINE (COVID19)	1079958-1	Pt found down and pulseless in home by husband. EMS called, Pt found to be in PEA arrest. Pt achieved ROSC with CPR and Epinephrin. Pt Passed away on 09/07/2021 at 1330. Pt was in multisystem organ failure.
Yes	COVID19 VACCINE (COVID19)	1079976-1	12/23/20 (Moderna #1) - Malaise, cough on 12/24, went to walk-in on 12/25 c/o cough, malaise, rx'd Augmentin x14d, Rapid covid negative (and PCR resulted negative). 12/27 slept all day, 12/28 back to work. 1/12/21 metallic taste in mouth, severe GI sx, malaise, aches, headache. 1/14 seen at walk-in and covid swabbed Negative. 1/21/21 exposed to parents who found out they were covid + on 1/22/21. 1/25/21 (Moderna #2) - Continued with persistent cough and GI sx. Then also developed urinary frequency and urgency. Seen at urgent care 2/1 c/o cough, dx URI, rx'd augmenting. Woke up morning of 2/2/21 abruptly, stood up, said something was wrong, and collapsed. CPR attempted immediately, EMS brought him to ER where he was pronounced dead.
Yes	COVID19 VACCINE (COVID19)	1080425-1	Narrative: Patient with h/o ESRD on HD MWF, HTN presented to ER on 2/20/21 with worsening dyspnea and GI symptoms; tested positive for COVID-19. Patient had received first COVID vaccination approx. 9 days prior. Patient admitted to ICU for treatment of COVID+ PNA. During admission, patient often could not tolerate removal of fluid during HD d/t tachycardia. He received dexamethasone, convalescent plasma for COVID. Patient underwent TTE which was notable for septal wall motion abnormalities and grossly reduced EF. Admission also c/b acute liver injury, possible cholecystitis, thrombocytopenia, SVT, encephalopathy. Patient then developed progressive shock and hemodynamic instability on 3/2 and passed away on 3/2/21.
Yes	COVID19 VACCINE (COVID19)	1080429-1	DEATH Narrative: no documentation regarding any immediate reaction after vaccine administration. 83 y.o. male with pmh severe pulmonary hypertension, s/p TAVR last year, severe asbestos related lung disease on chronic oxygen, recently started on palliative care. Was found by daugher deceased on the morning of 2/11/2021. Autopsy declined by family.
Yes	COVID19 VACCINE (COVID19)	1080430-1	Death Narrative: Death was not determined to be related to COVID vaccination. COVID vaccination (dose 1) occurred on 1/27/21 with no noted side effects. Death occurred on 2/14/21.
Yes	COVID19 VACCINE (COVID19)	1080431-1	Narrative: 67 year-old male received his 1st COVID vaccine dose at a clinic on 2/25/21 at ~ 11:45am. No known prior COVID infection. No history of vaccine allergies or allergies to any component of the COVID vaccine. Does have history of allergic reactions including hives, angioedema or anaphylaxis to some medications (neomycin, Neosporin, bacitracin) and environmental allergens (yellow jackets, fir trees). Patient reported previously daily use of diphenhydramine (2 caps every morning) and kept an epi-pen on hand. The afternoon of 2/26/21, patient presented to his neighbor's house requesting assistance with an epi-pen. Neighbor reported significant swelling around tongue and lips, and ability to faintly speak. Neighbor administered epi-pen, but unsure if it worked, so administered a 2nd epi-pen. Within a minute or two after the 2nd dose, patient slumped over and became non-responsive. EMS was called and neighbor began CPR. EMS reported that patient was non-responsive upon arrival. A King airway was placed and a Lucas device used for chest compressions. Three rounds of epinephrine were administered during transport to the local emergency room. Patient remained unresponsive with evidence of PEA during transport. Arrival at the ER occurred ~ 4:25pm. On arrival patient noted to be unresponsive with CPR in progress. Dose of epinephrine administered ~ 3 minutes after arrival in ER. No femoral pulse palpable, cardiac monitor did show some electrical activity. Evaluation of oral cavity showed significant swelling of tongue. Additional dose of epinephrine given. Patient remained with no palpable central pulse and showed continued evidence of PEA. Patient was estimated to have been down > 45 minutes. Patient pronounced deceased at 4:59pm.
Yes	COVID19 VACCINE (COVID19)	1080433-1	unknown cardiovascular event
Yes	COVID19 VACCINE (COVID19)	1080434-1	Death Narrative: Patient passed away on 3-2-21, patient received the vaccine on 2-24-21. Patient was obese and had several co-morbid conditions.
Yes	COVID19 VACCINE (COVID19)	1080671-1	Patient received vaccine 1/26/2021, complained of fever and chills post vaccine. Daughter reported worsening symptoms to confusion, decreased appetite, N/V and chest pain. Dry cough and SOB. Patient admitted to facility for Chest pain, AMS on 2/2/2021. Expired 2/2/2021.
Yes	COVID19 VACCINE (COVID19)	1081008-1	there were no signs of adverse reaction at the time of injections and she waited 15 minutes at the site to watch for side effects. and none were evident or reported. We were notified that she passed away on Saturday, March 6.
Yes	COVID19 VACCINE (COVID19)	1081033-1	Patient expired 2 days after receiving the vaccination. Patient had other signs of deterioration over the course of the previous month with worsening edema and difficulty breathing. Unlikely to be related according to our assessments, but wanted to err on the side of caution.
Yes	COVID19 VACCINE (COVID19)	1081155-1	Pt died on 3/6/2021. Received Vaccine on 2/12/2021. Unknown cause of death.
Yes	COVID19 VACCINE (COVID19)	1081304-1	patient passed away within 60 days of receiving a COVID vaccine
Yes	COVID19 VACCINE (COVID19)	1081305-1	Sudden death approximately 24 hours after receiving 2nd COVID vaccine - symptoms unknown - autopsy revealed cardiac disease as the cause of death
Yes	COVID19 VACCINE (COVID19)	1081547-1	NO IMMEDIATE ADVERSE EVENTS PRESENT FOLLOWING IMMUNIZATION. RESIDENT WAS ALERT, RESPONSIVE, TALKATIVE, WITHOUT COMPLAINTS, AND ENGAGING IN NORMAL ACTIVITIES AFTER IMMUNIZATION, AS WELL AS THE FOLLOWING DAY. HE WAS FOUND IN BED THE SECOND MORNING AFTER VACCINATION (AT 6:25AM) WITHOUT VITAL SIGNS AND HAD EXPIRED PEACEFULLY IN HIS SLEEP. HE WAS A DNR, NO LIFE SUSTAINING MEASURES WERE PERFORMED.
Yes	COVID19 VACCINE (COVID19)	1082467-1	Pt passed away on 3/6/21.
Yes	COVID19 VACCINE (COVID19)	1082707-1	death
Yes	COVID19 VACCINE (COVID19)	1082717-1	Patient dropped dead 24 hours after receiving the vaccine. The vaccine killed her. She received the vaccine 2/16/2021 and died 2/17/2021
Yes	COVID19 VACCINE (COVID19)	1082759-1	Death
	COVID19		

Yes	COVID19 VACCINE (COVID19)	1046613-1	patient passed away within 60 days of receiving a COVID vaccine
Yes	COVID19 VACCINE (COVID19)	1046698-1	patient passed away within 60 days of receiving a COVID vaccine
Yes	COVID19 VACCINE (COVID19)	1046795-1	Per ED note: Brought in ED by EMS at 1945 for acute shortness of breath and hypotension. Patient was placed on supplemental oxygen and covid test completed. Patient was placed on BiPAP to maintain oxygen greater than 90%. Found to be in metabolic acidosis. Patient became unresponsive and pulse could not be palpated. Chest compressions were initiated. ACLS medications given and pulses regained. Patient lost pulse 30 mins later and never regained pulse. Per ED noted; likely developed a PE. Passed away at 2127
Yes	COVID19 VACCINE (COVID19)	1046845-1	Deceased 02/18/2021 with an unknown cause of death
Yes	COVID19 VACCINE (COVID19)	1046881-1	Code blue called at 11:00pm. Patient had code status of Do Not Resuscitate.
Yes	COVID19 VACCINE (COVID19)	1047183-1	Pt had expired before second dose was delivered.
Yes	COVID19 VACCINE (COVID19)	1047197-1	death
Yes	COVID19 VACCINE (COVID19)	1047282-1	Patient felt fine on Friday afternoon and evening after shot. Felt fine on Saturday until the afternoon when she starte feeling fatigued and chilled. Decided to take a warm bath at about 6pm. Was found dead in bathtub at approximately 7pm with blisters on arms, legs, and face.
Yes	COVID19 VACCINE (COVID19)	1047326-1	According to patient's caregiver, patient presented with symptoms of fever (101.6 F) and purple blotches all over the body within an hour. Since patient was in hospice , caregiver called Hospice and a pharmacy and was told to give patient Benadryl and Tylenol. Patient was given both medications and the fever subsided in a few days but the purple blotches never went away. Patient passed away at the facility a week later.
Yes	COVID19 VACCINE (COVID19)	1048786-1	"Was given vaccine around 1:30Pm on 2-11-2021. He and his wife waited in the building for 15 minutes and then left. he denied complaint. (He was waiting to have both Covid shots before he went to cardiologist Re: CAD.) He had an alarm going off in his house, was going to basement to check it out. Police officer heard alarm, came into house, heard a thud when Doc fell. He was in PEA (Pulseless Electrical Activity) when brought into ER. Given 5 ""rounds of Epinephrine with no response."
Yes	COVID19 VACCINE (COVID19)	1048882-1	Vaccine was administered 2/1/2021 at approximately 9am. Due to self reporting of allergic reaction (hives) to Augmentin, patient was monitored on site for 30 minutes. After the monitoring period, she was cleared to go with no issues reported at the time. We were later informed that the patient passed away from a pulmonary embolism on 2/12/2021.
Yes	COVID19 VACCINE (COVID19)	1048947-1	Patient experienced an episode of emesis and loss of consciousness several hours after vaccine on 2/16/21. He was taken by EMS to the hospital and was noted to be hypoxic and hypotensive. He was admitted to the hospital and subsequently intubated. He was also found to have a small bowel obstruction and a nasogastric tube was placed to decompress the bowel. He required pressor support as well. He expired on 2/17/21.
Yes	COVID19 VACCINE (COVID19)	1049012-1	Patient was given vaccine on friday, one week later she passed away. The family called the pharmacy to inform us on Saturday, Feb 20, 2021. After the phone call was over, we saw in her pharmacy profile that she had received the vaccine one week prior
Yes	COVID19 VACCINE (COVID19)	1049389-1	Patient passed away Saturday at 14:04pm. Patient's wife reports his death was sudden, he passed away sitting in hi chair his heart just stopped she said. They tried to perform CPR, 911 was called and paramedics arrived at the scene and he was given medication but never had any return of vital signs and so his death was called at the scene. Wife reports he was not ill, did not have any symptoms prior to the event. They are not going to be doing a autopsy. She wanted us to know based on timing that there may be some possible correlation with his COVID19 vaccine. He obtained the vaccine on 02/09/2021 - wife reports he had no symptoms, not even arm soreness after the vaccine. Had no fever, shortness of breath. Did not complain of chest pain. We can update chart to reflect the patient is deceased and lets make a card for the family.
Yes	COVID19 VACCINE (COVID19)	1049406-1	Patient rcvd 1st covid 19 vaccine on 1/26/2021. Patient had house guests on 1/30/21. Those house guests tested positive for covid on 2/1/2021. Patient started getting symptoms on 02/2/2021. Patient tested postivie on 2/4/2021 Patient was hospitalized 2/7/2021. Patient passed away on 2/21/21.
Yes	COVID19 VACCINE (COVID19)	1049648-1	I was notified on 2/22/21 that this patient passed away over the weekend. I do not know the details, nor can I confirm anything beyond what I was told. I believe the death occurred on 2/20/21 due to a massive stroke.
Yes	COVID19 VACCINE (COVID19)	1049852-1	When calling to get billing information we were notified that patient had passed away. Patient's daughter said patien was having cvd a/s on 2.1.2021 got vaccine 2.2.2021 and passed away 2.5.2021. Cardiologist said not related
Yes	COVID19 VACCINE (COVID19)	1049963-1	Found lying face down without respiration or pulse, believed to be within 5 minutes of event. ACLS procedures unsuccessful. Unable to get autopsy. Believed to be heart attack secondary to COVID infection, but unconfirmed. Relative contribution of recent vaccination unknown.
Yes	COVID19 VACCINE (COVID19)	1049997-1	Vaccine was administered at Nursing Facility. Patient is an 89-year-old female with prior medical history of CVA with dysphagia, history of possible dementia, GERD, hyperlipidemia, and a pacemaker. She is a resident from town. She was sent for hypotension with a blood pressure of 90/52, tachypnea respirations of 54, possible aspiration pneumonia. Status post Covid vaccine earlier today. History is limited as patient is nonverbal on my exam. Death within 24 hours of vaccination
Yes	COVID19 VACCINE (COVID19)	1050137-1	Pt received second Moderna Vaccination on 2/21/21 at 1:00 pm at Pharmacy. Pt present on 2/22/21 to ER via ambulance at 1940. Upon presentation C/C hypotension Post COVID vaccine. Nurse notes states that Home Health nurse sent patient to ER secondary to hypotension and hyperglycemia. Pt states back ached and was holding his head. Nurse noted pt had random petechiae over body and bruising to abdomen following injections received during recent hospitalization. (unknown hospitalization). Patient was treated with IVF bolus in addition to initiating Dopamine for hypotension, patient became agonal and daughter at bedside presented Adv. Directive, pt was DNR. F pronounced time of death was 2110pm. (Pt only reported a sore shoulder secondary to vaccine).
Yes	COVID19 VACCINE (COVID19)	1050172-1	Individual developed severe body aches, severe shoulder discomfort, high fevers (documented max temp. 103.7 F). Daughter reported that she became non-responsive with high fevers, and when the fevers decreased she was more lucid. Her condition rapidly progressed to nausea vomiting, diarrhea and patient died on 2/9/2021.
Yes	COVID19 VACCINE (COVID19)	1050201-1	Died 7 days after receiving 2nd dose of Moderna vaccine. Had underlying hx Lung CA w/mets.
Yes	COVID19 VACCINE (COVID19)	1050281-1	Per family, patient has been feeling sick since he was vaccinated, patient went to ER on 02/15/2021, and after few hours at ER patient passed away.
Yes	COVID19 VACCINE (COVID19)	1050431-1	Since I was not with my husband I can only tell you what was told to me. He walked out of the store toward our car Someone watched him, concerned, because he was walking very slowly (normally has a slow gait because of leg braces and toe amputations so I don't know if it was unusually slow). The woman saw him fall and she ran to help- administered CPR immediately-and told me he died instantly. Medics tried to resuscitate and failed to bring a pulse. (My husband left our home around 11:15 to drop a package off at store. The store is one mile from our home. At

Yes	COVID19 VACCINE (COVID19)	1068308-1	again with a fever. He felt worse on 20Feb; On 19Feb, he began to feel ill again with a fever. He felt worse on 20Feb; fever; headache; stomach upset; This is a spontaneous report from a contactable consumer reporting for the father: A 75-year-old male patient received the 1st dose of bnt162b2 (BNT162B2, Lot # EL3428) at single dose at left arm on 03Feb2021 for Covid-19 immunisation. Medical history included type 2 diabetes mellitus. No known allergies. The patient had not experienced Covid-19 prior vaccination. Concomitant medication in 2 weeks included amitriptyline hydrochloride (manufacturer unknown) 10 mg, atorvastatin (manufacturer unknown) 20 mg, dutasteride (manufacturer unknown) 0.5 mg, linaclotide (LINZESS) 290 mcg, gabapentin (manufacturer unknown) 300 mg, montelukast (manufacturer unknown) 10 mg, ramipril (manufacturer unknown) 5 mg, insulin degludec (TRESIBA) 100 unit/ml, liraglutide (VICTOZA) 18 mg/3ml solution. No other vaccine in 4 weeks. The patient experienced cardiac arrest due to pericardial effusion on 21Feb2021 14:15, fever on 13Feb2021, headache on 13Feb2021, stomach upset on 13Feb2021, on 19feb, he began to feel ill again with a fever, he felt worse on 20feb on 19Feb2021, on 21feb he went to the ER after vomiting and passing out on 21Feb2021. Events resulted in Emergency room/department or urgent care. Therapeutic measures were taken as a result of cardiac arrest due to pericardial effusion. Course of events: In Feb2021, 10 days after his 1st injection, the patient developed fever, headache, and stomach upset. He went for a rapid Covid-19 test (nasal swab) and it was negative on 11Feb2021. The doctor told him he might be having a delayed reaction to the vaccination. After a couple of days, he improved. On 19Feb2021, he began to feel ill again with a fever. He felt worse on 20Feb2021. On 21Feb2021 he went to the ER after vomiting and passing out and received treatment: IV fluids, diagnostic testing at ER. Rapid Covid test (nasal swab) at ER came back negative again on 21Feb2021. His heart arrested suddenly and he could not be resuscitated. CT scan results, that came back after death, showed Covid like pneumonia and pericardial effusion. The patient died on 21Feb2021 14:15. Cause of death was cardiac arrest due to pericardial effusion. An autopsy was not performed. The outcome of cardiac arrest due to pericardial effusion was fatal, of fever, headache, stomach upset was recovering, of he began to feel ill again with a fever, he felt worse was not recovered, of he went to the ER after vomiting and passing out was unknown.; Reported Cause(s) of Death: cardiac arrest due to pericardial effusion; cardiac arrest due to pericardial effusion
Yes	COVID19 VACCINE (COVID19)	1068549-1	2/13/21 Patient had covid like symptoms 2/15/21 Patient admitted to Hospital with covid like sx and decreased O2 sat; tested positive for Covid on 2/15/21; treated with Remdesivir and convalesent Plasma. Sx worsened and patient died 2/26/21..
Yes	COVID19 VACCINE (COVID19)	1068700-1	Patient passed away 24 hours after receipt of 1st Dose Pfizer vaccine. Provider does not feel death was due to vaccination. but underlying conditions. No immediate side effects noted from vaccination.
Yes	COVID19 VACCINE (COVID19)	1068761-1	DEATH Narrative: patient was placed on hospice care following vaccine, unclear cause of death, not documented
Yes	COVID19 VACCINE (COVID19)	1068762-1	"DEATH Narrative: patient's wife reported he had gone in an outside hospital, had held his brilinta as advised anticipating shoulder surgery ""and he threw a big clot and died.""""
Yes	COVID19 VACCINE (COVID19)	1068850-1	Pfizer-BioNTech COVID- 19 Vaccine EUA: Wife of patient called Primary Care Physician to inform that patient had received dose #2 of Pfizer COVID vaccine, and later that evening experienced a seizure and expired.
Yes	COVID19 VACCINE (COVID19)	1068883-1	DEATH Narrative: PATIENT PASSED AWAY WHILE ON HOSPICE CARE
Yes	COVID19 VACCINE (COVID19)	1068886-1	DEATH Narrative: Pt he reports he developed chills SOB body aches the same night as receiving the COVID vaccine on 1.26.2021-pt is currently reporting CheSt tightness and SOB Admitted to hosp: ICU with Bilateral Pulmonary Emboli, LLE DVT, NSTEMI, Arrhythmia.
Yes	COVID19 VACCINE (COVID19)	1068889-1	death Narrative: no other details available, as nothing documented in record
Yes	COVID19 VACCINE (COVID19)	1069235-1	Death
Yes	COVID19 VACCINE (COVID19)	1069263-1	DIED
Yes	COVID19 VACCINE (COVID19)	1069560-1	Hospital course 1/31 ? 2/20/21 1/31 in ED pt was at home when children noticed his lips were blue, ems arrived and found him to be 50% on RA, on Non-rebreather pt got to 78%, covid on 01/26 Shortness of Breath 61-year-old male presents with EMS for evaluation of shortness of breath hypoxia. History is limited due to the patient's current clinical condition and so is primarily obtained from EMS. EMS reports that he tested positive for COVID-19 5 days ago. He began developing shortness of breath yesterday and his family called because his lips and fingers were blue today and he appeared short of breath. On EMS arrival he had a room air saturation of less than 50% so he was placed on nonrebreather with improvement in his saturation to 70% and he was transported to the emergency department. Patient does admit to shortness of breath. He denies any chest pain. He is noted to have a cast on his left ankle and said that he broke his left ankle on 23 December but has not had surgery. He denies any new pain or swelling of the leg. In the ED he was placed on 15L nasal cannula and NRB mask with improvement in SPO2 to low 90s. Additional work up revealed troponin of 1.35, lactic acid 5.8, and d-dimer 14.4. He received dexamethasone and was placed on heparin gtt. 1/31 admitted to ICU Acute hypoxic respiratory failure due to COVID-19 vs heart failure vs PE. CXR with bilateral hazy infiltrates more pronounced in the bases and left periphery and suspected multifocal pneumonia. At risk for PE given LLE immobility in the setting of COVID-19 with significantly elevated d-dimer. RISK of CTA outweighs benefit given AKI and iodine allergy. Continue with empiric treatment with heparin gtt. Admitted to ICU with SO2 in 60s-70s on 15L and NRB. Attempted 50L 95% FIO2 high flow and nasal cannula. Given lasix 40mg IV with good diuresis however SPO2 still remained low 80s with RR 40s and PO2 42 so the decision was made to intubate. Oxygenation improved following intubation, with further improvement following recruitment maneuver and increase in PEEP. FIO2 weaned to 90% with SPO2 remaining in mid 90s. Will continue to wean FIO2 as able. ARDS net protocol as much as possible. Consider prone ventilation and/or epoprostenol if unable to improve . VAP Bundle: HOB >30 degrees; Oral care per nursing standard and on DVT/PPI prophylaxis Sedation: Target Richmond Agitation and Sedation Scale (RASS) of 0 to -2 with propofol and fentanyl. Check baseline TG levels. COVID - 19: Convalescent plasma: Not indicated Steroids: Dexamethasone 6 mg / day for 10 days Remdesivir: Not indicated d/t AKI IL-6 inhibitor: Meets criteria for tocilizumab Systemic AC: Heparin gtt. No signs of bleeding (Platelets and Hb stable). Antibiotics: Start 3 and 7 day course of azithromycin and ceftriaxone, respectively. Elevated troponin Suspect demand ischemia d/t hypoxia; EKG does not show any ischemic changes AKI: Suspect d/t hypoxia in the setting of COVID infection. Urine output and electrolytes acceptable. Closed fracture of left ankle Suffered fracture following a fall on ice in December. Cast was placed on 12/30 by SOS. He was due to be re-evaluated this week for possible cast removal. Inhaled epoprostenol started Considered for ECMO but not initiated due to not a candidate Vasopressors required at times Antihypertensive infusion required at times severe hypoxia with position changes switched from heparin drip to enoxaparin prophylaxis 2/20 discharge summary 61 y/o male admitted to Hospital on 1/31 with hypoxia. He was diagnosed with COVID 19 5 days prior to admission, and had worsening respiratory status. He was intubated after arrival, and was on ventilator for the entire intervening time, until he was extubated on 2/20 at the time of transition to Comfort measures only. Prior to developing COVID 19, he had received his first dose of the Pfizer vaccine, as a member of the school system. He had a fractured L ankle after a fall on 12/31/20, and had a cast in place at the time of admission. He received Tocilizumab on 1/31, and underwent several cycles of prone positioning, beginning on 2/2. He completed a course of Decadron, he received Ceftriaxone and azithromycin beginning on admission, and completed a course of these. Anticoagulation with enoxaparin was utilized due to coagulopathy associated with COVID 19. Vasopressor support was required at times, as well as diuresis for fluid management. He required high levels of sedation to maintain ventilator synchrony, and high levels of ventilator support with high oxygen levels throughout his stay. Tracheostomy was being considered, but family decided that since he was not going to have good recovery, withdrawal of support, and allowing death was the appropriate choice for the patient and for them. He was extubated at 2100 on 2/20/2021. Death was pronounced at [illegible]

Yes	COVID19 VACCINE (COVID19)	1022397-1	Death 2/9/21
Yes	COVID19 VACCINE (COVID19)	1022529-1	Pt suffered Cardiac Arrest and respiratory arrest on 2/9/21 and passed away at a local hospital. He had multiple health conditions likely contributing to this. he arrested at home and CPR was attempted and unsuccessful. Pt received his Covid vaccine #1 on 1/27/21. No issues were noted after vaccine and was due for his 2nd dose next week. However, we were notified he passed away on 2/9/21. Very likely death not at all related to vaccine but wanted to document as patient was in the middle of the covid vaccine series.
Yes	COVID19 VACCINE (COVID19)	1022685-1	Received Pfizer Covid Vaccine in the AM on 2/9/21. Arrived to emergency department later the same day complaining of nausea, weakness, fatigue, Vomiting, Diarrhea. Post operative diagnosis, Ischemic colon/toxic megacolon.
Yes	COVID19 VACCINE (COVID19)	1022902-1	"death Narrative: 71 yo male who passed away on 1/29/2021, medical cause of death ""cholangiocarcinoma, interval between onset and death 14 months. Since patient passed away within 42 days of the covid19 vaccine administration, we are required to complete a report to VAERS. Vaccine (Pfizer) was administered without complications. The patient denied any prior severe reaction to this vaccine or its components or a severe allergic reaction such as anaphylaxis to any vaccine or to any injectable therapy. Synopsis- 1/23 71 yo male presented to ED with upper GI bleed. PMH: DM, HTN, cholangiocarcinoma of biliary tract requiring recurrent paracentesis, COPD, perigastric and lower esophageal varices (not on beta blockers due to bradycardia). Pt has had 2 episodes of coffee ground emesis. Lactic 2.6, ammonia 52. Rec'd protonix, octreotide, and ceftriaxone in ED. Family has been previously encouraged to speak to palliative care but has never been willing to. GI consulted. 1/24 EGD completed. No signs of active bleed. MDs recommending hospice. CT + for small bowel ileus. 1/26 Requires placement of NG tube to suction. Palliative care consulted. 1/27 Paracentesis completed. 4100mls removed. 1/28 Pt changed to palliative status. 1/29 Pt passed away."
Yes	COVID19 VACCINE (COVID19)	1023803-1	Was contacted by the person's daughter on 2/5/21. Patient started vomiting 2 days after vaccination. She aspirated and passed away 1/16/21. Patient had history of stroke and swallowing problems.
Yes	COVID19 VACCINE (COVID19)	1024067-1	1/15: Pfizer vaccine dose 1 administered 1/16: Fever, chills 1/22: Sore throat, coughing w/white phlegm, taking Tylenol and Mucinex. Fever and chills from 1/16 subsided. Had telehealth consultation with PA. Per her notes, patient said he gets these symptoms annually, requested for an antibiotic. PA referred him for a COVID test. Ordered hydrocodone/chlorphen ER suspension for his cough and an antibiotic. Antibiotic was recommended if symptoms do not subside. 1/23: COVID test administered 1/25: Reported positive for COVID 1/26: Telehealth session w/PA: she informed patient of his positive test, advised to quarantine and seek medical help at hospital if symptoms worsen. Patient reported that his sore throat mostly subsided but is still coughing at night. Said that the pharmacy didn't receive the prescription order for the antibiotic, so this was re-ordered. 1/31: Partner found him dead at 8:18AM on his bed. Death certificate issued by state says cause of death: COVID. Autopsy was not performed. Buried on 2/9/21.
Yes	COVID19 VACCINE (COVID19)	1024157-1	7 days after receiving the vaccine, patient suffered excessive diarrhea and slight coughing. 9 days after vaccine, patient was tested for Covid 19, and received positive results. Patient was transported to hospital via ambulance but hospital returned her to the nursing home since chest was clear, no respiratory issues, and no fever. 10 days after receiving the vaccine, patient was turned over to hospice care but still in the nursing home. Hospice was called in to provide better physician advice and access 24/7. 14 days after receiving vaccine, patient began experiencing excruciating body aches, coughing, low oxygen levels, and no appetite. 18 days after vaccine, patient died.
Yes	COVID19 VACCINE (COVID19)	1024226-1	New onset dizziness with hypotension, tachycardia, and vomiting blood. Sent to ER - told he went into cardiac arrest and died.
Yes	COVID19 VACCINE (COVID19)	1024592-1	No adverse reactions noted. Resident is on hospice for end of life care for terminal diagnosis cerebral atherosclerosis. Experiencing respiratory distress 2/10/2021 r/t to hospice prognosis.
Yes	COVID19 VACCINE (COVID19)	1024743-1	pt became lethargic, stopped eating. No fever; no nausea
Yes	COVID19 VACCINE (COVID19)	1025579-1	Patient received the vaccine at an outside healthcare facility on 2/11/21. At approximately 1 pm she screamed out and fell out of her chair. EMS was called and patient was found to be in Vfib. ACLS was performed for approximately 42 minutes prior to arrival at ED. At that time the patient had been pulseless for 25 minutes. Patient received 450 mg of amiodarone, epinephrine x7, sodium bicarbonate x2, and 7 AED shocks. In the ED 3 more doses of epinephrine were given, one more dose of sodium bicarbonate, and 5 additional shocks. ROSC was not achieved and time of death was called at 1416.
Yes	COVID19 VACCINE (COVID19)	1025641-1	Complained of dizziness on January 18,th seen by MD this date. Passed away on 22nd.
Yes	COVID19 VACCINE (COVID19)	1026095-1	DEATH 2/12/21
Yes	COVID19 VACCINE (COVID19)	1026141-1	death 2/12/21
Yes	COVID19 VACCINE (COVID19)	1026270-1	At 10:33 am Patient pushed her pendant for staff, staff arrived to her apartment and Patient was found unresponsive in her bathroom. Patient received her second COVID-19 Pfizer vaccine about 75 minuets prior to this, she had no adverse reaction's within the first hour of receiving the second dose. CPR was started until paramedics arrived, they took over and tried to resuscitate. Patient was pronounced dead at 11:33 am at scene.
Yes	COVID19 VACCINE (COVID19)	1026362-1	Patient stated he had a migraine after the vaccine. We were advised of a change in appetite on Thursday February 4th. Patient died on February 6th.
Yes	COVID19 VACCINE (COVID19)	1026699-1	Had a stroke 3 days after round one of Covid vaccine and subsequently died the next week due to complications of stroke. Upon admission to hospital, was in afib.
Yes	COVID19 VACCINE (COVID19)	1027051-1	Few minutes post vaccination, after moving to observation area via wheelchair, the patient complained of dizziness. She took glucose tabs she had brought with her. Staff wheeled her to Triage # 1. Her eyes rolled back in her head and she lost consciousness. Staff (paramedics on site) transferred her to gurney and started compressions. AED placed, V- Fib was rhythm, Shock # 1 given, CPR resumed. Shocked again. Fire truck and additional EMT arrived on site and took over care. Epinephrine was given 3 times via intra-osseous route, Amiodarone given intra-osseous route. Additional defibrillation with on site AED for a total of 6-7 times. Patient had good chest rise with ambu-bag, no airway obstruction or peri-oral edema noted. Code called at 12:40 PM.
Yes	COVID19 VACCINE (COVID19)	1027071-1	Adverse reaction to the vaccine started with variable weakness beginning 1/29/2021. On 1/30/21 around 8:30pm, he needed assistance in the bathroom related to weakness and had what was later identified as a stroke with left side weakness and slurred speech. In accordance with his wishes, he had care at home. Due to his advanced age and frailty, a CT scan was not pursued. The 325 mg of aspirin that he was previously taking daily was discontinued. After the stroke, he needed total care. Hospice was established at home. Nursing assistant care was delivered by daughter. Death followed 9 days later (2/9/2021).
Yes	COVID19 VACCINE (COVID19)	1027503-1	Patient died on 02/08/2021
Yes	COVID19 VACCINE (COVID19)	1027619-1	Swollen leg/pain- taken to urgent care- became unresponsive - CPR initiated- expired

			care initiated. All non-comfort measures were discontinued. Time of death: Jan 10,2021@14:56; immediate cause of death per death note is ""hypoxic respiratory failure"""
Yes	COVID19 VACCINE (COVID19)	0974172-1	Resident passed away 1/25/2021 at 1048pm after the vaccine was given on 1/24/2021. Resident had been being monitored but death was not expected.
Yes	COVID19 VACCINE (COVID19)	0974422-1	Patient developed fever to 102 within 24 hours with decreased mentation. Stopped eating/drinking despite aggressively treating fever. Was DNR B status. Family agreed to a trial of IV fluids on 1/21 but was not successfully started until 1/22 after several attempts. Family wanted only comfort measures with no transfer to hospital. Patient continued to have fevers to 102-103 range. Patient passed on 1/23 . Patient did test positive for COVID in early September without significant illness. She was in usual state of health prior to vaccination.
Yes	COVID19 VACCINE (COVID19)	0974489-1	No immediate symptoms. No symptoms ever reported. Patient was found dead in her home on 1/25/2021 and last seen on 1/24/2021. Neighbor called for welfare check because they had not seen her and she had not checked mailbox. No evidence of foul play.
Yes	COVID19 VACCINE (COVID19)	0974855-1	decedent had shortness of breath and hypoxia, cardiac arrested in front of the EMS crew, ACLS initiated, arrived in the Hospital ED asystole and pronounced dead
Yes	COVID19 VACCINE (COVID19)	0975206-1	1 fall after first dose on 1/8/2021 at 1930; no injuries; 4 falls after second dose on 1/14/21 at 1545, 1/15/21 at 1700, 1/21/21/at 1220 and 1/21/21 at 1330 all falls with no injuries. Started Ceftriaxone 1 GM IM daily for 5 dyas on 1/21/21 for UTI: E. Coli
Yes	COVID19 VACCINE (COVID19)	0975382-1	01/22/20When transferring resident from bed to W/C Resident became unresponsive to voice with eyes fix open and point up to the right. Placed resident back in bed found 82% o2 sats B/P 110/106 pulse 110 resp below 16 placed o2 via non rebreather with 20 l/min 02 up to 90% then stabilized at 89% Resident following all commands encouraged to take do breathing exercises, with some compliance, continues ABT/pneumonia , no s/s adverse 1/23/2021 16:48 Discharge Summary Note Text: Resident found unresponsive with no pulse or respirations in bed with emesis on gown. Time of death verified at 1645 with LPN. Funeral Home called at 1900 and body released at 2000.
Yes	COVID19 VACCINE (COVID19)	0975434-1	"vomiting x3 1/8/21 1/9/21 00:34 - called to resident room by CNAs, staff stated resident was ""different"". Vitals taken and 02 sat was low, O2 in room and applied via NC @3L, O2 sat returned to 98 and all other vitals WNL including BS. Resident asked how he felt, stated he felt ""okay"". Resident exhibiting some shakey movements and clearing throat, states he does not have any phlegm or drainage or trouble swallowing. MD called and updated on situation, voicemail left. 1/9/21 11am- resident has been making a ""growling"" noise this shift. resident also has tremors. resident alert and answers questions appropriately. when asked if resident wants to go to hospital, resident firmly states ""no"". vitals wnl. no emesis noted. will continue to monitor resident. 1/9/21 12p- resident not answering questions appropriately. resident only answering yes or no. resident cannot tell me name, or the year, resident cannot state where he is currently or birthdate."
Yes	COVID19 VACCINE (COVID19)	0975952-1	Narrative:
Yes	COVID19 VACCINE (COVID19)	0976032-1	Patient stated he wasn't feeling well on January 25, 2021, wasn't eating and complained of abdominal pain. Patient noted to have indigestion and was constipated. Meds provided and labs ordered. On morning of January 26, 2021, patient became weak, lethargic and hypoxic and was sent to emergency department around 0700 hours on January 26, 2021. At approximately 1100 hours, emergency physician notified this writer that patient was not going to overcome his illness and would be placed on comfort care. At approximately 1130 hours, this writer was notified that patient had passed away from multi-organ failure.
Yes	COVID19 VACCINE (COVID19)	0976111-1	"CC:full arrest HPI:HPI and ROS limited due to patient's condition. History is via EMS, medical record, and son. Per Son patient had Covid vaccine on Saturday morning. Slept all day Sunday. Woke up Sunday night a bit ""like coming out of a deep sleep per son, around 10 pm. Shortly after that patient was having a hard time breathing. Emergency called. Arrested around the time EMS arrived. King airway, I/O and CPR initiated. Patient has been in v fib. Was shocked multiple times, given 4 rounds of epi, bicarb and amiodarone. ACLS continued on arrival. Multiple rounds of epi, and attempted defib. Patient given epi, bicarb. Rhythms included fine v fib, asystole, and PEA. Unrecoverable with no cardiac motion. Time of death 11:50 pm."
Yes	COVID19 VACCINE (COVID19)	0977963-1	(Report per patients wife) Patient took his usual nap around 12pm. She found him lying in the bed unresponsvie at 2pm. EMS was not called. Patient's wife called the Funeral home.
Yes	COVID19 VACCINE (COVID19)	0978199-1	Arm hurting used his oxygen at time of bed appeared vomited.
Yes	COVID19 VACCINE (COVID19)	0978754-1	No symptoms appeared immediately after vaccination, although patient passed away around 6:00 pm unexpectedly. Staff talked with her last time at 5:30 pm and then found her at 6:00 pm passed away. Unknown at this time if death is directly related to receiving the vaccine.
Yes	COVID19 VACCINE (COVID19)	0979101-1	cardiac arrest - no warning signs
Yes	COVID19 VACCINE (COVID19)	0979155-1	Jan 3 vaccine administered, jan 4 started headaches, vomiting, pain in the back of the neck, Headaches, chills, loss of speech,
Yes	COVID19 VACCINE (COVID19)	0979255-1	Patient received COVID 19 vaccine the morning of 1/18/21 at Public Health COVID-19 vaccine clinic. I (person completing this report) work for PH. Later that night while in bed, patient reported difficulty breathing to his wife, then turned blue, and became unresponsive. Family report pt was without any symptoms prior to event. 911 called; CPR started by family member 15 min. after pt became unresponsive. EMS performed resuscitation for about 30-40 minutes with multiple defibrillation for V-fib. Between EMS and Medical Center ER, pt had 9 rounds of epi, CPR w/ LUCAS machine, given 2 doses of amiodarone (150 mg and 300 mg). Patient had 3 EKGs, which did not show STEMI, but did show nonspecific conduction delay and sinus arrest with junctional escape vs sinus bradycardia (HR 50's). Pt had return of spontaneous circulation. Pt intubated, and started on Levophed. Pt transferred to ICU, and had central line placed. Family decided to make patient DNR. Pt went into coarse VFib again, and as per wishes of family, code blue not called. Patient expired at 01:53 on 1/19/21.
Yes	COVID19 VACCINE (COVID19)	0979818-1	Patient arrived at ER with complaints of CPR in progress. Per EMS, patient became short of breath while performing yard work on 1/26/2021. At arrival, patient was in fine v fib with a total of 6 shocks delivered along with 300 mg amiodarone followed by 150 mg amiodarone, 1 amp epinephrine and 2 epinephrine drips adminstered en route to ED. CPR initiated at 1755 and EMS reports asystole at 1829. TOD 1909 pronounced by ED DO Dx: Cardiac arrest
Yes	COVID19 VACCINE (COVID19)	0979837-1	Per EMS, the patient was last seen walking and talking to wife 10 minutes prior to EMS arrival. EMS reports via patients wife, that patient was upstairs to change for his doctor appointment then patient's wife found him down. The patient received his COVID-19 vaccine on 1/25/21. EMS states they gave 5 rounds of EPI then patient moved into vfib then was shocked once but returned to asystole. In ED, the patient initially in asystole CPR was started immediately. The patient was given 3 rounds EPI, 1 round bicarb. The patient stayed in PEA throughout. Patient was given tPA. Patient continued to be in asystole and time of death was called at 11:35 am.
Yes	COVID19 VACCINE (COVID19)	0979926-1	Pt began experiencing shortness of breath 3 days after vaccine and expired later that day.
Yes	COVID19 VACCINE (COVID19)	0980107-1	Patient noted to have a change in status at 11:23PM that night. Her oxygen saturation had dropped from normal on room air to 82% and required oxygen. She was also noted to be lethargic with altered mental status and not responding verbally. She then began to mottle. Her oxygen saturation worsened to 51% on 4Liters of oxygen by the next day and she expired on 1/14/21.
	COVID19		Patient with inoperable pancreatic cancer [illegible]

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RM 15

Hoatsama /gai
(Grow Strong Together)

Parties Represented: REPUBLICAN PARTY OF SOUTH AFRICA, AFRICAN HEALTH ASSURANCE (AHA), KHOISAN REVOLUTION (KSR), PEOPLE'S AFRICAN PARTY (P.A.P.), INDEPENDENT PARTY (IP), SOUTH AFRICAN FIRST (SAF), PEOPLE'S RIGHTS PARTY (PR), TRUE FREEDOM PARTY (TFP), MAGOSHI SWARANANG MOVEMENT, SISONKE PEOPLES FORUM, AFRICAN CONGRESS OF DEMOCRATS (A.C.D) & YOUTH OF THE WORLD (YOW).

27 April 2020

The President of the Republic of South Africa
His Excellency, Mr Cyril Ramaphosa
Union Buildings
Pretoria

By e-mail

Dear President Ramaphosa,

REQUEST FOR INFORMATION

The letter is addressed to you, by myself, in my capacity as national co-ordinator of a conglomerate of small political parties.

1. In accordance with the relevant provisions of the Promotion of Access to Information Act of 2000 ("the Act") this is a formal legal request for information in respect of the following:
    a. All information that formed the basis and motivation of the executive decision to declare a state of disaster and subsequently impose the lockdown effective from 26 March 2020, in particular the epidemiological mathematic model and accompanying data, reports, etc.

    b. All information that formed the basis of the decision to extend the lockdown, for a further period of two weeks until 30 April 2020, e.g. the indicators and or measures, that necessitated the decision for the extension;

c. Actual figures and measures of the pandemic, in particular the death rate, the formula used in calculating the rate and what standard or evidence is used to indicate Covid-19 as the direct and immediate cause of a death;

d. Actual measures of infection, what is the method used to test for Covid-19, what test device is used, does the test particularly tests for Covid-19 or is it inferred and what is the reliability of the test and how was it determined.

2. The reasoning and basis for our request for information is as follows:

a. SA is a constitutional democracy, founded on the principles of open and accountable government sensitive to the civil liberties of its citizens and exercised a transparent and rational manner;

b. citizens therefore have the right to access information in order to discharge their constitutional right;

c. The Act gives citizens the right to access information and government the obligation to supply information to the public; and

d. Due to the probabilistic nature of the disaster declared, it is important to release the model that informed the decision to declare a national disaster, for independent review.

Failure by the Executive to release this information, would result in us having the right in seeking judicial relief provided for in the Constitution and in the Act, in particular.

This request is made in a quest to detect, discourage and avoid abuses of power and to ensure accountability.

Yours sincerely,

Mr. R. Maarman (MA) - **National Co-ordinator**

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THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/02/2020/21

The Information Officer
The Department of Co-Operative Governance & Traditional Affairs
Pretoria
0001

Per email: ThinavhuyoN@cogta.gov.za

Dear Sirs

Re: Transfer of request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000 (the Act)

The above matter has reference.

The Presidency received a request for access to information wherein the requestor, requested access to the following information:

"All information that formed the basis and motivation of the executive decision to declare a state of disaster and subsequently impose the lockdown effective from 26 March 2020 in particular the epidemiological mathematic model and accompanying data, report,etc"

We attach hereto a copy of the said request.

I have considered the request and I am of the view that your department is the relevant department to respond to the attached request.

I therefore transfer the attached request to your department in terms of section 20(1)(b) of the Act for further handling and response thereto.

Yours faithfully

L Mxenge

Ms Lusanda Mxenge
Acting Deputy Information Officer
Date: 18/06/2020

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RMS

THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/02/2020/21

Mr R Maarman
50 Jeannette Street
Ext 4, Ridgeway
Johannesburg
2091

Per email: rainbownation2020@yahoo.com

Dear Sir

Re: Your request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000

The above matter has reference.

In the abovementioned request, you requested access to the following information:

" All information that formed the basis and motivation of the decision to declare a state of disaster and subsequently impose the lockdown effective from 26 March 2020, in particular the epidemiological mathematic model and accompanying data, reports,etc"

As you might be aware after having first been identified in Wuhan,China, during December 2019, a novel coronavirus ("SARS-CoV-2) has spread globally, resulting in an international pandemic of the novel coronavirus disease (Covid-19).

On 15 March 2020, the Minister of Co-Operative Governance and Traditional Affairs, Dr Nkosazana Dlamini –Zuma declared a National State of Disaster in terms of section 27(1) of the Disaster Management Act.

Section 27(2) of the Disaster Management Act empowers the Minister to make regulations and to issue directions, subject to section 27(3) and after consulting the responsible cabinet members concerning the matters listed in paragraphs (a) to (o).

Having considered the above, I am of the view that the information is more closely related to the functions of the Department of Co-Operative Governance. In light of the above I have made the decision to transfer your re quest in terms of section 20(1)(b) of the Act to the Department of Co-Operative Governance and Traditional Affairs.

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Hoatsama /gai
(Grow Strong Together)

Parties Represented: REPUBLICAN PARTY OF SOUTH AFRICA, AFRICAN HEALTH ASSURANCE (AHA), PEOPLE'S AFRICAN PARTY (P.A.P.), PEOPLE'S RIGHTS PARTY (PR), MAGOSHI SWARANANG MOVEMENT, THE NATIONALS OF SOUTH AFRICA (NSA) ,ECONOMIC SOCIAL DEMOCRATS (ESD), UNITED PEOPLE OF SOUTH AFRICA (UPSA) & YOUTH OF THE WORLD (YOW).

25 May 2020

The President of the Republic of South Africa
His Excellency, Mr Cyril Ramaphosa
Union Buildings
Pretoria

By e-mail

Dear President Ramaphosa,

REQUEST FOR INFORMATION

This letter is addressed to you, in my capacity as national co-ordinator of a conglomerate of small political parties. Mr. President, in your recent televised address to the nation, you mentioned that you receive "guidance" from the WHO (World Health Organisation) and it has also been broadcasted that Mr Bill Gates met with you to discuss the Covid-19 pandemic.

1. In accordance with the relevant provisions of the Promotion of Access to Information Act of 2000 ("the Act") this is a formal legal request for information in respect of the following:
    a. Please explain and make public what guidance the WHO has been giving you, in the form of transcripts, minutes and or directives, et cetera?

    b. Please inform us who the person/s representing the WHO were that communicated with you or your representatives and if that person/s was or were vetted in terms of our national security protocols?

c. Please explain and make public what standing the WHO has in our sovereign constitutional republican order, which warrants or justifies taking their guidance and which grants it any authority in or over our Republic?

d. Please explain if and what measures were taken to safeguard our national security in your interactions with the WHO, as they are a foreign extra-constitutional entity?

e. Please explain in what capacity did Mr Gates meet with you? Was he or is he a representative of the WHO or the United States of America (US) government, et cetera?

f. If Mr Gates met with you in his capacity as a representative of WHO or US government , please release and explain the credentials Mr Gates presented?

g. Was Mr Gates vetted in terms of our national security protocols?

h. Please release the transcript/s of your meeting/s with Mr Gates with respect to COVID 19?

2. The reasoning and basis for our request for information is as follows:

a. South Africa is a constitutional democracy, founded on the principles of open and accountable government sensitive to the civil liberties of its citizens and exercised in a transparent and rational manner.

b. Citizens therefore have the right to access information in order to discharge their constitutional right.

c. The Act gives citizens the right to access information and the government the obligation to supply information to the public.

d. Mr. President, you have suspended many fundamental and constitutional rights, in your declaration of a national disaster, as you have deemed the COVID 19 pandemic a great risk to our national security, hence we seek clarity on the

consistency and rationality in your dealings with foreign agents and entities on this matter vis-à-vis our national security protocols.

e. Ours is a Constitutional Democratic Republic and Mr President you are duly invested with sovereign authority by the people to govern in accordance with the Constitution of South Africa, hence the reassurance sought to establish the standing of the WHO constitutionally and the credentials of Mr. Gates.

f. A natural disaster such as the one you have declared, leaves our nation vulnerable, a situation which can easily be exploited by foreign adversaries, hence the need for an abundance of caution in all dealings.

g. Any extra-constitutional authority granted to foreign agents and foreign entities would jeopardise the integrity of our democratic and constitutional order, upon which rests the legitimacy of our system of government, the soundness of our sovereignty and the well-functioning of our society.

Failure by the Executive to release this information, would result in us having the right in seeking judicial relief provided for in the Constitution and in the Act, in particular.

This request is made in a quest to detect, discourage and avoid abuses of power and to ensure accountability.

Yours sincerely,

Mr R Maarman (MA)
National Co-ordinator

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AM 15

THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/06/2020/21

Mr R Maarman
50 Jeannette Street
Ext 4, Ridgeway
Johannesburg
2091

Per email: rainbownation2020@yahoo.com

Dear Sir

Re: Your request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000

Your letter dated 25 May 2020 attached to the abovementioned request setting out the information you seek access to, has reference.

As you may be aware South Africa is a member of the World Health Organisation (WHO). As a member state of the WHO, South Africa is bound to follow technical guidance issued by the WHO in combating the spread of Covid19. The guidance offered by the WHO to the member states is available on the WHO website.

The President did not meet Mr Bill Gates, but had a telephonic conversation with him. For the issues discussed between the President and Mr Bill Gates we refer you to a tweet posted on the President's twitter account. According to the tweet posted on the President's twitter account, the Gates Foundation offered assistance to the country on mass-based testing kits and research.

We wish to draw your attention to the provisions of section 74 and 75 of the Act in relation to the appeal process.

Yours faithfully

Ms Lusanda Mxenge
Acting Deputy Information Officer

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Hoatsama /gai
(Grow Strong Together)

Parties Represented: REPUBLICAN PARTY OF SOUTH AFRICA, AFRICAN HEALTH ASSURANCE (AHA), PEOPLE'S AFRICAN PARTY (P.A.P.), PEOPLE'S RIGHTS PARTY (PR), MAGOSHI SWARANANG MOVEMENT, AFRICAN CONGRESS OF DEMOCRATS (A.C.D), THE NATIONALS OF SOUTH AFRICA (NSA) AFRICAN NATIONAL FREEDOM PARTY (ANFP), ECONOMIC SOCIAL DEMOCRATS (ESD) & YOUTH OF THE WORLD (YOW).

06 May 2020

The President of the Republic of South Africa
His Excellency, Mr Cyril Ramaphosa
Union Buildings
Pretoria

By e-mail

Dear President Ramaphosa,

REQUEST FOR INFORMATION

The letter is addressed to you, by myself, in my capacity as national co-ordinator of a conglomerate of small political parties.

1. In accordance with the relevant provisions of the Promotion of Access to Information Act of 2000 ("the Act") this is a formal legal request for information in respect of the following:
    a. The complete details of the total financial obligations in respect of the Lockdown-Debt, which you have committed this country to e.g. Loans & Borrowings, et cetera.

    b. The terms and conditions of these financial obligations, e.g. interest rates, currency, loan repayments, maturity dates, monetary and fiscal policy restraints.

    c. The collateral used to secure these financial obligation, e.g. land and or our deposits of natural resources.

d. Who were these Loans & Borrowings taken out with e.g. the International Monetary Fund (IMF), etc.

e. Please provide a detailed plan of the intended use of these funds reconciling to the total Financial obligation (to ensure accountability).

2. The reasoning and basis for our request for information is as follows:

a. South Africa is a constitutional democracy, founded on the principles of open and accountable government sensitive to the civil liberties of its citizens and exercised in a transparent and rational manner;

b. citizens therefore have the right to access information in order to discharge their constitutional right;

c. The Act gives citizens the right to access information and government the obligation to supply information to the public; and

d. Although you have incurred this vast and burdensome financial obligation, it is the taxpayers that shall have to honour the obligation. In case we default on the loans and if collateral was indeed pledged, we stand to lose valuable resources and impair or lose our sovereignty.

Failure by the Executive to release this information, would result in us having the right in seeking judicial relief provided for in the Constitution and in the Act, in particular.

This request is made in a quest to detect, discourage and avoid abuses of power and to ensure accountability.

Yours sincerely,

Mr. R. Maarman (MA) - **National Co-ordinator**

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THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/03/2020/21

The Information Officer
National Treasury
40 Nkomo Street
Pretoria
0001

Per email: paia@treasury.gov.za / dgregistry@treasury.gov.za

Dear Sirs

Re: Transfer – Request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000 ("The Act")

The above matter has reference.

The Presidency received a request for access to information from a Mr Ricardo Maarman in his capacity as national co-ordinator of a conglomerate of small political parties wherein he seeks information regarding details of total financial obligations in respect of the lockdown debt.

The full details of the information sought is set out in the request attached hereto.

The President on 21 April 2020 in his address to the nation made it clear that the Minister of Finance will provide details and other related tax announcements relating to the Covid 19 economic and social relief measures. The President also made it clear in his address that other details will be announced in the adjustment budget tabled by the Minister of Finance.

The Presidency has considered the request and we are of the view that the information sought is more closely related to the functions of the National Treasury.

In light of the above, I have made the decision to transfer the request to your department in terms of section 20(1)(b) of the Act.

We therefore transfer to your department the attached request for access to information in terms of section 20(1)(b) of the Act for further handling.

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We have provided the requestor with a copy of this letter.

Yours faithfully

Ms Lusanda Mxenge
Acting Deputy Information Officer
Date: 18/06/2020

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THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/03/2020/21

The Information Officer
National Treasury
40 Nkomo Street
Pretoria
0001

Per email: paia@treasury.gov.za / dgregistry@treasury.gov.za

Dear Sirs

Re: Transfer – Request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000 ("The Act")

The above matter has reference.

The Presidency received a request for access to information from a Mr Ricardo Maarman in his capacity as national co-ordinator of a conglomerate of small political parties wherein he seeks information regarding details of total financial obligations in respect of the lockdown debt.

The full details of the information sought is set out in the request attached hereto.

The President on 21 April 2020 in his address to the nation made it clear that the Minister of Finance will provide details and other related tax announcements relating to the Covid 19 economic and social relief measures. The President also made it clear in his address that other details will be announced in the adjustment budget tabled by the Minister of Finance.

The Presidency has considered the request and we are of the view that the information sought is more closely related to the functions of the National Treasury.

In light of the above, I have made the decision to transfer the request to your department in terms of section 20(1)(b) of the Act.

We therefore transfer to your department the attached request for access to information in terms of section 20(1)(b) of the Act for further handling.

We have provided the requestor with a copy of this letter.

Yours faithfully

Ms Lusanda Mxenge
Acting Deputy Information Officer
Date: 18/06/2020

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RMIG

THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/04/2020/21

The Information Officer
The National Department of Health
Pretoria
0001

Per email: matsoP@health.gov.za **and** gerrit.wissing@health.gov.za

Dear Sir

Re: Transfer of a request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000 ("the Act")

The above matter has reference.

The Presidency received a request from a Mr Ricardo Maarman wherein he sought access to information regarding the tracking and surveillance systems in relation to the contact tracing for Covid-19 infections.

We attach hereto a copy of the said request.

The Presidency has considered the contents of the request and I have made the decision to transfer the request to your department as the information sought is more closely related to the functions of the Department of Health.

We therefore transfer to your department the attached request in terms of section 20(1)(a) and (b) of the Act.

We have provided the requestor with a copy of this letter.

Yours faithfully

Ms Lusanda Mxenge
Acting Deputy Information Officer

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AM15

THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/04/2020/21

Mr Ricardo Maarman
50 Jeanette Street
Ridgeway Ext. 4
Johannesburg
2091

Per email: rainbownation2020@yahoo.com

Dear Sirs

Re: Your request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000 ("the Act")

Your request for access to information dated 19 May 2020 has reference.

In the abovementioned request, you attached thereto a letter detailing the information you request to be given access too. We attach hereto a copy of your letter for your ease of reference.

The Presidency has considered the content of your request and has noted that the information you seek is not in a record format as set out in the Act.

We wish to highlight that on 26 March 2020, Minister Ndabeni-Abrahams issued directions in the government gazette a set of directions dealing with the allowance for using phone data to assist with the tracing of persons who came into contact with someone who has tested positive with Covid-19. The data was intended to assist the Department of Health trace others who came into contact with persons who have tested positive with Covid-19. The directions you will note are intended solely to save lives and to combat the spread of the Covid19.

The Department of Justice and Correctional Services went further to appoint a Covid-19 Judge whose role is to safeguard the privacy of Covid-19 patients and contacts.

In light of the above, I have made the decision to transfer your request to the Department of Health in terms of Section 20 (1)(a)and(b) of the Act.

We attach hereto a copy of the letter of transfer.

We wish draw your attention to the provisions of section 74 and 75 of the Act in relation to the appeal

Yours faithfully

Ms Lusanda Mxenge
Acting Deputy Information Officer
Date: 18/06/2020

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THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE CHIEF OPERATIONS OFFICER

Private Bag X1000, PRETORIA, 0001

Enquiries: Mr Justice Hlungwani
Tel: 012 300 5376
Email: Justiceh@presidency.gov.za

Our Ref: PAIA/04/2020/21

The Information Officer
The National Department of Health
Pretoria
0001

Per email: matsoP@health.gov.za **and** gerrit.wissing@health.gov.za

Dear Sir

Re: Transfer of a request for access to information in terms of the Promotion of Access to Information Act, 2 of 2000 ("the Act")

The above matter has reference.

The Presidency received a request from a Mr Ricardo Maarman wherein he sought access to information regarding the tracking and surveillance systems in relation to the contact tracing for Covid-19 infections.

We attach hereto a copy of the said request.

The Presidency has considered the contents of the request and I have made the decision to transfer the request to your department as the information sought is more closely related to the functions of the Department of Health.

We therefore transfer to your department the attached request in terms of section 20(1)(a) and (b) of the Act.

We have provided the requestor with a copy of this letter.

Yours faithfully

Ms Lusanda Mxenge
Acting Deputy Information Officer
Date: 19/11/2020