Reviewer’s report

Title: Scent dog identification of samples from COVID-19 patients – a pilot study

Version: 0 Date: 17 Jul 2020

Reviewer's report:

Thank you to the editors for giving me the opportunity to read this very interesting manuscript that deserves to be published with your journal. I also thank the authors for the obvious hard work that went into this very important bit of research, and how easy and enjoyable it was to read this manuscript.

Overall this is a very good manuscript, however there are some major concerns/limitations that have not been addressed in enough depth in the current version of the manuscript. I will address general concerns first and then point out specific comments for each of the sections.

General Comments
1 - This is, as you state, preliminary research that will understandably lead to further studies. However, it is not stressed enough that this is a preliminary investigation. I believe it should be mentioned in the title and more weight should be placed on this in the discussion.

2 - The study uses hospital patients for the source of VOC but then discusses a couple of times of how dogs could be used at mass events to detect individuals with COVID-19. At those events individuals are more likely to be asymptomatic, pre-symptomatic or mildly symptomatic, how do the levels of VOC differ from hospitalised cases? The authors really need to stress in their discussion that for the dogs to be practically used at a mass event they need to have a high detection rate of these individuals as well as those in hospital. This is mentioned briefly in lines 157-159, but it needs to be elaborated on much further.

3 - One of the limitations of this study, which I assume will be explored in further research, is the potential of cross detection of other beta-coronaviruses (and potential alpha-coronaviruses) in the negative controls sniffed by the dogs. It is unlikely that these individuals would have had SARS or MERS as they would have most likely been clinically sick. But there is the potential for them to have been infected with OC43. Were the patients screened for other coronaviruses before they became negative controls? If so this needs to be stated. If not it, needs to be explicitly mentioned in the methods and a section of the discussion needs to be devoted to this in regards to interpretation of the study results. Are some of the false positives just other coronavirus infections? Does this mean that if dogs were used at mass events they would have the ability to detect both COVID-19 patients and those with mild non-COVID-19 respiratory infections? This would have ramifications for the sniffer dogs as a diagnostic/surveillance tool.
Title
Needs to mention that it is a preliminary study and that this is identification of positive samples not individuals.

Abstract
Line 29: Remove 'to rage', unscientific and unnecessarily emotive.
Line 38: Change the term 'hit rate' to 'detection rate' throughout.
Line 42: Please clarify that these are hospitalised clinical sick individuals. Just reading the abstract one could assume that they could be samples from all stages of infection.

Background
Line 56: This is not correct. Many countries are testing contacts of cases, and cohorts of individuals with high infection risk, testing is not used solely in the targeted fashion described. This sentence should reflect that. The limitations of current testing are its invasive-ness, the speed of result, and detection of asymptomatic cases. You mention the first two, but focus should also be placed on the asymptomatic & pres-symptomatic cases.

Method
Lots of useful information about sample preparation and training of the dogs. It was very clear about the mechanics of the equipment and the what the process entailed. However, there was little information about the double blinding. Please explicitly state who in the study was blinded.

Results
Table 1: Should the dogs names be anonymous? It is appropriate for them to be named in the acknowledgements as they were all 'good boys and girls', but I think in both this table and the supplementary table they should be just given letters or numbers.
Line 141: For readability this should just read as the number of false positives and false negatives.
Table 2 and Figure 1: There is a large variation in the sensitivity of detection between the dogs, with non-overlapping confidence intervals. Where these analysed to see if there was significant differences between dogs? This should be discussed here and in the discussion. Why is there such variation and what are the implications of this for using the dogs as a surveillance/diagnostic tool?

Discussion
Overall this is a good discussion however there are some limitations (as mentioned at start) that need to be discussed in more depth, namely:
1 - Strongly caveat that this is preliminary research and much more work is needed before it can be trialled at mass events
2 - Further work needed on detection of pre-symptomatic, asymptomatic and mild clinical cases
3 - The potential of cross detection of other coronaviruses
4 - No real discussion about the large range in sensitivity between dogs. High specificity is essential for screening programmes, but so too is sensitivity. At a mass event it would mean that there would potentially be a large number of individuals with infection that weren't detected, who could then seed subsequent infection. This needs to be discussed.
5 - Limited discussion about the potential to for the dogs to be an infection risk themselves or to act as fomites and spread infection between individuals. Needs to be discussed as if used wide scale the dogs may spread infection.
Conclusions
Line 176 - I think it is too early to conclude that dogs can be used in the settings you discuss and for mass detection. You need to stress that this is preliminary work and if the limitations are overcome in future studies, only then would it have the potential for use in these diagnostic settings.

Thank you again for giving me the opportunity to review this work. It is fantastic research and good manuscript. I’m sure that it will provide a platform for much needed research.

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No

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

Yes

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I am able to assess the statistics

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