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## Letter to the Editor

## Predictors and microbiology of respiratory and bloodstream bacterial infection in patients with COVID-1: author's response

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## To the Editor,

We thank the authors for their interest and comments regarding our publication [1]. Given the vast amount of literature published on the topic of coinfections and secondary infections with coronavirus disease 2019, as well as the heterogeneity in publication quality, methodological approach, and data reporting strategies, it was necessary to make some assumptions regarding whether studies met the inclusion criteria. We agree there are certainly limitations that may affect the precision of our estimate and have highlighted some of these concerns in our discussion. Nevertheless, each of the 171 studies was reviewed by a minimum of two authors to determine if the inclusion criteria were met. However, the inclusion of some studies may still be debatable.

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Although serological testing was an exclusion criterion, certain studies did not specify the microbiological method of testing [2] and did not explicitly indicate that serological testing was used (e.g. studies may have used PCR or serology to detect *Mycoplasma* spp.); hence, these studies were included. We also made the decision to include studies of patients with ventilator-associated pneumonia (without further microbiological detail) because the vast majority of cases are caused by bacteria [3,4].

Our meta-analysis and regression specifically focused on concomitant infection caused by bacteria, so all studies counted towards an estimate of bacterial coinfection or bacterial secondary infection. Please note that the final two columns in Table S1 indicate bacterial coinfection and bacterial secondary infection. We hope this helps clarify.

Our exclusion of letters to the editor was meant to remove any commentary or narrative-type correspondence. However, we did include research letters that provided sufficient data to meet the inclusion criteria [5,6].

Given some of these limitations mentioned, we have updated the inclusion criteria in our living review so that our next update will be more stringent with respect to study inclusion (e.g. requiring an explicit statement of microbiological testing approach, exclusion of any type of letter/correspondence) [7]. The full search strategy for our most recent rapid review is now included in the supplementary material.

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### Author contributions

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cmi.2022.01.020>.

### References

- [1] Langford BJ, So M, Leung V, Raybardhan S, Lo J, Kan T, et al. Predictors and microbiology of respiratory and bloodstream bacterial infection in patients with COVID-19: living rapid review update and meta-regression. *Clin Microbiol Infect* 2022;28:888–9.
- [2] Chen T, Dai Z, Mo P, Li X, Ma Z, Song S, et al. Clinical characteristics and outcomes of older patients with coronavirus disease 2019 (COVID-19) in Wuhan, China: a single-centered, retrospective study. *J Gerontol A Biol Sci Med Sci* 2020;75:1788–95.
- [3] Luyt CE, Hékimian G, Koulenti D, Chastre J. Microbial cause of ICU-acquired pneumonia: hospital-acquired pneumonia versus ventilator-associated pneumonia. *Curr Opin Crit Care* 2018;24:332–8.
- [4] Kalanuria AA, Mirski M, Ziai W. Ventilator-associated pneumonia in the ICU. In: Vincent JL, editor. *Annual update in intensive care and emergency medicine*. New York City, NY: Springer International Publishing; 2014. p. 65–77.
- [5] Lee S, Koh JS, Kim YJ, Kang DH, Park D, Park HS, et al. Secondary infection among hospitalized COVID-19 patients: a retrospective cohort study in a tertiary care setting. *Respirology* 2021;26:277–8.
- [6] Elabbadi A, Turpin M, Gerotziafas GT, Teulier M, Voiriot G, Fartoukh M. Bacterial coinfection in critically ill COVID-19 patients with severe pneumonia. *Infection* 2021;49:559–62.
- [7] Langford BJ, So M, Leung V, Simeonova M, Lo J, Raybardhan S, et al. Antibiotic resistant infections in patients with COVID-19: a rapid review. *Prospero* 2021. CRD42021297344.