

## SYNTHESIS

06/29/2021

# COVID-19 Vaccination for Post-Exposure Prophylaxis (PEP) or Ring Vaccination – What We Know So Far

## Introduction

PHO is actively monitoring, reviewing and assessing relevant information related to Coronavirus Disease 2019 (COVID-19). “What We Know So Far” documents are intended to provide a rapid review of the evidence related to a specific aspect or emerging issue related to COVID-19.

The development of these documents includes a systematic search of the published literature as well as scientific grey literature (e.g., [ProMED](#), [CIDRAP](#), [Johns Hopkins Situation Reports](#)) and media reports, where appropriate. Relevant results are reviewed and data extracted for synthesis. All “What We Know So Far” documents are reviewed by PHO subject-matter experts before posting.

As the COVID-19 outbreak continues to evolve and the scientific evidence rapidly expands, the information provided in these documents is only current as of the date of posting.

## Key Findings

- There is currently a lack of data supporting the use of COVID-19 vaccines for post-exposure prophylaxis (PEP) or ring vaccination. Since the median incubation period for SARS-CoV-2 is 4-5 days and it takes approximately 2 to 3 weeks to mount an immune response after the first dose of COVID-19 vaccine, it is unlikely that a post-exposure vaccination strategy targeting only exposed individuals would result in immunity within this incubation period to prevent infection.
- However, a tailored approach of vaccinating unvaccinated individuals at risk of exposure may be considered in circumstances in which contacts are unvaccinated and a case or outbreak represents an opportunity to encourage or facilitate vaccination. This is relevant in all settings, but may be particularly true within a closed setting (e.g., long-term care home) where there is an ongoing risk of exposure. Tailored messaging about the benefits of vaccination in specific areas where an outbreak is occurring may also help to increase vaccination uptake.

## Background

There is interest in the use of COVID-19 vaccines for post-exposure prophylaxis (PEP) or ring vaccination to reduce the risk of transmission and severity of SARS-CoV-2. PEP involves vaccinating exposed contacts of a confirmed case as a means of reducing their risk of becoming infected. Ring vaccination involves vaccinating all persons surrounding a case(s) who could potentially contribute to the chain of transmission (e.g., contacts of infected persons/cases and contacts of those contacts) by forming a ‘ring’ of protection

around the infected individual or cluster. Ring vaccination has been previously used as a strategy to control spread of other diseases such as smallpox and Ebola virus.<sup>1</sup>

Ring vaccination for two generations of contacts (or “two-ring strategy”) has been proposed as a potential strategy for case and contact management, and for outbreaks in the context of limited COVID-19 vaccine supply or uptake and in areas with otherwise low rates of viral transmission.<sup>2-5</sup> The first ring consists of unvaccinated close contacts of confirmed cases whereas the second ring consists of unvaccinated individuals exposed to the close contacts within the first ring. It has been suggested that this would result in a reduction of new cases by establishing immunity amongst this high-risk population which would then in turn decrease the risk of further transmission to the broader population.<sup>2</sup>

The objective of this synthesis is to evaluate whether the use of vaccine as PEP or ring-vaccination have been implemented for COVID-19 and to evaluate the outcomes of such strategies if available. Booster vaccines for fully vaccinated individuals was out of scope for this review.

## Methods

To identify relevant evidence on this topic, systematic searches in MEDLINE and Embase were conducted on June 17, 2021 by PHO Library Services. A grey literature search including pre-prints was also conducted on June 24, 2021 by PHO Library Services. An environmental scan of the grey literature was also conducted by PHO staff. It is recognized that there may be additional information not captured in this document. Relevant results were reviewed and synthesized.

## Results

There is currently no data on the use of COVID-19 vaccine as post-exposure prophylaxis among unvaccinated contacts. For ring vaccination, there was one modelling study and one example of implementation; however, no studies or evaluations of effectiveness were identified in the peer-reviewed, pre-print or grey literature.

- Since the median incubation period for SARS-CoV-2 is 4-5 days, it is unlikely that post-exposure vaccination would result in sufficient immune response in the contact within this incubation period to prevent/attenuate infection.<sup>6</sup> Immune response to reduce infection is generally attained by 2-3 weeks after first dose vaccine, making reduction in infection risk unlikely.<sup>7</sup> However, one paper speculated that individuals with longer disease incubation periods and those with weak immunity (i.e., after prior asymptomatic disease) could potentially benefit from PEP.<sup>8</sup>
- One paper modelled the use of COVID-19 vaccine as PEP (contact tracing and vaccination of one generation of contacts) in the context of a limited vaccine supply. This strategy was estimated to be the most efficient for rapidly reducing cases and deaths when at least 90% of contacts were traced and vaccinated. However, this model assumed that the vaccine would have 50% efficacy for PEP which may be an overestimate based on timing of immune response (2-3 weeks).<sup>3</sup>
- In March 2021, a ring vaccination strategy was implemented for students, their families and staff in schools within 3 postal codes of a COVID-19 variant community outbreak prior to widespread vaccination in Montreal, Quebec; however, no evaluation data was available.<sup>9</sup>
- The use of a second dose of COVID-19 vaccination as PEP in partially vaccinated individuals, or boosting dose among fully vaccinated individuals, exposed to a case was not mentioned in any of the literature reviewed. However, this would be conceptually analogous to the use of PEP for other

infectious diseases in previously infected individuals for a boosted immune response after an exposure.<sup>8</sup>

Based on the limited evidence, no jurisdictions made recommendations in favour of PEP whereas several jurisdictional guidelines currently recommend against routine use of COVID-19 vaccine for PEP.<sup>5,6,10</sup> However, Australian national guidelines describe the potential use of vaccination as an outbreak response tool, in addition to other public health interventions:<sup>4</sup>

- In an outbreak setting, vaccination of unvaccinated individuals at risk of exposure to cases may be considered in order to reduce the number and severity of COVID-19 infections based on the following factors:
  - population groups with low vaccine coverage (e.g., racialized and marginalized)
  - groups that are at higher risk of severe outcomes (e.g., elderly, immunocompromised)
  - ongoing risk of exposure
  - closed settings (e.g., long-term care homes or correctional facilities)
- Tailored messaging about the benefits of vaccination in specific circumstances such as an outbreak situation where there is an ongoing risk of exposure (e.g., contacts are unvaccinated within a closed settings such as a long-term care home) may be an opportunistic way to increase and facilitate vaccination uptake.

## Practical Implications

Implementation of a ring vaccination strategy is dependent on timely and complete contact tracing, identification of contacts of contacts, and that contacts maintain quarantine. For two-ring vaccination, contact tracing would need to include not only close contacts of the confirmed case but also contacts of those individuals which is resource intensive and can delay delivery of vaccine while contact information is being gathered.<sup>2</sup> Alternative approaches in the absence of formal contact tracing beyond first generation include use of postal code and/or setting (e.g., workplace, school) as a proxy for potential exposure, vaccinating an entire community, or using a communication strategy to promote vaccination among individuals who have been identified as a contact to try and reach individuals beyond the first ring.<sup>5,9</sup> This requires identification of cases in a low transmission setting where social contacts are largely geographically and/or setting based. Processes that focus vaccination around cases may also be resource-intensive for public health units that are already invested in delivering vaccine through mass clinics and other means, and with case contact management.

Additionally, early post-exposure vaccination requires vaccination of contacts which must occur very soon after the index case tests positive and before and/or while the individual is in self-isolation.<sup>8</sup> As individuals with known COVID-19 exposure are currently discouraged from attending vaccine clinics, a process to safely vaccinate contacts that are in self-isolation needs to be in place in order to prevent forward transmission should they already be positive.<sup>5</sup> Vaccination of contacts may also complicate assessment of adverse events following immunization, whereby if the contact becomes a case, it may be difficult to distinguish between some of the symptoms of the illness from vaccine-related adverse events following immunization (e.g., fatigue, headache, myalgia, fever, chills). As well, PEP and ring vaccination may result in contacts and contacts of contacts to dismiss symptoms of COVID-19 if they attribute their symptoms to vaccination.

## References

1. Kucharski AJ, Eggo RM, Watson CH, Camacho A, Funk S, Edmunds WJ. Effectiveness of ring vaccination as control strategy for Ebola virus disease. *Emerg Infect Dis*. 2016;22(1):105–8. Available from: <https://doi.org/10.3201/eid2201.151410>
2. Xu W, Su S, Jiang S. Ring vaccination of COVID-19 vaccines in medium and high-risk areas of countries with low incidence of SARS-CoV-2 infection. *Clin Transl Med*. 2021;11(2):e331. Available from: <https://doi.org/10.1002/ctm2.331>
3. MacIntyre CR, Costantino V, Trent M. Modelling of COVID-19 vaccination strategies and herd immunity, in scenarios of limited and full vaccine supply in NSW, Australia. *Vaccine*. 2021;S0264-410X(21)00501-6. Available from: <https://doi.org/10.1016/j.vaccine.2021.04.042>
4. Communicable Disease Network Australia. Coronavirus disease 2019 (COVID-19) CDNA national guidelines for public health units [Internet]. Canberra: Australian Government Department of Health; 2021 [cited 2021 Jul 05]. Available from: [https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/\\$File/COVID-19-SoNG-v4.7.pdf](https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/$File/COVID-19-SoNG-v4.7.pdf)
5. Scientific Advisory Group. COVID-19 Scientific Advisory Group rapid evidence report. Population vaccination strategies for COVID-19: evidence around the role of exposure risk [Internet]. Edmonton: Alberta Health Services; 2021 [cited 2021 Jul 05]. Available from: <https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-sag-vaccination-strategies-rapid-review.pdf>
6. Centers for Disease Control and Prevention. Interim clinical considerations for use of COVID-19 vaccines currently authorized in the United States [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2021 [cited 2021 Jul 05]. Available from: <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html>
7. Ontario Agency for Health Protection and Promotion (Public Health Ontario). COVID-19 real-world vaccine effectiveness – what we know so far. Toronto, ON: Queen’s Printer for Ontario; 2021. Available from: <https://www.publichealthontario.ca/-/media/documents/ncov/covid-wwksf/2021/04/wwksf-vaccine-effectiveness.pdf?la=en>
8. Muller CP. Can integrated post-exposure vaccination against SARS-COV2 mitigate severe disease? *Lancet Reg Health Eur*. 2021;5:100118. Available from: <https://doi.org/10.1016/j.lanepe.2021.100118>
9. Jelowicki A. 9 schools added to Montreal vaccination pilot project to curb spread of COVID-19 variants [Internet]. *Global News* [Internet], 2021 Mar 25 [cited 2021 Jul 05]; Education. Available from: <https://globalnews.ca/news/7718533/schools-added-montreal-vaccination-pilot-project-covid-19-variants/>
10. Public Health England. COVID-19: the green book, chapter 14a: coronavirus (COVID-19) vaccination information for public health professionals [Internet]. London: Crown Copyright; 2021 [modified 2021 Jul 01; cited 2021 Jul 05]. Available from: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/984310/Greenbook\\_chapter\\_14a\\_7May2021.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/984310/Greenbook_chapter_14a_7May2021.pdf)

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