

The different methods of monitoring COVID-19 infections in vaccinated populations can potentially predict outbreaks before they occur, but they have limitations that could lead to missed cases

Egunsola O, Farkas B, Flanagan J, Salmon C, Mastikhina L, Clement FM on behalf of the University of Calgary Health Technology Assessment Unit. Surveillance of COVID-19 in a Vaccinated Population: A Rapid Literature Review. June 25, 2021.

Why is all the evidence on this topic being summarized?

- COVID-19 testing needs to continue happening to prevent new outbreaks.
- RT-PCR tests (nose swabs or saliva tests) can have slow laboratory turnaround times and restricted availability, which limits their ability to slow viral spread.
- Alternative population-level testing methods may detect the presence of the virus in a setting before an outbreak.

What questions did we want to answer?

- What scientific evidence on surveillance approaches currently exists to monitor the presence of the virus in a vaccinated population?
- What technologies are emerging to identify infections from variants of concern?
- What international guidance exists on testing and surveillance for the virus?

How have we done this rapid review?

- Multiple databases were searched for articles with set criteria: persons who have been partially or fully vaccinated against COVID-19, surveillance approaches to monitor for COVID-19 variants and resurgence, and observational studies on those surveillance approaches.
- Of 914 unique citations, 33 full-text studies were included in the review.

How up to date is this rapid review?

- The database search was conducted on June 13, 2021. The studies selected were published between April and June 2021.

What are the main results of our rapid review?

- There are **five main approaches** to monitoring post-vaccination COVID-19 cases and emerging variants: 1) RT-PCR and rapid antigen screening (PCR tests use a polymerase chain reaction (PCR) to identify the viral genetic material of COVID-19, while antigen tests search for protein fragments specific to the virus); 2) genomic surveillance (tracking changes in the genetic

configuration of the virus); 3) wastewater surveillance (sampling of wastewater from treatment plants); 4) metagenomics (the study of genetic material from environmental samples); and 5) the testing of air filters on public buses.

- Monitoring COVID-19 cases in a healthcare setting, in long-term care facilities and in the community was mainly done with RT-PCR or antigen tests. Although breakthrough cases were identified by testing, the studies mostly show that vaccination is effective in preventing COVID-19 infection.
- Limitations to population surveillance were identified: Testing frequency tends to vary highly from person to person. Antigen tests have lower sensitivity and can produce false negatives, while timing of PCR testing can result in some missed infections.
- Wastewater surveillance was shown to predict major outbreaks several weeks in advance and was in-line with clinical data. This method had inconsistencies in variant representation depending on where the samples were taken, and differences in the ability to predict case numbers depending on the wastewater treatment plant.
- New surveillance technologies are emerging but have not yet been studied in a real-world setting. Some examples identified are a wearable monitoring device for early detection of COVID-19 symptoms, and deep learning-based models to detect infection based on CT scans and chest X-rays. Several new sample collection methods were also identified.
- This means that while new surveillance methods are emerging, there may still be some time before they are put into practice.

How confident are we in the results?

- This review included several studies which observed details of local variation in practices, which may not always be generalizable.
- Most of the studies in the review were designed as studies of existing surveillance programs themselves, focusing on their outcomes rather than their practicality. While each one included a vaccinated population, there were varying vaccination rates.
- Evidence-based guidance on surveillance in a vaccinated population is limited, and more is required that incorporates all modes of testing.

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