

Symptomatic SARS-CoV-2 breakthrough with delta variant after 3rd mRNA vaccine shot (booster)

Verena Schildgen, Jessica Lüsebrink and Oliver Schildgen

Kliniken der Stadt Köln gGmbH, Klinikum der Privaten Universität Witten/Herdecke mit Sitz in Köln, Germany

Keywords: Breakthrough infection, delta variant, German 3G regulation, SARS-CoV-2

Original Submission: 21 March 2022; **Accepted:** 19 May 2022

Article published online: 27 May 2022

Corresponding author. Dipl.-Biologe, Fachvirologe GfV, Kliniken der Stadt Köln gGmbH, Klinikum der Privaten Universität Witten/Herdecke, Institut für Pathologie, Ostmerheimer Str. 200, D-51109 Köln (Cologne), Germany. fax: +40(0)221-89073542.

E-mails: oliver.schildgen@uni-wh.de, schildgeno@kliniken-koeln.de

Although it is now known that actually used SARS-CoV-2-vaccines do not lead to sterile immunity, many countries have revoked pandemic restrictions for vaccinated and recovered individuals. As consequently cases of SARS-CoV-2 vaccination breakthrough infections increase nationwide due to a limited protection of only few months so called booster vaccinations were initiated in Germany. Taking into account the experience of the recent vaccination campaign in Israel [1] third shots of mRNA vaccines were initially applied to elderly (≥ 70 years) and high risk patients as well as to healthcare staff to avoid an increase of severe clinical COVID-19 courses.

Nevertheless, we have identified two cases of symptomatic booster breakthrough infection during routine screenings of medical staff members several weeks in advance if the Omicron wave.

First, a 21 year old Caucasian female patient who suffered from a mild otitis 56 days after booster vaccination. As she works in a highly vulnerable setting she decided to test herself by RAT (negative). The next day due to ongoing symptoms she performed another test (slightly positive), which was confirmed the same day by PCR (Altona SARS-CoV-2, Germany). While the PCR resulted in CT-values of 27.01 (E-gene) and 26.04 (S-gene) a second RAT later that day was negative again.

Second, a 60 year old Caucasian male suffered from common cold symptoms 15 days post boosting and five days after attending a 2G+ (fully vaccinated and/or recovered with negative rapid antigen test (RAT) without any protective requirements) celebration event with controlled vaccination/recovery ($\leq 6M$ after SARS-CoV-2 infection) status and on-site RATs performed immediately before access.

The patient tested positive for SARS-CoV-2 by two RATs, which were confirmed by the Altona SARS-CoV-2-PCR with CT-values of 14.62 (E-gene) and 13.87 (S-gene) and typed as delta variant by type specific PCRs (TibMolbiol, Berlin, Germany). He reported to have attended a celebration event 10 days after the booster shot at which solely fully vaccinated and/or recovered individuals with negative rapid antigen tests (RAT) were allowed. In Germany this type of hygiene concept is named 2G+, meaning *genesen* (=recovered), *geimpft* (=vaccinated), and tested (+). During the event no masks and no social distancing were required, and dancing was allowed. In total there were 112 guests and 10 staff persons involved. Vaccination or recovery status (less than six months after SARS-CoV-2 infection) were fully controlled and additionally, on-site RATs were performed at a controlled, mobile test booth at the entrance of the event location before entering.

Four days after the event (14 days after the booster shot) the patient was tested positive for SARS-CoV-2 twice in rapid antigen tests (RAT), which was confirmed by PCR from a throat wash (Altona SARS-CoV-2, Altona, Hamburg, Germany) with a CT-value of 14.62 for the E-gene and 13.87 for the S-gene. According to the most recent knowledge, twenty more guests (all with at least 2 vaccination shots) have been tested positive for SARS-CoV-2 by PCRs.

Both cases show that already during the delta wave even a booster vaccination was not effective to prevent an infection, and that in vulnerable settings hygiene restrictions such as face mask wearing remain the sole tool to prevent viral transmission. In addition, these cases demonstrate that concepts such as the German 2G+ concept that permit exclusive access to vaccinated and/or recovered persons without any restrictions rather lead to counterproductive effects regarding incidence rate due to a false sense of security in the population. For this reason, restrictions and test concepts of a respective setting must apply for every person concerned independent of its vaccination status. This is in line with the study of Subramanian and Kumar, who observed that incidence and vaccination rate are independent of each other [2].

It remains to be seen whether actions adapted to vaccination status may improve the pandemic situation, because as long as individuals may act without protective measures people must be aware that apart from test concepts and vaccination status they are at risk of infection.

Competing interest statement

The authors report no competing interests.

Acknowledgement

We thank Lisa Nussbaum and Jürgen Höher for critical comments on the manuscript.

References

- [1] Barda N, Dagan N, Cohen C, Hernan MA, Lipsitch M, Kohane IS, et al. Effectiveness of a third dose of the BNT162b2 mRNA COVID-19 vaccine for preventing severe outcomes in Israel: an observational study. *Lancet* 2021.
- [2] Subramanian SV, Kumar A. Increases in COVID-19 are unrelated to levels of vaccination across 68 countries and 2947 counties in the United States. *European Journal of Epidemiology* 2021.