Rapid Screening for Variants of Concern in Routine SARS-CoV-2 PCR Diagnostics

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ABSTRACT

The emerging spread of variants of concern (VOC) of SARS-CoV-2 has been noted in several countries worldwide during last months. VOCs associated with increased transmissibility and morality. Sequencing is the gold standard for investigation of variants, however it is expensive and timeconsuming. S-dropout routine monitoring in combination with VOC screening by RT-PCR is a useful tool for VOC surveillance.

Keywords: SARS-CoV-2; Vaccine; RT-PCR tests; Epidemiology

DESCRIPTION

The emerging spread of Variants of Concern (VOC) of SARS-CoV-2 has been noted in several countries worldwide during the few last months. Such variants (e.g. B.1.1.7, B1.351, and P.1) are associated with increased transmissibility and mortality, and possibly also the reduction of vaccine effectiveness [1-4]. Real-time surveillance with a prompt response is essential for the containment of their future spread.

Sequencing of positive samples is the gold standard for the typing classification of SARS-CoV-2 strains and also the identification of VOCs. However, this method is expensive and time-consuming. Although many countries have made a great effort to increase sequencing capacity it still only covers a minority of cases and the results only become available after several days or weeks. For prompt actions, largescale surveillance with cheaper and rapid methods is required uniformly.

Recently several RT-PCR tests for the detection of SARS-CoV-2 mutations have been developed and this approach is also recommended by ECDC [5-7]. The detection of Sgene drop-out by some SARSCoV-2 assays has also been shown as a useful tool for screening B.1.1.7.

For rapid screening of VOC, we introduced S-dropout routine monitoring in combination with VOC screening by RT-PCR in SYNLAB Estonia, Tallinn. SYNLAB is serving all of the Estonian regions and performing 79% of all Estonian SARS-CoV-2 PCR tests, so representing the whole country’s situation.

We use Taq Path COVID-19 CE-IVD RT-PCR (Thermo Fisher Scientific Inc.) for routine SARS-CoV-2 testing which is able to detect Sdropout associated with Del 69-70. Sdrops’ counts and proportion from positive results by counties and patient groups together with trend analysis is updated daily on the COVID-19 diagnostics dashboard (Figures 1-4).

Figure 1: Positive SARS-CoV-2 PCR results per day. Red: S-dropouts; blue: non-S-dropouts.
The same strain B.1.258 has been already described in the Czech Republic and Slovakia in the end of 2020 [8]. Two samples with N501Y and E484K mutations were confirmed as B.1.351 (South African variant).

CONCLUSION

Continuous monitoring of S-dropouts is a useful and inexpensive tool for a follow-up of the UK variants epidemiology. However, regular cross-sectional studies for the screening of all relevant VOC should be performed since the proportion of UK strains in S-dropouts is not stable and has significantly increased over the last 3 months in Estonia according to our data. Moreover, other important VOCs can appear and the UK strain can acquire additional mutations such as E484K.

The rapid detection of these variants means paying special attention to particular regions and patient groups as well, which should be mandatory in border SARS-CoV-2 screening, followed by prompt actions for containment of these variants.

In conclusion, RT-PCR detection of particular mutations is generally an easy and reliable way to screen thousands of samples during a short time and, together with S-dropout automated monitoring, is a useful tool for VOC containment. This approach can significantly support regular sequencing-based surveillance.

REFERENCES