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Antigen vs RT-PCR Tests for Screening Quarantined Students in Florida During the COVID-19 Pandemic SARS-CoV-2 Delta Variant Surge

In the US, schools opened in fall 2021 during a surge of COVID-19 cases attributed to the SARS-CoV-2 Delta variant.1 The US Centers for Disease Control and Prevention recommended masking in schools and return to school of asymptomatic quarantined close contacts at day 7 after the last date of SARS-CoV-2 exposure with a negative test result or at day 10 without a test. Rapid antigen tests have been proposed as a tool to reduce or even eliminate quarantine,2 but there are uncertainties about their performance compared with real-time reverse transcription-polymerase chain reaction (RT-PCR) tests.3–5 Most validation studies on these tests were done before the Delta variant emerged, which may impact results because of the variant’s higher viral load.6 The aim of this study was to assess whether rapid antigen and RT-PCR tests gave comparable results and whether antigen testing on day 5 after SARS-CoV-2 exposure would be helpful in making decisions about when quarantined children can return to making school.

Methods | In this diagnostic/prognostic study, data were collected from August 23, to October 6, 2021, in Florida in Alachua County’s 38 public schools that serve a population of 29,541 K-12 students. Data on race and ethnicity were not collected because they were not essential to the primary study objective. During the study period, masks were mandated for all students unless they had a physician-signed medical exemption. In an effort to reduce school days lost, the Florida Department of Health (FDOH) mandated that asymptomatic quarantined students be allowed to return to school at day 5 after exposure with a test result negative for SARS-CoV-2 or at day 8 without a test. This study was evaluated by the FDOH and was deemed exempt from review under 45 CFR 46.102(j)(2) because it was a public health surveillance activity. Written informed consent was obtained from students’ parents before sample collection.

Results | Between August 23 and October 6, 2021, the average SARS-CoV-2 test positivity rate in Alachua County was 11.7% across all ages and 10.8% for school-aged children (aged 5 to 19 years). Among isolates from Alachua County sequenced at the University of Florida, 95.9% were the Delta variant. Of 29,541 students, 1,731 symptomatic students were known to have been tested, and 1,601 had a positive test result for SARS-CoV-2, representing 5.4% of all students in the county (Figure).

Figure. Sample Collection Diagram

Table. Concordance Analysis of Rapid Antigen and RT-PCR Tests Among K-12 Students

| Age group, y | Positive Ag and RT-PCR test results (%) | Positive Ag and negative RT-PCR test results (%) | Negative Ag and positive RT-PCR test results (%) | Negative Ag and RT-PCR test results (%) | Total |
|-------------|----------------------------------------|-----------------------------------------------|-----------------------------------------------|----------------------------------------|-------|
| All         | 24 (4.0)                               | 1 (0.2)                                       | 6 (1.0)                                       | 572 (94.9)                             | 603*  |
| 5-10        | 10 (3.2)                               | 1 (0.3)                                       | 2 (0.6)                                       | 301 (95.9)                             | 314*  |
| 11-15       | 13 (6.2)                               | 0                                             | 2 (0.9)                                       | 196 (92.9)                             | 211*  |
| 16-19       | 1 (1.3)                                | 0                                             | 2 (2.6)                                       | 75 (96.2)                              | 78*   |

Abbreviations: Ag, antigen; RT-PCR, reverse transcription-polymerase chain reaction.

a Cohen κ, 0.87 (95% CI, 0.79-0.95); sensitivity, 80.0% (95% CI, 61.4%-92.3%); specificity, 99.9% (95% CI, 99.0%-100.0%); positive predictive value (PPV), 96.0% (95% CI, 97.7%-99.9%); negative predictive value (NPV), 99.0% (95% CI, 97.8%-99.6%).
b Cohen κ, 0.86 (95% CI, 0.75-0.98); sensitivity, 83.3% (95% CI, 51.6%-97.9%); specificity, 100.0% (95% CI, 98.0%-100.0%); PPV, 90.9% (95% CI, 58.7%-99.8%); NPV, 99.3% (95% CI, 97.6%-99.9%).
c Cohen κ, 0.92 (95% CI, 0.79-1.05); sensitivity, 86.7% (95% CI, 59.5%-98.3%); specificity, 100.0% (95% CI, 98.1%-100.0%); PPV, 100% (95% CI, 75.3%-100.0%); NPV, 99.0% (95% CI, 96.4%-99.9%).
d Cohen κ, 0.49 (95% CI, 0.30-0.68); sensitivity, 33.3% (95% CI, 0.8%-90.6%); specificity, 100.0% (95% CI, 95.2%-100.0%); PPV, 100% (95% CI, 75.3%-100.0%); NPV, 97.4% (95% CI, 90.9%-99.7%).
Of 1036 asymptomatic quarantine school contacts of the students with positive test results, 603 (58.2%) had paired samples collected on day 5 after exposure. Of these 603 student contacts tested, 25 (4.1%) had a positive rapid antigen test result (independent of RT-PCR test results), and 30 (5.0%) had a positive RT-PCR test result (independent of rapid antigen test results). Taken in concert, 24 (4.0%) had positive test results by both modalities, 6 (1.0%) had negative antigen and positive RT-PCR results, and 572 (94.9%) had negative results by both modalities (rapid antigen test positive and RT-PCR test negative). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]). The tests were highly concordant (Cohen’s κ, 0.87 [95% CI, 0.79-0.95]) (99.8% [95% CI, 99.0%-100.0%]).