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LETTER TO THE EDITOR

# Multicenter Evaluation of the Cepheid Xpert Xpress SARS-CoV-2 Assay for the Detection of SARS-CoV-2 in Oropharyngeal Swab Specimens

**Hongyan Hou,[a] Jun Chen,[b] Yueqin Wang,[c] Yanjun Lu,[a] Yaowu Zhu,[a] Bo Zhang,[a] Feng Wang,[a] Lie Mao,[a] Yi-Wei Tang,[d] Bicheng Hu,[c] Yi Ren,[b] Ziyong Sun[a]**

[a]Department of Laboratory Medicine, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
[b]Department of Laboratory Medicine, Wuhan Pulmonary Hospital, Wuhan Institute for Tuberculosis Control, Wuhan, China
[c]Department of Clinical Laboratory, Wuhan No. 1 Hospital, Wuhan, China
[d]Cepheid, Danaher Diagnostic Platform, Shanghai, China

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The coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a global health concern that has spread worldwide since December 2019 (1–4). For optimal detection of SARS-CoV-2, the collection and testing of either upper or lower respiratory samples are recommended (5–7). In China, oropharyngeal swab (OPS) specimens have been more widely used than nasopharyngeal swab (NPS) specimens as upper respiratory tract specimens for detection of SARS-CoV-2 during the early stages of COVID-19 outbreak (6).

The Cepheid Xpert Xpress SARS-CoV-2 assay (Cepheid, Sunnyvale, CA) is a rapid, random-access molecular test that detects the pan-sarbecovirus E gene and the N2 region of the N gene as its SARS-CoV-2-specific target. The assay has received United States Food and Drug Administration (FDA) emergency use authorization for nasopharyngeal, nasal, midturbinate, or oropharyngeal swab and nasal wash/aspirate specimens (8). The Xpert assay has demonstrated good accuracy in SARS-CoV-2 detection in NPS specimens (9). This study, done in three medical centers in Wuhan, China, aimed to establish performance characteristics of the Xpert Xpress assay in OPS specimens compared to those of commercially available real-time reverse transcription-PCR (RT-PCR) assays approved by the National Medical Products Administration (NMPA) for the detection of SARS-CoV-2 (10, 11).

A retrospective study was conducted on leftover OPS specimens collected during February to April 2020 that were submitted by clinicians for SARS-CoV-2 testing. The OPS specimens were collected from both sides of the throat as described previously (5, 10). An aliquot of OPS specimen was made and stored at −80°C within 24 h after collection. A total of 285 samples from unique patients were tested from three medical centers and included 99 from Wuhan Tongji Hospital (site 1), 96 from Wuhan Pulmonary Hospital (site 2), and 90 from Wuhan No. 1 Hospital (site 3). Among the patients tested, 159 (55.8%) were males and 126 (44.2%) were females; 220 (77.2%) patients were ≤65 years old, and 65 (22.8%) patients were >65 years old. More than half of the specimens (178; 62.5%) were from inpatients, and 107 (37.5%) specimens were from outpatients. The percentage of outpatients was 62.6% at site 1 and 50% at site 3, but all of the specimens at site 2 were from inpatients. In total, 153 (53.7%) patients were positive and 132 (46.3%) were negative by the first test using the NMPA-approved real-time RT-PCR method.

All 285 specimens were tested using the Cepheid Xpert Xpress SARS-CoV-2 assay. The Xpert assay demonstrated a high concordance of 96.1% with the NMPA-PCR

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Address correspondence to Ziyong Sun, zysun@tjh.tjmu.edu.cn.

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**TABLE 1** Xpert Xpress SARS-CoV-2 assay performance versus that of the NMPA-approved RT-PCR method

| Site | No. of results by type[a] | | | | PPA[b] (95% CI) | NPA[c] (95% CI) | Kappa coefficient (95% CI) |
|---|---|---|---|---|---|---|---|
| | TP | FP | FN | TN | | | |
| 1 | 60 | 5 | 0 | 34 | 100 (92.5–100) | 87.2 (71.8–95.2) | 0.89 (0.8–0.99) |
| 2 | 42 | 0 | 6 | 48 | 87.5 (74.1–94.8) | 100 (90.8–100) | 0.88 (0.78–0.97) |
| 3 | 45 | 0 | 0 | 45 | 100 (90.2–100) | 100 (90.2–100) | 1.0 (1.0–1.0) |
| Total | 147 | 5 | 6 | 127 | 96.1 (91.3–98.4) | 96.2 (90.9–98.6) | 0.92 (0.88–0.97) |

[a]TP, true positive; FP, false positive; TN, true negative; FN, false negative.
[b]PPA, positive percent agreement.
[c]NPA, negative percent agreement.

methods. The positive percent agreement of the Xpert assay was 96.1% (95% confidence interval [CI], 91.3 to 98.4%), negative percent agreement was 96.2% (95% CI, 90.9 to 98.6%), and the Kappa statistic was 0.92 (95% CI, 0.88 to 0.97) (Table 1). Three additional mixed samples with low, middle, and high threshold cycle ($C_T$) levels for SARS-CoV-2 were run by three different staff members on three different days in triplicate using one machine and one lot number of reagents. The coefficients of variation (CVs) of the Xpert assay were 0.86%, 0.73%, and 0.7% for the N2 gene and 0.84%, 0.7%, and 1.95% for the E gene in mixed samples with low, middle, and high $C_T$ values, respectively. The Xpert assay showed intratest CVs from 0.2 to 1.17% and 0.21 to 1.27% for the detection of N2 and E genes, respectively.

The upper respiratory samples for RT-PCR tests of SARS-CoV-2 virus included OPS and NPS. Although the positive rates of NPS and sputum were reported as higher than those for OPS, OPS specimens have been more widely used in China (5, 10). The OPS specimens were recommended to be collected for real-time RT-PCR assay by the first to fifth editions of the "Guideline of diagnosis and treatment for COVID-19" by the Chinese National Health Commission. Moreover, a swab might have a hard handle, which may cause bleeding when it is inserted into the nostril. This resulted in the dominant use of OPS as upper respiratory specimens in the early COVID-19 outbreak in China.

This is, to our knowledge, the first clinical study assessing the Cepheid Xpert Xpress SARS-CoV-2 assay in mainland China. Overall, the Xpert assay demonstrated high positive percent agreement (PPA) and negative percent agreement (NPA) for the detection of SARS-CoV-2 compared with results of the NMPA-approved real-time RT-PCR method. The assay is easy to use and provides rapid, accurate, and reproducible results for detection of SARS-CoV-2 in OPS at the point of care.

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