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Short communication

Is there a role for SARS-CoV-2 antigen testing in the post-containment strategy?

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ABSTRACT

**Background:** With the availability and widespread deployment of antigenic tests for SARS-CoV-2 during the second epidemic wave in Europe, the performance of such tests in real-life situations is beginning to become available.

**Objectives:** The question of the role of these tests during periods of low circulation of the virus has been legitimately raised.

**Study design:** We addressed this question by analyzing the results of more than 16,000 SARS-CoV-2 PCRs during the first half of 2020 in a French region heavily affected by COVID-19. We were thus able to calculate and extrapolate the theoretical sensitivity of the antigenic tests for various periods during and after the first epidemic wave.

**Results:** As the PCR-positivity rate of nasopharyngeal swabs declined over time, the proportion of samples with low Ct levels also decreased. Thus, the calculation of the analytical sensitivity of the antigenic tests ranged from 70 to 80% when the percentage of PCR positivity was > 1%, but fell below this score when it was lower.

**Conclusions:** The performance and relevance of antigenic tests appears to be more limited during phases of low circulation of the virus. This may have a negative impact on the effectiveness of isolation, testing, and contact tracing strategies.

1. **Background**

During the second wave of COVID-19, which Europe has been experiencing since October 2020, the arrival of rapid antigen immunoassay diagnostics (RADs) conducted at the point of care (POC) has reduced the pressure on testing laboratories while identifying SARS-CoV-2 infections more quickly, especially those of superspreaders. Data concerning real-life situations is scarce and the performance of such antigenic assays is heterogeneous, with specificity close to 100% for the best, but sensitivity varies among manufacturers [1–3]. The sensitivity of such tests, which is an intrinsic performance criterion of any assay, is normally fixed. However, in the case of SARS-CoV-2 RADs, the reference technique to which they are compared is real-time PCR, with a qualitative result in most cases. Thus, the sensitivity of these RADs is a function of the samples tested and, in particular, the Ct levels (cycle threshold) of the PCR. For those with the best performance, manufacturers show sensitivities of 90%. However, under real-life conditions with samples of varying Ct levels, the sensitivity is approximately 95%, 83%, 57%, and 8% for Ct levels < 20, between 20 and 25, between 25 and 30, and between 30 and 35, respectively [4].

2. **Objectives**

Thus, antigenic tests have a role to play in association with the PCR technique in the test, trace, and isolation strategy when circulation of the virus in the population is high. However, the search for the few infected individuals using such tests during periods of low circulation of the virus has been called into question.

3. **Study design**

We addressed this question, by studying the raw PCR Ct levels over several weeks from the end of February 2020, during the first wave, in a university hospital in Northern France that was strongly affected by COVID-19. We analyzed all nasopharyngeal swab samples, excluding the tests obtained after a first positive test. The total weekly analysis over the first half of 2020 represents more than 16,000 samples, of which 2050 were positive (13%).

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4. Results

We started the search for SARS-CoV-2 by PCR during week 10, with 30% positive tests, reaching a maximum of 39.4% positivity during week 13. A progressive decrease in the rate of positivity was observed with the implementation of the first confinement in France, resulting in <1% positive tests during the summer of 2020 (Fig. 1). The distribution of Ct scores obtained during the period of the study showed a greater proportion of samples with a Ct > 25 when the PCR test positivity rate fell below 1%. Thus, the raw values for the Ct of the SARS-CoV-2 PCR followed the same trend as the decrease in positivity rates, resulting in a higher proportion of tests with a high Ct. We thus extrapolated the sensitivity scores of the antigenic tests performed during the same period. The sensitivity varied between 70 and 80% for the period during which >5% of the tests were positive. However, the sensitivity of the antigenic tests to identify the few infected individuals in the population decreased when the positivity rate was lower during the post-confinement period.

5. Discussion

Recent data from the group of Didier Raoult were obtained on the infectivity of 3790 samples in cell culture [5], according to the Ct obtained by PCR. Persistence of infectivity was demonstrated for 70% of the samples with a Ct of 25, 20% for those with a Ct of 30, and <3% for those with a Ct of 35. Comparison of these data with the obtained sensitivity data of the antigenic tests according to PCR Ct levels raises the question of the strategy of screening populations in a situation in which the circulation of the virus is low. Ct values > 25 may correspond to three situations for which the distinction is not always simple: either an early ascending or late descending phase of viral replication or the control of contamination. The first two situations are important to consider and should not be neglected in considering the effectiveness of isolation, testing, and contact tracing strategies. However, the value of using such antigenic tests for optimal control of SARS-CoV-2 after an epidemic wave appears to be more limited. These data should be taken into consideration in recommendations by the health authorities of each country to ensure that the use of SARS-CoV-2 antigenic tests is appropriate and effective.

Declaration of Competing Interest

The author has no conflict of interest to declare.

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