Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

International Journal of Infectious Diseases 111 (2021) 28–30

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

Short Communication

How to (ab)use a COVID-19 antigen rapid test with soft drinks?

Thirumalaisamy P Velavan[1,2,*], Srinivas Reddy Pallerla[1], Peter G Kremsner[1,3]

[1] Institute of Tropical Medicine, Universitätsklinikum Tübingen, Tübingen, Germany
[2] Vietnamese-German Center for Medical Research, VG-CARE, Hanoi, Vietnam
[3] Centre de Recherches Médicales de Lambaréné, Lambaréné, Gabon

ARTICLE INFO

Article history:
Received 14 July 2021
Revised 5 August 2021
Accepted 12 August 2021

Keywords:
RDTs
SARS-CoV-2
false-positive
antigen test

ABSTRACT

With reasonably good specificity and sensitivity, the speed and convenience of COVID-19 antigen tests have led to self-testing in schools, offices, and universities in the European Union (EU). Although self-testing can be beneficial and increase the accessibility to testing, there are potential ways to confound a positive COVID-19 lateral flow test. We observed that all soft drinks, energy drinks, alcoholic beverages (vodka, whiskey, and brandy), commercially bottled mineral water, and carbonated mineral water caused the appearance of a red test line. However, when equal volumes of the buffer and the respective beverages are mixed, there are no false-positive test lines. Deceitful methods may easily lead to misuse of COVID-19 antigen rapid tests and lead to false-positive results; however, this does not prove that these tests are unreliable when performed correctly.

Rapid diagnostic tests (RDT) detect the presence of SARS-CoV-2 viral antigens in an oropharyngeal or nasopharyngeal specimen or saliva sample from an infected individual. When the target antigen is present in sufficient concentration, the antigen binds to specific antibodies coated on a nitrocellulose membrane in the test cassette and produces a visually detectable signal. While PCR-based testing remains the gold standard, rapid SARS-CoV-2 antigen tests that provide results within 10 to 15 minutes are often used as a surrogate for detecting the active virus (Velavan and Meyer 2021). With reasonably good specificity and sensitivity, the speed and convenience of COVID-19 antigen tests have led to self-testing in schools, offices, and universities in the European Union (EU). Although self-testing can be beneficial and increase accessibility to testing, there are potential ways to confound a positive COVID-19 lateral flow test. Given the greater accessibility of RDTs and the widespread use of home self-testing, fraudulent methods of achieving educational abstinence can easily lead to misuse of the COVID-19 antigen rapid tests and thus to false-positive results. When these false positives are then tested by PCR, they turn out to be true negatives. We investigated whether soft drinks, alcoholic beverages, scientific laboratory chemicals (acetic acid, Sterilium, absolute alcohol) can cause the appearance of a positive red test line. We tested various soft drinks and alcoholic beverages, including sparkling water, directly on the Abott Panbio COVID-19 Ag Lateral Flow Test Cassette to determine whether they could confound a positive test result. We observed that all soft drinks (Coca-Cola, Coca-Cola Zero, Fanta-Orange, Orange soft drink), energy drink (Red Bull), alcoholic beverages (vodka, whiskey, and brandy), commercially bottled mineral water, and carbonated mineral water caused the appearance of a red test line (Figure 1). However, when equal volumes of the buffer and the respective beverages are mixed, there are no false-positive test lines (Figure 2). The tests with chemicals, including acetic acid, Sterilium, and absolute alcohol, did not result in the appearance of a positive red test line. A likely explanation for the interference could be an altered pH in these solutions, which could modulate the function of the antibodies coated in the test line. An optimal pH, stabilized by the supplied buffer, must be critical for true positivity. Deceitful methods may easily lead to misuse of COVID-19 antigen rapid tests and result in false-positive results; however, this does not prove that these tests are unreliable when performed correctly.

* Correspondence: Thirumalaisamy P Velavan, Institute of Tropical Medicine, University of Tübingen, Wilhelmstraße 27 72074 Tübingen, Germany
E-mail address: velavan@medizin.uni-tuebingen.de (T.P. Velavan).

https://doi.org/10.1016/j.ijid.2021.08.023

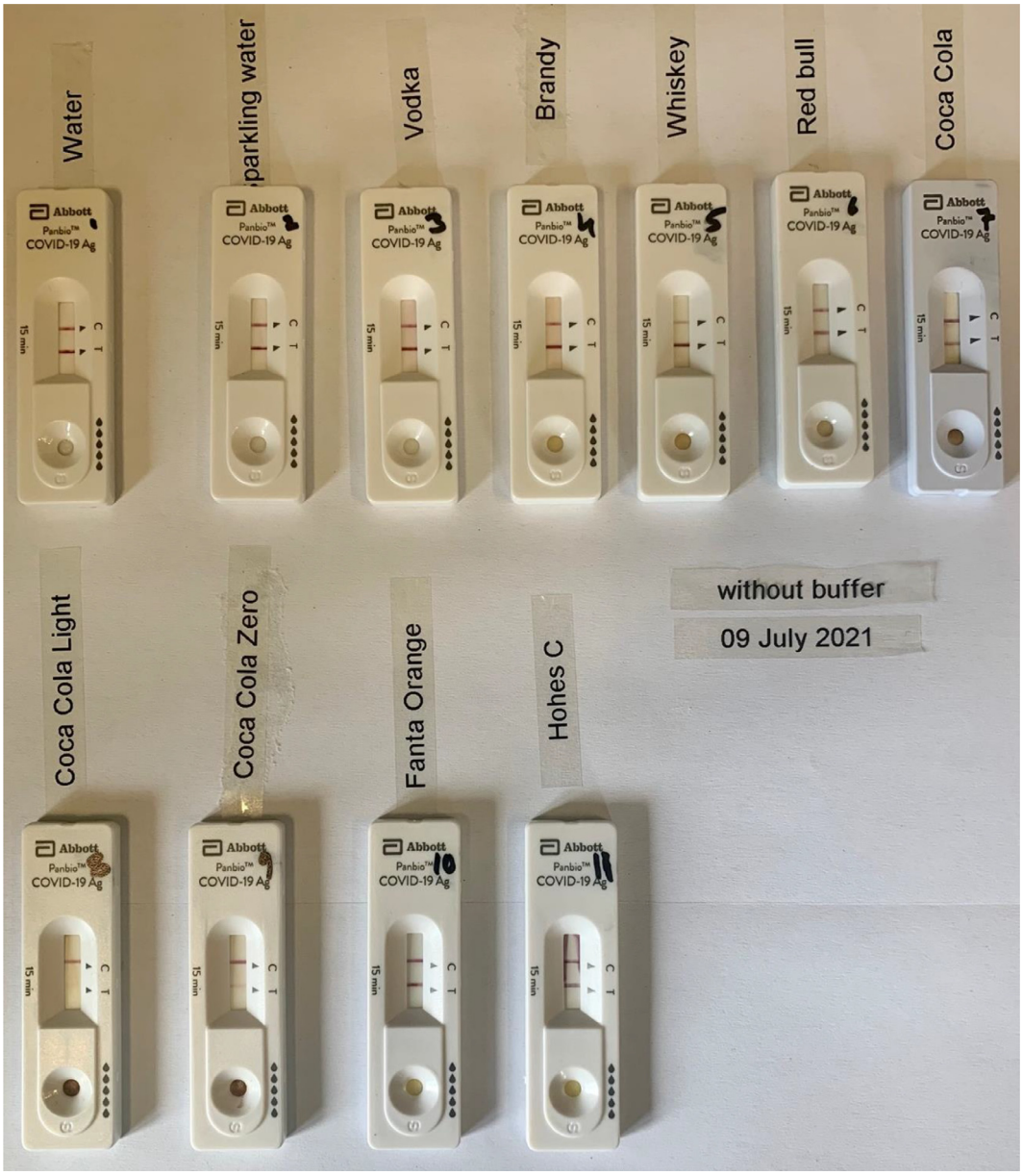

Figure 1. Soft drinks, alcoholic beverages, energy drinks, and water directly used as a sample.

Figure 2. Soft drinks, alcoholic beverages, energy drinks, and water equally mixed with the recommended buffer volume

Conflict of interest

All authors disclose no conflict of interest.

Funding source

The author TPV acknowledges the support of the Pan African Network for Rapid Research, Response, and Preparedness for Infectious Diseases Epidemics consortium (PANDORA-ID-NET) and the PAN-ASEAN Coalition for Epidemic and Outbreak Preparedness (PACE-UP; DAAD Project ID: 57592343;57445019).

Ethical Approval

Not applicable

Author contributions

TPV conceived the study. TPV, SRP performed the RDT tests. TPV and PGK wrote the commentary.

Reference

Velavan TP, Meyer CG. COVID-19: A PCR-defined pandemic. Int J Infect Dis 2021:278–9 Feb; 103.