

COVID-19 Survey: The role of breath analysis (volatolomics) in testing for COVID-19: update 2020

Larry J Kricka, Joe Wienczek, and Paolo Fortina (IFCC Emerging Technology Division)

COVID-19 has changed all of our lives, and presented new diagnostic needs and opportunities. Social distancing, sheltering in place, face coverings, and universal concerns over contracting COVID-19, have meant that previous diagnostic test modalities may no longer be optimal. There is an increasing need, and also a concomitant array of new opportunities, for simple and rapid testing for COVID-19. In the near future, simplifying and increasing access to COVID-19 testing could become the new medical imperative and would also lay a foundation for addressing testing needs in future pandemics.

Breath analysis (volatolomics) may provide a viable technology for rapid COVID-19 testing. As part of our current awareness initiative, the WG on Volatolomics, has assembled the recent breath analysis literature (up to 8/2020) that is focused on COVID testing or testing for COVID-related diseases. Breath analysis methods being evaluated include proton transfer reaction mass spectrometer-based detection, gas chromatography-ion mobility spectrometry, and PCR.

Clinical trials

- Canary. Ground-breaking human trial for COVID 19 rapid breath test to start in June in Johannesburg. May 23 2020. <https://www.canaryhealthtech.com/news/ground-breaking-human-trial-for-covid-19-rapid-breath-test-to-start-in-june-in-johannesburg>.
- Makoni M. In South Africa, COVID-19 breath test trial set for June. June 15 2020. <https://www.the-scientist.com/news-opinion/in-south-africa-covid-19-breath-test-trial-set-for-june-67631>.
- NIH. Breath analysis based disease biomarkers of COVID-19 and other diseases. April 13 2020. <https://clinicaltrials.gov/ct2/show/NCT04341012>.
- TOI Staff, Solomon S. Aiming for 10-second result, breathalyzer detector for COVID begins early tests. July 9 2020. <https://www.timesofisrael.com/israeli-startups-breathalyzer-detector-for-covid-19-begins-early-tests/>.

Diagnostic methods

- Anon. Breath gas analysis for COVID-19 detection. May 26 2020. <https://www.news-medical.net/whitepaper/20200526/Breath-Gas-Analysis-for-COVID-19-Detection.aspx>.
- Behold Israel. Israelis running tests on new breath analyzing device to detect COVID-19 in less than one minute. April 19 2020. <https://beholdisrael.org/israelis-running-tests-on-new-breath-analyzing-device-to-detect-covid-19-in-less-than-one-minute/>.
- Candanosa RM. These new sensors can detect coronavirus on your breath, instantly. July 17 2020. <https://news.northeastern.edu/2020/07/17/could-this-new-gas-sensor-help-researchers-test-regularly-for-the-coronavirus-in-the-air/>.
- Chen H, Qi X, Ma J, Zhang C, Feng H, Yao M. Breath-borne VOC biomarkers for COVID-19. medRxiv 2020. doi: <https://doi.org/10.1101/2020.06.21.20136523>.
- Cook C. French hospital develops breath test for COVID-19. August 3 2020. <https://www.aa.com.tr/en/europe/french-hospital-develops-breath-test-for-covid-19/1930294>.
- Crotti N. Ohio State researchers developing 'breathalyzer' for COVID-19. June 11 2020. <https://www.medicaldesignandoutsourcing.com/ohio-state-researchers-developing-breathalyzer-for-covid-19/>.
- Gough NR. COVID-19 testing should be as simple as breathing out. August 7 2020. <https://medium.com/datadriveninvestor/covid-19-testing-should-be-as-simple-as-breathing-out-afae6f002c>.
- Healey N and Whitticase J. Catch your breath: a device that spots critical Covid-19 cases. 2020. https://medical-technology.nridigital.com/medical-technology_jul20/n-tidal-spots-critical-covid-19-cases.
- IONICON. IONICON PTR-TOF instruments deployed for COVID-19 detection in breath. June 30 2020. <https://theanalyticalscientist.com/app-notes/ionicon-ptr-tof-instruments-deployed-for-covid-19-detection-in-breath>.
- IONICON. COVID-19 detection in breath. 2020. <https://www.ionicon.com/blog/2020/covid-19-detection-in-breath>.
- Jendry P, Schulz C, Twele F, Meller S, von Kockritz-Blickwede M, Osterhaus ADME, et al. Scent dog identification of samples from COVID-19 patients – a pilot study. BMC Infect Dis 2020;20:536. <https://doi.org/10.1186/s12879-020-05281-3>.

- Khoubnasabjafari M, Jouyban-Gharamaleki V, Ghanbari R, Jouyban A. Exhaled breath condensate as a potential specimen for diagnosing COVID-19. Bioanalysis. April 15 2020. <https://doi.org/10.4155/bio-2020-0083>.
- Lim JR. Where breath meets bark: canines collaborate with scientists to Identify COVID-19 biomarkers. June 8 2020. <https://www.research.chop.edu/cornerstone-blog/where-breath-meets-bark-canines-collaborate-with-scientists-to-identify-covid-19-biomarkers>.
- Medgadget. Breathalyzer to detect COVID-19 in seconds. June 10 2020. <https://www.medgadget.com/2020/06/breathalyzer-to-detect-covid-19-in-seconds.html>.
- Owlstone Medical. Integrate Breath Biopsy® into your COVID-19 research. 2020. <https://www.owlstonemedical.com/breath-biopsy-covid-19-research/>.
- Ruskiewicz D, Sanders D, O'Brien R, Hempel F, Reed MJ, Riepe AC, et al. Diagnosis of COVID-19 by analysis of breath with gas chromatography-ion mobility spectrometry - A feasibility study. August 6 2020. Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3668465.
- Sagaityte E. Take a breath. Engineering inventions at Brown to diagnose, treat COVID-19. July 18 2020. <https://www.browndailyherald.com/2020/07/18/take-breath-engineering-inventions-brown-diagnose-treat-covid-19/>.
- Science & Enterprise. Breath analysis sensor licensed to detect Covid-19. August 10 2020. <https://sciencebusiness.technewslit.com/?p=39704>.
- Shah R. Sixth Wave working on a COVID-19 breath test. August 5 2020. <https://investorintel.com/investorintel-video/dr-gluckman-on-sixth-waves-covid-19-test-which-can-detect-the-virus-in-breath/>.
- Shan B, Broza YY, Li W, Wang Y, Wu S, Liu Z, et al. Multiplexed nanomaterial-based sensor array for detection of COVID-19 in exhaled breath. ACS Nano 2020, XXXX, XXX, XXX-XXX. Just Accepted Manuscript. August 18 2020. <https://doi.org/10.1021/acsnano.0c05657>.
- Solomon S. Israeli startup's breath test device to sniff out COVID-19 set to start trials. April 22 2020. <https://www.timesofisrael.com/israeli-startup-hopes-to-sniff-out-deadly-coronavirus-via-breath-tests/>.

- TOFWERK AG. Clinical researchers pursue COVID detection in breath with the Vocus PTR-TOF. 2020. <https://www.tofwerk.com/clinical-researchers-pursue-covid-detection-in-breath-with-the-vocus-ptr-tof/>.
- Walker HJ, Burrell MM. Could breath analysis by MS could be a solution to rapid, non-invasive testing for COVID-19? July 31 2020. <https://www.future-science.com/doi/10.4155/bio-2020-0125>.
- ZP. The detection of COVID-19 on the breath followed by PCR. 2020. <https://www.zimmerpeacocktech.com/products/electrochemical-sensors/covid-19-and-pcr-on-the-breath/>.