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ScentCheck: A Covid-19 test that stops transmission in its tracks

Controlling the Covid-19 pandemic requires nimble, innovative design thinking as much as it does resolute government action. In the rush to limit the spread of the virus, public health authorities have recommended the use of robust but inadequate diagnostic testing approaches originally developed for diagnostic purposes, such as PCR testing, while the scientific research community has directed the bulk of its energies and resources towards developing vaccines and therapeutics. In the meantime, as the crisis ebbed and flowed and the months rolled by, public health scientists remained largely silent on the need for novel mass screening tools that could allow citizens to get tested frequently, inexpensively, and conveniently beyond the lab environment as a pathway to detecting active infections and interrupting transmission chains.

ScentCheck, a Covid-19 screening test our company has been developing and perfecting since the onset of the pandemic, responds to this need for a more flexible, accessible, and affordable population-level approach. Designed to fill the gap between highly sensitive but “snapshot”-type individual testing and no testing at all, which is the current state of play in most countries, its scent-based, AI-powered mechanism of action allows it to identify active viral infections when the potential for transmission is at its highest. By contrast, the gold standard PCR testing method excels at detecting even small quantities of viral RNA, but which do not necessarily imply an infectious carrier. It is this difference between detecting infections and spotting traces of them that we believe holds the key to a discerning, intelligent Covid-19 screening approach.

At NanoScent, a biotech startup in Israel’s Silicon Wadi – our country’s friendly challenge to Silicon Valley – we have been hard at work on user testing and fine-tuning ScentCheck since early February, after the pandemic had ravished Wuhan but before the first case was detected in Israel. We committed ourselves to this project in part because we anticipated a worst-case scenario, much like the one the world is currently immersed in, in which the spread of the virus would overwhelm health systems and exceed the capacity of conventional testing methods to capture new cases. But we also did it because it was a natural pivot: our sensor technology is already commercially proven in several other industrial applications, including industrial leak detection (Bazan Oil&Gas), nutrition (product to be launched mid-January 2021), and in-patient wellness monitoring (Kimberly-Clark), and we knew our expertise in developing scent recognition solutions could bring fresh thinking to the global Covid-19 response.

How ScentCheck works

ScentCheck’s technology is based on scanning volatile organic compounds (VOCs) contained in nasal exhalations for specific VOC patterns identified by researchers at the University of Edinburgh to act as likely “signatures” of a possible Covid-19 infection. To perform this sophisticated analysis in less than 30 seconds, ScentCheck collects nasal air samples into a specially designed bag that connects to the NanoScent reader, a POS-like device, which converts the chemical composition of the samples into data inputs, merges them with answers from a symptoms questionnaire, runs the data through a set of proprietary machine learning algorithms, and displays a positive or negative result on the reader’s screen. In case of a positive outcome, the person is referred for confirmatory PCR testing to rule out a false positive and as a necessary step before self-isolation.

The analytic accuracy of ScentCheck has been validated through both extensive internal R&D processes and external sample collection campaigns. The screening test’s sensitivity and specificity are currently 70% and 97%, respectively, while its overall accuracy is 85%, based on a 1000-sample feasibility study in which people tested with ScentCheck were also administered a PCR test in order to compare results.

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These levels of precision are in line with an [emerging view](#) in the epidemiological community, championed by physician-epidemiologist Dr. Michael Mina and researchers at his lab at the Harvard T.H. Chan School of Public Health, that a Covid-19 testing regimen characterised by high frequency of administration is overall more effective even at less-than-ideal sensitivity levels than the gold standard PCR testing, performed infrequently. Still, despite this more nuanced view on test sensitivity, NanoScent is working on fine-tuning the robustness of its ScentCheck sensor, sampling methodology, and AI algorithms so that the technology reaches 90% accuracy by the end of 2020.

Specifically, Mina has [explained](#) that an antigen test – comparable to ScentCheck in terms of affordability, ease of use, and frequency-readiness, though not in terms of the former’s inability to factor in mutations of the virus – is superior relative to a PCR test, when taking into account its much higher probability to capture active infections and thus interrupt community transmission. Scientists who share this view – and that includes our team at NanoScent – are in favour of operationalising at scale a screening tool capable of detecting active infections in populations in real time, rather than continuing to rely on a clinical diagnostic testing tool that confirms individual contagion with a more ambiguous timestamp.

Use cases

Intended as a first-line screening test, the applications we envision for ScentCheck are mainly in the context of environments of social and economic activity characterised by increased population flow. Those include air and transportation hubs, hotels, schools and universities, stadiums, cultural events, and shopping centres, as well as any public gatherings that could be classified as “superspreader events.” The ease of administering the screening test and its short measurement cycle time means that site operators without clinical experience can be quickly trained to screen visitors and interpret the data in near-real time.

One pilot study that illustrates how a massive health security screening using ScentCheck might work in practice is the “Corona Bouncer” test run NanoScent organised with the English Premier League. The study allowed us to test the device’s usability from an end user and operator perspective. As a result of the overwhelmingly positive response and as the sports industry attempts to resume some level of activity in the coming months, Tottenham has expressed its interest in staging a larger test event at an actual game with thousands of attendees.

While we prepare the ground for that scaled up pilot, at NanoScent we are optimistic that a similarly bold population-level approach to Covid-19 screenings and a recalibrated testing strategy will make their way to the agenda of decision-makers tasked with guiding countries on safely reopening their economies. ScentCheck represents our vision of a rapid, inexpensive screening tool that integrates public health safety vigilance into routine social and economic activities so that people and businesses can navigate the new normality with confidence and security.