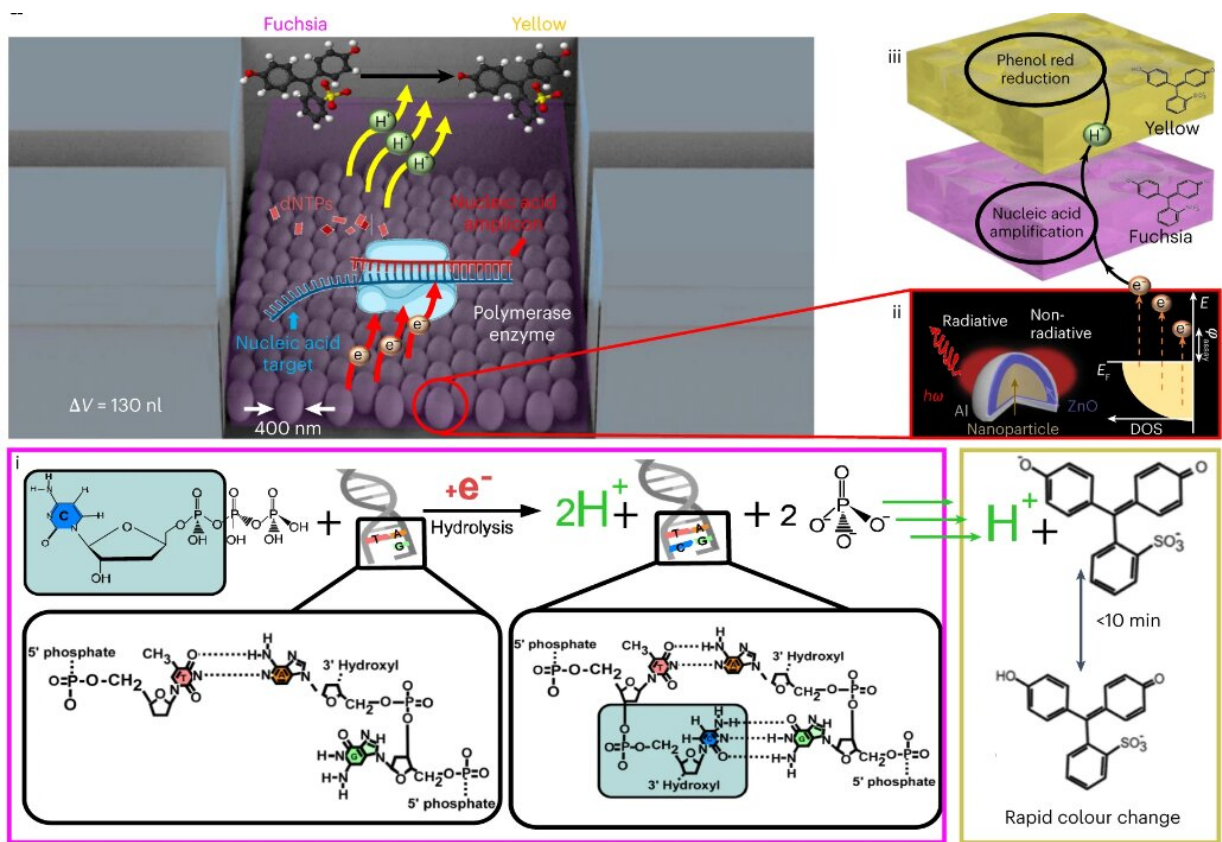# New diagnostic platform uses nanotechnology and machine learning to identify infectious diseases quickly

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On-chip plasmonic chambers on the QolorEX cartridge comprising the light-sensitive plasmonic-coated self-assembly nanoparticles. The chemical assay kinetics accelerate (inset i) according to the excess of the electrons at the reaction interface (inset ii), leading to a proton-dependent color change in media (inset iii). dNTP, deoxyribonucleotide triphosphate; DOS, density of states; E_F, Fermi energy; ϕ_{assay}, oxidation reaction initiation energy; $\hbar_\omega$, photon energy; ΔV,

Infectious diseases and respiratory infections in particular are a leading cause of global mortality. As such, there is an urgent need for rapid, large-scale diagnostic tools that can detect these diseases early, something which doesn't currently exist. To address these problems, McGill University Professor of Bioengineering Sara Mahshid's lab has developed an all-in-one detection platform (QolorEX) that can deliver test results in just 13 minutes.

For use in locations where people congregate, such as hospitals, schools, and airports, the tests are conducted by taking a saliva sample (no swabs needed) and transferring it to a microfluid device which then uses machine learning to automatically take microscopic images of the sample. Those images are sent to a cellphone application that decodes the data into a test result.

"Because we will likely see more pandemics in the future, our lab aims to build portable, low-cost technologies with practical clinical results for use in low-resource settings, at-home, or communal environments," says Mahshid and her students, Ph.D. candidates Tamer Abdel Fatah and Mahsa Jalali, co-authors of the paper recently published in *Nature Nanotechnology*

"This platform shown to have a 95% accuracy rate, on par with quantitative PCR when it comes to COVID testing using saliva samples is potentially a valuable tool for monitoring emerging viral infections, and variants, and even bacteria. Thanks to its accessibility, the number of tests being performed can be increased, potentially leading to an early diagnosis that could save lives and curb the spread of respiratory diseases

globally," adds Mahshid, who is also Canada Research Chair in Nano-Biosensing Devices.

Provided by McGill University