

Harvard's Wyss Institute Launches Torus Biosystems



2020-09-02

The Wyss Institute for Biologically Inspired Engineering at Harvard University announced that Cambridge, MA-based Torus Biosystems™, Inc., will develop and commercialize DNA nanotechnology developed at the Wyss Institute. The technology has the potential to disrupt current infectious disease diagnostics by delivering quantitative DNA and RNA results at the patient point-of-care in under 30 minutes.

The announcement follows a worldwide licensing agreement between [Harvard's](#) Office of Technology Development ([OTD](#)) and [Torus Biosystems](#).

While traditionally-used diagnostic tests detect and identify specific pathogens in human samples, they often lack both the specificity to call out particular genetic variants of pathogens and the sensitivity to detect minuscule, yet potentially dangerous levels of pathogens. Conventional assays are also time- and cost-intensive and, importantly, cannot be performed in highly multiplexed assays to simultaneously detect many sequence variants at a time.

With the overuse of antimicrobials and the widespread emergence of drug-resistant pathogens, infections are becoming increasingly difficult to treat effectively. Aiming to overcome the shortcomings of conventional assays, Torus Biosystems intends to employ Harvard technology to deliver rapid diagnostic test results and help clinicians decide on effective clinical interventions. One of the key inventions enabling the Torus platform is the toehold chemistry for DNA- and RNA-detection developed in Yin's [Wyss Institute lab](#).

"Toehold probes with their extraordinary precision and robustness are among the first breakthroughs of the Wyss Institute's DNA nanotechnology efforts, and it will be exciting to see how Torus Biosystems realizes their potential. My hope is that these innovations may empower systemic infectious disease diagnostics to improve and save the lives of many patients," said Wyss Core Faculty member Peng Yin, Ph.D., who is also Professor of Systems Biology at Harvard Medical School ([HMS](#)) and cofounder and Director of Torus Biosystems. Yin

previously cofounded other startups, Ultivue Inc. and NuProbe Global, based on technology developed in his Wyss Institute lab.

“We can program the binding behavior of toehold probe nucleotide sequences with extraordinary precision, down to the single-nucleotide level. Importantly, hundreds of these toehold probes are able to work together well on a single chip because they behave similarly across a broad range of temperatures. This uniquely enables broad pathogen identification in a single sample-to-answer instrument,” said Wyss alumnus David Zhang, Ph.D., who is now Associate Professor of Bioengineering at Rice University. Zhang is also a cofounder of NuProbe Global and now of Torus Biosystems.

“The capability to comprehensively and reliably assess multiple biomarkers simultaneously and quickly, including biomarkers related to specific pathogen strains, drug-resistances, and the body’s defense systems, could open the door to more effective precision medicine approaches and the development of better drugs,” said Wyss Core Faculty member David Walt, Ph.D., who is a cofounder of Torus Biosystems and is serving as an advisor to the company, bringing his wealth of experience from founding life science companies such as Illumina Inc., Quanterix Corp, Ultivue Inc., among many others. Walt is also the Hansjörg Wyss Professor of Biologically Inspired Engineering at HMS, Professor of Pathology at Brigham and Women’s Hospital ([BWH](#)), and a Howard Hughes Medical Institute Professor. In addition, he leads the Diagnostics Accelerator, a collaboration between the Wyss Institute and BWH.

Leveraging toehold probe technology together with other technologies developed at [Rice University](#) by Zhang, Torus is building a rapid and low-cost platform to deliver comprehensive and quantitative insights into the infection status of patients. The results from this highly specific, sensitive, and broad target analysis are expected to provide reliable sample-to-insight solutions to help reveal hidden, yet potentially therapy-relevant aspects of infectious disease biology and guide critical decisions on therapies.

“In the midst of a generational pandemic, the Torus platform can play an important role in an age of novel infectious diseases. The toehold technology from the Wyss Institute unlocks the platform’s unique potential to provide comprehensive, rapid, and clinically actionable diagnostic results at the patient point of service for infectious disease syndromes,” said Shawn Marcell, President and CEO of Torus Biosystems. While serving as an Entrepreneur-in-Residence at the Wyss Institute, Marcell was instrumental in de-risking the foundational

technology and spinning the company out into a private enterprise, consistent with the translational mission of the Institute. He has also driven the development of other Wyss-initiated companies, such as ReadCoor.

Read the [original article](#) on Harvard University.