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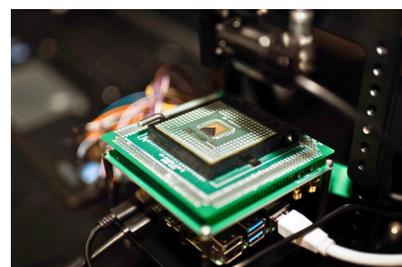
# NYCU–Japan Collaboration Unveils World’s First Automated Stem Cell Cultivation System



*The research team behind the Cyto Chamber and QC Chip, developed to advance automated stem cell cultivation and quality control.*

Edited by Chance Lai

A Taiwan-led research team has written a new chapter in regenerative medicine. After five years of close collaboration, National Yang Ming Chiao Tung University



*The QC Chip, developed by*

(NYCU) and the **CiRA Foundation at Kyoto University**—founded by Nobel Laureate Shinya Yamanaka—have unveiled the world’s first fully automated system capable of cultivating and differentiating stem cells: the **Cyto Chamber (Pioneer One)**.

The milestone marks a significant advance in stem cell manufacturing and highlights the growing impact of Taiwan–Japan scientific collaboration at the intersection of engineering and medicine.



*The Cyto Chamber (Pioneer One), jointly developed by NYCU and the CiRA Foundation, is the world’s first automated system designed for stem cell cultivation and differentiation.*

### **Tackling the Bottlenecks of Stem Cell Manufacturing**

Stem cells possess the potential to differentiate into a wide range of tissue types,

*NYCU’s semiconductor chip engineering team, enables real-time monitoring of stem cell quality using electronic engineering technologies.*

### **From International Debut to Industrial Impact**

The Cyto Chamber and QC Chip were recently unveiled at the CiRA Foundation in Japan, immediately drawing strong interest from Japanese industry leaders and research institutions. The debut highlighted the success of Taiwan–Japan cross-border collaboration and showcased NYCU’s distinctive ability to integrate engineering innovation with biomedical research.

Describing the achievement as “a perfect convergence of engineering, medicine, and chip technology,” NYCU President Chi-Hung Lin said Taiwan’s combined strengths in biomedicine and semiconductor engineering were a key reason Japanese partners chose Taiwan as a collaborator. The system, independently developed by a Taiwanese team, not only validates the original vision behind NYCU’s university merger, Lin noted, but also

making them a cornerstone of regenerative medicine. However, their preparation has long been constrained by labor-intensive procedures, high costs, and inconsistent quality caused by heavy reliance on manual operations.

To overcome these challenges, Taiwanese and Japanese researchers launched a joint effort five years ago. NYCU became the **only Taiwanese partner** in the CiRA Foundation's global "my iPS Project," with a shared goal of overcoming the technical barriers to large-scale stem cell production and quality control.

Beyond engineering, NYCU's interdisciplinary strengths—spanning remote sensing, AI, earth sciences, electronics, and data analytics—position the university as a comprehensive ecosystem for future space talent.

### **Cyto Chamber: Automating a Once Labor-Intensive Process**

NYCU and the National Center for Instrumentation Research, under the National

demonstrates Taiwan's scientific and technological capabilities on the global stage.

Looking ahead, Lin emphasized that the maturation and future mass production of the Cyto Chamber and QC Chip will enable regenerative medicine to move beyond laboratory research and into industrial and clinical applications. "This cross-border scientific journey is laying the foundation for new medical possibilities in the decade ahead," he said.



*Professor Chen-Yi Lee (left) of NYCU's Department of Electrical Engineering with the QC Chip research team he leads.*

### **Long-Term Commitment and National Support**

Five years ago, NYCU was entrusted by its Japanese partners with developing an automated stem cell platform. This effort led to the stationing of Japanese researchers in Taiwan for

Applied Research Laboratories, jointly developed the Cyto Chamber (Pioneer One). The system fully automates stem cell cultivation and passaging, integrating temperature regulation, carbon dioxide control, culture medium supply and removal, and continuous microscopic imaging into a single platform.



*NYCU Vice President Tzu-Hao Cheng (front row, center) with the Cyto Chamber research team he leads.*

Processes that previously required extensive human labor can now be executed with high efficiency and reproducibility. The system represents a critical step toward the industrialization of regenerative medicine and scalable cell manufacturing.

### **QC Chip Enables Real-Time Quality Monitoring**

Beyond automation, NYCU's semiconductor chip engineering team has

long-term collaboration. What once seemed an impossible mission has now been realized.

The achievement was made possible in part by support from Taiwan's Ministry of Education's Higher Education Sprout Project and the National Science and Technology Council's research commercialization programs, opening new opportunities for the globalization and industrialization of stem cell manufacturing in Taiwan.

developed an innovative QC Chip (Quality Control Chip) to address another long-standing challenge: stem cell quality assurance.

Unlike conventional inspection methods that rely on antibody labeling, the QC Chip applies electronic engineering technologies to monitor stem cell quality in real time. This approach significantly shortens testing time while enhancing consistency and stability—key requirements for clinical and industrial applications.

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