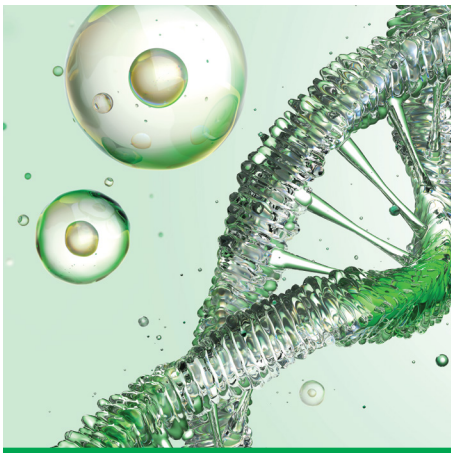


Advancing CTC and cfDNA Analysis for Early Cancer Detection: NGRL Customer Spotlight

Cancer detection is moving beyond traditional tissue biopsies into the bloodstream. As a result, circulating tumor cells (CTCs) and cell-free DNA (cfDNA) are transforming how researchers and clinicians approach cancer detection and monitoring. These blood-based biomarkers hold the promise of earlier detection, more precise monitoring, and a deeper understanding of how cancer evolves over time.

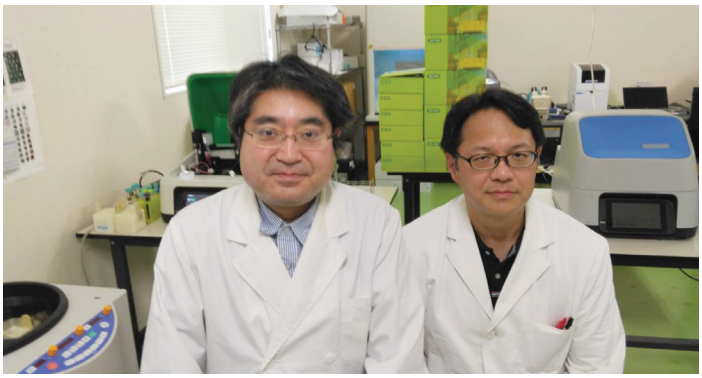
In Japan, NGRL (Nihon Gene Research Laboratories, Inc.) is at the forefront of this new approach. Since 2014, their research and development team has built an extensive network of collaborators spanning leading hospitals and research institutions to unlock the potential of these biomarkers, specifically for early cancer detection, treatment monitoring, and understanding disease progression.

We met with NGRL's lead researchers to learn about their work, the insights they've gained from studying CTCs, and why the Genesis Cell Isolation System with Celselect Slides™ is a cornerstone of their workflows.

Can you give us an overview of work done by NGRL and your collaborations?

Our R&D team conducts tests using Celselect Slides technology for CTC enumeration, alongside cfDNA analysis. Since 2014, we have collaborated with ten national universities, four private universities, two national research institutions, and 26 hospital facilities.

In total, as of 2025, we have conducted tests on more than 2,157 healthy individuals (including high-risk subjects) and more than 2,000 cancer patients, in collaboration with 42 research facilities across Japan.



Lead R&D researchers for NGRL's CTC study, Toru Yaegashi (M.Sc) and Katsutoshi Asano (Biotechnologist), with the Genesis Cell Isolation System in their laboratory.

What have you learned about CTCs, and what do these findings mean for oncology monitoring?

We studied 2,000 healthy subjects. These subjects included individuals who had not been diagnosed with cancer, but had a history of tobacco or alcohol use, or a history of high blood pressure, obesity, or diabetes. Of these, approximately 4.9% had one or more CTCs detected (CD45 negative, CK positive), with 4.4% showing exactly one CTC.

Interestingly, 10–20% of individuals with one or two CTCs later showed zero CTCs in follow-up tests conducted six months to one year later. However, we also observed cases where the CTC count increased to three during that same timeframe.

The ability to precisely detect CTCs, suggested by these examples, is critical, because changes in CTC dynamics may reflect evolving biological processes, and if so, could provide important indicators for monitoring disease over time. Table 1 summarizes the utility of using CTC staging to understand changes relating to the disease process.

Table 1. Stage-specific characteristics of CTCs. Cancer staging shows an association with specific CTC phenotypes and can be used for assessment of the disease process, according to NGRL researchers.

Cancer Stage	Dominant CTC Phenotype	Vimentin Expression	Clinical Implications
Stage 0–1*	Epithelial CTCs (EpCAM+, cytokeratin+)	Rare or absent	Useful for early detection and prognosis assessment
Stage 2	Early signs of EMT may be observed	Minimal to low	May indicate micro-metastatic potential
Stage 3–4	Mesenchymal CTCs post-EMT are prevalent	Highly expressed	Associated with increased metastatic risk and poor prognosis

* In early-stage cancers (stage 0–1), CTCs are predominantly epithelial in phenotype. EMT-associated markers such as cell-surface vimentin are rarely expressed at these stages.

CTC, circulating tumor cell; EpCAM, epithelial cell adhesion molecule; EMT, epithelial-mesenchymal transition.

Why did you choose the Bio-Rad Genesis System with Celselect Slides?

The Genesis System (Figure 1) provides high-performance CTC capture based on cell size, independent of cell surface markers. One advantage is that cells remain highly viable and can be captured without prior staining on Celselect Slides. (Figure 2 shows examples of CTCs and CTC clusters.)

This capability is paired with full automation, handling everything from cell capture to immunostaining after blood sample input. This streamlined process ensures high reproducibility, which is essential for generating consistent, reliable results.

Fig. 1. The Genesis Cell Isolation System automates the capture of cells for recovery or on-slide immunolabeling. Celselect Slides, reagents, and consumables can be used to enrich samples directly from whole blood for CTC analysis in a liquid biopsy.

Where do you see future CTC clinical research heading?

In clinical research settings, CTC enumeration offers a minimally invasive alternative to tissue biopsy because it requires just a simple blood draw. This means that individuals can be monitored continuously, opening the door to tracking treatment efficacy and detecting recurrence early, without adding significant burden to the patient. Frequent testing is invaluable for treatment response assessment, minimal residual disease detection, and prognosis evaluation.

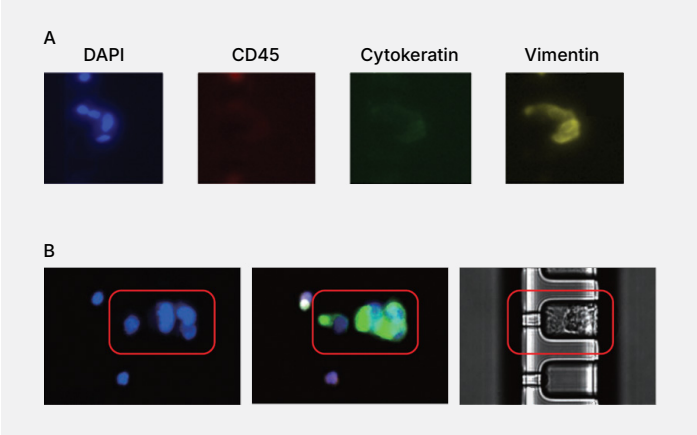


Fig. 2. Examples of labeled CTCs (A) and CTC clusters (B) from NGRL.

Shaping the Future of Treatment

By harnessing cutting-edge CTC and cfDNA technologies in collaboration with a robust clinical and research network, NGRL is helping shape a future where cancer can be detected earlier, monitored more precisely, and managed with less burden to individuals. Their work with the Genesis System and Celselect Slides demonstrates how automation, reproducibility, and minimally invasive approaches can move liquid biopsy from research into routine clinical monitoring, advancing one step closer to a personalized approach to healthcare.

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