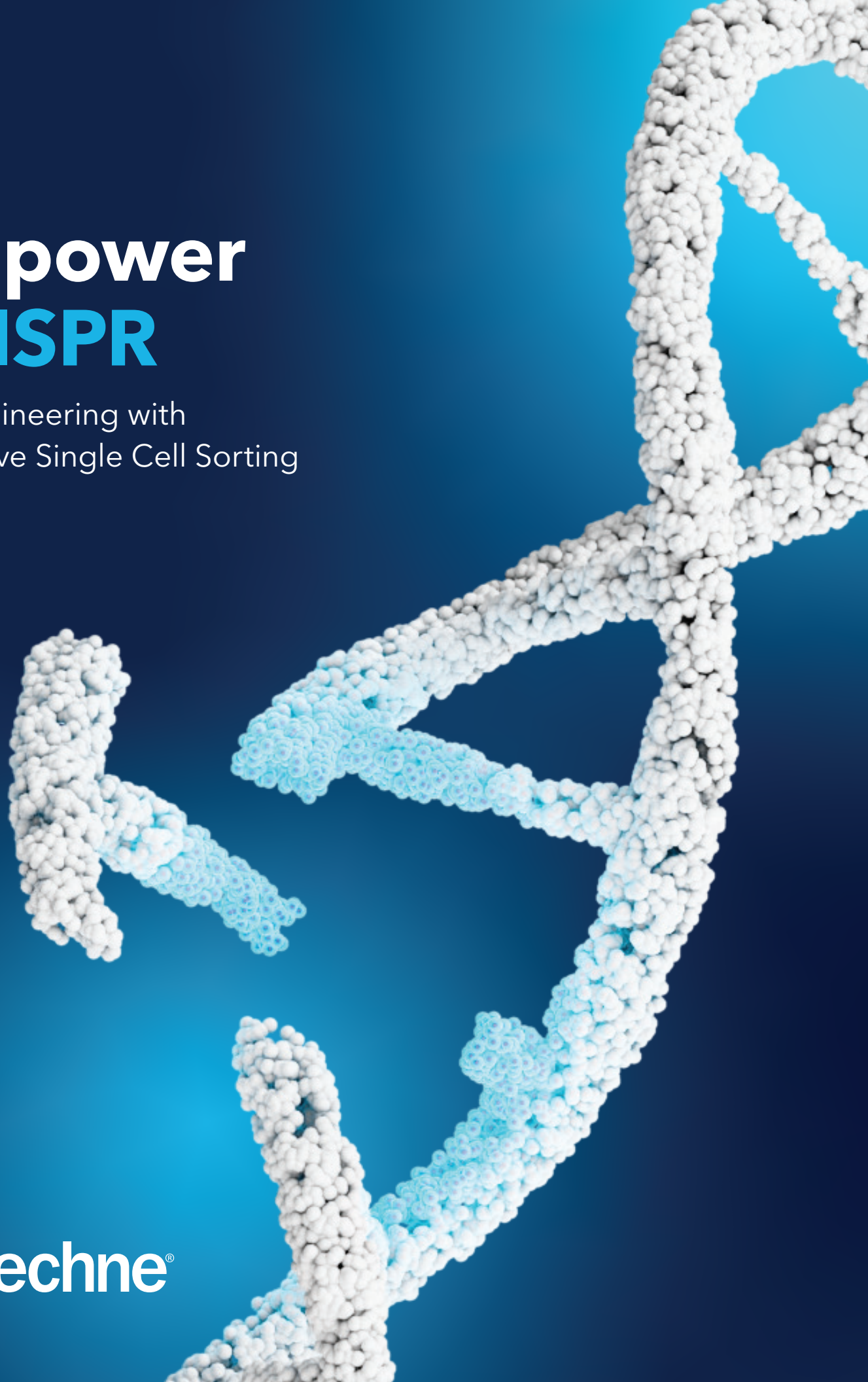
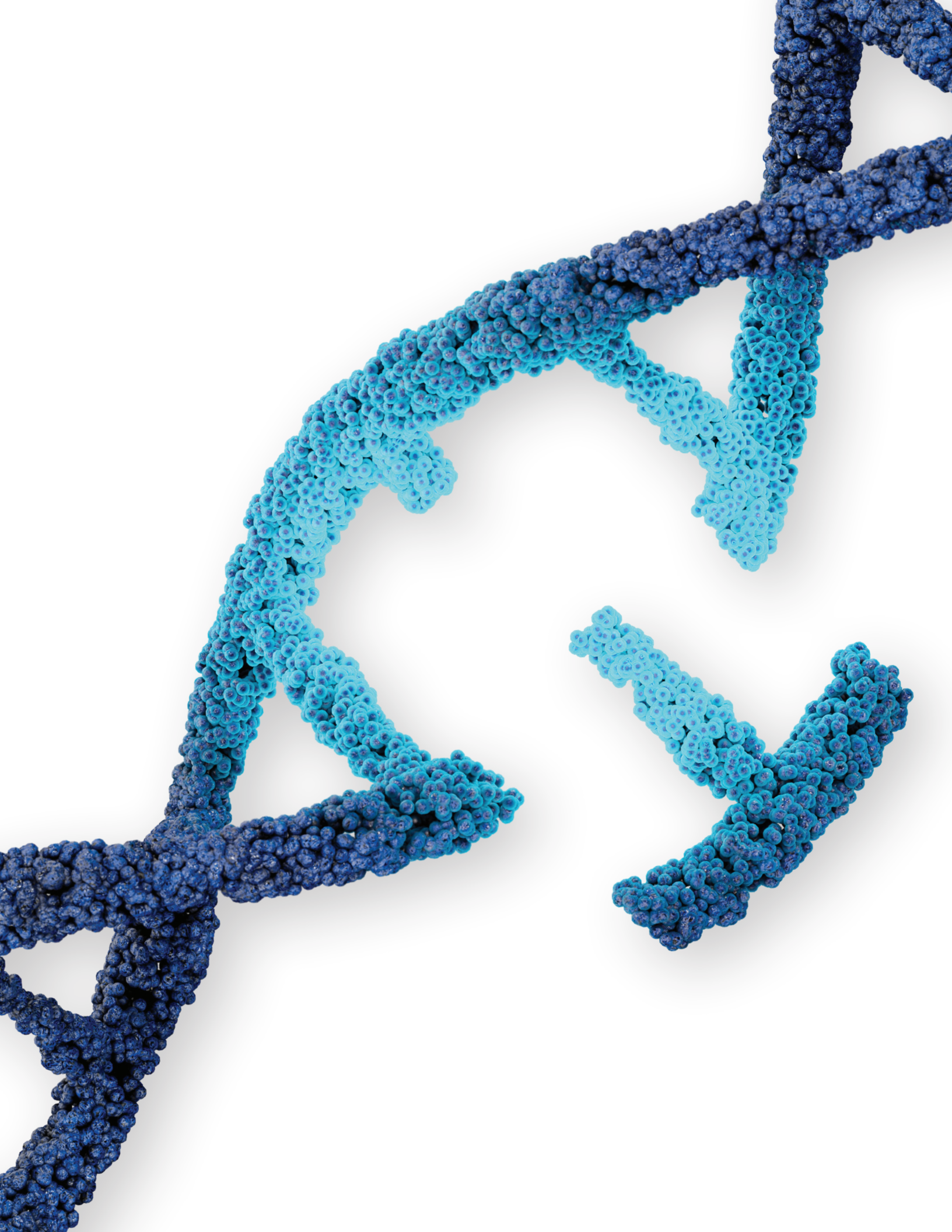
Empower CRISPR

Cell Engineering with
Innovative Single Cell Sorting



bio-techne®



Introduction

In biomedicine, one of the most revolutionizing tools is the CRISPR/Cas9 system, which allows modification of sequences in the genome with precision and efficiency.

CRISPR/Cas9 can be used with immortalized cell lines, primary cells, and induced pluripotent stem cells (iPSCs) to build models for studying gene functions, disease mechanisms and therapeutic approaches. When combined with induced pluripotent stem cells (iPSCs), CRISPR/Cas9 is especially powerful. It facilitates the precise editing of iPSC genomes, creating models that mirror disease-specific genetic aberrations[1]. These models are invaluable for delving into disease mechanisms and pioneering new treatments. Furthermore, by rectifying genetic anomalies in iPSCs, scientists can generate cells tailored to a specific immune profile, paving ways for personalized cell therapies for a host of diseases[2].

SINGLE CELL ISOLATION IN CRISPR CELL ENGINEERING

While CRISPR technology brings a new paradigm in cell engineering, it is not without challenges. Off-target editing and variable editing efficiency makes it critical to isolate clonal populations to further characterize the edited cells to identify clonal cells with desired characteristics. Working with clonal populations ensures that each clonal line of cells being studied possess heterogeneous genomic makeup and consistent biological behavior. Bio-Techne. Renowned for their fast, gentle and easy single cell dispensing, Namocell's 1-laser system Hana and 2-laser system Pala Single Cell Dispensers, now part of the Bio-Techne product family, enhance the speed and efficiency that are crucial for the next wave of cell engineering breakthroughs.

Learn More about the Hana and Pala Single Cell Dispensers

Featured in Peer-Reviewed Citations

...Hana and Pala Single Cell Dispenser Systems have been increasingly recognized by leading scientists & researchers...

The Hana and Pala Single Cell Dispenser systems have been increasingly recognized by leading scientists and researchers as the tool of choice for gently dispensing single cells to generate clonal cellsafter gene editing, with or without fluorescent tagging.

Combining microfluidics, flow cytometry and liquid dispensing, the Hana and Pala, with their remarkable ease-of-use, are serving research groups of all sizes and helping scientists get to their optimal clones more efficiently, as highlighted by the publication briefs below.

01 / Hypoimmune Induced Pluripotent Stem Cells Survive Long Term in Fully Immunocompetent, Allogeneic Rhesus Macaques

nature biotechnology

Rejection of cell therapeutics by the immune system is a critical aspect taken into consideration during cell engineering and cell therapy development. The study in this publication demonstrates how hypoimmune pluripotent (HIP) stem cells were engineered and transplanted into allogeneic rhesus macaques. The HIP cells successfully survived in these macaques and differentiated into various lineages. Human HIP cells were also studied, where they were differentiated into pancreatic islet cells, resulting in measurable improvements in diabetic mice.

The Hana Single Cell Dispenser was used to generate the foundational HIPs for the study. It facilitated two rounds of precise single cell cloning to create B2M$^{-/-}$-CIITA$^{-/-}$ iPSCs via CRISPR gene inactivation. This process involved depleting MHC class I & II expressions. The gentle cell handling by the Hana system ensured cell viability.

02 / Redefining the Role of Ampk in Autophagy and the Energy Stress Response

nature COMMUNICATIONS

This study revisits the role of adenosine monophosphate-activated protein kinase (AMPK) in autophagy, challenging the current understanding. It uncovers AMPK's dual functions: moderating the immediate induction of autophagy during energy deficits while preserving vital autophagy components. These dual roles are essential for cellular balance and survival during energy stress.

The Hana Single Cell Dispenser played a pivotal role in creating various knockout (KO) and double knockout (DKO) cell lines post-CRISPR editing. GFP-positive cells underwent sorting and were then dispensed for single cell cloning using the Hana system, establishing distinct clonal lines. The KO cell lines were instrumental in shedding light on the functions of the genes that were edited out

03 / CRISPR/Cas9-Based Screening of FDA-Approved Drugs for NRF2 Activation: A Novel Approach to Discover Therapeutics for Non-Alcoholic Fatty Liver Disease

antioxidants

Non-alcoholic fatty liver disease (NAFLD) impacts 20–25% of the global populace, a figure that intensifies with the growing prevalence of obesity while therapeutic solutions are scarce. To address this, the research team utilized an engineered cell line model to perform high-throughput screening on a vast library of FDA-approved substances. They identified six compounds with potential as therapeutic agents for NAFLD.

The Hana system played a crucial role in the research methodology. Utilizing CRISPR, the team tagged the endogenous heme oxygenase-1 (HMOX1) gene with a luciferase reporter in HEK293T cells. The Hana then dispensed the edited cells for cloning. The accurately edited clone served as the foundational model for the subsequent drug compound screening.

04 | Identification of Inhibitors of Tubulin Polymerization Using a CRISPR-Edited Cell Line with Endogenous Fluorescent Tagging of β-Tubulin & Histone H1

biomolecules

This research aimed to enhance high-throughput cancer drug screening by utilizing a cell line model with a GFP tag added to the β-tubulin gene through CRISPR. By inhibiting β-tubulin polymerization, one can gauge the restriction of proliferation. The GFP tag facilitates real-time monitoring of β-tubulin polymerization via high-content imaging. This live-cell approach expedites the screening process and boosts accuracy since it excludes additional cell preparation and allows genes to be observed in their most physiological state, thus offering a truer assessment of drug impacts.

In the study, Hana played an integral role by efficiently dispensing single cells for cloning after CRISPR editing. This optimization by Hana streamlined the cloning process, resulting in a larger number of viable clones. These clones were pivotal for screening desired traits like precise editing, minimal off-target effects, and robust proliferation.

05 | CRISPR-Directed Gene Editing as a Method to Reduce Chemoresistance in Lung Cancer Cells

SPRINGER LINK

This research introduces an innovative approach to improve cancer treatment outcomes by curtailing chemoresistance. By targeting genes believed to have acquired resistance during chemotherapy, radiation, or immunotherapies, the strategy involves using CRISPR editing to introduce mutations that incapacitate the specific gene. In a practical application of this concept, the team worked with a lung cancer cell line, editing the NRF2 gene to integrate two mutations.

The Namocell single cell dispenser was instrumental in this endeavor. Over two rounds of editing and cloning to develop the desired cell line, Hana efficiently dispensed individual cells, streamlining the meticulous process of generating the mutation-bearing lung cancer cell line.

06 | Age-Related Low Bone Mineral Density in C57BL/6 Mice Is Reflective of Aberrant Bone Morphogenetic Protein-2 Signaling Observed in Human Patients Diagnosed with Osteoporosis

International Journal of *Molecular Sciences*

Osteoporosis is a prevalent age-linked bone ailment. While potential treatments, BMP-2 and CK2.3, operate via the BMP-signaling pathway, their limitations underscore the need for dependable mouse models to understand associated complications. Drawing insights from a cell line model where the BMPR1a receptor (integral to BMP-2) was nullified using CRISPR, this study successfully showcased the C57BL/6 mouse strain as a reliable model for osteoporosis research.

The pivotal knockout cell line, foundational to this research, was crafted using the capabilities of Hana.

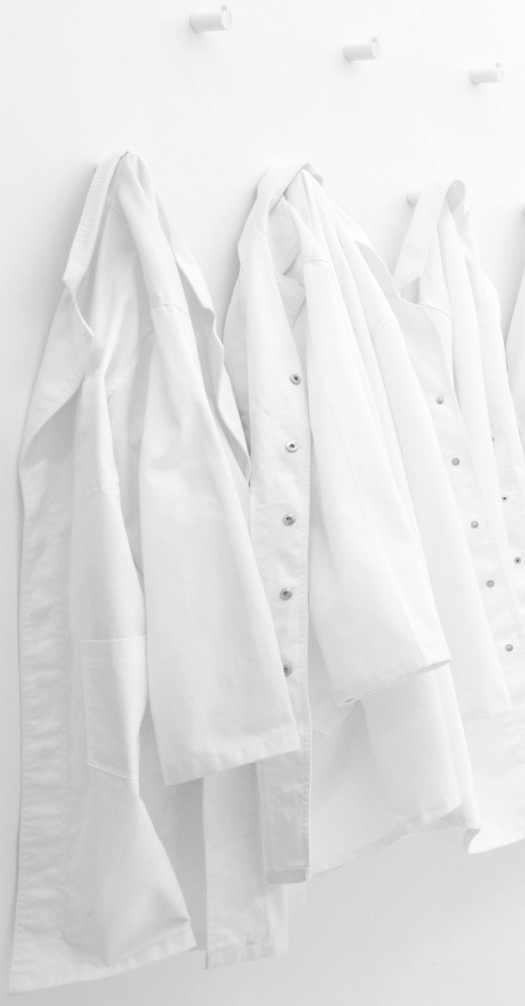
07 | Gene editing of SAMHD1 in macrophage-like cells reveals complex relationships between SAMHD1 phospho-regulation, HIV-1 restriction and cellular dNTP levels

bioRxiv

This paper holds significance for the scientific community due to its pioneering approach in studying HIV-1 infection within human macrophages. By introducing mutations to the SAMHD1 catalytic core locus in BLaER1 cells, the research offers a more physiologically relevant model for examining SAMHD1's anti-viral functions. This stands in contrast to the conventional methods that rely on SAMHD1 overexpression, which may not truly replicate in vivo conditions. The novel approach paves the way for devising strategies that target SAMHD1 with precision, without unintended interference in other cellular operations. The successful creation of both knock-out and knock-in cell lines, central to this study's innovations, was made possible through the utilization of a Namocell single cell dispenser, further underlining its importance in advancing cellular research methodologies.

Trusted by Leading Institutions

The researchers who published the citations featured in this monograph chose Namocell Single Cell Dispensers (now part of the Bio-Techne product family) for their cell engineering workflows due to the ease-of-use and gentle sorting that preservers cell viability.



FAST

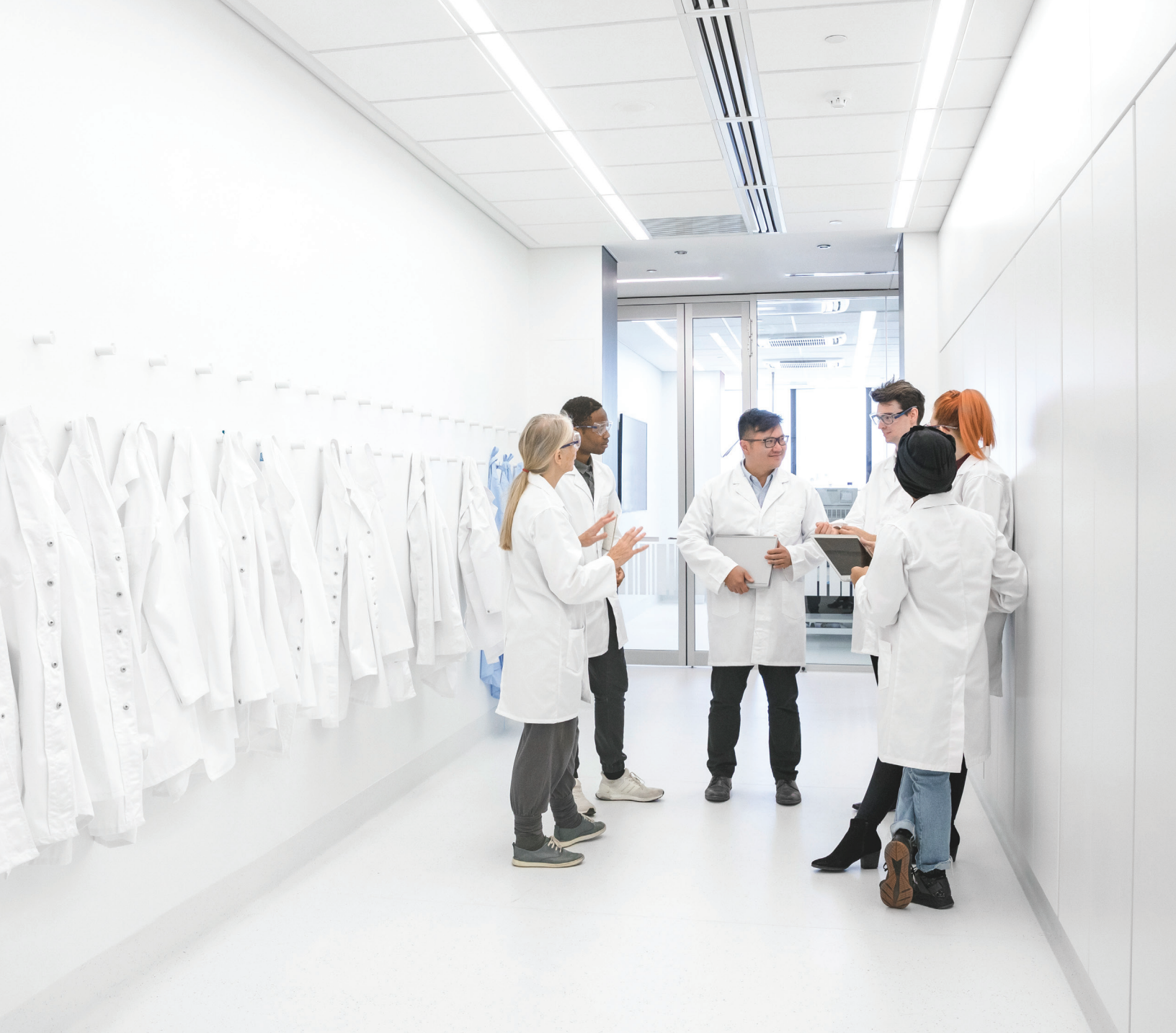
Bio-Techne's Hana and Pala Single Cell Dispensers instruments drastically reduce instrument overhead time, letting you go from initializing the instrument to achieving **plated single cells in as little as seven minutes**. This is in contrast to conventional FACS systems, which can take over an hour to operate and provide results.

EASY

Hana and Pala are automated and easy-to-use. The plug-and-play user interface streamlines many of the steps required for traditional FACS sorters, saving scientists and researchers valuable time and money. **The simplicity of the instruments make it possible for anyone to use** without specialized expertise or training.

GENTLE

At less than 2 psi, Hana and Pala Single Cell Dispensers use **low-pressure sorting** to accurately and efficiently sort cells gently, thus preserving cell viability and integrity for better clonal growth.



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