



# Single-cell Multi-omics for Accelerated Therapeutic Characterization and Release

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CEO Mission Bio

Moving precision medicine

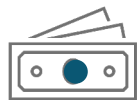
***FORWARD.***

Our mission is to help researchers and clinicians unlock single-cell biology to accelerate discovery, development, and delivery of advanced therapeutics

# Market Leader in Single-cell Multi-omics



**San Francisco,  
CA**



**\$ 120M raised to date**

*(Novo, Soleus, Mayfield, Cota, Agilent, LabCorp)*



**100+  
employees**



**Commercialized  
platform in 2017**

**>30**

Peer-reviewed  
publications

**>60%**

NCI Cancer  
Centers

**1000+**

End users  
worldwide

**~100**

Assays built  
for cancer

**50M+**

Genomes  
sequenced

**Integrated DNA & protein analysis  
from thousands of single cells**

**Expertise in microfluidics, molecular  
biology, and informatics**

# Translational Applications Across Market Segments

## THE LEADER IN SINGLE-CELL MULTI-OMICS ANALYSIS



### **TRANSLATIONAL CANCER CENTERS**

Resolve Clonal  
Heterogeneity



### **BIOPHARMA**

Enhance Biomarker  
Development



### **CELL AND GENE THERAPY**

Accelerate Approval And  
Expand Product Labeling



# Rapid Development of Cell & Gene Therapies



**\$14B**

Raised in  
H1 2021



**1,195**

Developers  
around the world

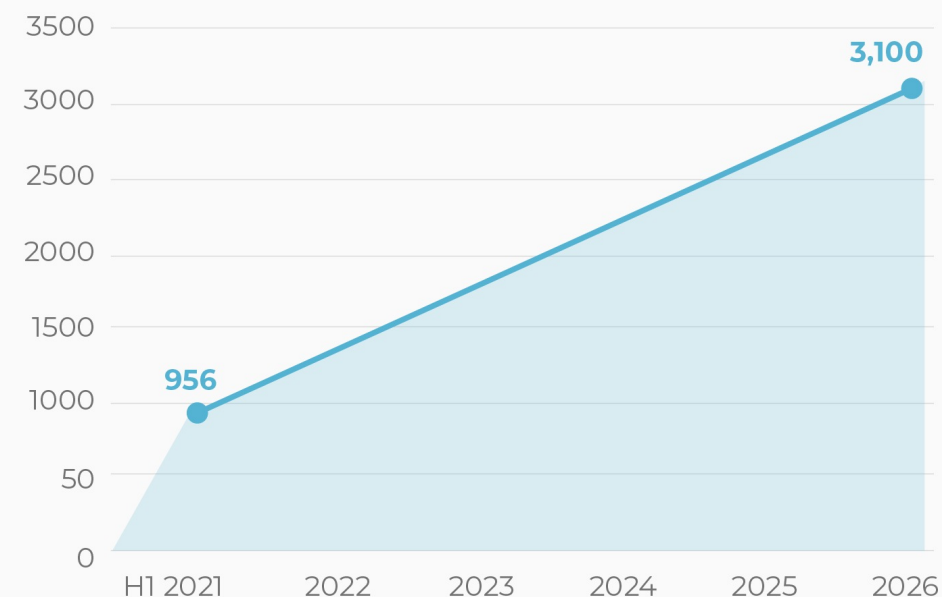


**>2,600**

Clinical  
trials

- H1 2021 strongest financing half on record
- Increasing # developers around world
- Forecasts predict rapid development of therapies by 2026

## 5 YEAR FORECAST OF THERAPY DEVELOPMENT

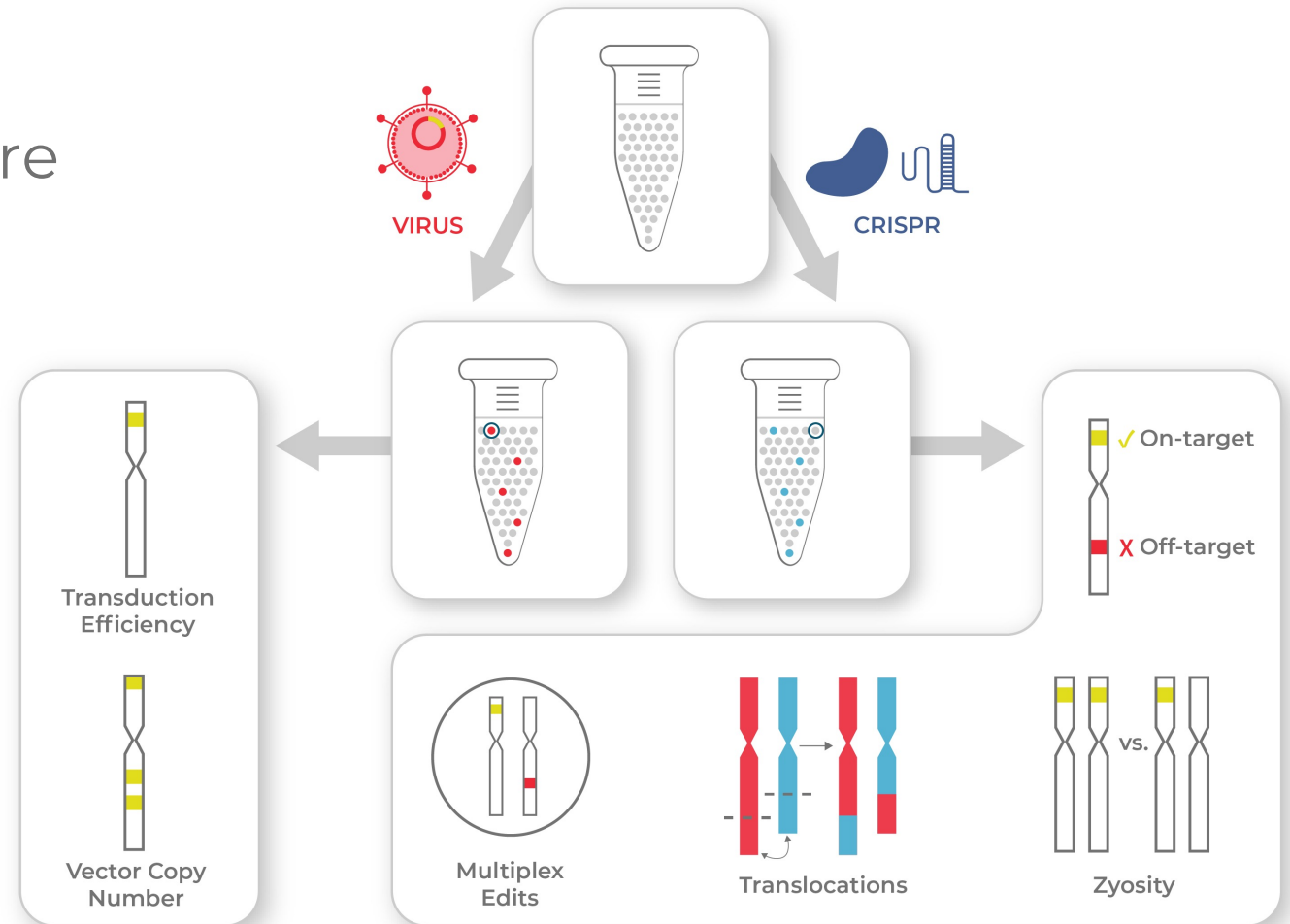


# Cell & Gene Therapies Are Complex

Gene-modified cell therapies are heterogeneous

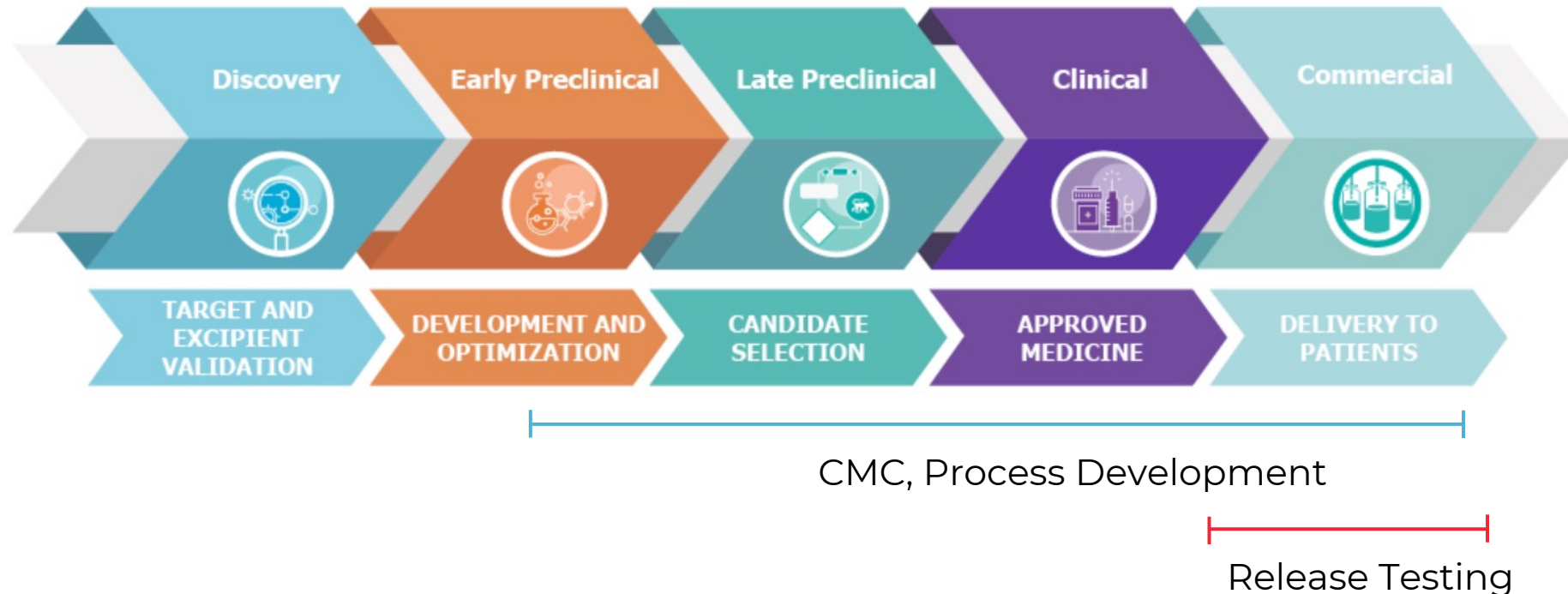
Cell-to-cell variation in:

- Genome engineering alterations by virus or gene editing
- Cell state / type (immunophenotype)



**Variation across cells may affect safety & efficacy**

# Expedited Pipeline for Therapy Development



- Accelerated development & reduced time to market
- Challenging to develop optimized assays in short timelines
- Regulators require precise, specific, & sensitive analytics for approval & release

# Thorough Testing is an Unmet Need in Development

## Cell and Gene Therapies Necessitate New Lot Release Test Methods

October 31, 2019

Cynthia A. Challener

BioPharm International, BioPharm International-11-01-2019, Volume 32, Issue 11

## Convergence: Inadequate testing of cell and gene therapies draws FDA concern

Posted 15 September 2021 | By [Joanne S. Eglovitch](#)

## FDA seeking more consistency from cell, gene therapy developers, top official says

Published May 19, 2021

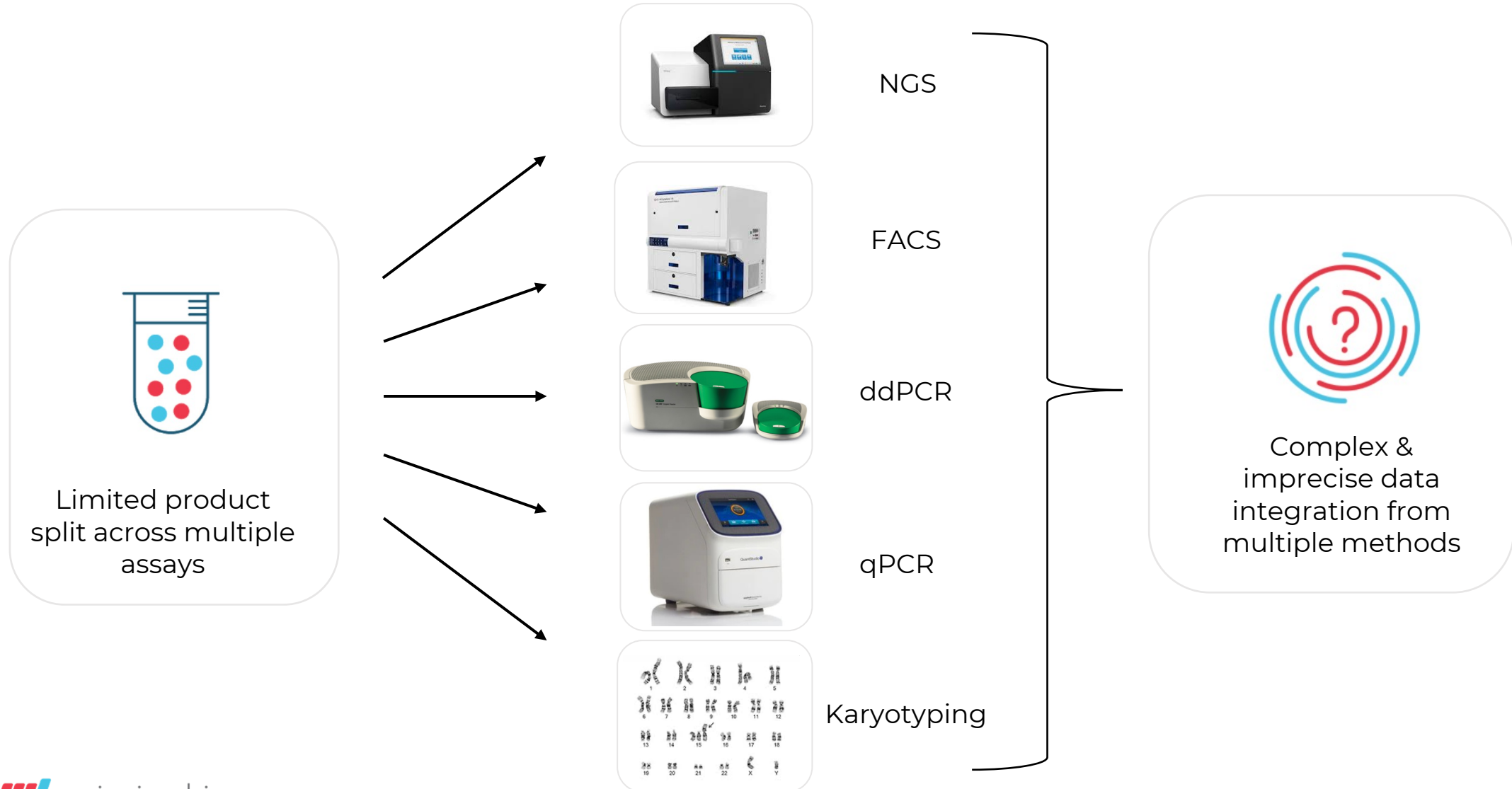
## For Cell and Gene Therapy Products, Early Characterization is Critical

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Source: Keith Chambers/Science Photo Library/Getty Images

- **Analytical characterization** is often inadequate
- **Multiple assays** are needed to measure multiple attributes
- **Robust** release tests needed to ensure batch consistency

# Conventional Multi-assay Workflows Yield Complex Data



# Mission Bio Can Help

## Who we Are

Leaders in high-throughput single-cell analysis with the goal of enabling advanced therapeutic development

**Only** solution for genotype + phenotype multi-omics at single-cell level

## How we Help

- ✓ Strategic partnership
- ✓ Consultation
- ✓ Single-cell assay design
- ✓ Wet lab processing
- ✓ Data analysis
- ✓ Assay transfer

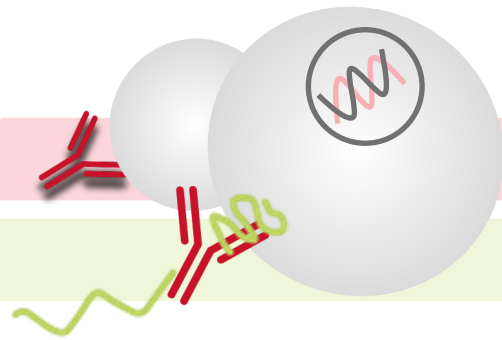


# Tapestri Enables Single-cell DNA + Protein Multi-omics

## Prep Sample

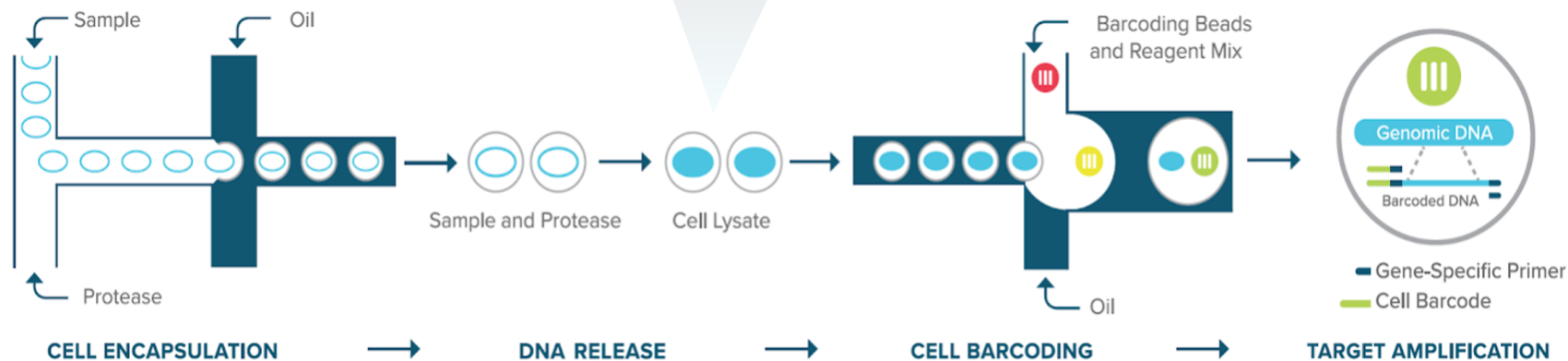
## Access DNA + Protein

## Barcode and Amplify



Targeted genomic DNA

Protein oligo



Step 1

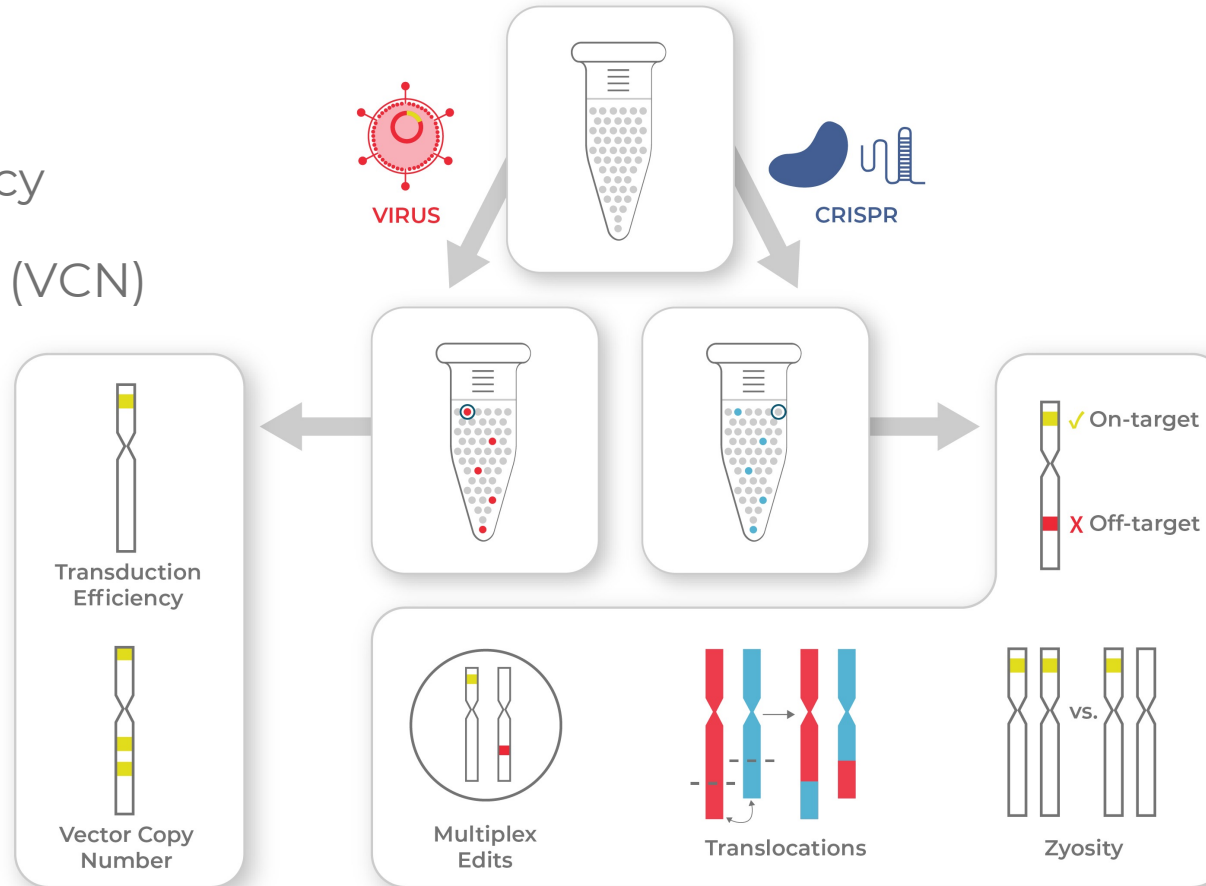
Step 2



# Tapestri Cell and Gene Therapy Solutions

## Transgene Delivery

- Transduction efficiency
- Vector Copy Number (VCN)

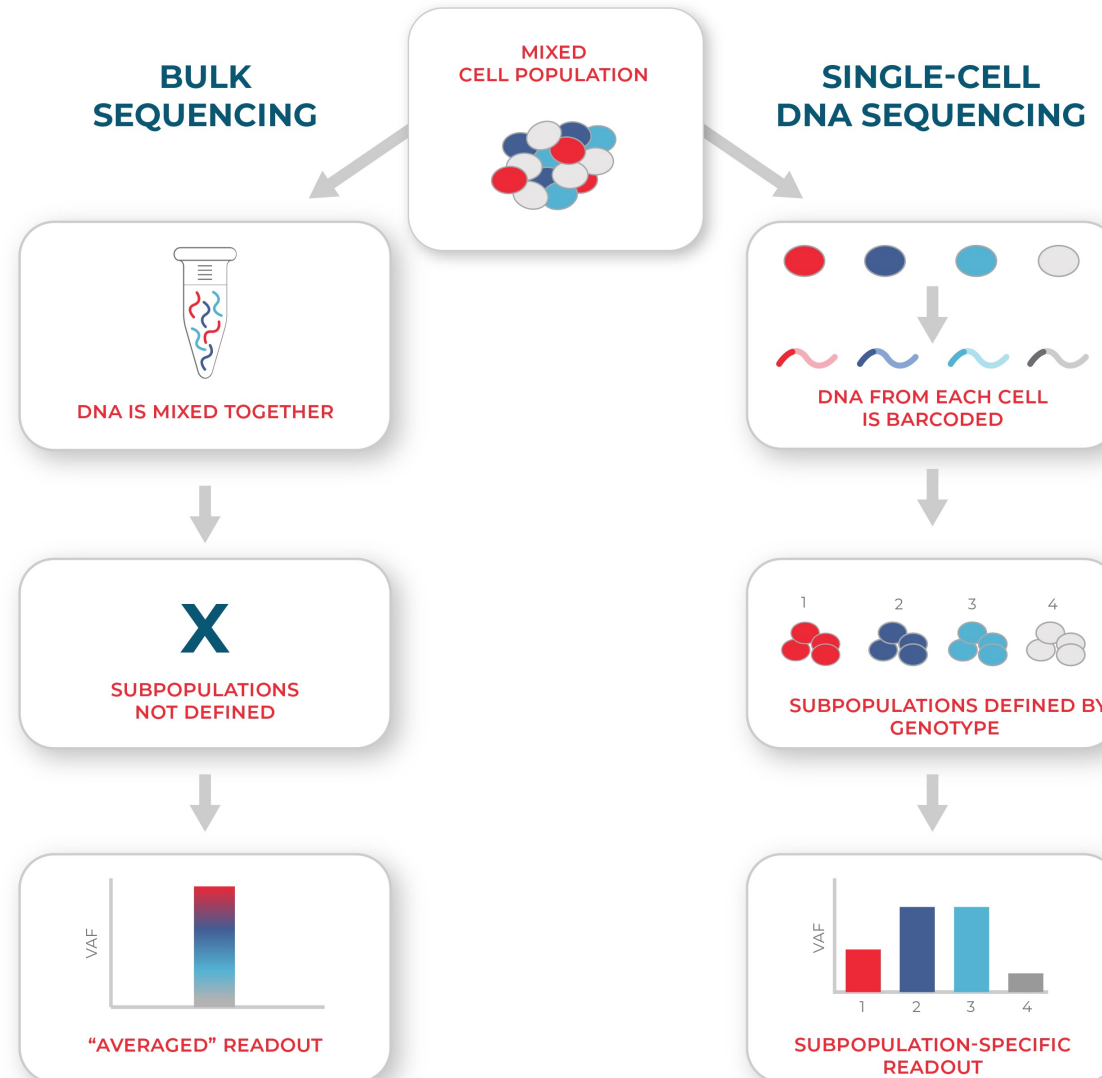


## Gene Editing

- On-/ off-target edits
- Multiplex edits
- Chromosome aberrations
- Zyosity of edits

# Single-cell Advantages Over Bulk Assays

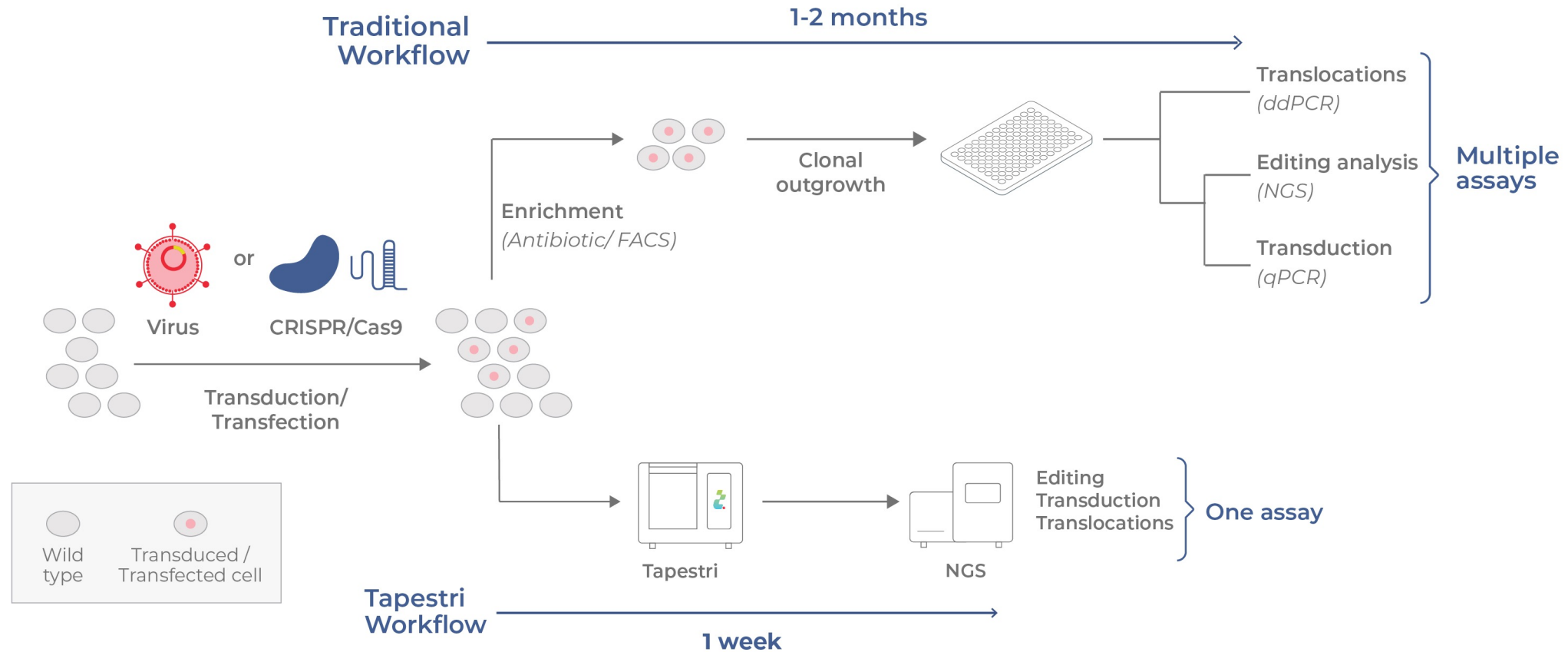
- Bulk assays mix DNA across cells
- Reports average readouts



- Single-cell DNA sequencing identifies genetic alterations in individual cells

- ✓ Co-occurrence
- ✓ Zygosity
- ✓ Rare events (0.1% of cells)

# Single Assay Measures Multiple Parameters in Less Time

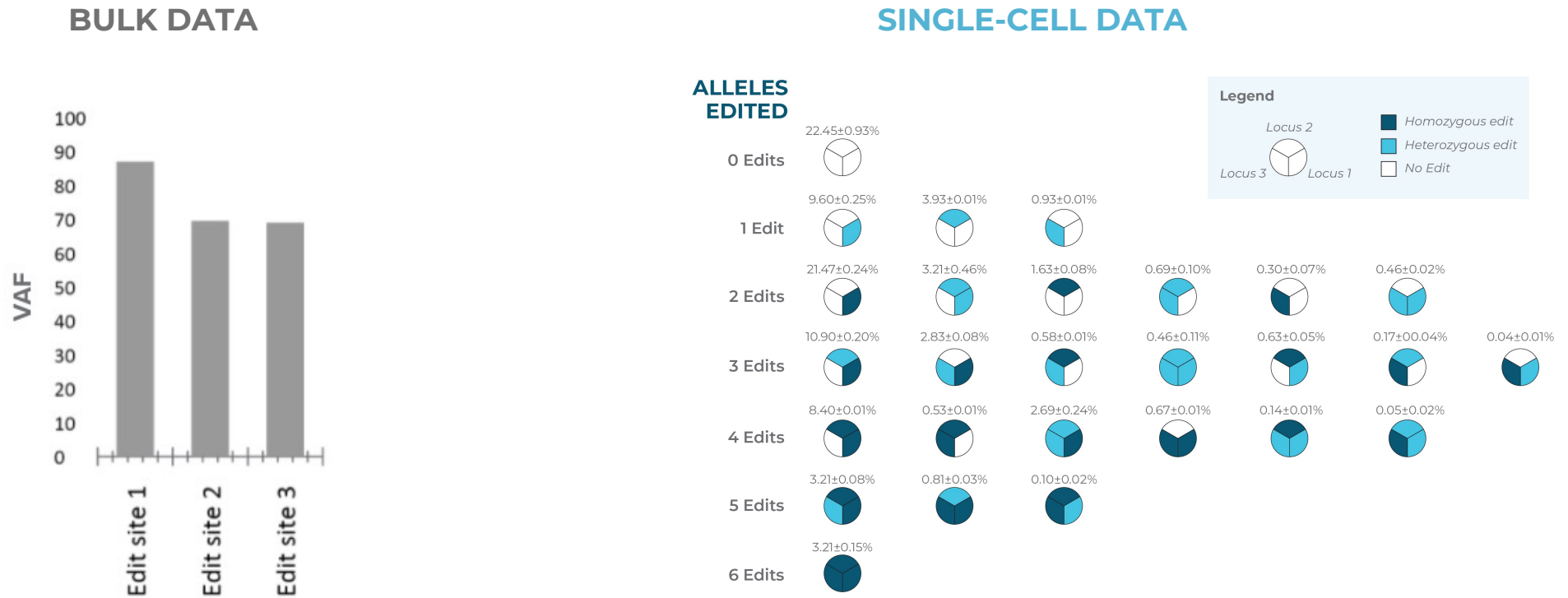


- **Bypass cell enrichment**
- **Bypass clonal outgrowth**

- **1000s cells analyzed**
- **1-week workflow**
- **1 multi-omics assay**

# Analysis of Multiplexed Gene Editing

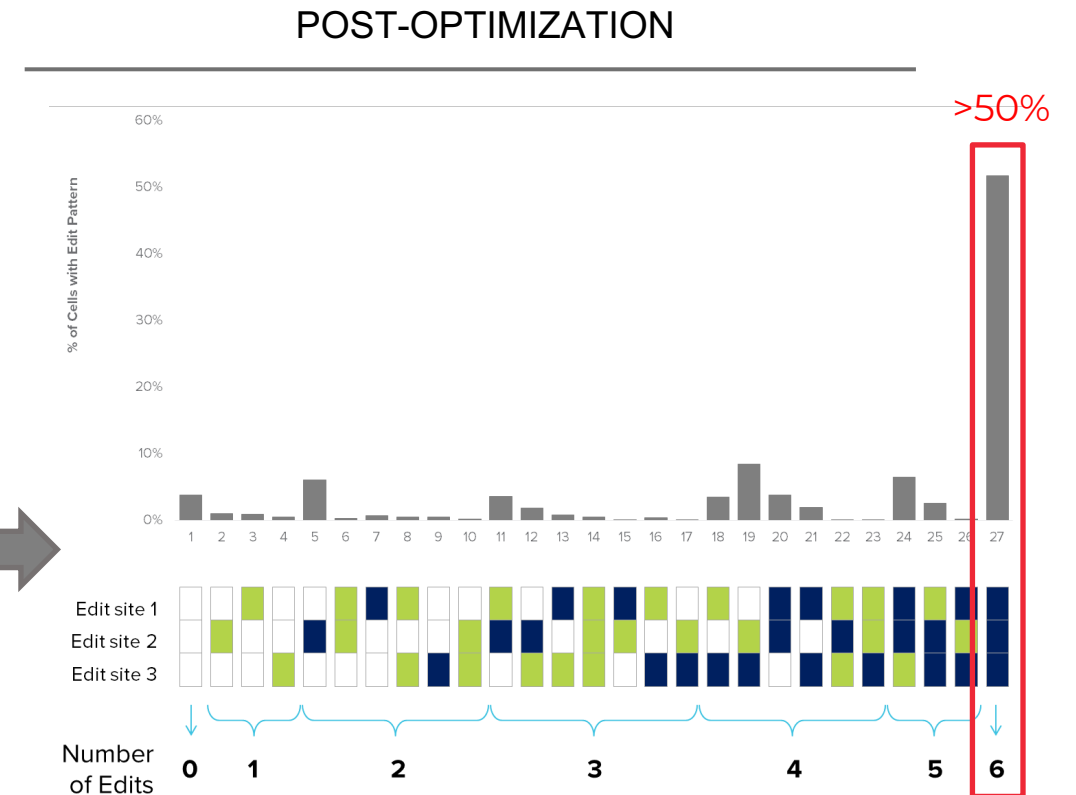
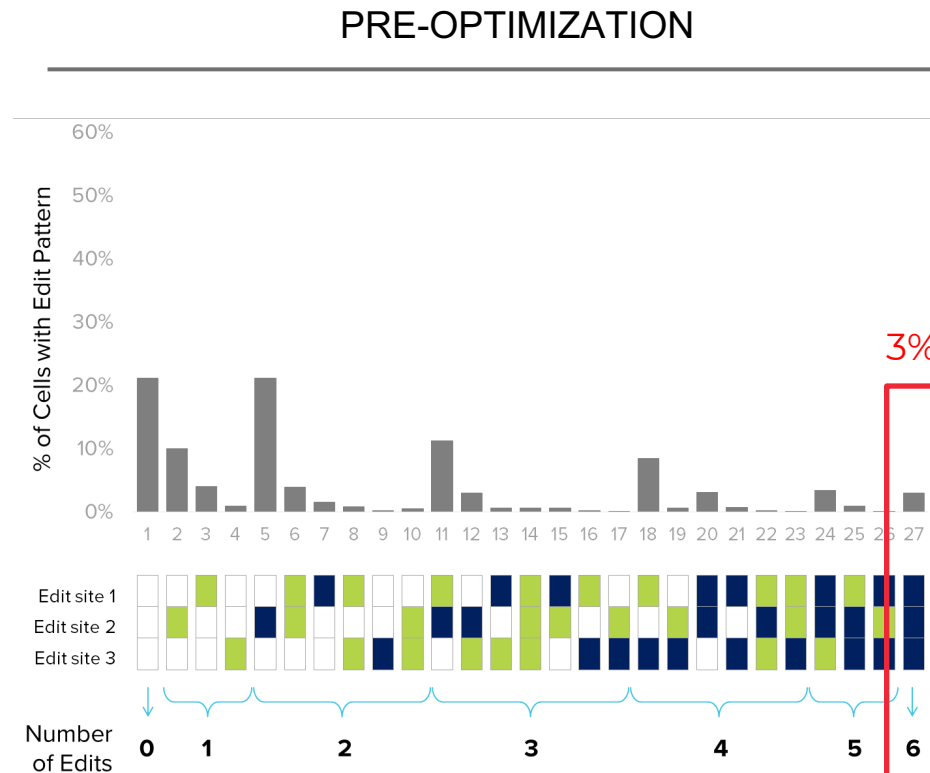
## Experiment: Multiplex CRISPR Editing to Obtain Cells with a Triple Knockout



- Bulk shows editing efficiency for each locus
- No zygosity information
- No knowledge of how edits co-occur

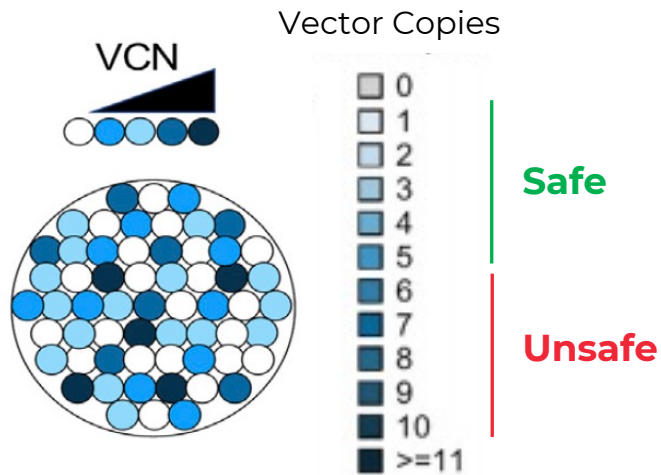
- All 27 different edit combinations detected
- zygosity & co-occurrence of edits

# CRISPR Editing Optimization with Single Cell



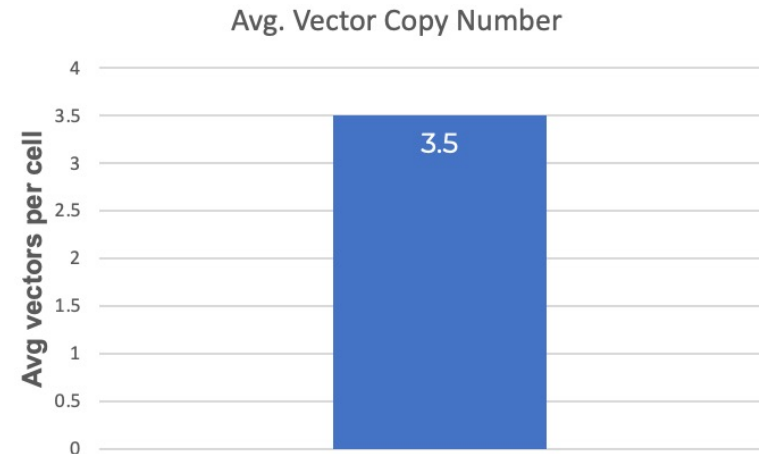
Homozygous  
at all 3 loci

# Single-cell Analysis of Vector Copy Number



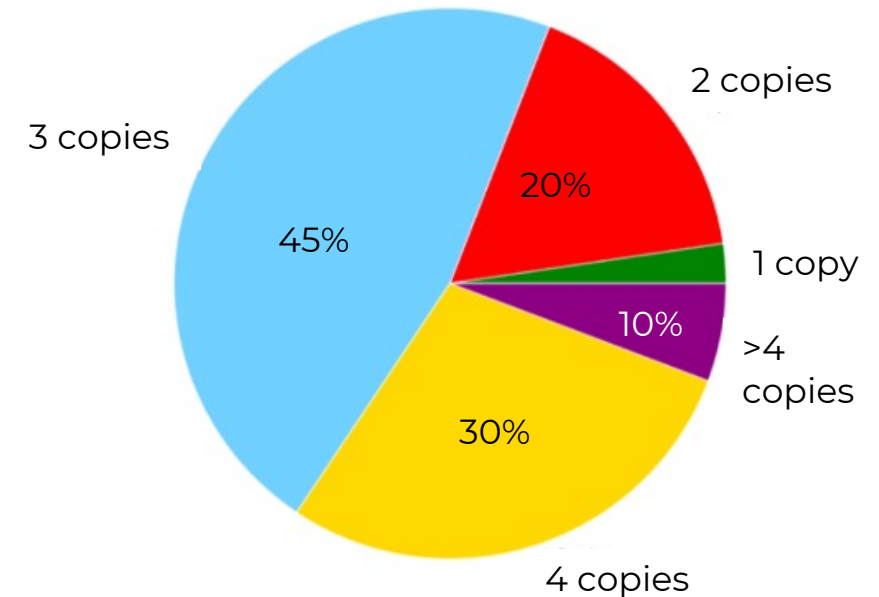
- Cell-to-cell variation in VCN

## BULK DATA



- Fails to report distribution of cells with different vector copies
- Potentially unsafe cells missed

## SINGLE-CELL DATA



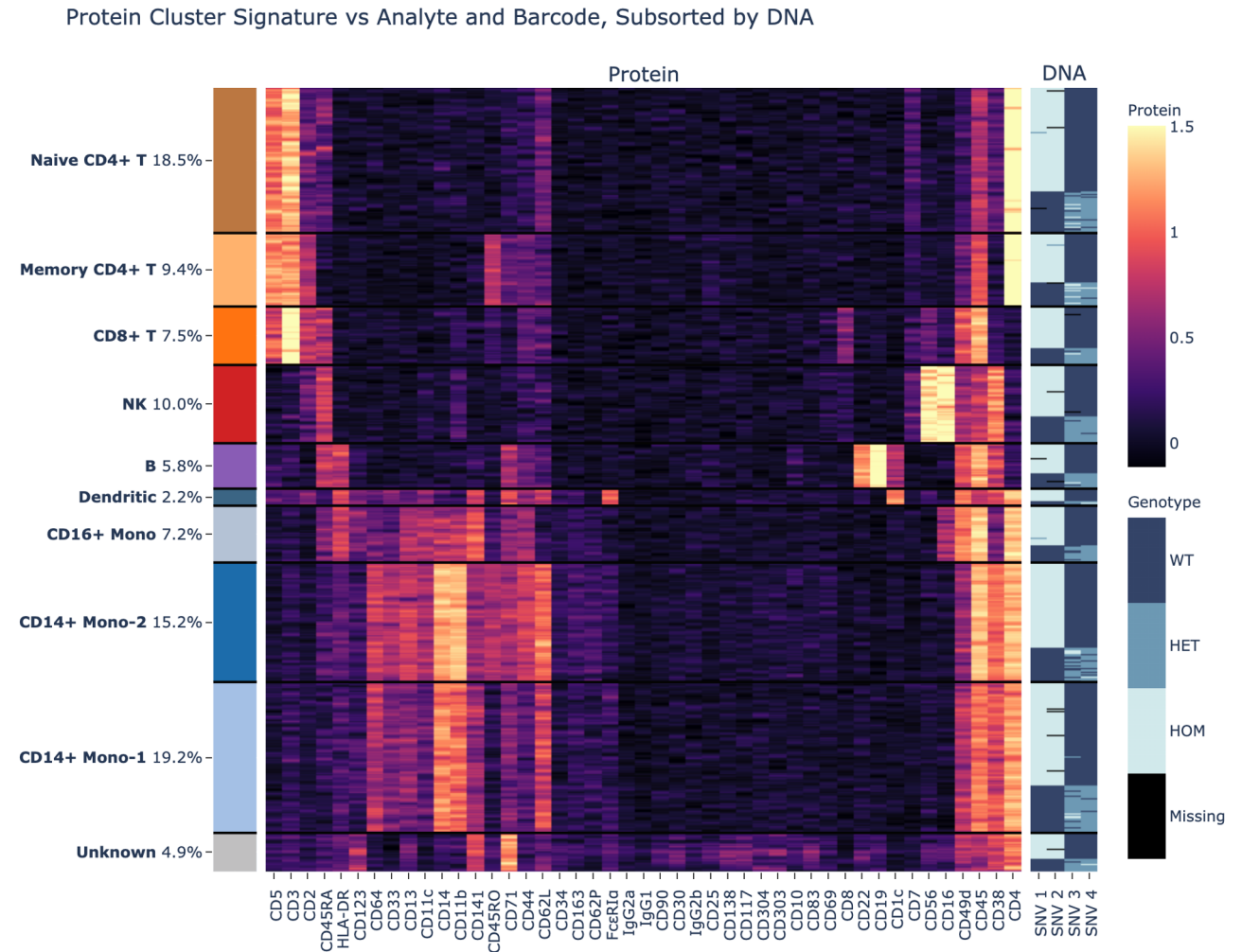
- % of cells with different numbers of vector copies
- Potentially unsafe cells detected

# Genotype and Phenotype Correlations at Single-cell Level

# Ready to use 45-plex TotalSeq™-D Human Heme Oncology Cocktail

A menu of >120 individual TotalSeq-D antibodies by BioLegend available now.

Custom AOCs can be spiked into the 45-plex  
TotalSeq™-D Human Heme Oncology  
Cocktail

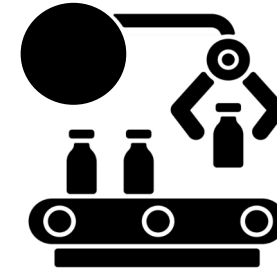




# Mission Bio's PAD Team Dedicated to Seamlessly Integrate Tapestri into your CGT Workflow



DEVELOPMENT



MANUFACTURING

**R&D/ Pre-Clinical**

**Clinical Trials**

**Commercial**

- IND-enabling studies
- CMC, analytics
- Protocol optimization

- Reverse translational studies
- Product & process development

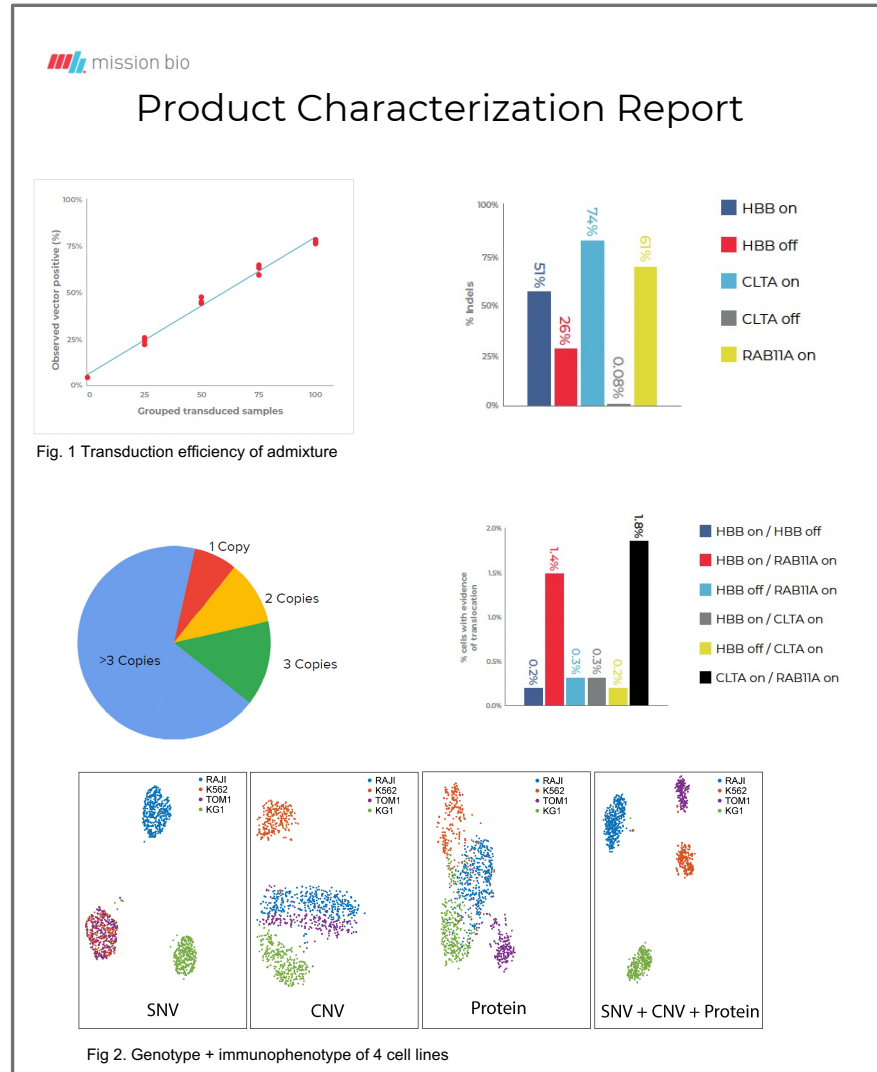
- Release testing
- Patient follow-up



# Detailed Analytical Report with Each PAD Project

Transduction efficiency

Viral vector copy number



On-/off-targets

Translocations  
& Karyotyping

Immunophenotype

# Single-cell Transduction Assay for Lot Release

## Mission Bio Transfers First Tapestri GMP-Ready CGT Assay to Avance Biosciences for Cell-Based Therapies

*GMP-compliant test for transduction efficiency marks a key milestone for Tapestri's ability to power single-cell analysis in clinical trial settings for cell & gene therapies*

**SOUTH SAN FRANCISCO, February 2, 2021** — **Mission Bio**, the pioneer in high-throughput single-cell DNA and multi-omics analysis, announced today the first tech transfer of a clinical trial-ready cell and gene therapy (CGT) assay from its Tapestri Platform to Avance Biosciences, Inc., a leading-edge CRO based in Houston, Texas, to assess transduction efficiency for an autologous cell therapy currently under development. This collaboration marks the first time the Tapestri Platform will undergo qualification and validation within a good manufacturing practice (GMP) setting, paving the way for its routine use in clinical trials on CGT materials to support the next wave of life-saving CGT treatments.

The Tapestri Platform will allow Avance to analyze cells that have been transduced with lentivirus, identifying transgene integration within individual cells without the need to grow clonal populations. Tapestri analysis not only reduces the timeframe of conventional workflows, but also enables large sample sizes (at the scale of thousands of individual cells) to be rapidly assessed — yielding highly accurate and precise measurements of transduction efficiency.

Assessing the safety and efficacy of CGT products is more challenging than conventional therapies because of the many potential variations between genetically altered cells. Cells modified with a viral vector will differ in transduction efficiency and the number of copies incorporated into the genome. Cells modified with tools like CRISPR can vary in on- and off-target edits, zygosity, or aberrant translocations. Before Tapestri, workflows required synchronizing data from multiple genotypic and phenotypic assays over several weeks, an approach with reduced specificity and limited ability to characterize cells with simultaneous edits.

# Single-cell Transduction Assay for Lot Release

**Project:** Single-cell transduction assay for lot release for gene-modified cell therapies.

1. Lentiviral transduction assay & analytics developed through PAD for proof of concept.



2. Final assay developed & tested across different lots for two products



3. Assay is transferred & validated at Avance (CRO)



4. Use for lot release across multiple drug candidates in clinical trials



# Single-cell Analysis is Shaping the Future

- Accommodate accelerated development timelines
  - Multiple assays combined in 1 workflow
  - Assess 1000s of cells in each run
- Improved resolution- single cell level
  - Protocol optimization
  - Safety: detect rare events
- Partnering with Mission Bio
  - Assay design
  - Development
  - Bioinformatics
  - Tech transfer



 tapestri

# Thank You!

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