ThermoFisher SCIENTIFIC

Bring your gene therapy to the forefront

by incorporating genetic analysis into your investigations at any phase of the gene therapy product development process.

Did you know?

The number of clinical trials using qPCR, dPCR, Sanger sequencing, or microarray technologies for genetic analysis increased by

56%

between 2014 and 2021.[1]

Phase 1: Proof-of-concept

Accelerate your timeline for gene therapy research by incorporating genetic analysis from the earliest development stage to help reduce risk of downstream therapeutic product attrition.

Identify molecular lesions

Find them: Identify the potential gene-therapy targets

Genetic analysis enables fast and straightforward identification of potentially causal variants throughout the genome.

Fix them: Correct the lesion

Verify and quantify even highly complex plasmid and viral vector constructs with precision and specificity. Genetic analysis technologies that provide single-nucleotide discrimination can give you greater confidence that your corrected lesion will integrate efficiently into the target gene and execute its intended function.

Fast: Maximize specificity in your animal models to faithfully mimic potential responses to your gene therapy product

Build synthetic genes using highly efficient and specific gene editing technologies.

Manage and track the genetic integrity of your transgenic animal colonies for long-term use.

Enhance your 3Rs animal research initiatives. Genetic analysis can provide additional data in vitro prior to testing in live animals.

Quantify transgene uptake and phenotypic efficacy with precision, accuracy, and specificity even at very low levels of transgene expression.

Go further: Advance identification of potential genetic markers

Evaluation of gene therapy outcome goes beyond expression of the edited transgene. Investigation of up-regulation or down-regulation in a single gene, an entire transcriptome, or regulatory microRNAs may reveal genetic markers that are associated with efficacy, targeting, toxicity, and other responses to your gene therapy product.

What are the 3Rs principles?

The 3Rs principles refer to animal research study design that prioritizes animal welfare in three ways:

Replace animal studies where feasible by using alternative approaches to achieve the same research goals

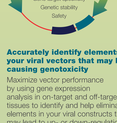
Reduce animal use by adopting methods that minimize the number of animals needed to achieve the goal

Refine study methods by designing protocols that minimize animal distress

Phase 2: Delivery vector design and optimization

Maximize performance of your transgene delivery vehicles. Genetic analysis technologies can help you build vectors designed for rapid and efficient transfection of the payload into the target cell population and integration of the transgene with minimal adverse side effects. Reducing toxicity remains one of the greatest challenges in unlocking the full potential of gene therapeutics.

Design, build, and package high performance viral vectors



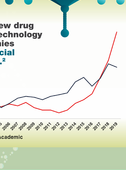
Accurately identify elements in your viral vectors that may be causing genotoxicity

Maximize vector performance by using gene expression analysis in on-target and off-target tissues to identify and help eliminate elements in your viral constructs that may lead to up- or down-regulation implicated in adverse responses to your gene therapy product.

Quickly and accurately titrate and optimize multiplicity of infection (MOI)

Minimize vector design cost and time with accurate quantitation of MOI. Genetic analysis can help determine the correct formulation of virus and cells to deliver the appropriate transgene payload into your cells.

- Authenticate your cell lines, detect contaminating cells, and track allelic drift with confidence using short-tandem repeats to confirm ploidy and identify mixed genotypes.
- Maximize viral delivery success with highly accurate, specific, and sensitive detection and quantitation of viral vector elements and viral titers before and after transfection.

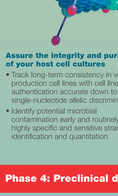


Phase 3: Delivery vehicle production

Maximize efficiency to help minimize cost and time in your vector delivery vehicle production. Highly reproducible genetic analysis technologies can streamline production workflows and save costs in dosage optimization, host-cell authentication, quantitation of in-process and adventitious contaminants, and production lot testing.

Quantify functional and residual vector components

Quickly and accurately determine the correct dosage of viral vector and cells to deliver the appropriate transgene payload.



Assure the integrity and purity of your host cell cultures

- Track long-term consistency in vector production cell lines with cell line authentication accurate down to single-nucleotide allelic discrimination.
- Identify potential microbial contamination early and routinely using highly specific and sensitive strain identification and quantitation.

Lot release quality control

Use high fidelity genetic technologies in lot testing to assess ongoing safety, potency, identity, and durable expression of your viral vector.

Phase 4: Preclinical development

Increase confidence in your preclinical studies using high-performance genetic analysis

Optimize your dosage escalation protocol with accurate, precise, and sensitive quantitation of functional viral particles.

Test for therapeutic efficacy of your gene therapy products with comprehensive and accurate quantitation of gene expression of your transgene and associated genetic biomarkers.

Test safety and toxicology using specific and comprehensive gene expression analysis to investigate on- and off-target genetic effects in tissues, DNA, and the immune system.

Assess successful gene transfer using highly accurate and specific genetic analysis to verify and quantitate edited gene sequences.

Propel your gene therapy research to the forefront of discovery. **Schedule a consultation to find out how.**

Find out more about our genetic analysis solutions.
thermofisher.com/biopharma-gene-therapy

References
1. GlobalData. Genome Scientific Market Landscape Report: Generic Insights for Biopharmaceuticals – Providing Drug Developers With Therapeutic Assets.
2. Agarwal S, Chunikhin Sergei P, Sankaran-Walters S, et al. Clinical Pharmacology of Gene Therapeutics: The First Decade. Clinical Pharmacology & Therapeutics. 2020; 108(1): 19–28. doi: 10.1002/cpt.1837. PMID: 31919524 PMCID: PMC7308540 EMSID: EMS79200

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