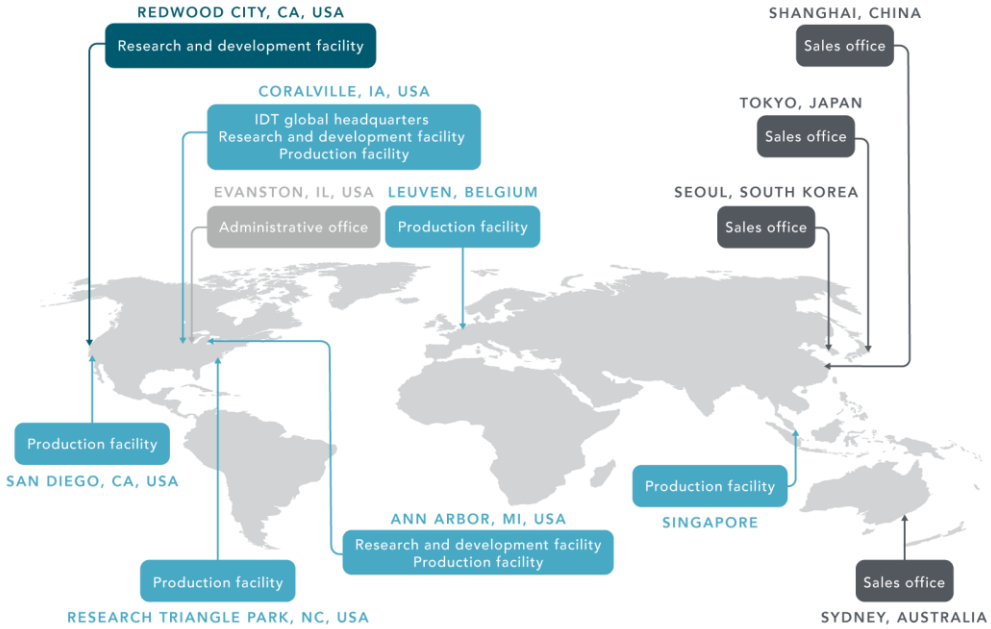
INTRODUCTION TO INTEGRATED DNA TECHNOLOGIES

A global leader in DNA and RNA synthesis

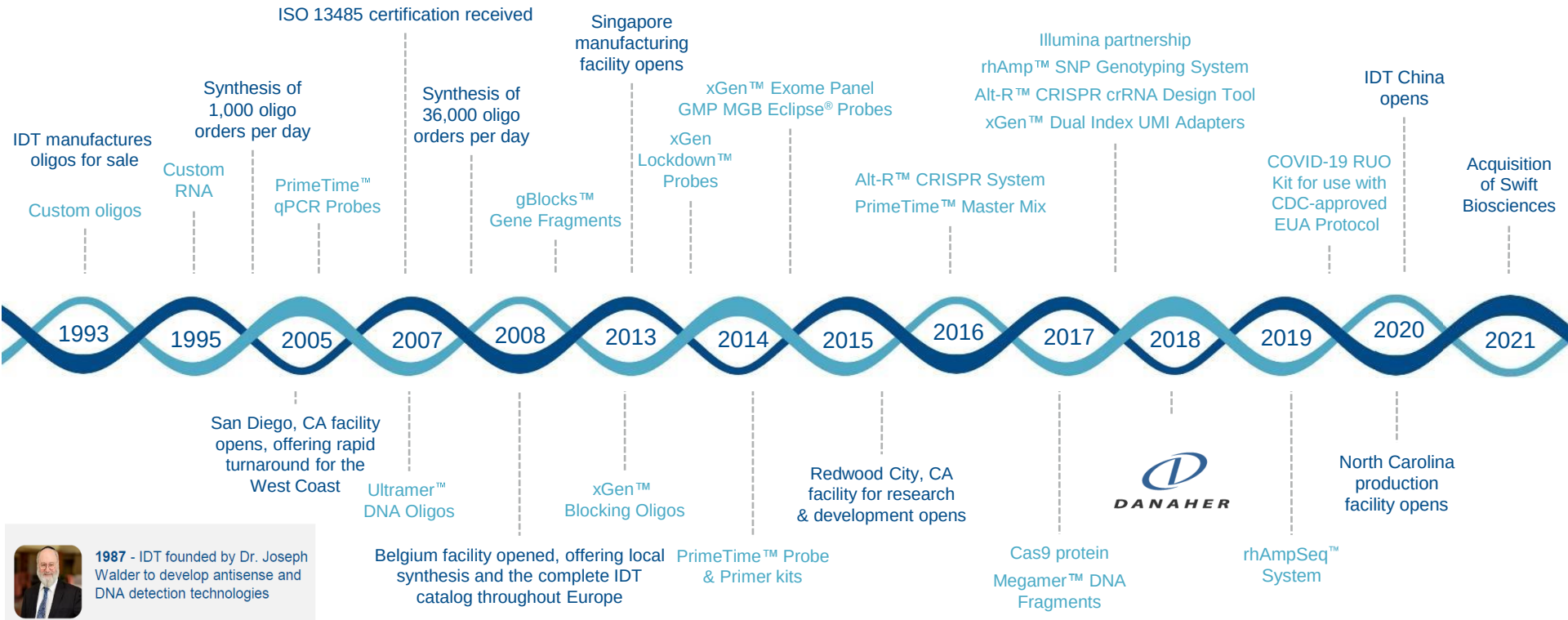
Serving academic researchers, biotech, and pharma customers around the world

- >4,200 orders per day
- >100,000 oligonucleotides produced per day
- >1,400 genes and gene fragments produced per day
- >135 million bases of DNA per month
- “Courier zones” near plants to deliver oligos to customers faster than FedEx



INTEGRATED DNA TECHNOLOGIES

Advanced oligo capabilities enable product evolution



1987 - IDT founded by Dr. Joseph Walder to develop antisense and DNA detection technologies

PRODUCT LAUNCHES
KEY COMPANY EVENTS

Danaher 2022

A global purpose-driven science and technology leader

LIFE SCIENCES

cytiva

aldevron

PALL

SCIEX

Beckman Coulter Life Sciences

IDT Integrated DNA Technologies

Leica Microsystems

Molecular Devices

phenomenex

DIAGNOSTICS

Beckman Coulter

Cepheid

Radiometer

Leica Biosystems

ENVIRONMENTAL and APPLIED SOLUTIONS

Water quality

HACH

ChemTreat

Trojan Technologies

McCrometer

Product ID

Videojet

ESKO

x-rite Pantone

Laetus

AVT

For research use only. Not for use in diagnostics or therapeutics.

IDT Integrated DNA Technologies

IDT’s commitment to sustainability

Our environmental policy

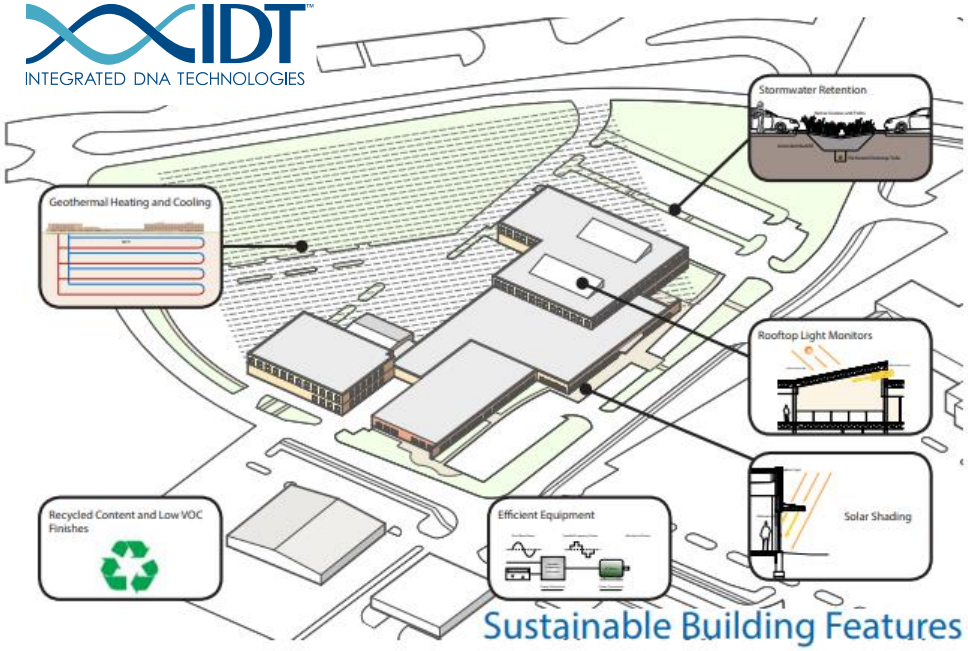
- Integrated DNA Technologies, Inc. is committed to minimizing the environmental impacts of its manufacturing and research operations and its products and services, and to continuously improving its environmental management programs.

Elimination of hazardous waste streams

- IDT received the Greenovation Award in 2017, 2018, 2019, 2020, and 2021. The awarded recognizes outstanding efforts in sustainability, reuse, green remediation, and alternative and renewable energy utilization.
- Beneficial Reuse: Since 2016, IDT HQ has participated in a beneficial reuse partnership; it allowed for the recycling of >773,000 lbs. of material in 2018.

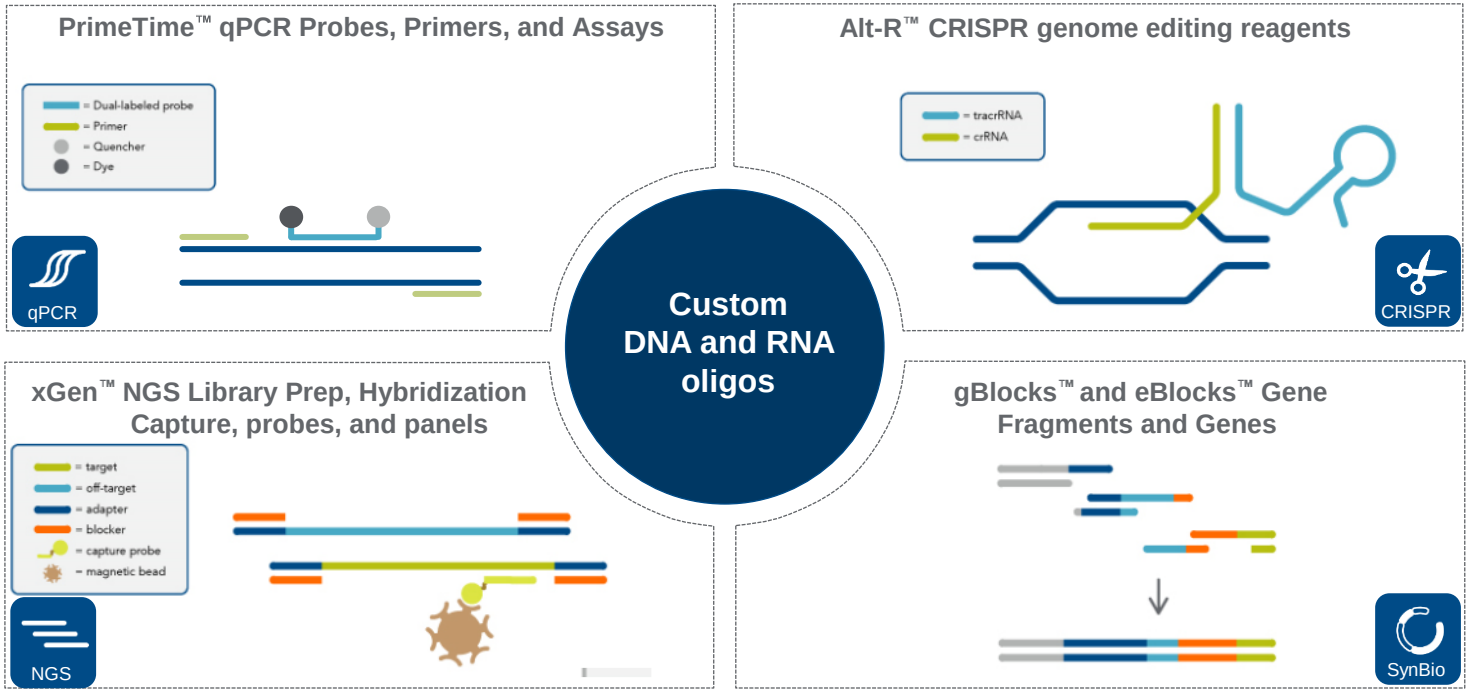
- Geothermal heating and cooling
- Recycled building materials
- Energy-efficient equipment
- Stormwater bioswales
- Rooftop light monitors
- Solar shading

IDT headquarters' sustainable building features



Innovative genomics solutions

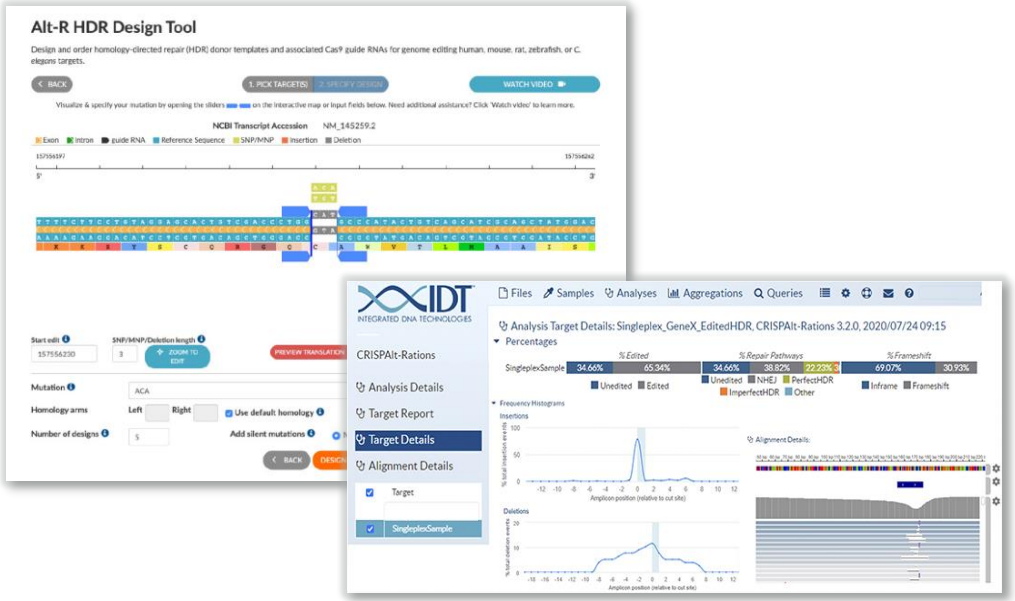
Leveraging expertise in DNA synthesis



IDT™ INTEGRATED DNA TECHNOLOGIES

End-to-end solutions

Complete workflows with reagents, enzymes, and bioinformatics tools



Design and analysis tools support your research beyond the bench

Product lines that include relevant enzymes and reagents:

- qPCR and PCR
- CRISPR
- NGS

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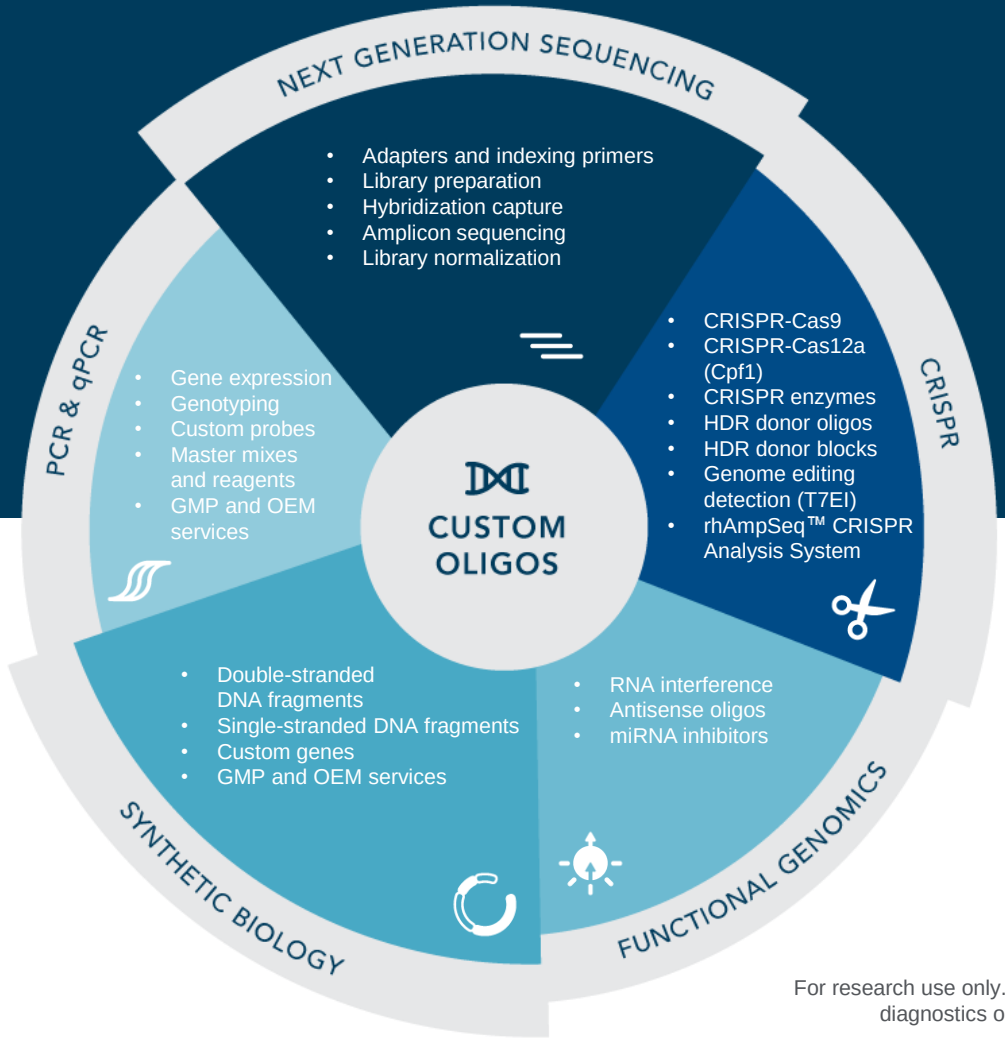
INTEGRATED DNA TECHNOLOGIES

IDT HAS EVOLVED— FOR YOU



INTEGRATED DNA TECHNOLOGIES

IDT'S PRODUCT LINES

IDT™
INTEGRATED DNA TECHNOLOGIES

Custom oligos

Custom DNA and RNA oligos
RUO-to-GMP solutions

PCR
qPCR
digital PCR

IDT
INTEGRATED DNA TECHNOLOGIES

Oligo and PCR solutions

Custom oligos

- Custom DNA oligos
- Custom RNA oligos
- oPools™ Oligo Pools
- Large-scale synthesis
- SameDay oligos
- Affinity Plus™ DNA and RNA oligos
- Inventoried oligos
- Oligo modifications

Gene expression

PrimeTime™ qPCR Primer and Probe Assays

- Predesigned or custom assays

PrimeTime™ gene expression Master Mix

- Optimized for probe-based qPCR

Custom qPCR probes

- Made to your specifications

SARS-CoV-2 qPCR panels

- Primers and probes made to your specifications in purity and scale

Genotyping

rhAmp™ SNP Genotyping System

- Easy, out-of-the-box solution

Affinity Plus™ qPCR Probes

- Locked nucleic acids for probe stability

PrimeTime™ LNA qPCR Probes

- Locked 5’ nucleic acid for improved detection

MGB Eclipse Probes

- Dual-labeled 5’ nuclease probes

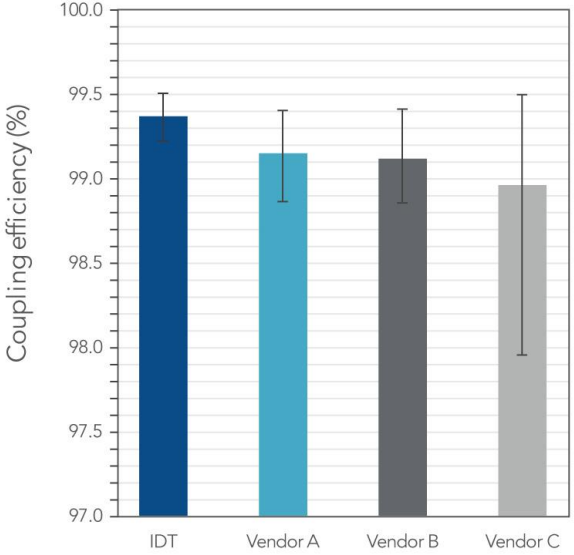
PACE SNP Genotyping Assays

- A reliable, cost-effective approach for SNP and indel detection

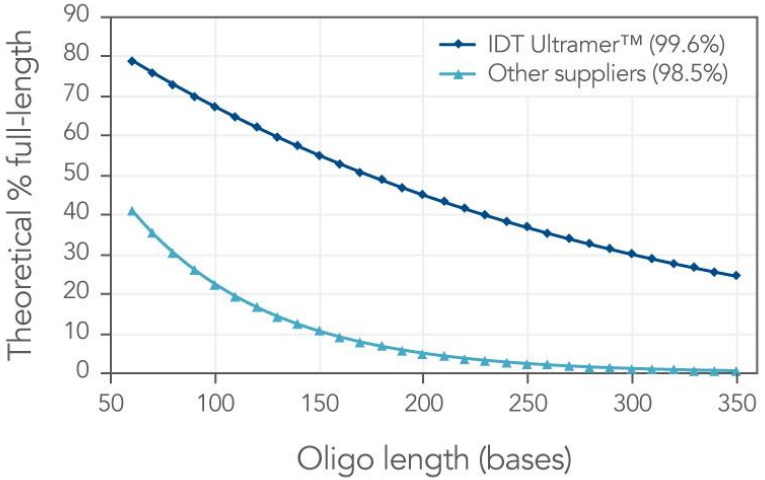
IDT
INTEGRATED DNA TECHNOLOGIES

Oligo synthesis expertise

IDT's high coupling efficiency results in more full-length product



30–45 nt oligos



Longer oligos, up to 200 nt

Our proprietary oligo manufacturing process enables a 99.4–99.6% coupling efficiency

IDT
INTEGRATED DNA TECHNOLOGIES

Synthetic biology solutions and services

Single-stranded DNA

- Ultramer™ Oligos
- Megamer™ Fragments
- oPools™ Oligo Pools

Linear double-stranded DNA

- gBlocks™ and gBlocks™ HiFi Gene Fragments
- eBlocks™ Gene Fragments

Custom gene synthesis

- Double-stranded DNA in a cloning vector

Custom projects

- Project-based solutions

IDT
INTEGRATED DNA TECHNOLOGIES

Synthetic biology portfolio and applications

oPools™ Oligo Pools

- 10-100,000+ oligos pooled
- 40-350 base length
- 1, 10, or 50 pmol

eBlocks™ Gene Fragments

- As little as 1-3 day TAT
- 1:5,000 bp error rate
- 300-1500 bp

gBlocks™ Gene Fragments

- 2-8 day TAT*
- 1:5,000 bp error rate
- 125-3000 bp

gBlocks™ HiFi Gene Fragments

- As little as 6-10 day TAT
- 1:12,000 bp error rate
- 1000-3000 bp

gBlocks™ libraries

- gBlocks with variable region “N” domains (Ab evolution)

Custom genes

- Short to long (25 bp to 10 kb or more)
- 4 µg yield
- Cloned in plasmids
- NGS sequence-verified
- Custom vector onboarding available

* This estimated shipping time is for tubes only. Plates estimated ship date is 10-15 business days.

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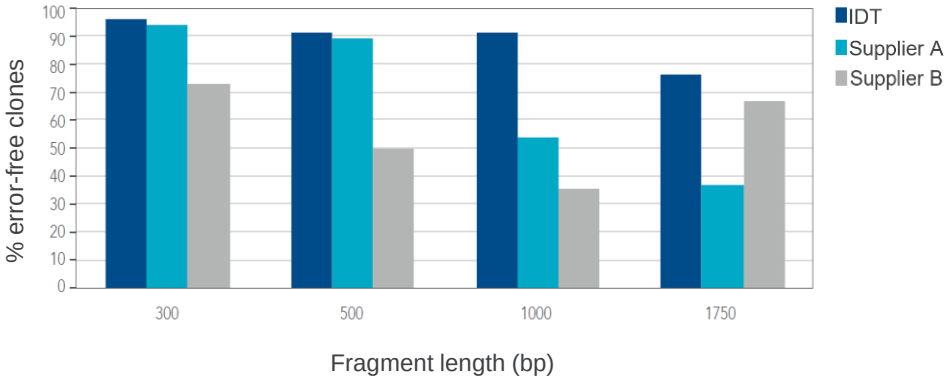
Higher-fidelity DNA fragments

Streamline cloning workflows by screening fewer colonies



dsDNA fragments between 300-1750 bp were cloned into a pUC-based vector, screened, and NGS sequence verified. N = 24 colonies per supplier per sequence.

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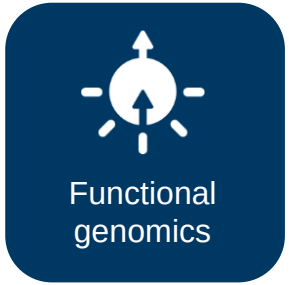
CRISPR and Functional Genomics solutions

Enzymes, gRNAs, donor templates, enhancers, and design and analysis tools



Antisense oligos (ASOs), RNA interference (Dicer substrate siRNAs, MicroRNA inhibitors)

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Alt-R™ CRISPR System

Alt-R™ Cas9 gRNA Design Tool
- Predesigned guides
- Custom designs
- Design checking

Alt-R™ Cas9 HDR Design Tool
- Friendly UI
- Empirically defined design rules
- Integration with Cas9 gRNA designs

rhAmpSeq™ Design Tool

Alt-R™ gRNAs
- Cas9 crRNA:tracrRNA
- Fluorescently labeled tracrRNAs
- Cas9 sgRNA
- Cas12a crRNA
- Custom ordering for any gRNA (i.e., pegRNA, Cas13)–36 to 150+ bases

Alt-R™ CRISPR proteins
- WT Cas9
- HiFi Cas9
- Cas9 nickases, dCas9
- *A.s.* Cas12a *Ultra*
- *L.b.* Cas12a *Ultra*
- Fluorescently labeled Cas9

Alt-R™ Electroporation Enhancers

Alt-R™ HDR Donor Oligos
- Up to 200 nt
- Modified ssODNs

Alt-R™ HDR Donor Blocks
- Modified to reduce blunt integration
- Up to 3000 nt
- Sequence-verified by NGS

Alt-R™ HDR Enhancers
- v2 small molecule
- New enhancers coming!

Megamer™ Fragments
- ssDNA 200-2000 bases
- Alternative for specific cell types where dsDNA may be cytotoxic

Genome Editing Detection Kit
- T7EI assay

rhAmpSeq™ CRISPR Analysis System
- Multiplexed amplicon NGS sequencing (singleplex on-target, multiple off-target)
- Cloud-hosted interface for customer analysis of NGS CRISPR editing data (CRISPRAltRation platform)

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IDT scientists are authors on 30 CRISPR-related publications and are involved in numerous partnerships to advance the field of genome editing.

IDT's CRISPR R&D program facilitates a complete workflow solution

ARTICLE

https://doi.org/10.1038/s41467-021-24017-8 OPEN

AsCas12a ultra nuclease facilitates the rapid generation of therapeutic cell medicines

Liyang Zhang[1,4], John A. Zuris[2,4], Ramya Viswanathan[2,4], Bernice Thommandru[1,4], H. Tomas Rube[3,4], Steve E. Gle, Sarah F. Beaudoin[1], Swarali Lele[2], Sean N. Scott[2], Kevi, Mollie S. Schubert[1], Gavin L. Kurgan[1], Matthew S. Mc, Richard A. Morgan[2], Mark A. Behlke[1✉] & Christophe

Though AsCas12a fills a crucial gap in the curre, tively poor editing efficiency, restricting its ove, variant, "AsCas12a Ultra", that increased editir, examined in HSPCs, iPSCs, T cells, and NK cells, high on-target specificity thereby mitigating the ri, for complex therapeutic genome editing applicatic, three clinically relevant genes in T cells at >90, knock-in efficiencies of up to 60%. We demonst, cells, which afforded enhanced anti-tumor NK ce, generation of allogeneic cell-based therapies in, CRISPR nuclease with significant advantages in b, edited cell medicines.

NATURE COMMUNICATIONS | (2021)12:3908 | https://doi.org/10.103

nature COMMUNICATIONS

ARTICLES

https://doi.org/10.1038/s41591-018-0137-0

nature medicine

A high-fidelity Cas9 mutant delivered as a ribonucleoprotein complex enables efficient gene editing in human hematopoietic stem and progenitor cells

Christopher A. Vakulskas[1,7], Daniel P. Dever[2,7], Garrett R. Rettig[1], Rolf Turk[1], Ashley M. Jacobi[1], Michael A. Collingwood[1], Nicole M. Bode[1], Matthew S. McNeill[1], Shuqi Yan[1], Joab Camarena[2], Ciaran M. Lee[3], So Hyun Park[3], Volker Wiebking[2], Rasmus O. Bak[4,5], Natalia Gomez-Ospina[2], Mara Pavel-Dinu[2], Wenchao Sun[6], Gang Bao[3], Matthew H. Porteus[2*] and Mark A. Behlke[1*]

Translation of the CRISPR–Cas9 system to human therapeutics holds high promise. However, specificity remains a concern especially when modifying stem cell populations. We show that existing rationally engineered Cas9 high-fidelity variants have reduced on-target activity when using the therapeutically relevant ribonucleoprotein (RNP) delivery method. Therefore, we devised an unbiased bacterial screen to isolate variants that retain activity in the RNP format. Introduction of a single point mutation, p.R691A, in Cas9 (high-fidelity (HiFi) Cas9) retained the high on-target activity of Cas9 while reducing off-target editing. HiFi Cas9 induces robust AAV6-mediated gene targeting at five therapeutically relevant loci (*HBB*, *IL2RG*, *CCR5*, *HEXB*, and *TRAC*) in human CD34⁺ hematopoietic stem and progenitor cells (HSPCs) as well as primary T cells. We also show that HiFi Cas9 mediates high-level correction of the sickle cell disease (SCD)-causing p.E6V mutation in HSPCs derived from patients with SCD. We anticipate that HiFi Cas9 will have wide utility for both basic science and therapeutic genome-editing applications.

NATURE MEDICINE | VOL 24 | AUGUST 2018 | 1216–1224 | www.nature.com/naturemedicine

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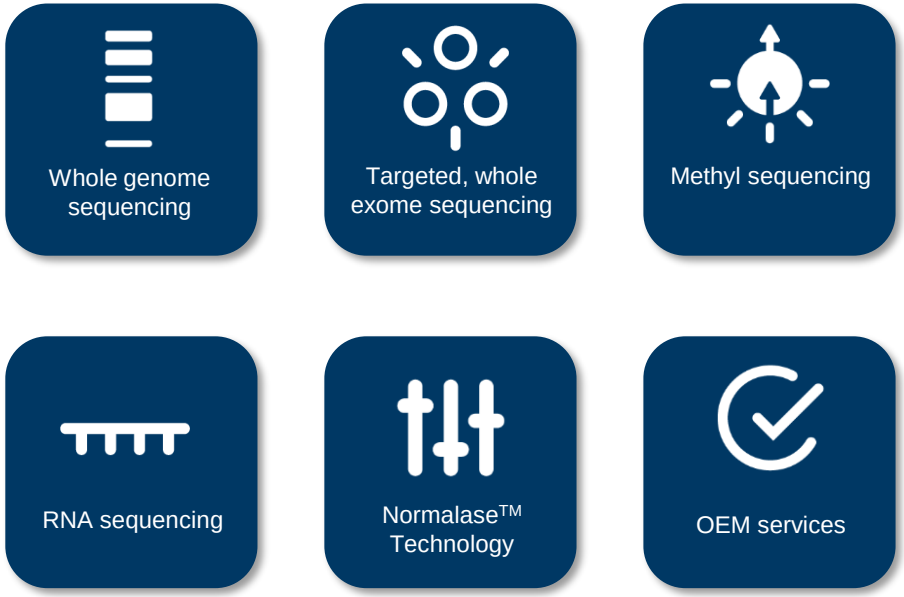
xGen™ NGS—made with comprehensive solutions



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xGen™ NGS—made for research flexibility

xGen™ DNA Library Preparation

- DNA Library Prep Kit
- cfDNA and FFPE DNA Library Prep Kit
- ssDNA and Low-input DNA Library Prep Kit

xGen™ RNA Library Preparation

- Broad-Range RNA Library Prep Kit
- RNA Library Prep Kit

xGen™ Methyl-Seq DNA Library Preparation

xGen™ Adapters and Indexing Primers

xGen™ Custom Hyb Panels

xGen™ Pre-Designed Hyb Panels

- Exome Hyb Panel v2
- AML Cancer Hyb Panel
- Inherited Diseases Hyb Panel
- Human mtDNA Hyb Panel
- Human CNV Backbone Hyb Panel
- Pan-Cancer Hyb Panel
- Human ID Hyb Panel
- SARS-CoV-2 Hyb Panel

xGen™ Hyb Capture Core Reagents

xGen™ Custom Amplicon Panels

xGen™ Pre-Designed Amplicon Panels

- SARS-CoV-2 Amplicon Panel
- SARS-CoV-2 Midnight Amplicon Panel
- SARS-CoV-2 ARTIC Amplicon Panel
- Oncology/Inherited Diseases Amplicon Panels
- Metagenomics Amplicon Panels
- GFR Pathway Amplicon Panel
- Human Sample ID Amplicon Panel

xGen™ Amplicon Core Reagents

xGen™ Normalase™ Module

IDT™
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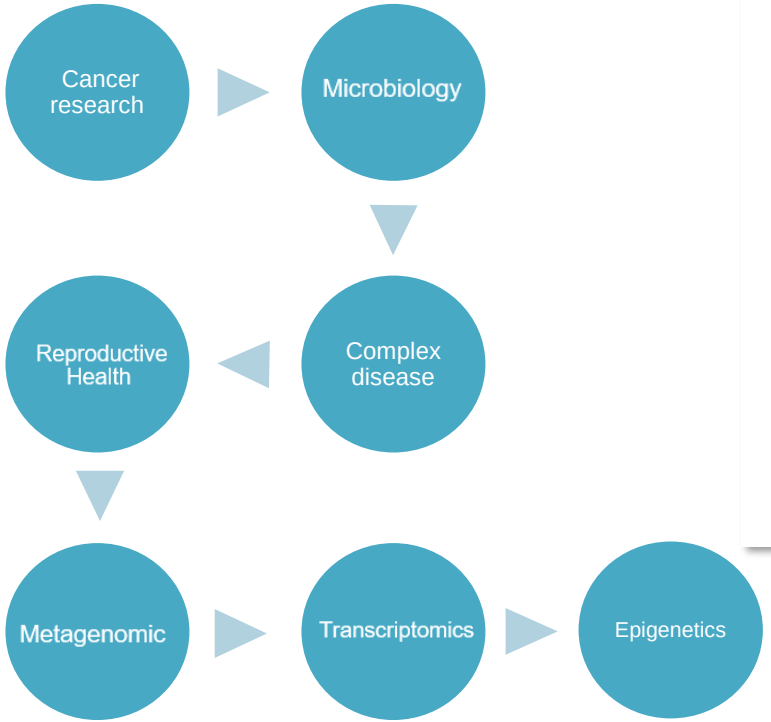
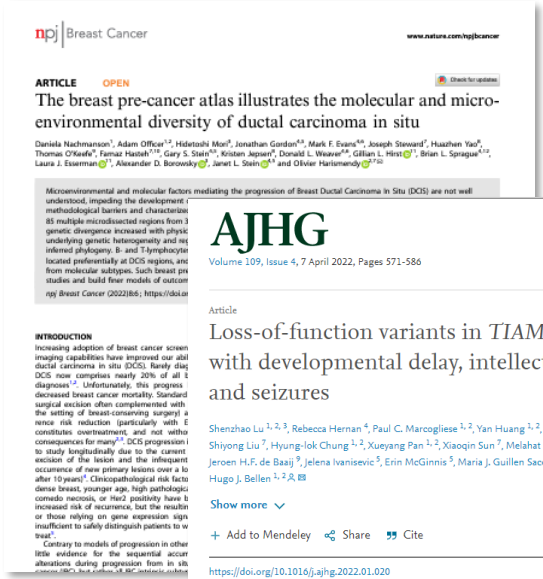
Workflow flexibility for many different applications

More than 500+ published studies use IDT's xGen™ NGS products



Oncology research


npj Breast Cancer

www.nature.com/npjbcancer

ARTICLE OPEN

The breast pre-cancer atlas illustrates the molecular and micro-environmental diversity of ductal carcinoma in situ

Viral research

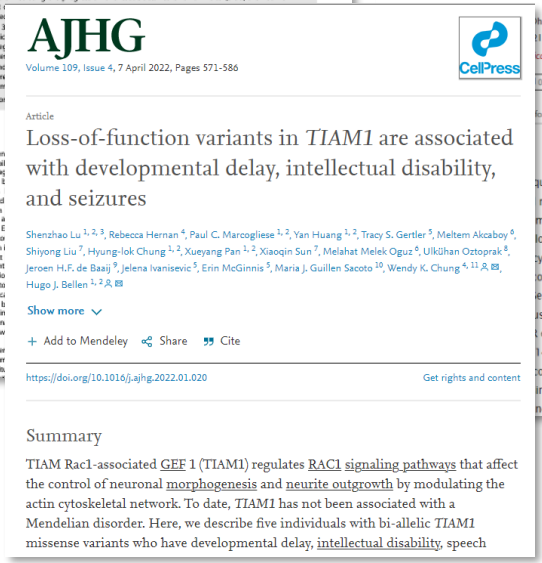

medRxiv

THE PREPRINT SERVER FOR HEALTH SCIENCES

BMJ Yale

Performance of COVIDSeq and Swift normalase amplicon SARS-CoV-2 panels for SARS-CoV-2 Genomes Sequencing: Practical Guide and Combining FASTQ Strategy

Exome research


AJHG

Volume 109, Issue 4, 7 April 2022, Pages 571-586

CellPress

Article

Loss-of-function variants in *TIAM1* are associated with developmental delay, intellectual disability, and seizures

Show more

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https://doi.org/10.1016/j.ajhg.2022.01.020

Get rights and content

Summary

TIAM Rac1-associated GEF 1 (TIAM1) regulates RAC1 signaling pathways that affect the control of neuronal morphogenesis and neurite outgrowth by modulating the actin cytoskeletal network. To date, *TIAM1* has not been associated with a Mendelian disorder. Here, we describe five individuals with bi-allelic *TIAM1* missense variants who have developmental delay, intellectual disability, speech

IDT INTEGRATED DNA TECHNOLOGIES

IDT’s design & analysis tools

Oligo design and handling

- OligoAnalyzer™ Tool
- UNAFold Tool
- Resuspension calculator
- Dilution Calculator

qPCR assays and genotyping

- PrimerQuest™ Tool
- Realtime PCR Tool
- Predesigned qPCR Assays
- PrimeTime™ Multiplex Dye Selection
- rhAmp™ Genotyping Design Tool

CRISPR genome editing

- Alt-R™ Predesigned and Custom Cas9 crRNA Selection Tools
- CRISPR-Cas9 Design Checker
- Alt-R™ HDR Design Tool
- rhAmpSeq™ CRISPR Analysis Tool

NGS tools

- Library Concentration Conversion Calculator
- Target Capture Probe Design and Ordering Tool
- Custom Adapter Configurator Tool
- xGen™ NGS Solutions Builder Tool (NEW!)

Genes and gene fragments

- Codon Optimization Tool
- gBlocks™ Gene Fragments Entry Tool

Gene regulation and RNAi

- Predesigned DsiRNA Selection Tool
- RNAi Design Tool

IDT™
INTEGRATED DNA TECHNOLOGIES

IDT B2B: 21 CFR 820 GMP COMPLIANT AND ISO 13485:2016 CERTIFIED

IDT™
INTEGRATED DNA TECHNOLOGIES

Strategic Services: We offer key GMP components to help build your assays

Our track record:

- >90,000 GMP oligonucleotides synthesized per year, largely as components of molecular assays
- 2 sites (Coralville, Leuven) with dedicated GMP production capabilities
- >500 diagnostic and biotechnology organizations served
- >1,000 molecular assays or OEM products commercialized using IDT components

GMP refers to products manufactured under ISO 13485: 2016 QMS. Purchaser is solely responsible for all decisions regarding the use of these products and any associated regulatory or legal obligations for their legal marketing.

QUALITY

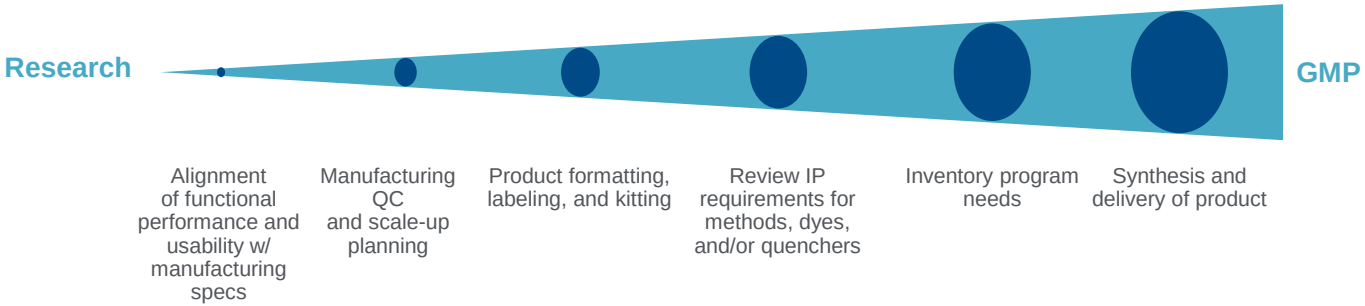
FLEXIBILITY

SPEED

PERSONALIZED SUPPORT

Why choose IDT to transition from research to GMP?

- Dedicated strategic account manager to help align on specs, timelines, pricing, supply agreements, inventory programs, and more
- Years of technical expertise and experience in oligo design, synthesis, manufacturing, and end-use application
- Lot-to-lot consistency
- Picomole to multi-gram single-lot scalability
- Your product, your way (plates and tubes, custom formulations/spec sheets, your packaging)



GMP refers to products manufactured under ISO 13485: 2016 QMS. Purchaser is solely responsible for all decisions regarding the use of these products and any associated regulatory or legal obligations for their legal marketing.

For research use only. Not for use in diagnostics or therapeutics.

IDT™
INTEGRATED DNA TECHNOLOGIES

Support and education

Take advantage of IDT's extensive resources

- Expert customer service available 24/7
- Regular webinars and presentations from our R&D team
- Educational resources on the web, including
  - FAQs
  - DECODED online newsletter
  - IDT community blog
  - IDT publications
  - Past webinars and video tutorials

Questions?

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Phone: 1800 092 259

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Coralville

IDT
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Leuven

San Diego

Singapore

THANK YOU

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