

LIFE TECHNOLOGIES™
SYNTHETIC BIOLOGY



Synthetic vaccine research and development
Comprehensive, innovative solutions and technologies

life
technologies™

From plan to product, Life Technologies supports your synthetic vaccine goals

We combine next-generation sequencing, *in silico* gene design and synthesis, synthetic biology products, and manufacturing capabilities to form a comprehensive synthetic vaccine development workflow.

Going from drug research to application—faster

The healthcare demands in developing and developed countries are wide-ranging and growing. Worldwide, the healthcare industry requires ways to streamline the drug research–development–application pipeline to make it more efficient and scalable, to deliver cost-effective vaccines for infectious diseases and novel solutions for large, aging populations. This industry has the potential to treat, heal, and save millions of lives.

Solutions for improved vaccines

By accessing modern omics analysis techniques and precision molecular manipulation tools, the promise of significant health improvements and preventive strategies for all individuals is closer than ever. At Life Technologies, we're partnering with the industry's most forward-thinking leaders to improve the therapeutic pipeline and success rate of experiments and trials. Together, we're employing innovative, rigorous, and robust tools to provide comprehensive solutions to the pharmaceuticals and biopharmaceuticals industries to better develop, optimize, and mass-produce the prophylactics and treatments needed.

Our end-to-end solutions support your goals to:

1. Develop vaccines

- Enhanced and longer-lived immune responses
- Improved efficacies and safety profiles
- Immune responses that are more focused on relevant targets and epitopes
- More fine-tuned effector functions

2. Expedite research and development

- Unlimited flexibility in vaccine design
- Reduce costs and time to market

3. Meet your production goal

- Reduce production costs
- Increase capacity
- Achieve rapid availability of your product

4. Work in regulated environments

- Maintain GMP conformity
- Utilize chemically defined media and supplements
- Incorporate certified-origin components

Workflow solutions for synthetic vaccine research and development:

OPTIMIZE antigens

- Gene design and synthesis
- Test and deploy synthetic genes, variants, libraries
- Employ analysis from synthetic sequential permutational libraries
- Modulate immunogenicity by design
- Get fast results; high expression and capacity

DEVELOP immunogen

- Vector construction
- Seamless cloning and assembly
- High-order genetic assembly
- Plasmid transfection
- Engineer for efficacy and high titer
- Separate candidates, e.g., by magnetic bead or FACS strategies

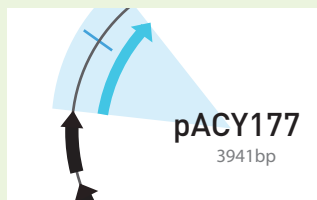
PRODUCE immunogen

- Various cell types
- Cell culture, media optimization, and fermentation
- Chemically defined, AOF media and matched feed

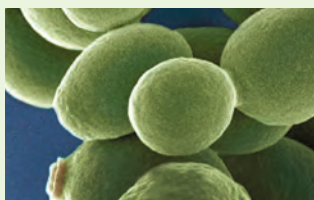
PURIFY immunogen

- Resins and chromatography
- Polish RNA, DNA, and protein with high-capacity, high-resolution chromatography resins
- Rapid assays for key contaminants and impurities

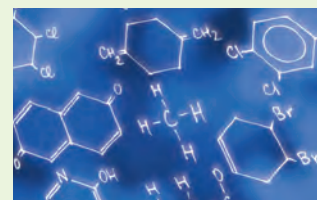
Our comprehensive portfolio of industry-leading brands and products for research and development includes:



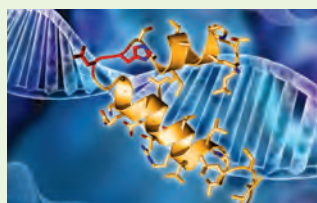
Vector NTI®
sequence analysis
software



GeneArt® cloning,
assembly, and
site-directed
mutagenesis kits



Ambion® *in vitro*
transcription kit



GeneArt®
Precision TALs



Gibco® cell
culture products



POROS®
chromatography
resins

Ion Torrent™ semiconductor sequencing – speed, scalability, simplicity*



- Fast run times
- Flexible output
- Long read lengths
- Highly accurate data

* The content provided herein may relate to products that have not been officially released and is subject to change without notice.

Proven synthetic vaccine capabilities

Life Technologies has a proven track record for our GeneArt® molecular engineering tools in vaccine development. Below are a few examples of how our tools are fueling industry breakthroughs:

Successful testing of an engineered HIV vaccine

In February 2008, GeneArt was awarded two US patents to protect the use of specific, custom-designed HIV gene sequences for development of therapeutics or vaccines. In a 40-person clinical trial, the prophylactic vaccination proved to be safe and well tolerated, and it triggered a strong and lasting immune response in 90 % of the vaccinated subjects (*J Exp Med* 205:63 [2008]). Additional trials are ongoing. In 2009, GeneArt was awarded a contract by the HIV Vaccine Consortium (UK) to design and produce two HIV vaccine candidates based on the HIV gene sequences used in the 2008 trial.

Production of synthetic genes for the development of an H1N1 vaccine in 5 days

In May 2009, the GeneArt gene synthesis and assembly platform was employed to create synthetic H1N1 genes for a top European pharmaceutical company, and the product was delivered within a 5-day period. GeneArt created an additional ten H1N1 viral coat protein constructs for the Robert Koch Institute (the central federal institution responsible for disease control and prevention in Germany).

The proof is in the published

Our tools and technologies for synthetic biology have been widely cited, and have been featured in the *Journal of Virology*, the *Journal of Immunology*, *Human Vaccines*, and the *Proceedings of the National Academy of Sciences of the United States of America*, among several others. Research topics have included the implications of synthetic biology, vaccine development, and research breakthroughs related to HIV, Ebola viruses, and malaria.

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To see a comprehensive list of published research that cites the use of Life Technologies products and solutions for synthetic vaccine research and development, go to lifetechnologies.com/syntheticbiology

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