



**Synbio Technologies**  
**Genes for Life**



## Services and Products

- ▶ Syno® 1.0 Oligo Synthesis
- ▶ Syno® 2.0 Gene Synthesis
- ▶ Syno® 3.0 High Throughput Gene Synthesis
- ▶ Syno® Synthetic DNA Libraries
- ▶ Custom RNA Synthesis
- ▶ Molecular Biology Services
- ▶ CRISPR-Cas9 Gene Editing
- ▶ Protein Expression and Purification
- ▶ DNA Sequencing & Gene Analysis
- ▶ Synthetic Biology Applications

# DNA Synthesis Platform

A real roadmap to  
innovate through  
DNA synthesis



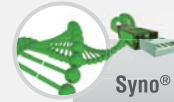
Syno® 1.0: Chemical  
DNA synthesis



Syno® 2.0: PCR based  
enzyme synthesis



Syno® 3.0: Chip/microfluidic  
based synthesis



Syno® 3.5: Automated  
high throughput synthesis

## • Competitive Advantages

- ✓ **Leading Complete Synthesis Platform:** The Syno® 1.0, 2.0 and 3.0 technologies are designed to meet our customers' every request with regards to flux, turnaround time, pricing, and sequence complexity.
- ✓ **Proprietary Assembly Technology:** Successfully assemble a single DNA fragment of up to and including 150 kb in length.
- ✓ **NG™ Codon Optimization Technology:** Increase the protein expression levels in most host cells.
- ✓ **Syno® 3.0 Next Generation DNA Synthesis:** Simultaneously synthesize up to 20,000 genes to cut down on cost and turnaround time. Custom gene synthesis as low as \$0.09/bp.

### » Syno® 1.0: Oligo Synthesis

Long Oligos, Modified Oligos, Fluorescent Probes, High Quality Oligos for NGS, and Large-Scale Oligo Synthesis

### » Syno® 2.0: Gene Synthesis

*De novo* Gene Synthesis, Metabolic Pathway Synthesis and Assembly, Gene Cluster and Small Genome Synthesis and Assembly

### » Syno® 3.0: High Throughput Gene Synthesis

**Syno® 3.0 Gene Synthesis:** High throughput gene synthesis with competitive pricing starting at just \$0.09/bp

**Oligo Pools Synthesis:** Parallel synthesis for tens of thousands of oligos simultaneously with high efficiency and competitive prices starting at \$0.01/nucleotide

**sgRNA Library Construction:** Technical approach for sgRNA design and synthesis, allowing for the construction of high capacity and customizable sgRNA expression libraries

**Probes for High-Throughput Sequencing:** High-throughput and highly-precise nucleotide probes for NGS or target sequencing

**Aptamer Synthesis and Library Construction:** Generate both normal aptamer and modified aptamer with high purity and low mutation rate, as well as customized random aptamer library with large capacity through use of Syno® 3.0 Technology

### » Syno® Synthetic DNA Libraries

Alanine Scan Library, Site Saturation Library, Degenerate Mutant Library, Random Substitution Library, Antibody Library, and Modular Substitution Library

G T C A T C A T T T A C T C A G T T C C T T A G A T C G G C T A T G C A T C



## Plasmid DNA Preparation



### • Competitive Advantages

- ✓ **Low Endotoxin Level Capabilities:** Animal-derived materials free, <math><0.005\text{ EU}/\mu\text{g}</math>, on request
- ✓ **GMP-Like Manufacturing Pipeline:** Complete and detailed manufacturing documentation
- ✓ **Strict Quality Control:** ISO9001/2015 quality management
- ✓ **Express Plasmid Preparation:** USA based manufacturing allows high quality and fast delivery

### • Service Procedure



## Custom RNA Synthesis

RNA interference (RNAi) is a simpler approach for gene expression regulation researches. The efficient and easy handling in loss-of-function studies makes RNAi an exciting innovative tool in fundamental gene functional researches, drug target screening and pharmaceutical development. Synbio Technologies provides siRNA, miRNA, ncRNA, and long RNA synthesis services to give you a new experience in RNAi studies.

- **siRNA:** Custom siRNAs provide the most flexible and convenient experience in RNA interference investigations.
- **miRNA:** Outstanding miRNA products including microRNA mimic / precursor / inhibitor.
- **lncRNA:** High-quality long non-coding RNAs (>200 nucleotides) for diverse cellular regulations.
- **long RNA:** Chemical synthesis of RNAs with the length of up to 100 nucleotides.

## Molecular Biology Services



- PCR Cloning and Subcloning
- Site-Directed Mutagenesis
- Vector Construction
- Sanger Sequencing

## Protein Expression and Purification



- NG<sup>TM</sup> Codon Optimization
- Bacterial Expression System
- Yeast Expression System
- Mammalian Cell Expression System

## Custom Target Capture Probe for NGS



- Syno<sup>®</sup> Enrich Capture Probe Synthesis
- Syno<sup>®</sup> qPCR Probe Design and Synthesis
- Syno<sup>®</sup> Vision FISH Technology Platform
- NGS Library Construction

# CRISPR-Cas9 Gene Editing Platform

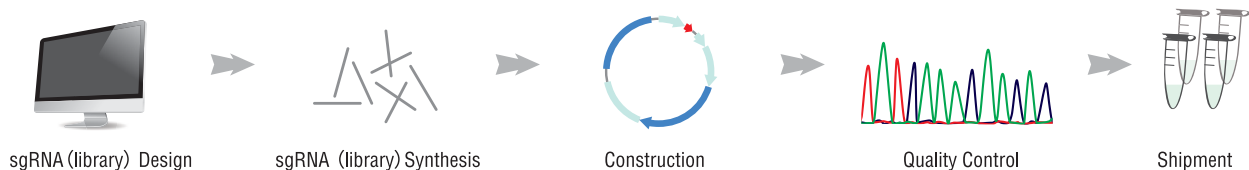


The CRISPR-Cas9 system is an adaptive immune system response to foreign DNA endogenous to certain bacteria and archaea organisms. Over the past few decades, synthetic sgRNA sequences have been utilized to achieve targeted DNA cleavage and splicing within the genome of target organisms. The speed and efficiency of the CRISPR-Cas9 system have made it one of the most widely used gene editing technologies to date.

## • Competitive Advantages

- ✓ **One-Stop Services:** Complete strategy from sgRNA design, synthesis and viability validation to stable strain construction and target screening.
- ✓ **Bioinformatics Platform:** Experienced informatics analysis teams provide customized bioinformatics service for genomics and transcriptomics analysis.
- ✓ **sgRNA Library Design and Construction:** Our proprietary chip-based Syno® 3.0 DNA Synthesis Platform provides high-throughput and cost effective sgRNA library construction.

## • Service Procedure



### sgRNA Design

Includes 20+ model species, efficient sgRNA for gene or genome

**sgRNA Design, Ready-to-Use CRISPR-Cas9 sgRNA Synthesis, and sgRNA Vector Construction**



### Validated sgRNA Package

Three guide RNAs per gene were designed to ensure a 100% success rate across the human/rat/mouse genomes

**Gene Knockout Package includes 3 Validated sgRNA, Positive sgRNA Control, Negative sgRNA Control within in 8-10 business days**



### sgRNA Library Synthesis

Proprietary syno® 3.0 gene synthesis platform allows for rapid sgRNA library construction

**sgRNA Library Construction, Lentivirus Package, Cell Line Construction, and High Throughput/Content Screening**



### sgRNA Panel Construction

Proprietary sgRNA design platform, integrated sgRNA panel library production

**Human Protein Kinase sgRNA Panel Library, Customized sgRNA Panel Library Design and Construction**



### Microbial Genome Editing

Optimized yeast function, customizable phenotype editing

**Multiple Gene Editing In Yeast Services Offered**



### Mammalian Cell Line Genome Editing

Accurate genome editing on both the cell and animal levels

**sgRNA Endogenous Activity Detection, Lentiviral Packaging, Customized Stable Cell Lines Construction, and Small Animal Gene Knockout**



### Bioinformatics Analysis

Deep data mining to study gene function

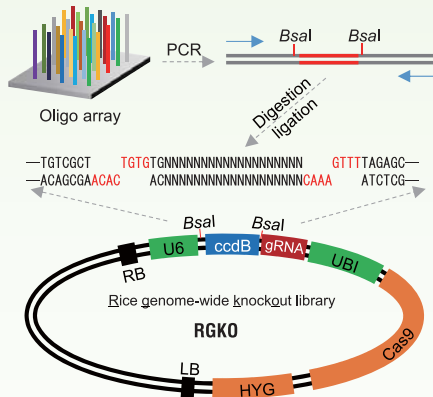
**Differential Expression Analysis, GO Enrichment Analysis, KEGG Enrichment Analysis, Drug-Target Prediction**

# Case Studies



## sgRNA Library

To design a sgRNA library including 88,541 sgRNA is applied to mutate rice and the mutation frequency is 83.9%. This research achievement proves that sgRNA libraries can be applied to generate a loss-of-function mutation rice, which provided a useful resource for rice research and breeding.



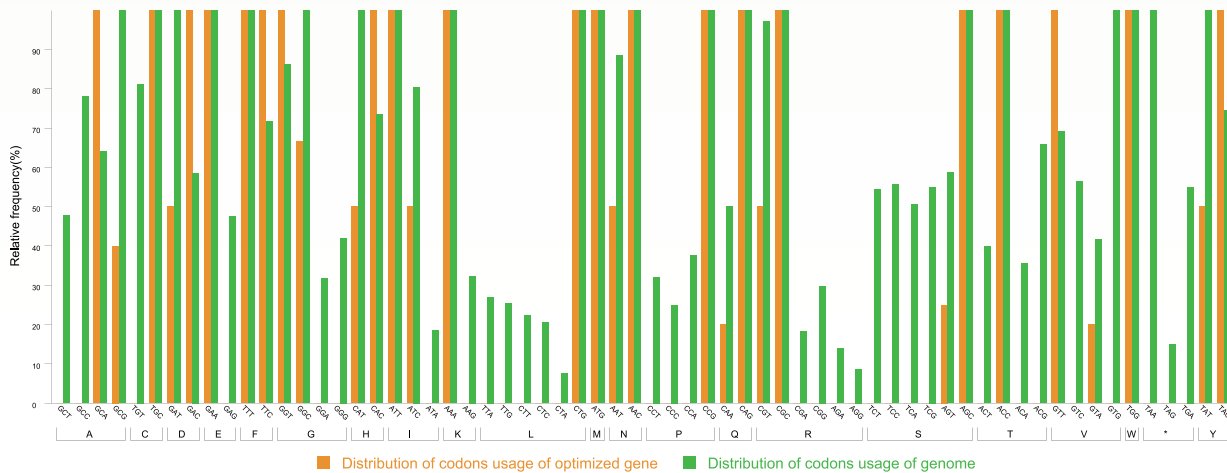
Summary of T<sub>0</sub> transgenic plants generated from sgRNA libraries.

Project	Pools	sgRNA number	Total T <sub>0</sub> plants	Sampling survey			
				Total identi.	Single sgRNA	RGKO sgRNA	Mutation rate
2015051*	RGKO#2	62	1,488	364	—	—	315/364 (86.5%)
2015091	RGKO#2	910	2,646				
2015092	RGKO#34	823	1,430	41	38 (92.7%)	35 (85.4%)	25/32 (78.1%)
2015093	RGKO#66	733	1,056				
2015101			14,304				
2016041	RGKO-ALL (Whole library)	88,541	20,160	103	95 (89.3%)	86 (83.5%)	26/31 (83.9%)
2016101			49,920				

Lu, Y., et al., Genome-wide Targeted Mutagenesis in Rice Using the CRISPR/Cas9 System. *Mol Plant*, 2017.

## NG™ Codon Optimization Technology

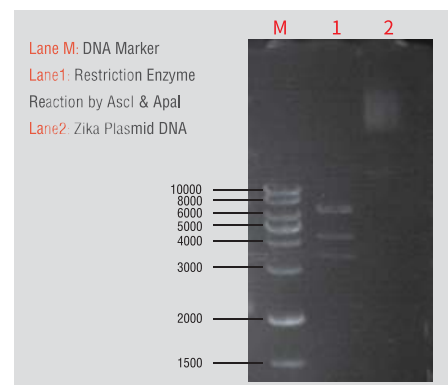
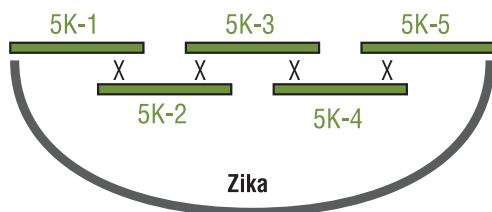
NG™ Codon Optimization Technology enhances the protein expression level and raises protein solubility significantly by improving codon usage efficiency, reducing the GC content and embedded hairpin structures.



Y and X axis represent relative usage frequency of codons and genetic codons, respectively. The codon usage (red lines) was rather dispersed compared with the optimized one (green lines).

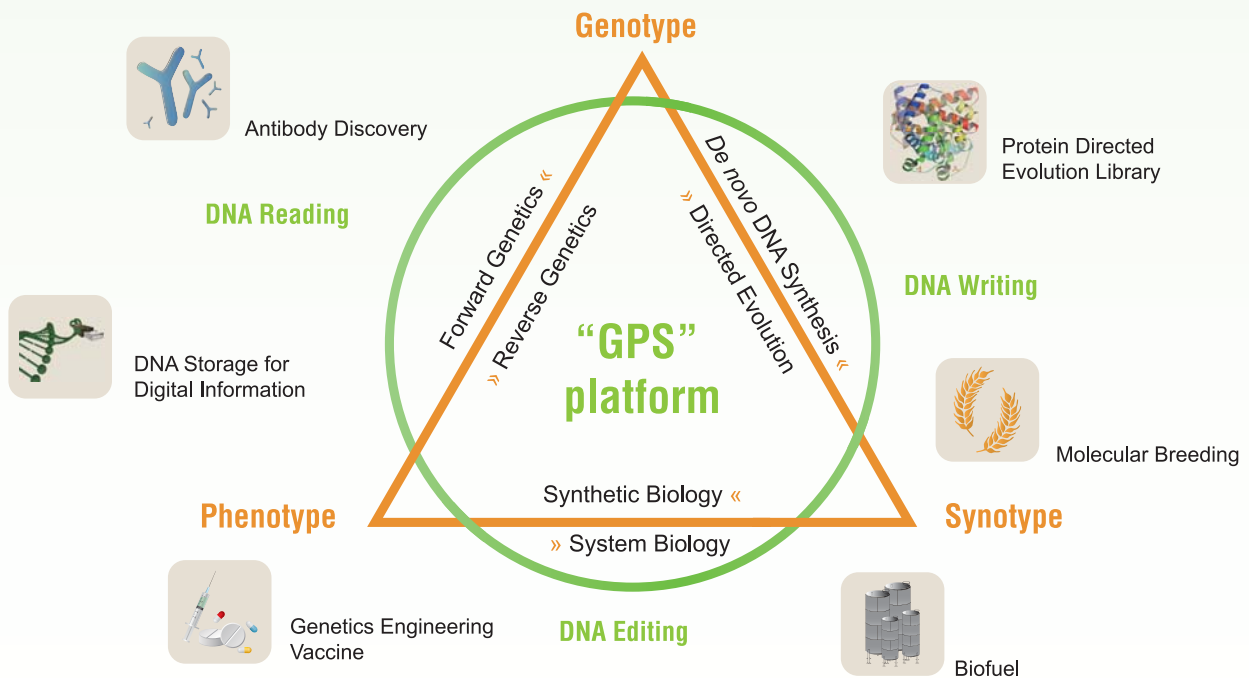
## Genome Synthesis and Large Fragment Gene Assembly

Synbio Technologies has extensive experience with both large fragment assembly and gene synthesis. Using this experience, we successfully synthesized Zika virus DNA, HCLV-flag virus DNA and other virus genomes.



# Synbio Technologies—Genes for Life

Synbio Technologies is founded by professionals with track record of success in scientific research and industrial management. The company has developed a cutting-edge DNA synthesis platform consisting of the Syno® 1.0, Syno® 2.0 and Syno® 3.0 Technologies. Through our distinctive Syno® Synthesis Platforms, we can satisfy all our customers' needs requests. This also includes construction of humanized antibody libraries, optimization of industrial enzymes, chromosome/genome synthesis, development of genetic engineering vaccines and DNA informatics storage. Synbio Technologies has further developed our Genotype-Phenotype-Synotype ("GPS") - an advanced biotechnology transformation and application platform based on the Syno® Synthesis Technologies. The innovative "GPS" Platform follows the biological central dogma and expands genotype, phenotype and synotype effectively to achieve the one stop solution of gene "design-construction-application".



## Antibody Discovery

- Antibody Sequencing
- Monoclonal Antibody Generation
- Antibody Humanization
- Antibody Reforming
- Stable Cell Line Development
- Transient Protein Expression
- cGMP Supply

## Protein Directed Evolution Library

- Site-Directed Mutagenesis Library
- Random Mutant Library
- Sequence Combination Library
- Non-Frame Shift Truncation Library

## Digital Information Storage

- Coding Sequence Design
- DNA Synthesis
- Information Verification

## Genetic Engineering Vaccine

- Design and Construction of the Antigen Library
- Expression and Purification of Antigen Protein
- Screening and Identification of Targets

## Synbio Technologies

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