

# siRNA Synthesis Service

Custom and wide array of siRNAs of exceptionally high quality

- **High quality siRNA at an affordable price**

- High-throughput RNA synthesis platforms produce siRNA of consistent and exceptionally high quality at an affordable price.

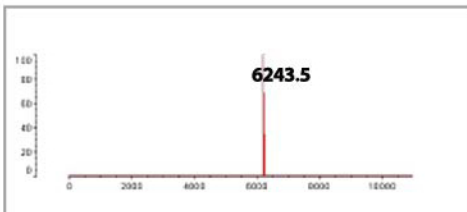
- **Guaranteed highly purified siRNA**

- Purified by either Bioneer's proprietary BioRP column technology (free of charge) or by HPLC and PAGE (additional charge) to guarantee the highest possible purity.

- **Each RNA is quality controlled**

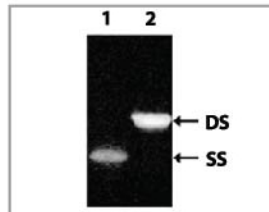
- Single-stranded RNAs are checked via MALDI-TOF analysis (Fig. 1) and Double-stranded siRNA duplexes are confirmed by PAGE analysis (Fig. 2).

- **All Bioneer's siRNA products are manufactured in a state-of-the-art clean room**



**Fig. 1. MALDI-TOF mass spectrometry analysis of the synthesized siRNA**

All shipped siRNAs are processed through rigorous quality control (QC) procedures, including MALDI-TOF and gel analysis.



**Fig. 2. Complementary single-stranded RNAs were annealed to form double-stranded siRNA**

The resulting siRNA was analyzed by 15% non-denaturing PAGE. SS: single-stranded RNA, DS: double-stranded siRNA.

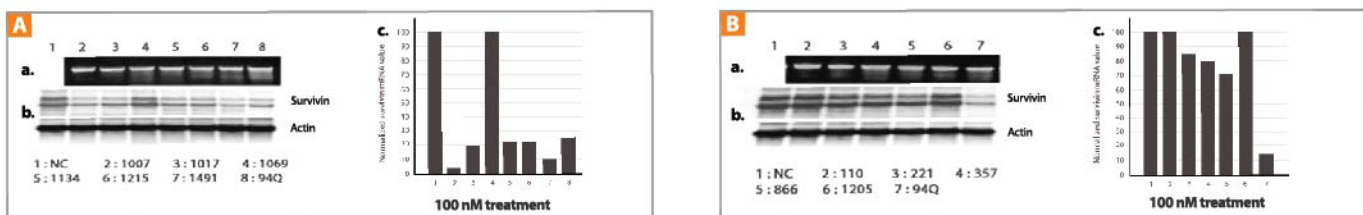
## Turbo si-Designer

- **Bioneer's proprietary siRNA design algorithm**

- **Identify highly effective siRNA target sites with high success rates**

- **Highly effective in selecting functional siRNAs: 83.8% of the tested siRNA showed >70% knockdown and 38.1% elicited >90% knockdown**

Successful RNAi experiments in mammalian cultured cells depend upon several factors. Specifically it is important to design and identify effective and specific siRNA sites and to perform efficient and specific delivery of siRNA to the desired target cell types. To facilitate the design process, Bioneer, in collaboration with the National Genome Information Center (NGIC) in South Korea, has developed Turbo si-Designer a proprietary siRNA selection algorithm. Turbo si-Designer can identify highly effective siRNA target sites with superior success rates. The performance of the Turbo-si-Designer was evaluated by designing hundreds of siRNAs and testing their knockdown efficacy by Real-Time PCR analysis. When compared with other web-based design tools, Turbo si-Designer algorithm successfully predicted functional siRNAs at a high probability of efficient knockdown. Notably, siRNAs with the low NGIC score were mostly nonfunctional, indicating that ineffective siRNAs are efficiently removed by Turbo si-Designer (Fig. 3).



**Fig. 3. Knockdown efficiency of siRNAs designed by Turbo si-Designer was analyzed by Northern blot and real-time PCR analysis.**

A) Knockdown efficiency of high score siRNAs. B) Knockdown efficiency of low score siRNAs. (a: siRNA 15% PAGE, b: Northern blot analysis, c: Real-Time PCR analysis)

## AccuTarget™ Genome-Wide Predesigned siRNA Library

- **AccuTarget™ Genome-wide Predesigned siRNA Libraries** are available for 132,000 siRNAs more than 44,000 target genes from human, mouse, and rat genomes
- **Three top-scoring, validated siRNAs per target gene** are available.
- **2 of 3 siRNA for one target gene** guarantee more than 80% of knockdown efficiency.
- **Maximized knockdown efficiency for target gene, minimized off-target effect**
- **Bioneer's proprietary siRNA design algorithm: Turbo si-Designer**

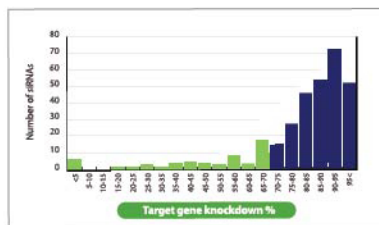


Figure 4. *AccuTarget™* Pre-designed siRNA Libraries are highly effective.

To determine the knockdown efficiency of predesigned siRNAs, HeLa cells were transfected with siRNAs at 100 nM concentration. Twenty four hours of post-transfection, total RNA was isolated and the level of target mRNA was measured by RT-qPCR. This data demonstrates the effectiveness of the Turbo si-Designer algorithm: 83.8% of tested siRNAs induced >70% knockdown and 38.1% of tested siRNAs elicited >90% knockdown.

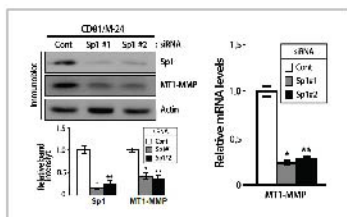


Figure 5. Sp1 transcription factor mediates CD81-dependent expression of MT1-MMP.

After transfection of two Sp1-specific siRNAs, CD81 transfectant cells were examined for MT1-MMP protein (D) and mRNA levels (E) using immunoblotting and quantitative real-time RT-PCR analyses, respectively.

Ref: Hong IK et al., *JBC*, 2014

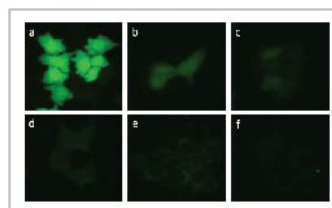


Figure 6. GFP expression following delivery of GFP-specific siRNA with cationic liposomes. H4II-E cells were treated with GFP-specific siRNA alone or cationic liposome/siRNA complexes.

a) Untreated H4II-E cells, (b) treated with siRNA alone, (c) treated with Lipofectamine®/siRNA complex, (d) treated with conventional liposome/siRNA complex, (e) treated with PEGylated liposome/siRNA complex, and (f) treated with PLR-PEGylated liposome/siRNA complex. Ref: Kim HK et al., *Intern J Pharm*, 2010

Product	Purification	Scale
<i>AccuTarget™</i> Genome-wide Predesigned siRNA library	BioRP/HPLC	10 nmole
		20 nmole
		50 nmole
		100 nmole

## AccuTarget™ Real-Time PCR Primer Library

- **AccuTarget™ Real-Time PCR Primer Library** is comprised of highly specific and sensitive real-time primer set based on the human genome.
- **Always ready-to-ship for 11,154 Human genes specific primers**
- **All primers containing 11,154 pairs are verified for amplification efficiency through *Exicycler™* 96 and *AccuPower® GreenStar™* qPCR PreMix.**
- **New primers are continuously being updated.**
- **High quality under 100% MALDI-TOF QC and strict manufacturing process**

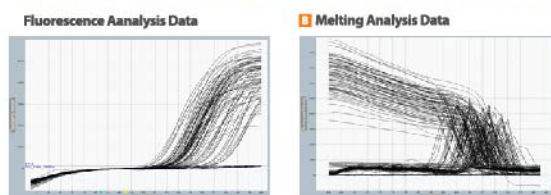


Figure 7. Real-Time PCR validation test of human Oxidoreductase using *AccuTarget™* Human Oxidoreductase Real-Time PCR Primer Set.

Product	Purification	Scale
<i>AccuTarget™</i> Real-Time PCR primer library	BioRP	100 rxns
		200 rxns



## AccuTarget™ Premade siRNA Sets

- **AccuTarget™ Premade siRNA sets organized by gene family and function are available.**
- **AccuTarget™ Premade siRNA sets contains 54,144 predesigned and manufactured siRNAs for immediate use in your experiments**
- **AccuTarget™ Human Druggable siRNA sets are available for 8,175 genes.**
- **New library sets are continuously being updated.**

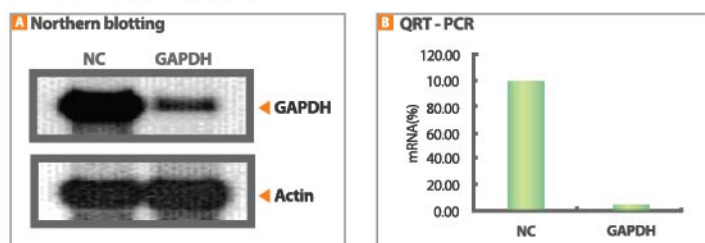
Gene Family Functional Class	Human Genes		Gene Family Functional Class	Human Genes	
	No. of Genes	No. of siRNA		No. of Genes	No. of siRNA
Antioxidant siRNA set	38	144	Lyase siRNA set	123	369
Apoptosis siRNA set	290	870	Motor siRNA set	122	366
Cancer siRNA set	1,157	3,471	NF-κB pathway siRNA set	37	111
Caspase siRNA set	37	111	Nucleic acid binding siRNA set	2,573	7,719
Cell cycle siRNA set	112	336	Oxidoreductase siRNA set	551	1,653
Cyclase siRNA set	21	63	Peptidase siRNA set	491	1,473
Cyclase siRNA set	52	156	Phosphatase siRNA set	188	564
Deaminase siRNA set	22	66	Phosphatase siRNA set	1,516	4,548
GPCR signaling pathway siRNA set	727	2,181	Transferase siRNA set	1,428	4,284
Helicase siRNA set	114	342	Transporter siRNA set	1,021	3,063
Isomerase siRNA set	104	312	Tubulin siRNA set	20	60
Kinase siRNA set	699	2,097	Ubiquitin siRNA set	77	231
Ligase siRNA set	272	816			

Product	Purification	Scale
AccuTarget™ Premade siRNA sets	BioRP/HPLC	1 siRNA (0.25, 0.5, 2 nmole)
		2 siRNA (0.25, 0.5, 2 nmole)
		3 siRNA (0.25, 0.5, 2 nmole)
AccuTarget™ Human Druggable Set	BioRP/HPLC	2 nmole (minimum order 10 siRNAs)

## AccuTarget™ Control siRNAs

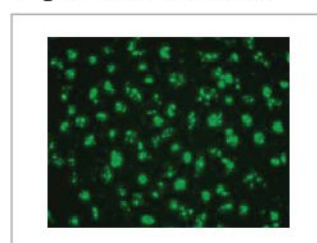
- **Positive control siRNA - Human GAPDH, GFP, Luciferase and Mouse Lamin A/C and cyclophilin Bc - and Negative control siRNAs - commonly used for Human, Mouse and Rat - are available.**
- **Fluorescently labeled siRNA can be used for monitoring transfection efficiency AccuTarget™ control siRNA (Positive & Negative)**
- **Convenient and cost-effective**
- **Various scales - 1, 5, 10, 20 and 50 nmole - with options in purification methods - BioRP or HPLC.**

### Positive Control siRNA



**Figure 8. HeLa cells were transfected with GAPDH and NC (negative control) siRNA.** Twenty four hours post-transfection, total cellular RNA was isolated from transfected cells and subjected to Northern blot and Real-Time PCR analyses. Highly efficient knockdown of GAPDH mRNA can be easily achieved using our positive control GAPDH siRNA.

### Negative Control siRNA



**Figure 9. HeLa cells transfected with FITC-labeled NC siRNA (Cat No.: SN-1021) was observed by confocal microscopy.** The fluorescent cells indicate that the target cells were successfully transfected with the siRNA.

Product	Purification	Scale
AccuTarget™ Negative control siRNA	BioRP/HPLC	1 nmole
		5 nmole
		10 nmole
		20 nmole
		50 nmole
AccuTarget™ Positive control siRNA (Human GAPDH, GFP, Luciferase siRNA and Mouse Lamin A/G, cyclophilin Bc siRNA)	BioRP/HPLC	1 nmole
		5 nmole
		10 nmole
		20 nmole
		50 nmole
AccuTarget™ Fluorescein labeled negative control	HPLC	1 nmole
		5 nmole
		10 nmole
		20 nmole
		50 nmole
AccuTarget™ GAPDH Control siRNA Set, 5 nmole(Positive) + 2 nmole(Negative)	BioRP/HPLC	(5P + 2N) nmole
AccuTarget™ GFP Control siRNA Set, 5nmole(Positive) + 2 nmole(Negative)	BioRP/HPLC	(5P + 2N) nmole
AccuTarget™ Luciferase Control siRNA Set, 5 nmole(Positive) + 2 nmole(Negative)	BioRP/HPLC	(5P + 2N) nmole

## AccuTarget™ Custom Designed siRNA Synthesis

- Up to 65 mer siRNA including a choice of 32 different 3' overhangs can be ordered with a variety of modification options.
- High-throughput synthesis system (384 parallel synthesizer) and automatic purification system (BioRP & HPLC)
- High quality under 100% MALDI-TOF QC and strict manufacturing process
- 100 % satisfaction guarantee

Bioneer's High-throughput RNA synthesis platforms produce siRNA of consistent and exceptionally high quality at an affordable price. Custom synthesized siRNAs are provided in various formats and amounts, and many different types of modifications including fluorescent labels.

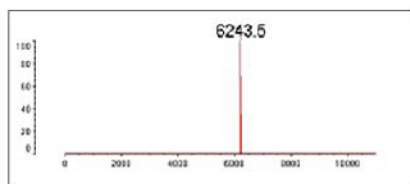


Figure 10. MALDI-TOF mass spectrometry analysis of the synthesized siRNA.

All shipped siRNAs are processed through quality control (QC) procedures, including MALDI-TOF and gel analysis.



Figure 11. All siRNAs are manufactured in clean room

Sequence Modification	5' Labeling	3' Labeling
DNA	Fluorescein	Fluorescein
2'-OMe	Phosphorylation	Phosphorylation
2'-F(U)	Biotin	Biotin
2'-F(C)	Amine	Amine
Inosine	Cy3	Inverted dT
Deoxy-abase	Cy5	Dabcyl
Phosphorothioate	TAMRA	TAMRA
5-Methyl dC	Thiol	Thiol
5-Bromo dU	Cy5.5	Cholesterol
Spacer(C3, C6, C12, C18 atom)	Spacer(C3, C6, C12, C18 atom)	Spacer(C3, C6, C12, C18 atom)

Product	Purification	Scale
AccuTarget™ Custom designed siRNA synthesis	BioRP/HPLC	10 nmole
		20 nmole
		50 nmole
		100 nmole



# miRNA Synthesis Service

## AccuTarget™ Human miRNA Mimic & Inhibitor Library

Ready-to-transfect miRNA mimics behave like endogenous miRNAs and inhibitors suppress target miRNA activity to study loss-of-function effects after transfection into cells.

AccuTarget™ Human miRNA mimics are double-stranded RNA oligonucleotides that are chemically synthesized, and available for 2,582 human mature microRNAs.

AccuTarget™ Human miRNA inhibitors are single stranded synthetic inhibitor targeting all human miRNAs in the **miRBase Sequence Database (Version 20)**. These miRNA mimics & inhibitors are available at 5, 10 and 20 nmole guaranteed yield. We also offer miRNA mimics and inhibitors library sets consisting of predesigned mimics/inhibitors at various small scales (0.25, 0.5, 1, or 2 nmole) in a 96-well plate layout to meet the unique needs of individual customers. Flexible miRNA library sets for customer-specified mimics & inhibitors are also available for the minimum order of 48.

### • Purification

- For your more demanding applications, Bioneer's automated HPLC and Bio-RP purification methods ensure high quality, high-throughput miRNA mimics and inhibitors at an affordable price.

### • Affordable pricing

- Bioneer provides a variety of high quality miRNA products at an affordable price

### • Synthesis and QC

- Bioneer miRNA mimics and inhibitors are produced in clean room facility by fully automated high-throughput miRNA production system. Bioneer miRNA products are assessed by MALDI-TOF Mass spectrometry analysis. Mass spec data is provided with every miRNA mimic and inhibitor. Additionally, miRNA mimics are tested by gel electrophoresis to verify that both RNA strands annealed properly

### AccuTarget™ Custom miRNAs

Product	Purification	Scale
AccuTarget™ Human miRNA mimic	BioRP	5 nmole
	BioRP	10 nmole
	BioRP	20 nmole
AccuTarget™ Human miRNA inhibitor	BioRP	5 nmole
	BioRP	10 nmole
	BioRP	20 nmole

### AccuTarget™ library miRNAs

Product	Purification	Scale
AccuTarget™ Human miRNA mimic	BioRP	0.25 nmole
	BioRP	0.5 nmole
	BioRP	1 nmole
	BioRP	2 nmole
AccuTarget™ Human miRNA inhibitor	BioRP	0.1 nmole
	BioRP	0.25 nmole
	BioRP	0.5 nmole
	BioRP	2 nmole

## AccuTarget™ miRNA Mimic Controls

We offer AccuTarget™ miRNA mimic controls to optimize assay conditions for miRNA mimic function studies. Both positive and negative controls are provided for miRNA gain-of-function studies using Bioneer's AccuTarget™ miRNA mimics. AccuTarget™ miRNA housekeeping positive controls target the 3' UTR (untranslated region) of the standard housekeeping gene, GAPDH, and BIONEER's miRNA mimic negative control sequences are based on common miRNA structure for use as negative experimental controls in human, mouse, and rat cells. The negative controls had been analyzed by BLAST against all human, mouse and rat genomic sequences and miRNA sequences in the current **miRBase Database (Version 20)**.

### ● Excellent performance

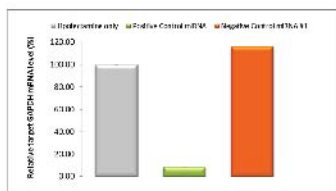
- miRNA Housekeeping Positive controls targeting GAPDH with clear read-out of mimic function (knockdown efficiency of >90 %) miRNA mimic Negative controls with minimal sequence identity with miRNAs in human, mouse and rat

### ● Monitoring of transfection rate

- Fluorescently labeled negative controls for conveniently monitoring cellular uptake and/or transfection efficiency

### ● Competitive pricing

- Great value for your research dollar



**Figure 12. Performances of miRNA mimic Positive and Negative controls.**

*AccuTarget™* miRNA Positive & Negative controls were transfected at 20 nM using Lipofectamine™ RNAiMAX into HeLa cell lines and assessed for their ability to decrease target mRNA levels. Down-regulation of GAPDH was determined using the Real-Time quantitative RT-PCR at 48 hours post-transfection using Bioneer's *Exicycler™* 96 qPCR instrument.

### **AccuTarget™ Control miRNAs**

Product	Purification	Scale
<i>AccuTarget™</i> miRNA Housekeeping Positive control (GAPDH)	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> miRNA mimic Negative control #1	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> miRNA mimic Negative control #2	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> Fluorescein-labeled miRNA mimic Negative Control siRNA #1	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> Fluorescein-labeled miRNA mimic Negative Control siRNA #2	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> miRNA inhibitor Negative control #1	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> miRNA inhibitor Negative control #2	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> Fluorescein-labeled miRNA inhibitor Negative Control siRNA #1	BioRP	5 nmole
		10 nmole
		20 nmole
<i>AccuTarget™</i> Fluorescein-labeled miRNA inhibitor Negative Control siRNA #2	BioRP	5 nmole
		10 nmole
		20 nmole

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