

mRNA therapeutics



Streamline mRNA synthesis for development of therapeutics

Accelerate your development pipeline with TheraPure products

mRNA synthesis is a vital step in a variety of applications, like structural, biochemical, and genetic studies, and in development of therapeutics. The ribonucleic acid is synthesized by *in vitro* transcription—a straightforward process to make an mRNA molecule, i.e., an RNA transcript, of any sequence or size, ranging from short oligonucleotides to mRNAs several kilobases in length [1,2].

The mRNA synthesis workflow for developing an mRNA therapeutic consists of target sequence discovery and cloning, DNA template preparation, and *in vitro* transcription (IVT) (Figure 1).

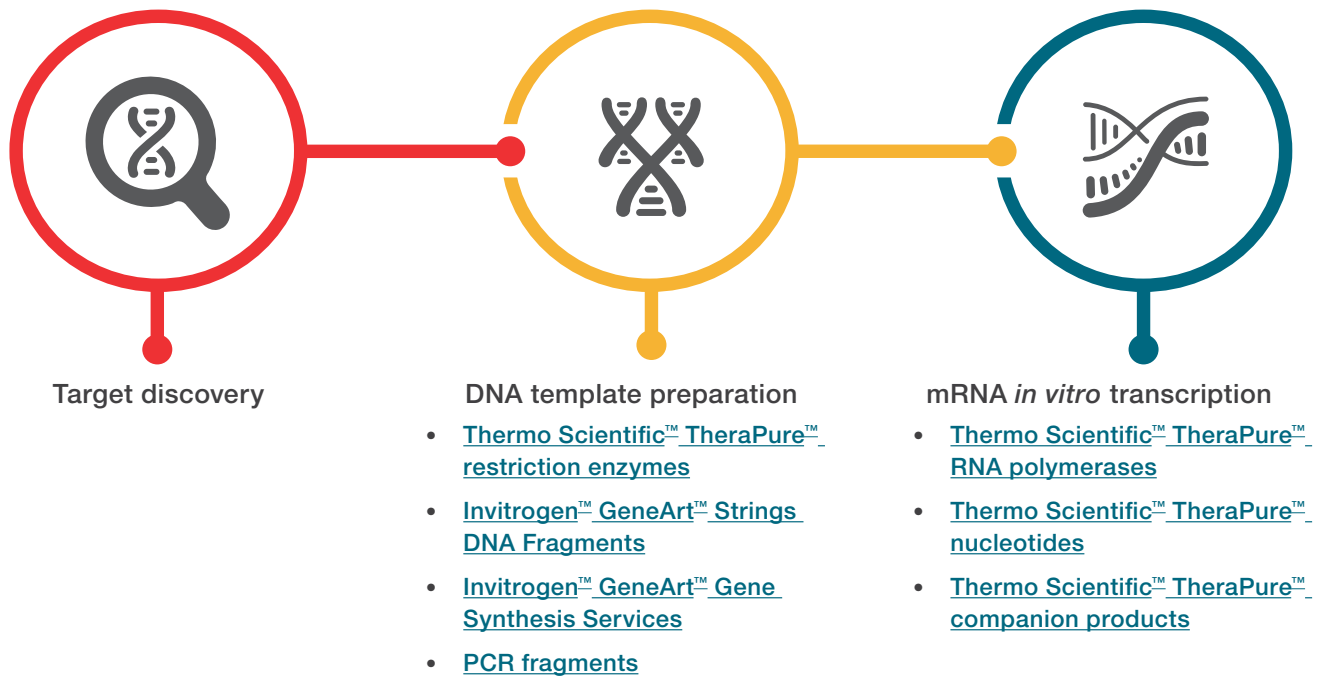


Figure 1. mRNA synthesis scheme. mRNA synthesis consists of DNA template preparation by restriction digestion of plasmid or other DNA templates (PCR, isothermal amplification, Gene Synthesis Services) containing the mRNA target. Linearized double-stranded DNA is used as a template for mRNA synthesis by *in vitro* transcription.

Thermo Scientific™ TheraPure™ products are designed to support mRNA synthesis and are recommended for process optimization and early development of mRNA vaccines and therapeutics (Figure 2), including proof of concept, research, and preclinical studies.

These versatile products, which include convenient stand-alone enzymes, nucleotides, and modified nucleotides for optimization of the IVT process, offer:

- No risk of prion contamination with animal origin-free (AOF) raw materials
- Extensive quality testing to help deliver high-quality, reliable IVT results
- A simplified transition to Thermo Scientific™ TheraPure™ GMP products* for manufacturing GMP mRNA therapeutics
- Scalability for custom manufacturing and formulation to fit your research needs

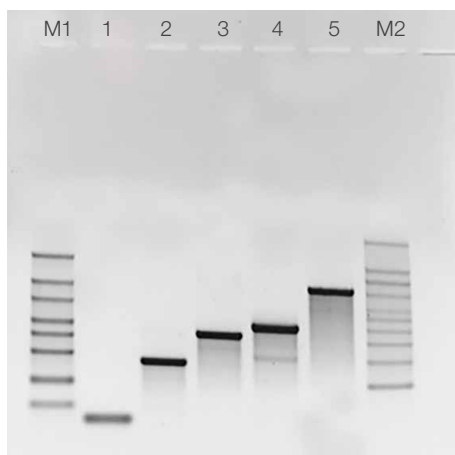


Figure 2. RNA transcripts generated using Thermo Scientific™ TheraPure™ IVT enzymes. Thermo Scientific™ TheraPure™ T7 RNA Polymerase delivers robust RNA synthesis for a wide range of template sizes. M1: Thermo Scientific™ RiboRuler™ High Range RNA Ladder; 1: 18S RNA (135 bp); 2: eGFP RNA (895 bp); 3: Fluc RNA (1,828 bp); 4: Xef RNA (1,890 bp); 5: fusion of eGFP gene (4,500 bp); M2: Invitrogen™ Millennium™ RNA Marker.

The TheraPure enzymes, nucleotides, and modified nucleotides come in convenient formats for process development. They are an excellent choice for mRNA vaccine and therapeutic developers looking for high-quality products that offer process optimization for a quick and easy transition to GMP mRNA therapeutic manufacturing.

Ordering information

Product	Concentration	Volume	Cat. No.
TheraPure restriction enzymes			
TheraPure Eam1104I	20 U/μL	150 μL	ER023T1
TheraPure RNA polymerases			
TheraPure T7 RNA Polymerase	200 U/μL	100 μL	EP011T1
TheraPure IVT companion products			
TheraPure Pyrophosphatase, Inorganic	0.1 U/μL	100 μL	EF022T1
TheraPure Pyrophosphatase, Inorganic	1 U/μL	10 μL	EF0221T1
TheraPure RNase Inhibitor	40 U/μL	250 μL	EO038T1
TheraPure DNase I, RNase-free	50 U/μL	100 μL	EN052T1
TheraPure nucleotides and modified nucleotides			
TheraPure ATP, 100 mM, Sodium Solution	100 mM	200 μL	R044T1
TheraPure CTP, 100 mM, Sodium Solution	100 mM	200 μL	R045T1
TheraPure GTP, 100 mM, Sodium Solution	100 mM	200 μL	R046T1
TheraPure UTP, 100 mM, Sodium Solution	100 mM	200 μL	R047T1
TheraPure ATP, 200 mM, Tris Solution	200 mM	200 μL	R00044T1
TheraPure CTP, 200 mM, Tris Solution	200 mM	200 μL	R00045T1
TheraPure GTP, 200 mM, Tris Solution	200 mM	200 μL	R00046T1
TheraPure UTP, 200 mM, Tris Solution	200 mM	200 μL	R00047T1
TheraPure N ¹ -Methylpseudo-UTP, 100 mM, Sodium Solution**	100 mM	50 μL	R0491T1

References:

1. Beckert B, Masquida B (2011) Synthesis of RNA by *in vitro* transcription. In: Nielsen, H (eds) RNA. *Methods in Molecular Biology*, vol 703. Humana Press. https://doi.org/10.1007/978-1-59745-248-9_3
2. Dousis A, Ravichandran K, Hobert EM et al. (2023) An engineered T7 RNA polymerase that produces mRNA free of immunostimulatory byproducts. *Nat Biotechnol* 41, 560–568. <https://doi.org/10.1038/s41587-022-01525-6>

* "TheraPure GMP products" are of a quality suitable for the raw, ancillary, or starting materials needed for further manufacturing and as such are manufactured in facilities with ISO 9001–certified quality management systems operating in accordance with relevant good manufacturing practice (GMP) principles as outlined in ICH Q7 or equivalent guidance documents or standards.

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