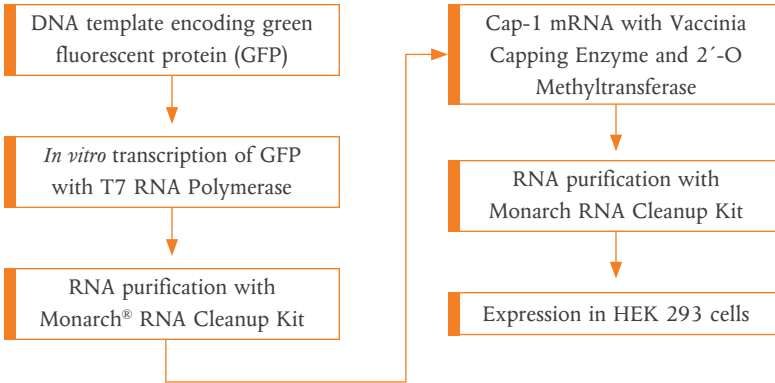


NOT SURE WHETHER YOU NEED RESEARCH-GRADE OR GMP-GRADE MATERIALS?

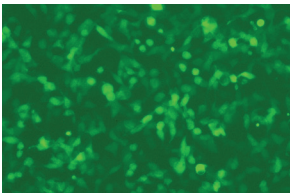
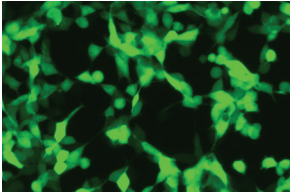
We are happy to work with you to assess your needs to help identify which solution will work best for you. Our research-grade reagents produced under ISO13485 & 9001 controls are highly pure and undergo stringent quality controls, and, in many cases, will satisfy your needs. The table below highlights our capabilities for both research-grade and GMP-grade materials.

		
	RESEARCH GRADE (IPSWICH, MA, USA)	GMP GRADE (ROWLEY, MA, USA)
MANUFACTURING PROCESSES	<ul style="list-style-type: none">• Animal-derived material may be used during manufacturing or in final formulation (e.g., BSA)• Can remove animal-derived material, if needed• Manufacturing process may evolve as requirements to scale change; products subject to contractual change control provisions	<ul style="list-style-type: none">• Manufacturing process and final formulation is animal-free• Fully characterized cell banks, dedicated chromatography resins, filtration into sterile containers• Strict change control system reduces risk and ensures additional transparency
PRODUCT ATTRIBUTES	<ul style="list-style-type: none">• Traceability information available for raw materials and finished product, upon request• Extensive specifications applied to all products, including custom specifications, upon request• Stringent assays performed on all products, with pass/fail criteria provided	<ul style="list-style-type: none">• TSE/BSE statements for all products; animal-free raw materials, processes and formulation• Compendial assays applied to all products, including bioburden and endotoxin levels• Qualified assays for all products, including <i>E. coli</i> gDNA and other contamination assays (quantitative result)
QA & REGULATORY	<ul style="list-style-type: none">• ISO 9001 and ISO 13485 certification• Robust manufacturing records across all products• Change management and lot disposition processes in place	<ul style="list-style-type: none">• ISO 9001 and ISO 13485 certification• Batch history files/batch records and defined CQAs and CPPs• Enhanced change management and lot disposition processes in place

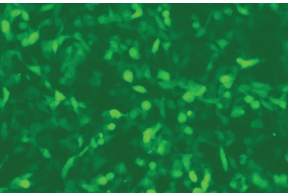
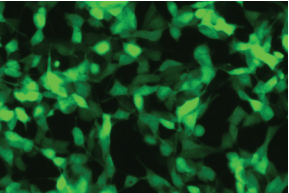
Comparability analyses of research-grade and GMP-grade IVT reagents



Research-grade IVT reagents



GMP-grade IVT reagents



USA
New England Biolabs, Inc.
Telephone (978) 927-5054
Toll Free (USA Orders) 1-800-632-5227
Toll Free (USA Tech) 1-800-632-7799
Fax (978) 921-1350
info@neb.com
www.neb.com

Australia & New Zealand
New England Biolabs (Australia) PTY
Telephone: 1800 934 218 (AU)
info.au@neb.com
Telephone: 0800 437 209 (NZ)
info.nz@neb.com

Canada
New England Biolabs, Ltd.
Toll Free: 1-800-387-1095
info.ca@neb.com

China
New England Biolabs (Beijing), Ltd.
Telephone: 010-82378265/82378266
info@neb-china.com

France
New England Biolabs France
Telephone: 0800 100 632
info.fr@neb.com

Germany & Austria
New England Biolabs GmbH
Free Call: 0800/246 5227 (Germany)
Free Call: 00800/246 52277 (Austria)
info.de@neb.com

Japan
New England Biolabs Japan, Inc.
Telephone: +81 (0)3 5669 6191
info.jp@neb.com

Singapore
New England Biolabs, PTE, Ltd.
Telephone +65 638 59623
sales.sg@neb.com

United Kingdom
New England Biolabs (UK), Ltd.
Call Free: 0800 318486
info.uk@neb.com



One or more of these products are covered by patents, trademarks and/or copyrights owned or controlled by New England Biolabs, Inc. For more information, please email us at usabios@neb.com. The use of these products may require you to obtain additional third party intellectual property rights for certain applications.

Your purchase, acceptance, and/or payment of and for NEB's products is pursuant to NEB's Terms of Sale at www.neb.com/support/terms-of-sale. NEB does not agree to and is not bound by any other terms or conditions, unless those terms and conditions have been expressly agreed to in writing by a duly authorized officer of NEB.

B CORPORATION® is a trademark of B Lab, Inc. CLEANCAP® is a registered trademark of TriLink BioTechnologies.

© Copyright 2021, New England Biolabs, Inc.; all rights reserved.



GMP-GRADE REAGENTS FOR RNA SYNTHESIS

TOOLS TO TAKE YOU FROM TEMPLATE TO TRANSCRIPT



be INSPIRED
drive DISCOVERY
stay GENUINE

For over 45 years, NEB® has been a world leader in the discovery and production of reagents for the life science industry. Our **enzymology expertise** effectively positions us to supply reagents for the synthesis of high-quality RNA – from template generation and transcription, to capping, tailing and cleanup after synthesis. These products are designed and manufactured based on **decades of molecular biology experience**, so that you can **be confident they will work for your application**.

To better serve the needs of customers in regulated markets, NEB has opened a state-of-the-art, 43,000 sq. ft. production facility in Rowley, MA for the manufacture of GMP-grade* materials – approximately 15 minutes from our main campus in Ipswich, MA, USA. This purpose-built facility includes Quality Control and Production functions ranging from a shipping/receiving area and dedicated warehouse, to separate inoculation preparation, fermentation, purification and filling suites.

ENABLING GRAM-SCALE RNA SYNTHESIS

NEB manufactures and inventories the following enzyme specificities at GMP-grade, meeting customer needs with short lead times:

- Vaccinia Capping Enzyme
 - RNase Inhibitor, Murine
- T7 RNA Polymerase
 - Pyrophosphatase, Inorganic (*E. coli*)
- mRNA Cap 2'-O-Methyltransferase
 - DNase I (RNase-free)

* "GMP-grade" is a branding term NEB uses to describe reagents manufactured at our Rowley, MA facility, where we utilize procedures and process controls to manufacture reagents under more rigorous conditions to achieve more stringent product specifications, and in compliance with ISO 9001 and ISO 13485 quality management system standards. NEB does not manufacture or sell products known as Active Pharmaceutical Ingredients (APIs), nor do we manufacture products in compliance with all of the Current Good Manufacturing Practice regulations.

BENEFITS OF GMP-GRADE MANUFACTURING AT NEB

NEB's expertise in enzyme manufacturing positions us to best anticipate your needs and minimize the risk of transferring manufacture of your materials to our GMP-grade production facility. Examples of customer requirements that are achieved by our GMP-grade reagents include:

- Bioburden and/or endotoxin specifications on reagents
- Certified animal-free origin and manufacturing process
- Qualified equipment, utilities, QC test methods and instrumentation to deliver the highest levels of lot-to-lot consistency

Infrastructure & Approach

- Purpose-built for GMP-grade manufacturing
- Increased manufacturing output
- ISO 8 clean rooms, ISO 5 filling hoods
- Environmental monitoring of the facility
- Animal-free facility

Manufacturing Processes

- Lateral transfer from Ipswich to Rowley
- Characterized master cell banks
- Ampicillin-free processes
- Dedicated chromatography resins
- 0.22 micron-filtered final product

Product Attributes/Testing

- TSE/BSE statements – animal-free raw materials, processes and formulation
- Bioburden and endotoxin included for all products, with numerical values provided
- Appearance, protein concentration, gDNA contamination and other current QCs qualified
- Stability testing program
- Contamination and other current QCs qualified

QA & Regulatory

- ISO 9001 and ISO 13485 certification
- Batch history files/batch records
- Defined CQAs and CPPs
- Enhanced change management and lot disposition processes
- Customer support for regulatory submissions



Learn more at www.neb.com/GMP

mRNA SYNTHESIS WORKFLOW EXAMPLE & AVAILABLE NEB PRODUCTS

TEMPLATE GENERATION	IN VITRO TRANSCRIPTION		RNA CAPPING	POLY(A) TAILING	RNA PURIFICATION
Q5® High-Fidelity DNA Polymerase	HiScribe® T7 mRNA Kit with CleanCap® Reagent AG				Monarch® RNA Cleanup Kit (10 µg)
	HiScribe T7 ARCA mRNA Synthesis Kit (with tailing)				
dNTP solution mixes	HiScribe T7 ARCA mRNA Synthesis Kit			E. coli Poly(A) Polymerase	Monarch RNA Cleanup Kit (50 µg)
<div><div><div>GMP</div><div>COMING SOON</div></div><div>BspQI*</div></div>	<div><div><div>GMP</div></div><div>HiScribe T7 High Yield RNA Synthesis Components</div></div>	<div><div><div>GMP</div></div><div>Vaccinia Capping System</div></div>		Monarch RNA Cleanup Kit (500 µg)	
DNA Assembly <ul style="list-style-type: none">• NEBuilder HiFi DNA Assembly• Golden Gate Assembly	HiScribe T7 Quick High Yield RNA Synthesis Kit	<div><div><div>GMP</div></div><div>mRNA Cap 2'-O-Methyltransferase</div></div>		Lithium Chloride	
	HiScribe SP6 High Yield RNA Synthesis Kit	ARCA and other mRNA cap analogs			
	T3 & SP6 RNA Polymerases				
	<div><div><div>GMP</div></div><div>T7 RNA Polymerase</div></div>				
	Hi-T7 RNA Polymerase				
	Companion Products				
	<div><div><div>GMP</div></div><div>RNase inhibitor (Murine)</div></div>				Companion Products
	RNase Inhibitor (Human Placental)				Monarch RNA Cleanup Binding Buffer
	<div><div><div>GMP</div></div><div>Pyrophosphatase, Inorganic (E. coli)</div></div>				Monarch RNA Cleanup Wash Buffer
	Pyrophosphatase, Inorganic (Yeast)			Nuclease-free Water	
<div><div><div>GMP</div></div><div>DNase I (RNase-free)</div></div>					
NTPs					

GMP

= available in GMP-grade

* NEB can offer large-scale preparations of restriction enzymes using Recombinant Albumin (BSA-free)

From research to therapeutic production, NEB's *in vitro* transcription portfolio will meet your needs.

NEB's portfolio of research-grade and GMP-grade reagents support microgram scale research production to gram scale therapeutic mRNA production. Our optimized HiScribe kits enable convenient *in vitro* transcription (IVT) workflows. When it is time to scale up and optimize reaction components, our standalone reagents are readily available in formats matching our GMP-grade offering, enabling a seamless transition to large-scale therapeutic manufacturing.

To inquire about custom formats, or GMP-grade reagent production, contact us at custom@neb.com.