

One Foundation for the Whole mRNA Process

One qualified GMP supply base for a cell-free process – from nuclease-free water and transcription buffers, through RNA purification and LNP encapsulation, to excipient-grade formulation – that carries an mRNA product from template to the final drug product.

mRNA is not made in a bioreactor. It is made **cell-free**, by in-vitro transcription – so an mRNA programme is a **long chain of buffers, salts, solvents and excipients**, not a cell culture, and sourcing that chain from many suppliers is what slows qualification and scale-up. And the product is **the most nuclease-sensitive molecule in biomanufacturing**: a trace of an RNase anywhere in the chain degrades the entire product. This briefing shows how one coherent, qualified PAN range covers the whole workflow, and why the water underneath it – **WFI Beyond, nuclease-free** – is the single input where mRNA has the least margin for error. A process built this way carries the mark **Built on WFI Beyond**.

[Download the PDF](#)

[The mRNA process toolkit](#)

[Read Edition D02 – Water](#)

BUILT ON WFI BEYOND

the mark for the water beneath a molecule that earns it.

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Key takeaways

- mRNA is a **cell-free process** made by in-vitro transcription – so it runs on a **long chain of buffers, salts, solvents and excipients**, not a cell culture. Consolidating that chain onto one qualified supply base is the whole game.
- The product is **RNA – the most nuclease-sensitive molecule in biomanufacturing**. A trace of an RNase anywhere degrades the entire batch, so **nuclease-free inputs are not a nicety; they are the process**.
- The workflow is a cell-free chain – **template DNA preparation, in-vitro transcription, DNase digestion, RNA purification, LNP encapsulation, solvent removal / TFF, excipient-grade formulation and fill** – plus QC & stability, with an optional cell-based transfection-studies step.
- A **small set of qualified PAN stocks recurs across every step**: nuclease-free WFI-quality water is the base of them all; Tris, NaCl 5 M, the magnesium IVT cofactor, histidine, sucrose, trehalose, the polysorbates and ethanol recur again and again.
- **Water is the sharpest input**. WFI Beyond is **nuclease-free** (RNase and DNase not detected) – exactly what an mRNA process needs; endotoxin **more than 50x below the limit** (spec < 0.005 EU/mL); sterile, animal-component-free, with all **24 ICH Q3D elemental impurities measured by ICP-MS** on every lot.
- The **excipient-grade formulation set** is the mRNA-LNP standard – histidine, polysorbate 20/80, sucrose, trehalose, rHSA, mannitol – and the final formulation can be built on **WFI Beyond**.
- **DPBS and WFI Beyond are backed by filed FDA Type IV (excipient) DMFs** (MF044371, MF044505); research grade to GMP with no reformulation; delivered by a GMP operation proven at commercial scale and recognised among Pharma Tech Outlook's Top 10 CMOs in Europe (2024).

READ BY FUNCTION

A shared story, then a section written for your role: **Developers & Researchers** · **Production** · **Procurement** · **Quality Assurance** · **Regulatory Affairs** · **Decision-makers & BD** · **CDMOs & CMOs**

ONE SUPPLY BASE, THE WHOLE PROCESS

The mRNA process, on one foundation

A cell-free chain from template to drug product, built from a handful of recurring stocks on a nuclease-free water base – one qualified supplier from research to GMP.

cell-free · template to vial

IVT, purification, LNP encapsulation and formulation – one coherent range of buffers, solvents and excipients.

nuclease-free water

WFI Beyond carries no RNase or DNase – the one attribute an mRNA process cannot compromise on.

a handful of stocks

WFI water in every step; Tris, NaCl, the Mg cofactor, histidine, sucrose, trehalose and the polysorbates recur throughout.

2 filed FDA DMFs

DPBS (MF044371) and WFI Beyond (MF044505) – Type IV (excipient), referenceable by Letter of Authorization.

SECTION 1

Where the cost and the risk sit in an mRNA programme

mRNA broke the industry's usual shape. There is **no cell line to develop, no bioreactor to scale, no titre to win** – the molecule is made cell-free, by an enzymatic in-vitro transcription reaction, in days rather than months. That is mRNA's whole promise: **speed**. But it moves the challenge. What a cell culture did inside a living system, an mRNA process must do with **chemistry** – a long, sequential chain of buffers, salts, solvents and excipients, from the transcription reaction through purification, LNP encapsulation and final formulation. The programme's cost, its timeline and much of its risk sit in **assembling and qualifying that chain**, and sourcing it from a scattered supplier base is exactly what slows a modality whose point was to be fast.

And the product is uniquely fragile. **RNA is the most nuclease-sensitive molecule in biomanufacturing** – ribonucleases are everywhere, robust, and need only trace amounts to cut an mRNA strand and destroy its function. There is no purification step that rebuilds a degraded transcript. So every input that touches the process – above all the water, which is the base of

every buffer and reaction – has to be **nuclease-free**, not as a preference but as a condition of the product existing at all. In an mRNA process, input quality is not a procurement line; it is whether you have a product.

A cell culture does its chemistry inside a cell. mRNA does it in a tube – so the buffers, solvents and water are the process, and an RNase anywhere is the end of the batch.

SECTION 2

One cell-free chain, from template to drug product

The mRNA workflow can be written as a sequence of steps – an **upstream** that prepares the template and transcribes the RNA, and a **downstream** that purifies, encapsulates and formulates it. PAN supplies the process chemistry for every step. (An optional cell-based step, **M0**, supports transfection studies only; the mRNA itself is made cell-free.)

Step	Stage	What happens
UPSTREAM (USP) · TEMPLATE, TRANSCRIPTION & TEMPLATE REMOVAL		
M0	Cell-based studies / transfection (optional)	HEK293 media for transfection-based mRNA studies – not part of the cell-free production chain.
M1	Template DNA preparation	Linearised plasmid template; resuspension, precipitation and wash on a nuclease-free water base.
M2	In-vitro transcription (IVT)	Enzymatic synthesis of the mRNA; Tris transcription buffer and a magnesium cofactor on nuclease-free water.
M3	DNase digestion	DNase I removes the DNA template; magnesium cofactor; nuclease-free water.
DOWNSTREAM (DSP) · PURIFICATION, LNP, EXCHANGE & FORMULATION		
M4	RNA purification	Removal of enzymes, dsRNA and residual DNA on high-salt, chelation and chromatography buffers.
M5	LNP manufacturing & encapsulation	mRNA encapsulated in lipid nanoparticles – an ethanol organic phase mixed with an acidic aqueous phase.
M6	Solvent removal / TFF	

Step	Stage	What happens
		Ethanol removal and buffer exchange into a neutral storage/formulation buffer by tangential-flow filtration.
M7	Formulation (excipient grade)	Final mRNA-LNP formulation – histidine or Tris, tonicity, cryo/lyoprotectants and surfactants.
M8	Fill & storage	Fill; cryo/lyoprotectants for frozen or lyophilised storage.
ACROSS THE CHAIN		
M9	QC & stability	Endotoxin, sterility, residual nuclease, identity and potency; ICH Q1A stability; DMF-backed support.

SECTION 3

One foundation – a handful of stocks, reused across the process

Look across the steps and the same pattern appears as in every PAN process edition: the dozens of working buffers and reagents are built from a **small set of concentrated stock solutions that recur again and again. Nuclease-free WFI-quality water is the base of every step. Tris 1 M** runs from template prep through IVT, purification, TFF and formulation; **NaCl 5 M** and **phosphate** recur across purification, exchange and formulation; the **magnesium cofactor** serves both the IVT reaction and the DNase step; and the formulation excipients – **histidine, sucrose, trehalose, polysorbate 20/80, rHSA, mannitol** – carry from LNP mixing into the final drug product. Qualify a handful of stocks once, and they serve the whole chain – fewer SKUs to qualify, one consistent chemistry from research to GMP.

THE VALUE, STATED PLAINLY

Buffer, solvent and excipient chemistry – from research to GMP

Every stock in the range is offered **research-grade today**, and the **identical product** is available **GMP grade on request, with no reformulation**. The buffer a team transcribes and purifies on in development is the buffer it scales and files with – so there is **no comparability gap** opening up when an mRNA programme crosses

from research into GMP, on the modality where speed to clinic is the entire point.

SECTION 4

Delivered as process bundles – one box per step

PAN delivers the range the way the process runs it – as **step-specific process bundles**, one box per step, each holding the exact set of liquids that step needs, every bottle labelled with its name, article number, lot, volume, storage and production date. A team orders the **bundle for its step** – the *IVT Bundle*, the *RNA Purification Bundle*, the *LNP Bundle*, the *Formulation Bundle* – rather than assembling a catalogue list and reconciling it on receipt. The stocks are **research grade today, GMP on request**, and the downstream buffers can be produced on the **WFI Beyond** water base as an added safety standard (Section 7). Full component-and-article-number listings are in Appendix A.

SECTION 5

Template, transcription and template removal

The upstream makes the RNA. **Template DNA preparation (M1)** resuspends and purifies the linearised plasmid template on a **nuclease-free water base**, with Tris/EDTA, NaCl, ethanol and potassium acetate for precipitation and wash, and the **RNase/DNase Neutralizer** for surface and equipment decontamination – the first line of defence against the ribonucleases that are the process's main enemy. **In-vitro transcription (M2)** is the enzymatic heart: the mRNA is synthesised in a **Tris transcription buffer** with a **magnesium chloride cofactor** on nuclease-free water (a ready-to-use IVT Reaction Buffer 10× is in preparation; PAN already supplies the components). **DNase digestion (M3)** then removes the DNA template with **DNase I** and its magnesium cofactor. Through all three, the water is nuclease-free – because the whole point of these steps is to protect, and then cleanly transcribe, a nucleic acid.

SECTION 6

Purification, LNP encapsulation and formulation

The downstream turns transcribed RNA into a formulated drug product. **RNA purification (M4)** clears enzymes, double-stranded RNA and residual DNA on high-salt, chelation, detergent and chromatography buffers (NaCl, EDTA,

glycine, Tris, phosphate, DPBS, HEPES). **LNP manufacturing (M5)** encapsulates the mRNA in lipid nanoparticles – an **ethanol organic phase** rapidly mixed with an **acidic aqueous phase** (sodium acetate or citrate), with histidine and sucrose already present for the formulation that follows. **Solvent removal / TFF (M6)** strips the ethanol and exchanges into a **neutral storage buffer** (sodium citrate neutral, Tris, phosphate, DPBS/HEPES).

Formulation (M7) is the mRNA-LNP standard excipient set – **histidine** as the standard mRNA-LNP buffer, tonicity (NaCl, L-arginine), cryo- and lyoprotectants (**sucrose, trehalose, glycerol, mannitol**), surfactants (**polysorbate 20 and 80**) and an animal-free stabiliser (**rHSA**) – with the **final formulation built on WFI Beyond**. **Fill & storage (M8)** fills and protects the product for frozen or lyophilised storage. One qualified set of stocks carries the whole downstream, and every buffer in it can be built on WFI Beyond.

SECTION 7

Water, and why it matters most of all here

Water is the base of every buffer, every reaction and the final formulation, so it sets the quality ceiling for the whole process. In mRNA there is no modality where that ceiling matters more – because the product is a nucleic acid and the pharmacopoeial Water for Injection monograph (Ph. Eur. 0169, its core dating to 1969) is **silent on the one attribute that decides whether an mRNA survives: nuclease activity**. A water can meet the monograph in full and still carry an RNase that quietly degrades every transcript made on it. WFI Beyond starts from that gap.

What WFI Beyond is. WFI Beyond is PAN's beyond-compendial Water for Injection – water that first meets the monograph and then goes past it, proven lot by lot on the Certificate of Analysis:

- **Nuclease-free** – RNase and DNase **not detected**. For mRNA this is the decisive attribute: the water is the base of the transcription reaction and every buffer, and a residual RNase would degrade the product at its source. The monograph does not test for it.
- **Endotoxin more than 50x below the compendial limit** (spec < 0.005 EU/mL) – because endotoxin in an injectable mRNA-LNP cannot be removed downstream.

- **Sterile** (0.1 µm filtered, filled into gamma-irradiated single-use containers) and **animal-component-free**, with a signed BSE/TSE and ICH Q3 declaration.
- **All 24 ICH Q3D elemental impurities specified and measured by ICP-MS** on every lot – a first for a water. Trace metals also catalyse RNA hydrolysis, so a documented low-metal water protects transcript integrity as well.
- **DMF-backed** – a filed FDA Type IV (excipient) Drug Master File (MF044505), referenceable in an IND/BLA through a Letter of Authorization.

(The full water story is *In-Depth · Industry Edition D02 · Water: The WFI Beyond Standard*.) A representative case: a developer needed the highest-quality water to dilute a plasmid before electroporating human T cells, and PAN-Celltech supplied WFI Beyond custom-filled into 1 mL vials – read [the anonymised nuclease-free-water case study](#) in the Knowledge Hub.

BUILT ON WFI BEYOND the mark for the water beneath a molecule that earns it.

A SAFETY STANDARD FOR THE MOST NUCLEASE-SENSITIVE PRODUCT THERE IS

Built on WFI Beyond

Because every buffer, reaction and the final formulation is built on a water base, the same upgrade is open to all of them. On request, the buffers for any step – or the whole process – can be produced on the **WFI Beyond** water base instead of standard WFI-quality water, giving the finished liquids the same nuclease-free, ultra-low-endotoxin, metal-controlled foundation. For an mRNA product, this is the **recommended safety standard**: it removes the one contaminant class that can silently destroy the product, at the layer where it is cheapest to control.

How to get it. The WFI Beyond upgrade is **opt-in and made to order** – produced through PAN-Celltech's Custom Solutions / custom GMP program, with a Certificate of Analysis per lot and DMF-backed regulatory support, in formats from custom 1 mL vials up to 1000 L. Ask your PAN contact to build any step, or the whole process, Built on WFI Beyond.

The DMF advantage

Two of the universal utilities are backed by filed FDA **Type IV Drug Master Files** – **DPBS (MF044371)** and **WFI Beyond (MF044505)**. Type IV is the FDA's category for **excipients**, which is what these materials are in a finished mRNA-LNP drug product, so you reference them in your IND/BLA through a Letter of Authorization rather than re-proving or reconstructing them – taking months of independent testing off the critical path, with PAN's proprietary detail protected in the FDA's confidential file. (DMF and stability support are optional, on-request services.)

SECTION 9

The proof at commercial scale

The GMP liquids are filled by the PAN-Celltech GMP operation that has proven itself at commercial scale – GMP-compliant and audit-proven manufacture in an EU Annex 1 facility (a capability, not a certification):

up to ~1.8M L / year

Combined manufacturing output; the GMP facility alone runs up to ~1.0M L/year.

2 filed FDA DMFs

DPBS (Type IV, MF044371) and WFI Beyond (MF044505) CoA on every lot.

Track-record figures are anonymised; capacity figures are stated as "up to".

AUTHOR'S INSIGHT

The molecule that is undone by what you cannot see

Of all the modalities in this series, mRNA is the one where the gap between "meets specification" and "fit for the product" is widest. A water, a buffer or a reagent can pass every compendial test and still carry the one thing an mRNA process cannot survive – a **ribonuclease**, active in trace amounts, invisible on a standard certificate. The transcript it degrades does not fail loudly; it simply underperforms, and the loss surfaces downstream as low yield, poor potency or a failed stability point, with no way to tell from the batch record which input carried it in.

That is why, for mRNA, the **water and the reaction buffers are not commodities**. They are the parts of the process in most direct contact with the most fragile molecule in the pharmacopoeia. Specifying them nuclease-free up front – and building the process on water that is proven RNase- and DNase-free on every lot – is the cheapest and most decisive insurance an mRNA programme can buy.

– A personal note from the author, drawn from the interview programme behind this In-Depth series.

What the one-foundation approach means for you – by function

The story above is shared. The sections below translate it into the terms of a specific role – read yours, skip the rest.

A · DEVELOPERS & RESEARCHERS

Develop the whole mRNA chain on one qualified base

An mRNA process touches template prep, an IVT reaction, DNase digestion, purification, LNP encapsulation and a formulation – a long reagent chain usually assembled from a scattered supplier base. PAN lets you build it on **one coherent range**: nuclease-free water, transcription and reaction buffers, purification and diafiltration stocks, LNP solvents and the excipient-grade formulation set. Because the stocks scale to the identical GMP product with no reformulation, the chemistry you transcribe and purify on is the chemistry you file with – no comparability gap on the modality where speed is everything.

The chemistry is built for how mRNA behaves – a **magnesium cofactor** that serves both the IVT reaction and the DNase step, **histidine** as the mRNA-LNP standard formulation buffer, PS20/PS80 and sucrose/trehalose for stability – and every buffer can be built on **WFI Beyond** where the product earns it. (See the [mRNA process toolkit](#) in the Knowledge Hub.)

B · PRODUCTION & MANUFACTURING

Ready-made buffers off the shelf – and RNase control built in

An mRNA campaign burns through buffer and solvent volume across template prep, transcription, purification, LNP mixing and formulation, and every litre made in-house is weighing, mixing and QC-checking that isn't making product – and, worse, an extra opportunity to introduce an RNase. Ordering the stocks and ready-to-use buffers **from stock, in GMP grade with a CoA per lot**, on a nuclease-free water base, takes that off the floor and removes contamination entry points at the stage where an RNase cannot be undone. And you can order them **by the process step** – as a bundle, one labelled box – instead of picking each off a catalogue line.

It also keeps a fast modality fast. **On-stock dispatch** replaces custom-manufacturing slots and multi-week lead times, and the range scales from a small prep to process volumes without re-qualifying the supply.

C · PROCUREMENT

Qualify one supply base, not a fragmented reagent chain

mRNA's long reagent chain is a procurement challenge before it is a technical one: sourced from many suppliers, it multiplies qualification, audits, documentation and packaging standards and slows scale-up. Because a **handful of universal stocks** cover the whole workflow on one nuclease-free water base, you qualify and carry far fewer SKUs – fewer vendors, fewer audits, one standard. The right lens is **total cost of ownership**, where the hidden tail – qualification labour, incoming QC, and above all the cost of a batch lost to a contaminant – dwarfs the unit price, and a single on-stock, GMP-grade, DMF-supported source collapses most of it.

Held stock is insurance against the demand a fast modality cannot forecast. The reliability is proven: an entire specialty portfolio bridged at **~150,000 L over ~2 years with zero rejections** (see the Knowledge Hub). And key inputs are DMF-supported today, turning a sourcing decision into a regulatory asset.

D · QUALITY ASSURANCE

One audited source, and the attributes mRNA is actually judged on

Consolidating water, buffers, solvents and excipients to **one audited GMP source** collapses the QA load a fragmented mRNA supply creates – a single set of documentation and specifications, one packaging standard, one EU Annex 1 site to assess **on-site or remotely, in full or in part**, with a **Certificate of Analysis on every lot**. And because DPBS and WFI Beyond are excipients in the finished product, that documentation is already on file with the FDA as a Type IV (excipient) DMF your regulatory team can reference.

The attributes that matter for mRNA are built in and documented: **nuclease-free water on the CoA** (RNase and DNase not detected), ultra-low endotoxin, a documented low elemental-impurity profile, and a signed BSE/TSE declaration – with the modern impurity classes (ICH Q3D, residual solvents, nitrosamines) answered ahead of the questions. Stability support is available on request.

E · REGULATORY AFFAIRS

Reference our filings; document the mRNA dossier once

The two utilities most likely to sit in an mRNA-LNP submission – **DPBS and WFI Beyond** – are backed by filed FDA **Type IV (excipient) Drug Master Files** (MF044371, MF044505). You cross-reference them through a Letter of Authorization, so the water and the aqueous base are referenceable as exactly what they are in the product, without rebuilding a dossier or re-proving the material – months off the critical path.

Because one qualified range carries the process from research to GMP on the identical chemistry, the material named in your control strategy is **consistent from template to drug product**, and the beyond-compendial dossier answers the modern impurity questions (ICH Q3D, Q3C, nitrosamines, TSE/BSE) before they are asked. Where a specific product you rely on is not yet filed, PAN-Celltech will write and file a custom DMF on request.

F • DECISION-MAKERS, BD & PROJECT LEADS

Protect the speed; de-risk the batch

mRNA's promise is **speed** – and a fragmented, under-qualified reagent chain is precisely what erodes it. One qualified supply base across the whole process, research grade to GMP with no reformulation, plus DMF-backed references, takes weeks-to-months out of qualification and filing and keeps a fast modality fast. Every week saved is the advantage the platform was chosen for.

The larger prize is **de-risking a batch undone by something invisible**. Removing the failure modes a fragmented supply invites – an RNase that degrades a transcript, an endotoxin that cannot be cleared from an injectable, a supply gap against a fast schedule – is exactly the CMC and supply-chain diligence investors and partners look for in mRNA. It reframes PAN from a vendor of liquids into a partner that takes time and risk out of the path to the clinic, backed by external recognition (Pharma Tech Outlook's "Top 10 CMOs in Europe", 2024) and a proven continuity record.

G • CDMOS & CMOS

A standard mRNA supply base you can run – and offer to your clients

For a contract manufacturer running mRNA programmes, one qualified range – nuclease-free water, transcription and purification buffers, LNP solvents and the excipient-grade formulation set, all with a CoA per lot – lets you

standardise incoming materials across every client rather than re-qualifying a different reagent chain for each. And because DPBS and WFI Beyond are filed as **Type IV (excipient) DMFs your clients can reference directly**, it is a regulatory asset you pass straight through to the sponsor.

As a capacity partner, PAN-Celltech runs custom-formulated GMP (EU Annex 1) production, including private-label lines and custom single-use fill **from 1 mL to 1000 L**, with scale to match – combined output **up to ~1.8 million litres a year** – and a continuity record to underwrite it. The same GMP chemistry serves a client's programme from early development through to commercial supply.

In one arc

A cell-free process → a long chain of buffers, salts, solvents and excipients from template to drug product → a handful of qualified stocks recurring across every step → all on a nuclease-free water base → research grade today, the identical products GMP on request with no reformulation → water engineered beyond the monograph, nuclease-free and ultra-low in endotoxin → DMF-backed regulatory confidence. One foundation for the whole mRNA process, from a single partner whose reason for building it is to take risk and time out of *your* path to the clinic.

DOCUMENTS – SELF-SERVICE

What to ask your PAN contact for

The mRNA process toolkit specification, a representative Certificate of Analysis, a DMF Letter of Authorization, and the water story behind the safety standard.

TOOLKIT

The mRNA process toolkit

Products by step, article

ON REQUEST

Certificate of Analysis

A representative production-lot CoA; a lot-specific CoA is

ON REQUEST

DMF Letter of Authorization

Reference our filed FDA Type IV DMFs – WFI Beyond

IN-DEPTH D02

The WFI Beyond Standard

The full water story behind the safety standard.

numbers and
process notes.

issued with
every delivery.

(MF044505),
DPBS
(MF044371).

Downstream buffers are available GMP grade, manufactured by PAN-Celltech; stocks are research-grade today, the same products GMP on request with no reformulation. The IVT Reaction Buffer 10x is in preparation (PAN supplies the components today). Manufactured to GMP in an EU Annex 1 facility (a capability, not a certification). WFI Beyond is opt-in, for further manufacturing / as an excipient.

APPENDIX A · CATALOGUE REFERENCE

The mRNA toolkit – by process step

Key products by step, with article numbers, across the cell-free chain M0–M8 plus QC (M9). Stocks are **GMP (CT- numbers)** where shown, research grade otherwise, available GMP on request with no reformulation. Every buffer is available **beyond-compendial**, produced with **WFI Beyond** (CT-981500) instead of standard WFI, on request. Article numbers are taken from the PAN mRNA-technology product pages.

Step	Key product	Article no.
UPSTREAM (USP) · M0–M3 · TEMPLATE, TRANSCRIPTION & TEMPLATE REMOVAL		
M0 · Cell-based studies / transfection (optional; GMP on request)	Panserin 293S (suspension HEK293)	P04-710609
	Panserin 293A (adherent HEK293)	P04-710608
	Panserin 401 (HEK293 allround)	P04-710401
M1 · Template DNA preparation	WFI Quality Water (nuclease-free base)	CT-991500
	RNase/DNase Neutralizer	P10-61500
	Tris Buffer 1 M, pH 8.4	CT-05500
	EDTA 0.5 M, pH 8.0	CT-10500
	NaCl 5 M Stock	CT-77055
	Ethanol 20 %	CT-89500

Step	Key product	Article no.
M2 · In-vitro transcription (IVT)	Potassium acetate 3 M, pH 5.5	CT-76500
	Tris Buffer 1 M, pH 8.4	CT-05500
	Magnesium Chloride 1 M (cofactor)	CT-75100
	WFI Quality Water	CT-991500
	IVT Reaction Buffer 10× (in preparation)	in preparation
M3 · DNase digestion	DNase I	P60-37780100
	Magnesium Chloride 1 M (cofactor)	CT-75100
	WFI Quality Water	CT-991500
DOWNSTREAM (DSP) · M4-M8 · PURIFICATION, LNP, EXCHANGE, FORMULATION & FILL		
M4 · RNA purification	NaCl 5 M Stock	CT-77055
	EDTA 0.5 M, pH 8.0	CT-10500
	Glycine 100 mM, pH 3.0	CT-69500
	Tris Buffer 1 M, pH 8.4	CT-05500
	Phosphate Buffer 100 mM	CT-18810
	DPBS w/o Ca & Mg (GMP)	CT-36500
	HEPES Buffer 1 M (GMP)	CT-01100
	NaOH 1 M Stock	CT-55105
	WFI Quality Water	CT-991500
M5 · LNP manufacturing & encapsulation	Ethanol 20 % (organic phase)	CT-89500
	Sodium acetate 100 mM, pH 4.5	CT-76451
	Citrate Buffer 100 mM, pH 3.0	CT-62500
	Sucrose 30 %	CT-00131
	Polysorbate 80 (PS80) 1 %	CT-00311
	Histidine 100 mM	CT-69510

Step	Key product	Article no.
M6 · Solvent removal / TFF	DPBS w/o Ca & Mg (GMP)	CT-36500
	WFI Quality Water (aqueous phase)	CT-991500
	Tris Buffer 1 M, pH 8.4	CT-05500
	NaCl 5 M Stock	CT-77055
	Phosphate Buffer 100 mM	CT-18810
	Sodium citrate neutral (~pH 6.5)	CT-62310
M7 · Formulation (excipient grade)	DPBS w/o Ca & Mg (GMP)	CT-36500
	HEPES Buffer 1 M (GMP)	CT-01100
	WFI Quality Water	CT-991500
	Histidine 100 mM (mRNA-LNP standard)	CT-69510
	Tris Buffer 1 M, pH 8.4	CT-05500
	Phosphate Buffer 100 mM	CT-18810
	Sodium chloride 0.9 % (GMP)	CT-39500
	L-Arginine 1 M, pH 7.0	CT-69520
	Glycerol 20 %	CT-00901
	Polysorbate 20 (PS20) 1 %	CT-00211
	Polysorbate 80 (PS80) 1 %	CT-00311
	Recombinant human serum albumin (rHSA)	CT-27500
	Mannitol 10 %	CT-00401
	Sucrose 30 %	CT-00131
	Trehalose 30 %	CT-00231
M8 · Fill & storage	NaOH 1 M Stock	CT-55105
	WFI Beyond (final formulation)	CT-981500
	Sucrose 30 %	CT-00131

Step	Key product	Article no.
	Trehalose 30 %	CT-00231
	WFI Quality Water / WFI Beyond	CT-991500 / CT-981500
SERVICE · M9		
M9 · QC & stability · service	Release testing: CoA per lot, endotoxin (LAL), residual nuclease / RNase, bioburden & sterility, ICH Q1A stability, DMF / LoA	-

Universal utility. Nuclease-free WFI-quality water (CT-991500) is the base of every step. **WFI Beyond** (CT-981500) is Water for Injection engineered beyond Ph. Eur. monograph 0169 – nuclease-free (RNase & DNase not detected), endotoxin < 0.005 EU/mL (>50x below limit), all 24 ICH Q3D elements by ICP-MS – and, with DPBS, is backed by a filed FDA Type IV (excipient) DMF (MF044505, MF044371). The IVT Reaction Buffer 10x is in preparation (components available today). Full specifications and current article numbers on request.

FREQUENTLY ASKED QUESTIONS

The mRNA toolkit, answered

Why is nuclease-free water non-negotiable for mRNA?



Because the product is RNA, and ribonucleases (RNases) are ubiquitous, robust and need only trace amounts to cut an mRNA strand and destroy its function – with no purification step that rebuilds a degraded transcript. Water is the base of the transcription reaction and every buffer, so if the water carries an RNase it degrades the product at its source. WFI Beyond is nuclease-free: RNase and DNase are not detected.

How does one supply base cover the whole mRNA process?



mRNA is a cell-free chain – template prep, in-vitro transcription, DNase digestion, RNA purification, LNP encapsulation, solvent removal / TFF, formulation and fill. PAN supplies the water, buffers, salts, solvents and excipients for every step, built from a small set of recurring stocks on a nuclease-free water base, so one qualified supplier carries the process from research to GMP.

What is in the excipient-grade formulation set?



The mRNA-LNP standard: histidine as the standard formulation buffer, tonicity agents (NaCl, L-arginine), cryo- and lyoprotectants (sucrose, trehalose, glycerol, mannitol), surfactants (polysorbate 20 and 80) and an animal-free stabiliser (recombinant human serum albumin). The final formulation can be built on WFI Beyond.

Do you supply the IVT reaction buffer?



PAN already supplies the IVT components – the Tris transcription buffer base and the magnesium chloride cofactor on nuclease-free water. A ready-to-use IVT Reaction Buffer 10x is in preparation.

What does "Built on WFI Beyond" mean for an mRNA process?



Every buffer, reaction and the final formulation is built on a water base, so any step or the whole process can be produced on the beyond-compendial WFI Beyond water base instead of standard WFI. That removes the contaminant class most likely to destroy the product – residual nuclease – plus endotoxin and trace metals, at the cheapest layer to control. It is opt-in and made to order, with a CoA per lot and DMF-backed support.

Can I reference the Drug Master File in my submission?



Yes. DPBS and WFI Beyond are backed by filed FDA Type IV (excipient) DMFs (MF044371, MF044505). You cross-reference them in your IND/BLA through a Letter of Authorization, so the material is referenceable as exactly what it is in the product without rebuilding a dossier.

GO FURTHER

Related reading

IN-DEPTH D02

The WFI Beyond Standard

The full water story behind the safety standard.

CASE STUDY

Nuclease-free water in the clinic

WFI Beyond in 1 mL vials for clinical CAR-T manufacturing.

TOOLKIT

The mRNA process toolkit

Products by step, with article numbers.

KNOWLEDGE HUB

Case studies & tech papers

The anonymised proof stories, in full.

Build your mRNA process on one foundation

Develop with us from research grade to the identical GMP material with no reformulation, or switch to us and qualify one audited, DMF-backed supply base across your whole process – on a nuclease-free water foundation.

Request the specification, a Certificate of Analysis, a DMF Letter of Authorization, or a custom GMP quote – and put **Built on WFI Beyond** beneath your mRNA.

Start a Custom & GMP Project Enquiry

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PAN-Biotech GmbH · PAN-Celltech GmbH (GMP arm / manufacturer of record). Made in Germany. GMP-compliant, audit-proven; EU Annex 1 is a capability, not a certification. WFI Beyond is opt-in and is an excipient for further manufacturing, not for direct human use.