3.2.P.5.4 Batch Analyses

Batch analysis data is generated for GMP mRNA-1273 Drug Product according to an approved specification as presented in Table 1 and Table 2. Refer to Section 3.2.P.2.3.7.4 for additional details concerning specification changes and Section 3.2.P.2.3.7.5 for additional details concerning analytical procedure changes. As described in Section 3.2.P.5.3, analytical method validation is complete. Moving forward, mRNA-1273 Drug Product will be tested in accordance with the validated methods.

The Certificates of analyses are provided as an attachment in this section (CoAs mRNA-1273 Drug Product Lots).

Table 1: Batch Analysis Data for mRNA-1273 Drug Product

GMP mRNA-1273 Drug Product Lot Number / Manufacturer Lot Number		6007520001	6007520002	6007520003	6007520004	6007520005	6007520006	6007520007	6007520008
Date of Manufacture		**28May2020**	**02Jun2020**	**04Jun2020**	**25Jun2020**	**30Jun2020**	**08Jul2020**	**09Jul2020**	**21Aug2020**
Manufacturing Location		**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**
Purpose		**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**
Scale		**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**
Yield (Vials passing Visual Inspection)		**2507**	**2987**	**2567**	**3004**	**3005**	**2757**	**3061**	**1583**
Release Specification		**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 2**	**SPC-1063, Version 2**	**SPC-1063, Version 2**
Test	**Acceptance Criteria**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Appearance (SOP-0278)	White to off-white dispersion. May contain visible, white or translucent product-related particulates	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates.
RNA content by AEX-HPLC (SOP-0235)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Identity by Rev Transcription/Sanger Sequencing (SOP-0544)	Sequence matches description	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms
Purity by RP-HPLC (SOP-0383)	[redacted]	[redacted]	[redacted]	[redacted]	N/A	N/A	N/A	N/A	N/A
	[redacted]	N/A	N/A	N/A	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Product-related impurities by RP-HPLC (SOP-0383)	Report % area impurity group 1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Report % area impurity group 2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Report % area impurity group 3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
% RNA encapsulation [redacted] (SOP-0298)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
In vitro Translation (SOP-0937)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
pH (SOP-0288)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Osmolality (SOP-0279)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Particle size by Dynamic Light Scattering (SOP-0107)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Polydispersity by Dynamic Light Scattering (SOP-0107)	Report results	[redacted]	[redacted]	[redacted]	[redacted]	N/A	N/A	N/A	N/A
	[redacted]	N/A	N/A	N/A	N/A	[redacted]	[redacted]	[redacted]	[redacted]

GMP mRNA-1273 Drug Product Lot Number / Manufacturer Lot Number			6007520001	6007520002	6007520003	6007520004	6007520005	6007520006	6007520007	6007520008
Date of Manufacture			**28May2020**	**02Jun2020**	**04Jun2020**	**25Jun2020**	**30Jun2020**	**08Jul2020**	**09Jul2020**	**21Aug2020**
Manufacturing Location			**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**	**ModernaTX, Inc.**
Purpose			**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**	**Phase 3/Clinical lot**
Scale			**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**	**3000 vial (Scale A)**
Yield (Vials passing Visual Inspection)			**2507**	**2987**	**2567**	**3004**	**3005**	**2757**	**3061**	**1583**
Release Specification			**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 1**	**SPC-1063, Version 2**	**SPC-1063, Version 2**	**SPC-1063, Version 2**
Test		**Acceptance Criteria**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Lipid identification by UPLC-CAD (SOP-0502)	SM-102	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms
	Cholesterol	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms
	DSPC	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms
	PEG2000-DMG	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms	Conforms
Lipid content by UPLC-CAD (SOP-0502)	SM-102	[redacted]								
	Cholesterol									
	DSPC	[redacted]	[redacted]	[redacted]	[redacted]	N/A	N/A	N/A	N/A	N/A
		[redacted]	N/A	N/A	N/A	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	PEG2000-DMG	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Lipid impurities by UPLC-CAD (SOP-0502)			RRT / %Area	RRT / %Area	RRT / %Area	RRT / %Area	RRT / %Area	RRT / %Area	RRT / %Area	RRT / %Area
		Report individual impurities %area and RRT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
		Report %area total impurities	Total Area% [redacted]	Total Area% [redacted]	Total Area% [redacted]	Total Area% [redacted]	Total Area% [redacted]	Total Area% [redacted]	Total Area% [redacted]	Total Area % [redacted]
Particulate matter (SOP-0509)	≥ 25 µm	[redacted]								
	≥ 10 µm									
Container content (SOP-0950)										
Bacterial endotoxin										
Sterility		No Growth	No Growth	No Growth	No Growth	No Growth	No Growth	No Growth	No Growth	No Growth

a) The stability Acceptance Criteria for %purity is 50% as presented in Section 3.2.P.8.3
Abbreviations: N/A = specification is not applicable for product; kDa = kilodalton; RT = retention time; RRT = relative retention time

Table 2: Batch Analysis Data for mRNA-1273 Drug Product Scale A and Scale B PPQ and Post PPQ GMP lots

GMP mRNA-1273 Drug Product Lot Number		6007320001	6007320002	6007320003	6007320004	6007320005
Manufacturer Lot Number		057G20	062G20	001H20	032H20	011J20
Date of Manufacture		30Jul2020	06Aug2020	11Aug2020	13Sep2020	11Oct2020
Manufacturing Location		Catalent	Catalent	Catalent	Catalent	Catalent
Purpose		PPQ lot	PPQ lot	PPQ lot	GMP lot	PPQ lot
Scale		10000 vial (Scale A)	10000 vial (Scale A)	10000 vial (Scale A)	10000 vial (Scale A)	150000 vial (Scale B)
Yield (Vials passing Visual Inspection)		5858*	8783*	7992*	12283**	103676***
Release Specification		SPC-1128, Version 1	SPC-1128, Version 1	SPC-1128, Version 1	SPC-1128, Version 1	SPC-1128, Version 2
Test	**Acceptance Criteria**	**Result**	**Result**	**Result**	**Result**	**Result**
Appearance (SOP-0278)	White to off-white dispersion. May contain visible, white or translucent product-related particulates	White to off-white dispersion, essentially free of particulates.	White to off-white dispersion, essentially free of particulates	White to off-white dispersion, essentially free of particulates	White to off-white dispersion, essentially free of particulates	White to off-white dispersion, essentially free of particulates
RNA content by AEX-HPLC (SOP-0999)	[redacted]					
Identity by Rev Transcription/Sanger Sequencing (SOP-1032)	Sequence matches description	Conforms	Conforms	Conforms	Conforms	Conforms
Purity by RP-HPLC (SOP-0996)	[redacted]					
Product-related impurities by RP-HPLC (SOP-0996)	Report % area impurity group 1	[redacted]				
	Report % area impurity group 2					
	Report % area impurity group 3					
% RNA encapsulation [redacted] (SOP-0298)	[redacted]	[redacted]			N/A	N/A
[redacted] (SOP-1000)		N/A	N/A	N/A	[redacted]	
In vitro Translation (SOP-0937)	[redacted]					
pH (SOP-0288)						
Osmolality (SOP-0279)						
Particle size by Dynamic Light Scattering (SOP-0998)						
Polydispersity by Dynamic Light Scattering (SOP-0998)						

GMP mRNA-1273 Drug Product Lot Number			**6007320001**	**6007320002**	**6007320003**	**6007320004**	**6007320005**
Manufacturer Lot Number			**057G20**	**062G20**	**001H20**	**032H20**	**011J20**
Date of Manufacture			**30Jul2020**	**06Aug2020**	**11Aug2020**	**13Sep2020**	**11Oct2020**
Manufacturing Location			**Catalent**	**Catalent**	**Catalent**	**Catalent**	**Catalent**
Purpose			**PPQ lot**	**PPQ lot**	**PPQ lot**	**GMP lot**	**PPQ lot**
Scale			**10000 vial (Scale A)**	**10000 vial (Scale A)**	**10000 vial (Scale A)**	**10000 vial (Scale A)**	**150000 vial (Scale B)**
Yield (Vials passing Visual Inspection)			**5858***	**8783***	**7992***	**12283****	**103676*****
Release Specification			**SPC-1128, Version 1**	**SPC-1128, Version 1**	**SPC-1128, Version 1**	**SPC-1128, Version 1**	**SPC-1128, Version 2**
Test		**Acceptance Criteria**	**Result**	**Result**	**Result**	**Result**	**Result**
Lipid identification by UPLC-CAD (SOP-1001)	SM-102	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms
	Cholesterol	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms
	DSPC	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms
	PEG2000-DMG	Matches RT of reference	Conforms	Conforms	Conforms	Conforms	Conforms
Lipid content by UPLC-CAD (SOP-1001)	SM-102	[redacted]					
	Cholesterol						
	DSPC						
	PEG2000-DMG						
Lipid impurities by UPLC-CAD (SOP-1001)		[redacted]	RRT / %Area	RRT / %Area	RRT / %Area	RRT / %Area	RRT / %Area
			Total impurities: ≤ 10% area	Total Area%	Total Area%	Total Area%	Total Area%	Total Area%
Particulate matter (SOP-0509)	≥ 25 µm	[redacted]					
	≥ 10 µm						
Container content (SOP-0950)							
Bacterial endotoxin							
Sterility		No Growth	No Growth	No Growth	No Growth	No Growth	No Growth

*175 vials were sampled prior to visual inspection
**71 vials were sampled prior to visual inspection
***430 vials were sampled prior to visual inspection
a) The stability Acceptance Criteria for %purity is 50% as presented in Section 3.2.P.8.3
Abbreviations: N/A = specification is not applicable for product; kDa = kilodalton; RT = retention time; RRT = relative retention time; PPQ = Process Performance Qualification