

<b>PATENT ASSIGNMENT COVER SHEET</b>
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Electronic Version v1.1  
 Stylesheet Version v1.2

EPAS ID: PAT4356532

<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT
<b>NATURE OF CONVEYANCE:</b>	ASSIGNMENT

**CONVEYING PARTY DATA**

Name	Execution Date
SHIRE HUMAN GENETIC THERAPIES, INC.	12/16/2016

**RECEIVING PARTY DATA**

<b>Name:</b>	RANA THERAPEUTICS, INC.
<b>Street Address:</b>	128 SPRING STREET
<b>City:</b>	LEXINGTON
<b>State/Country:</b>	MASSACHUSETTS
<b>Postal Code:</b>	02421

**PROPERTY NUMBERS Total: 113**

Property Type	Number
Application Number:	61265653
Application Number:	12957340
Application Number:	13800501
Application Number:	14309387
Application Number:	15092226
Application Number:	61418389
Application Number:	13306781
Application Number:	14325594
Application Number:	14714871
Application Number:	61494745
Application Number:	61494882
Application Number:	14124615
Application Number:	61494881
Application Number:	14124608
Application Number:	14308546
Application Number:	14308554
Application Number:	61617468
Application Number:	14389023
Application Number:	15368280
Application Number:	61617478

PATENT

<b>Property Type</b>	<b>Number</b>
Application Number:	14389165
Application Number:	61657452
Application Number:	14406504
Application Number:	61658543
Application Number:	61834512
Application Number:	14898071
Application Number:	61657465
Application Number:	14406424
Application Number:	61734753
Application Number:	14650104
Application Number:	61783663
Application Number:	14307322
Application Number:	14876071
Application Number:	61789375
Application Number:	14775818
Application Number:	61784996
Application Number:	14775915
Application Number:	61785098
Application Number:	61920165
Application Number:	14776506
Application Number:	61784903
Application Number:	14775835
Application Number:	61784766
Application Number:	14774263
Application Number:	61784253
Application Number:	14775844
Application Number:	61784337
Application Number:	14775846
Application Number:	61894294
Application Number:	14521351
Application Number:	61894299
Application Number:	61953516
Application Number:	14521161
Application Number:	61894303
Application Number:	14521323
Application Number:	15349720
Application Number:	61894246
Application Number:	62020161

<b>Property Type</b>	<b>Number</b>
<b>Application Number:</b>	14521168
<b>Application Number:</b>	61969483
<b>Application Number:</b>	15128303
<b>Application Number:</b>	61984503
<b>Application Number:</b>	14696140
<b>Application Number:</b>	62005266
<b>Application Number:</b>	15314818
<b>Application Number:</b>	62016512
<b>Application Number:</b>	14749027
<b>Application Number:</b>	62020163
<b>Application Number:</b>	14790562
<b>Application Number:</b>	62088141
<b>Application Number:</b>	14959453
<b>Application Number:</b>	62135338
<b>Application Number:</b>	15073163
<b>Application Number:</b>	62241350
<b>Application Number:</b>	15294249
<b>Application Number:</b>	62320073
<b>Application Number:</b>	62349331
<b>Application Number:</b>	62420413
<b>Application Number:</b>	62420421
<b>Application Number:</b>	62421021
<b>Application Number:</b>	62420428
<b>Application Number:</b>	62421007
<b>Application Number:</b>	62420435
<b>PCT Number:</b>	US1058457
<b>PCT Number:</b>	US1162459
<b>PCT Number:</b>	US1241663
<b>PCT Number:</b>	US1241724
<b>PCT Number:</b>	US1334602
<b>PCT Number:</b>	US1334604
<b>PCT Number:</b>	US1344771
<b>PCT Number:</b>	US1442129
<b>PCT Number:</b>	US1344769
<b>PCT Number:</b>	US1373672
<b>PCT Number:</b>	US1428849
<b>PCT Number:</b>	US1428498
<b>PCT Number:</b>	US1428441

Property Type	Number
PCT Number:	US1427422
PCT Number:	US1427717
PCT Number:	US1428330
PCT Number:	US1427602
PCT Number:	US1427587
PCT Number:	US1461841
PCT Number:	US1461793
PCT Number:	US1461830
PCT Number:	US1461786
PCT Number:	US1521403
PCT Number:	US1527563
PCT Number:	US1533173
PCT Number:	US1537392
PCT Number:	US1539004
PCT Number:	US1564023
PCT Number:	US1622895
PCT Number:	US1657044

**CORRESPONDENCE DATA**

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<b>NAME OF SUBMITTER:</b>	MEAGHAN E. BYCHOWSKI
<b>SIGNATURE:</b>	/MEAGHAN E. BYCHOWSKI/
<b>DATE SIGNED:</b>	04/06/2017

**Total Attachments: 44**

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**PATENT ASSIGNMENT**

This PATENT ASSIGNMENT, dated as of December 22, 2016 (this "Patent Assignment"), is made by and between Shire Human Genetic Therapies, Inc., a Delaware corporation (the "Seller") and RaNA Therapeutics, Inc., a Delaware corporation (the "Buyer"). Capitalized terms used but not defined in this Patent Assignment shall have the respective meanings ascribed to them in the Asset Purchase Agreement, dated as of the date hereof, between the Buyer and the Seller (the "Purchase Agreement").

WHEREAS, pursuant to and on the terms and conditions set forth in the Purchase Agreement, the Seller has agreed to assign to the Buyer all of its and the Selling Subsidiaries' right, title and interest in and to (a) all issued patents and pending patent applications identified on Schedule A ("Scheduled Patents"), (b) any patents or patent applications claiming priority to any of the Scheduled Patents, including any continuation, divisional, continuation-in-part, substitution, reissue, renewal, reexamination, supplemental protection certificate, certificate of correction, extension, and foreign counterpart of any such Scheduled Patents, and (c) the right to recover for past, present or future infringement of any of the foregoing (all of the foregoing in clauses (a), (b) and (c), the "Transferred Patent Rights"); and

WHEREAS, the Buyer desires to acquire all such right, title and interest in and to the Transferred Patent Rights.

NOW, THEREFORE, in consideration of the mutual promises set forth in the Purchase Agreement and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Seller and the Buyer hereby agree as follows:

1. The Seller hereby assigns to the Buyer, and Buyer hereby accepts, all of the Seller's right, title and interest in and to the Transferred Patent Rights.
2. The Seller agrees to execute all necessary documents and to do all acts reasonably necessary to vest and confirm in the Buyer, its successors and assigns, the legal title to all the Transferred Patent Rights, without further compensation but at the expense of the Buyer or its successors and assigns.
3. The Seller does hereby authorize and request the Commissioner for Patents in the United States Patent and Trademark and the officials of corresponding entities or agencies in any applicable jurisdictions to (a) record and register this Patent Assignment to the Buyer, its successors and assigns, (b) record the Buyer, its successors and assigns as the assignee and owner of the Transferred Patent Rights, and (c) issue any and all patents or certificates of invention that may be granted upon any of the Transferred Patent Rights in the name of Buyer, its successors and assigns, as the assignee to the entire interest therein.

4. Neither the representations and warranties nor the rights, remedies or obligations of the parties under the Purchase Agreement shall be deemed to be enlarged, modified or altered in any way by this Patent Assignment, and the Seller is not making any representations or warranties of any kind whatsoever by virtue of, and shall have no liability under, this Patent Assignment. This Patent Assignment is subject in all respects to the terms and conditions of the Purchase Agreement, and in the event of any conflict between this Patent Assignment and the Purchase Agreement, the terms of the Purchase Agreement shall govern and control.

5. This Patent Assignment and any claims arising hereunder shall be governed by and construed in accordance with the Laws of the State of Delaware, without giving effect to any choice or conflict of Law provision or rule that would cause the application of Laws of any jurisdiction other than those of the State of Delaware. Each of the parties (a) consents to submit itself to the exclusive personal jurisdiction of any state or federal court sitting in the State of Delaware, County of New Castle, in any action or proceeding arising out of or relating to this Patent Assignment, (b) agrees that all claims in respect of such action or proceeding may be heard and determined in any such court, (c) agrees that it shall not attempt to deny or defeat such personal jurisdiction by motion or other request for leave from any such court and (d) agrees not to bring any action or proceeding arising out of or relating to this Patent Assignment in any other court. Each of the parties waives any defense of inconvenient forum to the maintenance of any action or proceeding so brought and waives any bond, surety or other security that might be required of any other party with respect thereto. Either party may make service on the other party by sending or delivering a copy of the process to the party to be served at the address and in the manner provided for the giving of notices in Section 6.1 of the Purchase Agreement. Nothing in this paragraph 5, however, shall affect the right of any party to serve legal process in any other manner permitted by law.

6. This Patent Assignment may be executed in counterparts, each of which shall be deemed an original but both of which together shall be considered one and the same agreement and shall become effective when counterparts have been signed by each of the parties and delivered to the other party, it being understood that both parties need not sign the same counterpart. This Patent Assignment may be executed and delivered by facsimile or .pdf transmission.

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Executed as of this 19<sup>th</sup> day of December 2016.

SHIRE HUMAN GENETIC THERAPIES,  
INC.

By: [Signature]

Name: Jason Baranski

Title: Secretary/Director

Commonwealth  
-State of Massachusetts

County of Middlesex

On this 19<sup>th</sup> day of December 2016, before me, the undersigned notary public, personally appeared Jason Baranski, proved to me through satisfactory evidence of identification, which was USA Passport, to be the person whose name is signed on the preceding document, and acknowledged to me that he signed it voluntarily for its stated purpose.

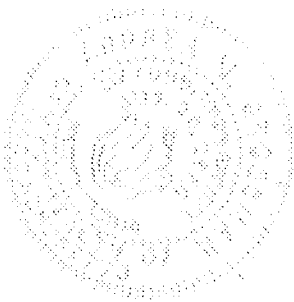
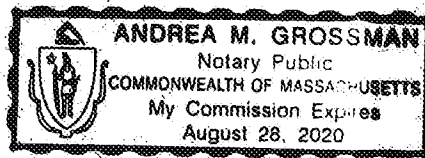
[affix seal]

[Signature]

Notary Public

Andrea M. Grossman

My commission expires:



[Signature Page to Patent Assignment Agreement]



ACCEPTED:

RANA THERAPEUTICS, INC.

By: Ronald C. Renaud, Jr.

Name: Ronald C. Renaud, Jr.

Title: President and Chief Executive Officer

State of \_\_\_\_\_)

County of \_\_\_\_\_)

On this 16 day of December 2016, before me, the undersigned notary public, personally appeared RONALD RENAUD, proved to me through satisfactory evidence of identification, which was DRIVERS LICENSE, to be the person whose name is signed on the preceding document, and acknowledged to me that he signed it voluntarily for its stated purpose.

[affix seal]



Nili M. Smallcomb

Notary Public

My commission expires:



**Schedule A**

<b>Country Name</b>	<b>Title</b>	<b>Status</b>	<b>Application Number</b>	<b>Filing Date</b>	<b>Patent Number</b>
United States of America	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Converted	61/265653	01-Dec-2009	
United States of America	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Abandoned	12/957340	30-Nov-2010	
United States of America	LIVER SPECIFIC DELIVERY OF MESSENGER RNA	Published	13/800501	13-Mar-2013	
United States of America	MRNA THERAPY FOR UREA CYCLE DISORDERS	Published	14/309387	19-Jun-2014	
United States of America	LIVER SPECIFIC DELIVERY OF MESSENGER RNA	Published	15/092,226	06-Apr-2016	
Patent Cooperation Treaty	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	National	PCT/US10/58457	30-Nov-2010	
Australia	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN	Granted	2010326132	30-Nov-2010	201032613 2

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<b>Country Name</b>	<b>Title</b>	<b>Status</b>	<b>Application Number</b>	<b>Filing Date</b>	<b>Patent Number</b>
	HUMAN GENETIC DISEASES				
Australia	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Granted	2014250713	30-Nov-2010	2014250713
Australia	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Pending	2016250459	30-Nov-2010	
Canada	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Pending	2782676	30-Nov-2010	
European Patent Convention	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Published	10835016.6	30-Nov-2010	
Hong Kong	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Published	13104368.1	30-Nov-2010	
New Zealand	DELIVERY OF MRNA FOR THE AUGMENTATION	Granted	600616	30-Nov-2010	600616

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES				
New Zealand	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Granted	700688	30-Nov-2010	700688
New Zealand	DELIVERY OF MRNA FOR THE AUGMENTATION OF PROTEINS AND ENZYMES IN HUMAN GENETIC DISEASES	Pending	716192	30-Nov-2010	
United States of America	mRNA FOR USE IN TREATMENT OF HUMAN GENETIC DISEASES	Converted	61/418389	30-Nov-2010	
United States of America	mRNA FOR USE IN TREATMENT OF HUMAN GENETIC DISEASES	Granted	13/306781	29-Nov-2011	8853377
United States of America	mRNA FOR USE IN TREATMENT OF HUMAN GENETIC DISEASES	Granted	14/325594	08-Jul-2014	9061021
United States of America	mRNA FOR USE IN TREATMENT OF HUMAN GENETIC DISEASES	Published	14/714871	18-May-2015	
Patent Cooperation Treaty	mRNA FOR USE IN TREATMENT OF HUMAN GENETIC DISEASES	Expired	PCT/US11/62459	29-Nov-2011	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
United States of America	CLEAVABLE LIPIDS	Converted	61/494745	08-Jun-2011	
United States of America	LYOPHILIZED LIPOSOMAL FORMULATIONS	Converted	61/494882	08-Jun-2011	
Patent Cooperation Treaty	CLEAVABLE LIPIDS	National	PCT/US12/41663	08-Jun-2012	
Australia	CLEAVABLE LIPIDS	Pending	2012267578	08-Jun-2012	
Brazil	CLEAVABLE LIPIDS	Pending	1120130315520	08-Jun-2012	
Canada	CLEAVABLE LIPIDS	Pending	2838063	08-Jun-2012	
China (People's Republic)	CLEAVABLE LIPIDS	Granted	201280036307.6	08-Jun-2012	ZL201280036307.6
China (People's Republic)	CLEAVABLE LIPIDS	Pending	201610884286.3	08-Jun-2012	
European Patent Convention	CLEAVABLE LIPIDS	Published	12728004.8	08-Jun-2012	
Hong Kong	CLEAVABLE LIPIDS	Published	14110374.9	08-Jun-2012	
India	CLEAVABLE LIPIDS	Pending	10971/DEL NP/2013	08-Jun-2012	
Japan	CLEAVABLE LIPIDS	Granted	2014-514897	08-Jun-2012	6022557
Japan	CLEAVABLE LIPIDS	Pending	2016-197096	08-Jun-2012	
United States of America	CLEAVABLE LIPIDS	Published	14/124615	04-Jun-2014	
United States of America	COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Converted	61/494881	08-Jun-2011	

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**PATENT**  
**REEL: 042177 FRAME: 0044**

Country Name	Title	Status	Application Number	Filing Date	Patent Number
Patent Cooperation Treaty	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	National	PCT/US12/41724	08-Jun-2012	
Australia	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	2012267531	08-Jun-2012	
Brazil	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	1120130315539	08-Jun-2012	
Canada	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	2838069	08-Jun-2012	
Chile	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	CL2013-03478	08-Jun-2012	
China (People's Republic)	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	201280036309.5	08-Jun-2012	
European Patent Convention	LIPID NANOPARTICLE COMPOSITIONS AND METHODS	Published	12728007.1	08-Jun-2012	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	FOR MRNA DELIVERY				
Hong Kong	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	14110308.0	08-Jun-2012	
Hong Kong	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	14112735.9	08-Jun-2012	
Israel	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	229699	08-Jun-2012	
India	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	59/DELNP/2014	08-Jun-2012	
Japan	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	2014-514907	08-Jun-2012	
Japan	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	2016-200575	08-Jun-2012	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Korea, Republic of	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	10-2014-7000142	08-Jun-2012	
Mexico	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	MX/A/2013/014419	08-Jun-2012	
New Zealand	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Allowed	618275	08-Jun-2012	
New Zealand	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	719345	08-Jun-2012	
Peru	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	2767-2013	08-Jun-2012	
Russian Federation	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	2013154295	08-Jun-2012	
Ukraine	LIPID NANOPARTICLE COMPOSITIONS AND METHODS	Pending	a201315567	08-Jun-2012	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	FOR MRNA DELIVERY				
United States of America	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	14/124608	05-Mar-2014	
United States of America	MRNA THERAPY FOR FABRY DISEASE	Granted	14/308546	18-Jun-2014	9,308,281
United States of America	PULMONARY DELIVERY OF MRNA	Allowed	14/308554	18-Jun-2014	
South Africa	LIPID NANOPARTICLE COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Pending	2013/08975	08-Jun-2012	
United States of America	IONIZABLE CATIONIC LIPIDS	Converted	61/617468	29-Mar-2012	
Patent Cooperation Treaty	IONIZABLE CATIONIC LIPIDS	National	PCT/US13/34602	29-Mar-2013	
Australia	IONIZABLE CATIONIC LIPIDS	Pending	2013237873	29-Mar-2013	
Brazil	IONIZABLE CATIONIC LIPIDS	Pending	1120140241317	29-Mar-2013	
Canada	IONIZABLE CATIONIC LIPIDS	Pending	2868034	29-Mar-2013	
China (People's Republic)	IONIZABLE CATIONIC LIPIDS	Published	201380026332.0	29-Mar-2013	
European Patent Convention	IONIZABLE CATIONIC LIPIDS	Published	13768446.0	29-Mar-2013	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Hong Kong	IONIZABLE CATIONIC LIPIDS	Pending	15107434.2	29-Mar-2013	
India	IONIZABLE CATIONIC LIPIDS	Pending	8519/DELN P/2014	29-Mar-2013	
Japan	IONIZABLE CATIONIC LIPIDS	Published	2015-503636	29-Mar-2013	
United States of America	IONIZABLE CATIONIC LIPIDS	Allowed	14/389023	29-Sep-2014	
United States of America	IONIZABLE CATIONIC LIPIDS	Pending	15/368280	12-Dec-2016	
United States of America	LIPID-DERIVED NEUTRAL NANOPARTICLES	Converted	61/617478	29-Mar-2012	
Patent Cooperation Treaty	LIPID-DERIVED NEUTRAL NANOPARTICLES	National	PCT/US13/34604	29-Mar-2013	
Australia	LIPID-DERIVED NEUTRAL NANOPARTICLES	Pending	2013237874	29-Mar-2013	
Brazil	LIPID-DERIVED NEUTRAL NANOPARTICLES	Pending	1120140241333	29-Mar-2013	
Canada	LIPID-DERIVED NEUTRAL NANOPARTICLES	Pending	2868030	29-Mar-2013	
China (People's Republic)	LIPID-DERIVED NEUTRAL NANOPARTICLES	Published	201380026368.9	29-Mar-2013	
European Patent Convention	LIPID-DERIVED NEUTRAL NANOPARTICLES	Published	13769005.3	29-Mar-2013	
Hong Kong	LIPID-DERIVED NEUTRAL NANOPARTICLES	Pending	15107433.3	29-Mar-2013	
India	LIPID-DERIVED NEUTRAL NANOPARTICLES	Pending	8520/DELN P/2014	29-Mar-2013	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Japan	LIPID-DERIVED NEUTRAL NANOPARTICLES	Published	2015-503637	29-Mar-2013	
United States of America	LIPID-DERIVED NEUTRAL NANOPARTICLES	Published	14/389165	29-Sep-2014	
United States of America	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS (TRANSLOCATION )	Converted	61/657452	08-Jun-2012	
Patent Cooperation Treaty	PULMONARY DELIVERY OF mRNA TO NON-LUNG TARGET CELLS	National	PCT/US13/44771	07-Jun-2013	
Australia	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Pending	2013271392	07-Jun-2013	
Brazil	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Pending	1120140306770	07-Jun-2013	
Canada	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Pending	2876155	07-Jun-2013	
China (People's Republic)	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Published	201380039829.6	07-Jun-2013	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Eurasian Patent Organization	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Pending	201492055	07-Jun-2013	
European Patent Convention	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Published	13800103.7	07-Jun-2013	
Hong Kong	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Published	15108982.6	07-Jun-2013	
Hong Kong	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Published	15109129.8	07-Jun-2013	
India	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Pending	10818/DEL NP/2014	07-Jun-2013	
Japan	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Published	2015-516249	07-Jun-2013	
Mexico	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Published	MX/A/2014 /015041	07-Jun-2013	
United States of America	PULMONARY DELIVERY OF MRNA TO NON-LUNG TARGET CELLS	Published	14/406504	08-Dec-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
United States of America	MESSENGER RNA BASED VIRAL PRODUCTION	Expired	61/658,543	12-Jun-2012	
United States of America	MESSENGER RNA BASED VIRAL PRODUCTION	Converted	61/834,512	13-Jun-2013	
Patent Cooperation Treaty	MESSENGER RNA BASED VIRAL PRODUCTION	National	PCT/US14/42129	12-Jun-2014	
European Patent Convention	MESSENGER RNA BASED VIRAL PRODUCTION	Published	14736225.5	12-Jun-2014	
United States of America	MESSENGER RNA BASED VIRAL PRODUCTION	Published	14/898,071	11-Dec-2015	
United States of America	NUCLEASE RESISTANT POLYNUCLEOTIDES AND RELATED METHODS (POLY-U)	Converted	61/657465	08-Jun-2012	
Patent Cooperation Treaty	NUCLEASE RESISTANT POLYNUCLEOTIDES AND USES THEREOF	National	PCT/US13/44769	07-Jun-2013	
European Patent Convention	NUCLEASE RESISTANT POLYNUCLEOTIDES AND USES THEREOF	Published	13800190.4	07-Jun-2013	
United States of America	NUCLEASE RESISTANT POLYNUCLEOTIDES AND USES THEREOF	Published	14/406424	08-Dec-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
United States of America	COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Converted	61/734753	07-Dec-2012	
Patent Cooperation Treaty	LIPIDIC NANOPARTICLES FOR MRNA DELIVERY	National	PCT/US13/73672	06-Dec-2013	
European Patent Convention	LIPIDIC NANOPARTICLES FOR MRNA DELIVERY	Published	13812359.1	06-Dec-2013	
United States of America	COMPOSITIONS AND METHODS FOR MRNA DELIVERY	Published	14/650104	05-Jun-2015	
United States of America	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Converted	61/783663	14-Mar-2013	
United States of America	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Granted	14/307322	17-Jun-2014	9181321
United States of America	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Published	14/876071	06-Oct-2015	
Patent Cooperation Treaty	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	National	PCT/US14/28849	14-Mar-2014	
Australia	CFTR MRNA COMPOSITIONS AND RELATED	Pending	2014236305	14-Mar-2014	

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<b>Country Name</b>	<b>Title</b>	<b>Status</b>	<b>Application Number</b>	<b>Filing Date</b>	<b>Patent Number</b>
	METHODS AND USES				
Brazil	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	BR1120150 22868-2	14-Mar-2014	
Canada	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	2904151	14-Mar-2014	
Chile	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	2675-2015	14-Mar-2014	
China (People's Republic)	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Published	2014800150 43.5	14-Mar-2014	
Eurasian Patent Organization	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	201591477	14-Mar-2014	
European Patent Convention	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Published	14718284.4	14-Mar-2014	
Hong Kong	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	16105865.3	14-Mar-2014	
Hong Kong	CFTR MRNA COMPOSITIONS AND RELATED	Pending	16108273.3	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	METHODS AND USES				
Israel	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	240982	14-Mar-2014	
Japan	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Published	2016-502924	14-Mar-2014	
Korea, Republic of	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Published	10-2015-7023977	14-Mar-2014	
Mexico	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	MX/A/2015/012333	14-Mar-2014	
New Zealand	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	711657	14-Mar-2014	
Peru	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Published	001986-2015/DIN	14-Mar-2014	
Singapore	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	1120150739 1V	14-Mar-2014	
Ukraine	CFTR MRNA COMPOSITIONS AND RELATED	Pending	a201508754	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	METHODS AND USES				
South Africa	CFTR MRNA COMPOSITIONS AND RELATED METHODS AND USES	Pending	2015/07609	14-Mar-2014	
United States of America	SYNERGISTIC ENHANCEMENT OF THE DELIVERY OF NUCLEIC ACIDS VIA BLENDED FORMULATIONS	Converted	61/789375	15-Mar-2013	
Patent Cooperation Treaty	SYNERGISTIC ENHANCEMENT OF THE DELIVERY OF NUCLEIC ACIDS VIA BLENDED FORMULATIONS	National	PCT/US14/28498	14-Mar-2014	
European Patent Convention	SYNERGISTIC ENHANCEMENT OF THE DELIVERY OF NUCLEIC ACIDS VIA BLENDED FORMULATIONS	Published	14721647.7	14-Mar-2014	
United States of America	SYNERGISTIC ENHANCEMENT OF THE DELIVERY OF NUCLEIC ACIDS VIA BLENDED FORMULATIONS	Published	14/775818	14-Sep-2015	
United States of America	METHODS FOR PURIFICATION OF MESSENGER RNA	Converted	61/784996	14-Mar-2013	

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**PATENT**  
**REEL: 042177 FRAME: 0056**

Country Name	Title	Status	Application Number	Filing Date	Patent Number
Patent Cooperation Treaty	METHODS FOR PURIFICATION OF MESSENGER RNA	National	PCT/US14/28441	14-Mar-2014	
Australia	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2014236396	14-Mar-2014	
Brazil	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	BR112015022660-4	14-Mar-2014	
Canada	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2902892	14-Mar-2014	
China (People's Republic)	METHODS FOR PURIFICATION OF MESSENGER RNA	Published	201480013665.4	14-Mar-2014	
Eurasian Patent Organization	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	201591229	14-Mar-2014	
European Patent Convention	METHODS FOR PURIFICATION OF MESSENGER RNA	Published	14714150.1	14-Mar-2014	
Israel	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	240215	14-Mar-2014	
India	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	9359/DELNP/2015	14-Mar-2014	
Japan	METHODS FOR PURIFICATION OF MESSENGER RNA	Published	2016-502790	14-Mar-2014	
Korea, Republic of	METHODS FOR PURIFICATION OF MESSENGER RNA	Published	10-2015-7024040	14-Mar-2014	
Mexico	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	MX/A/2015/012865	14-Mar-2014	
New Zealand	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	710400	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Singapore	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	11201507425R	14-Mar-2014	
South Africa	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2015/05607	14-Mar-2014	
United States of America	METHODS FOR PURIFICATION OF MESSENGER RNA	Published	14/775915	14-Sep-2015	
United States of America	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Converted	61/785098	14-Mar-2013	
United States of America	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Converted	61/920165	23-Dec-2013	
Patent Cooperation Treaty	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	National	PCT/US14/27422	14-Mar-2014	
Australia	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	2014239562	14-Mar-2014	
Brazil	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	BR112015022507-1	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Canada	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	2902884	14-Mar-2014	
China (People's Republic)	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Published	201480010106.8	14-Mar-2014	
Eurasian Patent Organization	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	201591281	14-Mar-2014	
European Patent Convention	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Published	14721635.2	14-Mar-2014	
Hong Kong	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	16107939.1	14-Mar-2014	
Israel	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	240465	14-Mar-2014	
India	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES	Pending	9157/DELN P/2015	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	AND RELATED METHODS				
Japan	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Published	2016-502430	14-Mar-2014	
Korea, Republic of	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Published	10-2015-7021965	14-Mar-2014	
Mexico	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Published	MX/A/2015/011943	14-Mar-2014	
New Zealand	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	710768	14-Mar-2014	
Singapore	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	11201507474Q	14-Mar-2014	
United States of America	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Published	14/776506	14-Sep-2015	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
South Africa	RIBONUCLEIC ACIDS WITH 4'-THIO-MODIFIED NUCLEOTIDES AND RELATED METHODS	Pending	2015/07605	14-Mar-2014	
United States of America	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Converted	61/784903	14-Mar-2013	
Patent Cooperation Treaty	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	National	PCT/US14/27717	14-Mar-2014	
Australia	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Pending	2014239184	14-Mar-2014	
Brazil	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Pending	BR112015022855-0	14-Mar-2014	
Canada	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Pending	2903880	14-Mar-2014	
China (People's Republic)	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Published	201480010113.8	14-Mar-2014	
Eurasian Patent Organization	METHODS AND COMPOSITIONS FOR DELIVERING	Pending	201591293	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	MRNA CODED ANTIBODIES				
European Patent Convention	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Published	14717945.1	14-Mar-2014	
Japan	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Published	2016-502526	14-Mar-2014	
Mexico	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Published	MX/A/2015/011947	14-Mar-2014	
United States of America	METHODS AND COMPOSITIONS FOR DELIVERING MRNA CODED ANTIBODIES	Published	14/775835	14-Sep-2015	
United States of America	MRNA THERAPEUTIC COMPOSITIONS AND USE TO TREAT DISEASES AND DISORDERS	Converted	61/784766	14-Mar-2013	
Patent Cooperation Treaty	MRNA THERAPEUTIC COMPOSITIONS AND USE TO TREAT DISEASES AND DISORDERS	National	PCT/US14/28330	14-Mar-2014	
European Patent Convention	MRNA THERAPEUTIC COMPOSITIONS AND USE TO TREAT DISEASES	Published	14718277.8	14-Mar-2014	

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**PATENT**  
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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	AND DISORDERS				
United States of America	MRNA THERAPEUTIC COMPOSITIONS AND USE TO TREAT DISEASES AND DISORDERS	Published	14/774263	10-Sep-2015	
United States of America	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Converted	61/784253	14-Mar-2013	
Patent Cooperation Treaty	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	National	PCT/US14/27602	14-Mar-2014	
Australia	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	2014239264	14-Mar-2014	
Brazil	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	BR112015022141-6	14-Mar-2014	
Canada	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	2903488	14-Mar-2014	
China (People's Republic)	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	201480010108.7	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Eurasian Patent Organization	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	201591286	14-Mar-2014	
European Patent Convention	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	14720376.4	14-Mar-2014	
India	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	9158/DELN P/2015	14-Mar-2014	
Japan	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	2016-502491	14-Mar-2014	
Mexico	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	MX/A/2015/011945	14-Mar-2014	
United States of America	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	14/775844	14-Sep-2015	
United States of America	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Converted	61/784337	14-Mar-2013	
Patent Cooperation Treaty	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	National	PCT/US14/27587	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	RNA				
Australia	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	2014239250	14-Mar-2014	
Brazil	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	BR112015022505-5	14-Mar-2014	
Canada	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	2903487	14-Mar-2014	
China (People's Republic)	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	201480013628.3	14-Mar-2014	
Eurasian Patent Organization	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	201591283	14-Mar-2014	
European Patent Convention	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	14721636.0	14-Mar-2014	
India	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Pending	9353/DELNP/2015	14-Mar-2014	
Japan	QUANTITATIVE ASSESSMENT FOR	Published	2016-502485	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	CAP EFFICIENCY OF MESSENGER RNA				
Mexico	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	MX/A/2015 /011944	14-Mar-2014	
United States of America	QUANTITATIVE ASSESSMENT FOR CAP EFFICIENCY OF MESSENGER RNA	Published	14/775846	14-Sep-2015	
United States of America	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Converted	61/894294	22-Oct-2013	
United States of America	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Published	14/521351	22-Oct-2014	
Patent Cooperation Treaty	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	National	PCT/US14/61841	22-Oct-2014	
Australia	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Pending	2014340092	22-Oct-2014	
Brazil	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Pending	11 2016 009014-4	22-Oct-2014	

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**PATENT**  
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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Canada	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Pending	2,928,188	22-Oct-2014	
China (People's Republic)	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Pending	201480057860.7	22-Oct-2014	
Eurasian Patent Organization	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Pending	201690590	22-Oct-2014	
European Patent Convention	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Published	14799919.7	22-Oct-2014	
Japan	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Pending	2016-522104	22-Oct-2014	
Mexico	MRNA THERAPY FOR ARGININOSUCCINATE SYNTHETASE DEFICIENCY	Pending	MX/A/2016/005237	22-Oct-2014	
United States of America	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Converted	61/894299	22-Oct-2013	
United States of America	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Converted	61/953516	14-Mar-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
United States of America	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Published	14/521161	22-Oct-2014	
Patent Cooperation Treaty	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	National	PCT/US14/61793	22-Oct-2014	
Australia	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	2014340155	22-Oct-2014	
Brazil	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	11 2016 009077-2	22-Oct-2014	
Canada	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	2,928,078	22-Oct-2014	
Chile	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	2016-957	22-Oct-2014	
China (People's Republic)	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Published	2014800639 47.5	22-Oct-2014	
Eurasian Patent Organization	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	201690576	22-Oct-2014	
European Patent Convention	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Published	14792713.1	22-Oct-2014	
Israel	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	245030	22-Oct-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
India	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	201617014708.0	22-Oct-2014	
Japan	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	2016-526008	22-Oct-2014	
Korea, Republic of	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Published	10-2016-7012277	22-Oct-2014	
Mexico	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	MX/A/2016/005238	22-Oct-2014	
New Zealand	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	718817	22-Oct-2014	
Peru	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	000532-2016/DIN	22-Oct-2014	
Singapore	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	11201602943P	22-Oct-2014	
Ukraine	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	a201603986	22-Oct-2014	
South Africa	LIPID FORMULATIONS FOR DELIVERY OF MESSENGER RNA	Pending	2016/02842	22-Oct-2014	
United States of America	MRNA THERAPY FOR PHENYLKETONUR	Converted	61/894303	22-Oct-2013	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	IA				
United States of America	MRNA THERAPY FOR PHENYLKETONURIA	Issued	14/521323	22-Oct-2014	9,522,176
United States of America	MRNA THERAPY FOR PHENYLKETONURIA	Pending	15/349720	11-Nov-2016	
Patent Cooperation Treaty	MRNA THERAPY FOR PHENYLKETONURIA	Published	PCT/US14/61830	22-Oct-2014	
Australia	MRNA THERAPY FOR PHENYLKETONURIA	Pending	2014340083	22-Oct-2014	
Brazil	MRNA THERAPY FOR PHENYLKETONURIA	Pending	BR 11 2016 020606-1	22-Oct-2014	
Canada	MRNA THERAPY FOR PHENYLKETONURIA	Pending	2,928,186	22-Oct-2014	
China (People's Republic)	MRNA THERAPY FOR PHENYLKETONURIA	Published	2014800576 57.X	22-Oct-2014	
Eurasian Patent Organization	MRNA THERAPY FOR PHENYLKETONURIA	Pending	201690581	22-Oct-2014	
European Patent Convention	MRNA THERAPY FOR PHENYLKETONURIA	Published	14792715.6	22-Oct-2014	

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**PATENT**  
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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Japan	MRNA THERAPY FOR PHENYLKETONURIA	Pending	2016-523331	22-Oct-2014	
Mexico	MRNA THERAPY FOR PHENYLKETONURIA	Pending	MX/A/2016/005239	22-Oct-2014	
United States of America	CNS DELIVERY OF MRNA AND USES THEREOF	Converted	61/894246	22-Oct-2013	
United States of America	CNS DELIVERY OF MRNA AND USES THEREOF	Converted	62/020161	02-Jul-2014	
United States of America	CNS DELIVERY OF MRNA AND USES THEREOF	Published	14/521168	22-Oct-2014	
Patent Cooperation Treaty	CNS DELIVERY OF MRNA AND USES THEREOF	Published	PCT/US14/61786	22-Oct-2014	
Australia	CNS DELIVERY OF MRNA AND USES THEREOF	Pending	2014340149	22-Oct-2014	
Brazil	CNS DELIVERY OF MRNA AND USES THEREOF	Pending	112016008832-8	22-Oct-2014	
Canada	CNS DELIVERY OF MRNA AND USES THEREOF	Pending	2,928,040	22-Oct-2014	
China (People's Republic)	CNS DELIVERY OF MRNA AND USES THEREOF	Published	201480057659.9	22-Oct-2014	
Eurasian Patent Organization	CNS DELIVERY OF MRNA AND USES THEREOF	Pending	201690588	22-Oct-2014	
European Patent Convention	CNS DELIVERY OF MRNA AND USES THEREOF	Published	14792712.3	22-Oct-2014	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Japan	CNS DELIVERY OF MRNA AND USES THEREOF	Pending	2016-522098	22-Oct-2014	
Mexico	CNS DELIVERY OF MRNA AND USES THEREOF	Pending	MX/A/2016/005236	22-Oct-2014	
United States of America	MESSENGER RNA THERAPY FOR THE TREATMENT OF OCULAR DISEASES	Converted	61/969483	24-Mar-2014	
Patent Cooperation Treaty	MRNA THERAPY FOR TREATMENT OF OCULAR DISEASES	Published	PCT/US15/21403	19-Mar-2015	
United States of America	MRNA THERAPY FOR THE TREATMENT OF OCULAR DISEASES	Pending	15/128,303	22-Sep-2016	
European Patent Convention	MRNA THERAPY FOR THE TREATMENT OF OCULAR DISEASES	Pending	15767977	19-Mar-2015	
United States of America	METHODS FOR PURIFICATION OF MESSENGER RNA	Converted	61/984503	25-Apr-2014	
United States of America	METHODS FOR PURIFICATION OF MESSENGER RNA	Published	14/696140	24-Apr-2015	
Patent Cooperation Treaty	METHODS FOR PURIFICATION OF MESSENGER RNA	Published	PCT/US15/27563	24-Apr-2015	
Australia	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2015249312	24-Apr-2015	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Brazil	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	BR 11 2016 024632-2	24-Apr-2015	
Canada	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2944800	24-Apr-2015	
China	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2015800194 00.X	24-Apr-2015	
Eurasia	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	201691696	24-Apr-2015	
European Patent Convention	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	15783316.1	24-Apr-2015	
Israel	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	247973	24-Apr-2015	
India	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2016170398 72	24-Apr-2015	
Japan	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2016-562218	24-Apr-2015	
South Korea	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	10-2016-7028137	24-Apr-2015	
Mexico	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	MX/A/2016 /013965	24-Apr-2015	
New Zealand	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	724524	24-Apr-2015	
Singapore	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	1120160872 5Y	24-Apr-2015	
South Africa	METHODS FOR PURIFICATION OF MESSENGER RNA	Pending	2016/06632	24-Apr-2015	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
United States of America	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Converted	62/005266	30-May-2014	
Patent Cooperation Treaty	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Published	PCT/US15/33173	29-May-2015	
Australia	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	2015266764	29-May-2015	
Brazil	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	BR1120160277058	29-May-2015	
Canada	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	N/A	29-May-2015	
China	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	N/A	29-May-2015	
European Patent Convention	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	15799261.1	29-May-2015	
India	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	NA	29-May-2015	
Japan	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	NA	29-May-2015	
United States of America	BIODEGRADABLE LIPIDS FOR DELIVERY OF NUCLEIC ACIDS	Pending	15/314,818	29-Nov-2016	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
United States of America	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	Converted	62/016512	24-Jun-2014	
United States of America	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	Published	14/749027	24-Jun-2015	
Patent Cooperation Treaty	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	Published	PCT/US15/37392	24-Jun-2015	
Australia	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Brazil	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Canada	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Chile	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
China	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF	To Be Filed (30M=Dec. 24)			

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**PATENT**  
**REEL: 042177 FRAME: 0075**

Country Name	Title	Status	Application Number	Filing Date	Patent Number
	NUCLEIC ACIDS				
Eurasian Patent Organization	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
European Patent Convention	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Israel	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
India	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Japan	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Korea, Republic of	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Mexico	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
New Zealand	STEREOCHEMICALLY ENRICHED COMPOSITIONS	To Be Filed (30M=Dec. 24)			

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**PATENT**  
**REEL: 042177 FRAME: 0076**

Country Name	Title	Status	Application Number	Filing Date	Patent Number
	FOR DELIVERY OF NUCLEIC ACIDS				
Peru	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Singapore	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
Ukraine	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
South Africa	STEREOCHEMICALLY ENRICHED COMPOSITIONS FOR DELIVERY OF NUCLEIC ACIDS	To Be Filed (30M=Dec. 24)			
United States of America	ENCAPSULATION OF MESSENGER RNA	Converted	62/020163	02-Jul-2014	
United States of America	ENCAPSULATION OF MESSENGER RNA	Published	14/790562	02-Jul-2015	
Patent Cooperation Treaty	ENCAPSULATION OF MESSENGER RNA	Published	PCT/US15/39004	02-Jul-2015	
Australia	ENCAPSULATION OF MESSENGER RNA	To Be Filed (30 M = Jan. 2)			
Brazil	ENCAPSULATION OF MESSENGER RNA	To Be Filed (30 M = Jan. 2)			

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
Canada	ENCAPSULATION OF MESSENGER RNA	To Be Filed (30 M = Jan. 2)			
China	ENCAPSULATION OF MESSENGER RNA	To Be Filed (30 M = Jan. 2)			
European Patent Convention	ENCAPSULATION OF MESSENGER RNA	To Be Filed (30 M = Jan. 2)			
India	ENCAPSULATION OF MESSENGER RNA	To Be Filed (30 M = Jan. 2)			
Japan	ENCAPSULATION OF MESSENGER RNA	To Be Filed (30 M = Jan. 2)			
United States of America	MRNA THERAPY FOR TREATMENT OF ARTICULAR DISEASE	Converted	62/088141	05-Dec-2014	
United States of America	MESSENGER RNA THERAPY FOR TREATMENT OF ARTICULAR DISEASE	Published	14/959453	04-Dec-2015	
Patent Cooperation Treaty	MESSENGER RNA THERAPY FOR TREATMENT OF ARTICULAR DISEASE	Published	PCT/US15/64023	04-Dec-2015	
United States of America	MRNA THERAPY FOR POMPE DISEASE	Converted	62/135338	19-Mar-2015	
United States of America	MRNA THERAPY FOR POMPE DISEASE	Published	15/073,163	17-Mar-2016	
Patent Cooperation Treaty	MRNA THERAPY FOR POMPE DISEASE	Published	PCT/US16/22895	17-Mar-2016	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
United States of America	MODIFICATION OF RNA-RELATED ENZYMES FOR ENHANCED PRODUCTION	Converted	62/241350	14-Oct-2015	
United States of America	MODIFICATION OF RNA-RELATED ENZYMES FOR ENHANCED PRODUCTION	Pending	15/294,249	14-Oct-2016	
Patent Cooperation Treaty	MODIFICATION OF RNA-RELATED ENZYMES FOR ENHANCED PRODUCTION	Pending	PCT/US16/57044	14-Oct-2016	
United States of America	MULTIMERIC CODING NUCLEIC ACID AND USES THEREOF	Pending	62/320,073	08-Apr-2016	
United States of America	MESSENGER RNA THERAPY FOR THE TREATMENT OF ORNITHINE TRANSCARBAMY LASE DEFICIENCY	Pending	62/349,331	13-Jun-2016	
United States of America	NOVEL LIPID NANOPARTICLE FORMULATIONS OF MRNA	Pending	62/420,413	10-Nov-2016	
United States of America	NOVEL ICE-BASED LIPID NANOPARTICLE FORMULATION FOR DELIVERY OF	Pending	62/420,421	10-Nov-2016	

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Country Name	Title	Status	Application Number	Filing Date	Patent Number
	MRNA				
United States of America	NOVEL ICE-BASED LIPID NANOPARTICLE FORMULATION FOR DELIVERY OF MRNA	Pending	62/421,021	11-Nov-2016	
United States of America	NOVEL ICE-BASED LIPID NANOPARTICLE FORMULATION FOR DELIVERY OF MRNA	Pending	62/420,428	10-Nov-2016	
United States of America	NOVEL ICE-BASED LIPID NANOPARTICLE FORMULATION FOR DELIVERY OF MRNA	Pending	62/421,007	11-Nov-2016	
United States of America	NOVEL FORMULATIONS FOR SUBCUTANEOUS DELIVERY OF NUCLEIC ACIDS	Pending	62/420,435	10-Nov-2016	

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