

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
 Stylesheet Version v1.2

EPAS ID: PAT3902637

SUBMISSION TYPE:	NEW ASSIGNMENT	
NATURE OF CONVEYANCE:	ASSIGNMENT	
CONVEYING PARTY DATA		
	Name	Execution Date
	NOVARTIS VACCINES AND DIAGNOSTICS, INC.	02/27/2015
RECEIVING PARTY DATA		
Name:	NOVARTIS AG	
Street Address:	LICHTSTRASSE 35	
City:	BASEL	
State/Country:	SWITZERLAND	
Postal Code:	4056	
PROPERTY NUMBERS Total: 1		
	Property Type	Number
	Application Number:	15166010
CORRESPONDENCE DATA		
Fax Number:	(617)428-7045	
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>		
Phone:	(617) 428-0200	
Email:	patentadministrator@clarkelbing.com	
Correspondent Name:	CLARK & ELBING LLP	
Address Line 1:	101 FEDERAL STREET	
Address Line 2:	15TH FLOOR	
Address Line 4:	BOSTON, MASSACHUSETTS 02110	
ATTORNEY DOCKET NUMBER:	51093-002003	
NAME OF SUBMITTER:	SUSAN M. MICHAUD, PH.D.	
SIGNATURE:	/Susan M. Michaud, Ph.D./	
DATE SIGNED:	06/03/2016	
Total Attachments: 36		
source=51093-002001, 002002 final assignment from novartis to novartis ag#page1.tif		
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source=51093-002001, 002002 final assignment from novartis to novartis ag#page5.tif		

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The Commonwealth of Massachusetts

William Francis Galvin
Secretary of the Commonwealth

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America

This public document

2. has been signed by: Joanna B. Burns

3. acting in the capacity of: Notary Public

4. bears the seal/stamp of: Joanna B. Burns
whose commission expires on: April 21, 2017

Certified

5. at: Boston, Massachusetts

6. the: 2 March, 2015

7. by: the Secretary of the Commonwealth

8. No.: 1798190

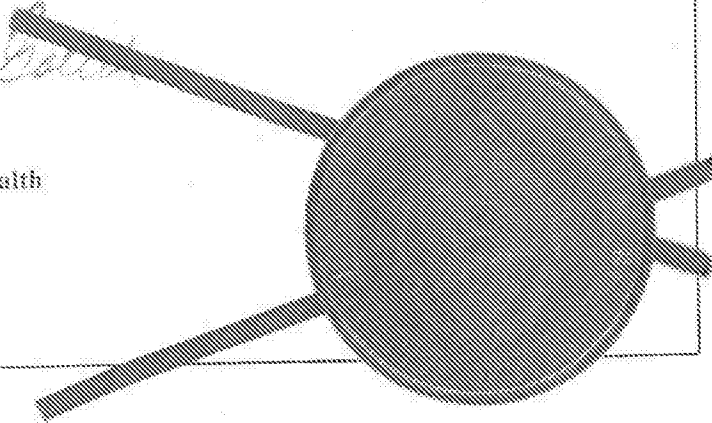
9. Seal/stamp:

Great Seal of the Commonwealth

10. Signature:



William Francis Galvin
Secretary of the Commonwealth



prepared by CChung

PATENT

REEL: 038878 FRAME: 0111

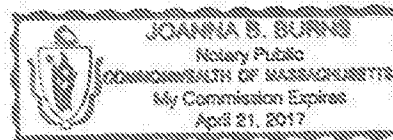
Commonwealth of Massachusetts)
)
County of Middlesex)

On this 27th day of February, 2015, before me, the undersigned notary public, personally appeared Nicholas Finnie and Helen Lee, who proved to me through satisfactory evidence of identification, which were Novartis id badges, to be the persons whose names are signed in my presence on the preceding or attached document on behalf of Novartis Vaccines and Diagnostics, Inc.



Joanna B. Burns
Notary Public

My Commission Expires on April 21, 2017



NOVARTIS PHARMA AG

AND

NOVARTIS VACCINES AND DIAGNOSTICS, INC.

AND

NOVARTIS AG

PATENT ASSIGNMENT AGREEMENT

PATENT

REEL: 038878 FRAME: 0113

Patent Assignment Agreement

This assignment agreement (the "Assignment") is made on 27th February 2015

between:

- (1) NOVARTIS PHARMA AG, a corporation incorporated in Switzerland, having its registered office at Lichtstrasse 35, 4056 Basel, Switzerland, and
 - (2) NOVARTIS VACCINES AND DIAGNOSTICS, Inc., a company incorporated under the laws of Delaware, with an address at 350 Massachusetts Avenue, Cambridge, MA 02139, and
 - (3) NOVARTIS AG, a corporation incorporated in Switzerland, having its registered office at Lichtstrasse 35, 4056 Basel, Switzerland (the "Designee"),
- together the "parties" and each a "party".

Whereas:

- (A) Under that certain agreement dated 1 April 2007, Novartis Vaccines and Diagnostics, S.r.l. has transferred all right, title, and interest in the PAT051491 Patents (as defined below) to Novartis Pharma AG (the "2007 Agreement") and the 2007 Agreement was effective to transfer all right, title, and interest in the PAT051491 Patents to Novartis Pharma AG in certain countries in which the PAT051491 Patents have been prosecuted;
- (B) Under an assignment dated July 15, 2009 (the "2009 Assignment"), executed because of a change of inventorship in the PAT051491 Patents (as defined below), Novartis Vaccines and Diagnostics, Inc. is a co-owner of the PAT051491 Patents in certain countries;
- (C) Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. now seek to designate Designee to receive and hold title to their rights in the PAT051491 Patents (as defined below), and agree to transfer title in and to the PAT051491 Patents to Designee; and
- (D) The PAT051491 Patents (as defined below) have been prosecuted and developed in the intervening years, and the parties desire to clarify and summarize the assets transferred under the 2007 Agreement such that all right, title and interest vest with Designee.

It is agreed as follows:

1. Interpretation

1.1 In this Assignment:

"PAT051491 Patents" means the patents and patent applications listed in Schedule I.

2 **Assignment**

In consideration of the sum of one Euro (€1), receipt of which is hereby acknowledged by Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc., Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. hereby assign to the Designee all of their title in and to the PAT051491 Patents together with all rights, privileges and advantages thereto, including, without limitation, the right to take proceedings and recover damages and obtain all other remedies in respect of past infringements thereof, and the right to claim priority from any patent application therein, to hold unto the Designee absolutely for the full term of the PAT051491 Patents.

3 **Exclusion of Warranties**

Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. grant such title as they may have in the PAT051491 Patents, but exclude any and all warranties (express and/or implied) in relation to the PAT051491 Patents, other than those set out in the 2007 Agreement and in the 2009 Assignment.

4 **Further Assurance**

Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. shall execute all such documents and render all such assistance as may be reasonably required for the purpose of giving full effect to this Assignment, including any documents required to clarify and perfect the chain of title of any of the PAT051491 Patents.

5 **Entire Agreement**

This Assignment is subordinate to the 2007 Agreement and modifies it to the extent that title to the PAT051491 Patents is hereby transferred to Designee. Other than this modification, any other term of this Assignment which is inconsistent with the 2007 Agreement is not applicable to the extent of the inconsistency. Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. acknowledge that they have not been induced to enter into this Assignment by any representation, warranty or undertaking not expressly incorporated into the 2007 Agreement.

6 **Variation**

No variation of this Assignment shall be effective unless in writing and signed by or on behalf of all parties.

7 **Invalidity**

- 7.1 If any provision in this Assignment shall be held to be illegal, invalid or unenforceable, in whole or in part, such provision or part shall to that extent be

deemed not to form part of this Assignment but the legality, validity or enforceability of the remainder of this Assignment shall not be affected.

- 7.2 If any illegal, invalid or unenforceable provision would be legal, valid and enforceable if some part of it were deleted or modified, the provision shall apply with whatever deletion or modification is necessary to give effect to the commercial intention of the parties.

8 **Governing Law and Submission to Jurisdiction**

- 8.1 This Assignment and any non-contractual obligations arising out of it shall be governed by, and construed in accordance with, the laws of Switzerland.

- 8.2 The parties irrevocably agree that the courts of Switzerland shall have exclusive jurisdiction to settle any dispute, whether contractual or non-contractual, which may arise out of or in connection with this Assignment. The parties irrevocably submit to the jurisdiction of such courts and waive any objection to proceedings in any such court on the ground of venue or on the ground that the proceedings have been brought in an inconvenient forum.

9 **Execution**

The parties may execute this Agreement in multiple counterparts, each of which constitutes an original, and all of which, collectively, constitute only one agreement. The signatures of all of the parties need not appear on the same counterpart.

IN WITNESS whereof this Assignment has been duly executed on the date first set out above.

For and on behalf of Novartis Vaccines and Diagnostics, Inc.

Signature:	<u></u>	<u></u>
Name:	<u>Helen Lee</u>	<u>Nicholas Finnie</u>
Title:	<u>Assistant Secretary</u>	<u>Company Officer</u>

For and on behalf of Novartis Pharma AG

Signature:	<u></u>	<u></u>
Name:	<u></u>	<u></u>
Title:	<u></u>	<u></u>

For and on behalf of Novartis AG

Signature:	<u></u>	<u></u>
Name:	<u></u>	<u></u>
Title:	<u></u>	<u></u>

SCHEDULE 1
PAT051491 Patents

Schedule 1

Case reference	Country	Filing Number	Filing	Grant Number	Registered Owners (List)
PAT051491-AT-EPT01	Austria	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-AU-PCT	Australia	2002214127	29 Oct 2001	2002214127	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD	Australia	2004226909	02 Nov 2004	2004226909	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD02	Australia	2008200977	25 Feb 2008	2008200977	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD03	Australia	2010200611	10 Feb 2010	2010200611	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD04	Australia	2012200299	18 Jan 2012	2012200299	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD05	Australia	2014274586	11 Dec 2014		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-BE-EPT01	Belgium	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-CA-PCT	Canada	2428303	29 Oct 2001		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-CA-PCTD	Canada	2,881,568			Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-CH-EPT01	Switzerland	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-DE-EPT01	Germany	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-DE-ETD04	Germany	10179737.1	25 Sep 2010	20148256.5	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-DK-EPT01	Denmark	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-ETD	European Procedure	06075446.2	29 Oct 2001		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-ETD02	European Procedure	09004551.9	30 Mar 2009		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-ETD03	European Procedure	10179744.7	25 Sep 2010		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-ETD05	European Procedure	13154233.8			Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-ES-EPT01	Spain	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-FR-EPT01	France	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-FR-ETD04	France	10179737.1	25 Sep 2010	EP2277695	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-GB-EPT01	United Kingdom	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-GB-ETD04	United Kingdom	10179737.1	25 Sep 2010	EP2277695	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-HK-FPR	Hong Kong	11108521.0	15 Aug 2011		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-HK-FPR02	Hong Kong	11107796.6	26 Jul 2011	1153754	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-HK-FPR03	Hong Kong	11107796.6	26 Jul 2011		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-IE-EPT01	Ireland	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-IL-PCT	Israel	154853	28 Oct 2001	154853	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IL-PCTD	Israel	202254	03 Dec 2008		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IL-PCTD02	Israel	211775	29 Oct 2011		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IL-PCTD03	Israel				Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IN-PCT	India	461/KOLNP/2003	29 Oct 2001	226459	Chiron Spa; J. Craig Venter Institute
PAT051491-IN-PCTD	India	4620/KOLNP/2007	17 Oct 2007		Chiron Spa; J. Craig Venter Institute
PAT051491-IN-PCTD02	India				Chiron Spa; J. Craig Venter Institute
PAT051491-IT-EPT01	Italy	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCT	Japan	2004-571012	29 Oct 2001	4254931	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD02	Japan	2008-317741	12 Dec 2008	4874323	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD03	Japan	2011-139927	23 Jun 2011		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD04	Japan	2013-43775	06 Mar 2013		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD05	Japan				Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-MX-PCT	Mexico	PA/a/03/003630	29 Oct 2001	276471	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-MX-PCTD	Mexico	MX/a/2007/015135	30 Nov 2007	291635	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-MX-PCTD02	Mexico	MX/a/2011/000938	24 Jan 2011	305943	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute

PAT051491-MX- PCTD03	Mexico	MX/a/2012/00661 43	29 Nov 2012		Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-MX- PCTD04	Mexico	MX/s/2015/001810			Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-NL-EPT01	Netherlands	01982564.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l. (J. Craig Venter Institute
PAT051491-NZ-PC1	New Zealand	524888	29 Oct 2001	524888	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-NZ-PC1D	New Zealand	540544	29 Oct 2001	540544	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-NZ- PCTD02	New Zealand	560966	27 Aug 2007	560966	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-NZ- PCTD03	New Zealand	583028	02 Feb 2010	583028	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-NZ- PCTD04	New Zealand	593617	15 Jun 2011	593617	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-NZ- PCTD05	New Zealand	594677	29 Aug 2011	594677	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-SE-EPT01	Sweden	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l. (J. Craig Venter Institute
PAT051491-SG-PC1	Singapore	200301161-6	29 Oct 2001	95354	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-SG-PC1D	Singapore	200504052-2	27 Jun 2005	165961	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-US-CNT01	United States of	11/434203	16 May 2006	8431139	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-US-CNT02	United States of	11/434127	16 May 2006	7955604	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-US-CNT04	United States of	11/434199	16 May 2006	8137673	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-US-PC1	United States of	10/415182	29 Oct 2001	7939087	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-US-PC1D	United States of	11/434184	16 May 2006	8025690	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-US- PCTD02	United States of	13/038657	30 Aug 2012	(abandoned)	Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-US- PCTD03	US	14/615,100	5 Feb 2014		Novartis Vaccines and Diagnostics, Inc. (J. Craig Venter Institute
PAT051491-ZA-PC1	South Africa	2603/2739	29 Oct 2001	2603/2739	Chiron Spa (J. Craig Venter Institute

Dr. Balhassar Besserdich
Anwalt und Notar

Kellerhals Anwälte Hirschgässlein 11 CH-4010 Basel
Telefon +41 78 200 30 00 Fax +41 58 200 30 11 www.kellerhals.ch

KELLERHALS

NOTARIAT | NOTARIES PUBLIC

NOVARTIS PHARMA AG

AND

NOVARTIS VACCINES AND DIAGNOSTICS, INC.

AND

NOVARTIS AG

PATENT ASSIGNMENT AGREEMENT

Patent Assignment Agreement

This assignment agreement (the "Assignment") is made on 27th February 2015

between:

- (1) NOVARTIS PHARMA AG, a corporation incorporated in Switzerland, having its registered office at Lichtstrasse 35, 4056 Basel, Switzerland, and
 - (2) NOVARTIS VACCINES AND DIAGNOSTICS, Inc., a company incorporated under the laws of Delaware, with an address at 350 Massachusetts Avenue, Cambridge, MA 02139, and
 - (3) NOVARTIS AG, a corporation incorporated in Switzerland, having its registered office at Lichtstrasse 35, 4056 Basel, Switzerland (the "Designee"),
- together the "parties" and each a "party".

Whereas:

- (A) Under that certain agreement dated 1 April 2007, Novartis Vaccines and Diagnostics, S.r.l. has transferred all right, title, and interest in the PAT051491 Patents (as defined below) to Novartis Pharma AG (the "2007 Agreement") and the 2007 Agreement was effective to transfer all right, title, and interest in the PAT051491 Patents to Novartis Pharma AG in certain countries in which the PAT051491 Patents have been prosecuted;
- (B) Under an assignment dated July 15, 2009 (the "2009 Assignment"), executed because of a change of inventorship in the PAT051491 Patents (as defined below), Novartis Vaccines and Diagnostics, Inc. is a co-owner of the PAT051491 Patents in certain countries;
- (C) Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. now seek to designate Designee to receive and hold title to their rights in the PAT051491 Patents (as defined below), and agree to transfer title in and to the PAT051491 Patents to Designee; and
- (D) The PAT051491 Patents (as defined below) have been prosecuted and developed in the intervening years, and the parties desire to clarify and summarize the assets transferred under the 2007 Agreement such that all right, title and interest vest with Designee.

It is agreed as follows:

1. Interpretation

1.1 In this Assignment:

"PAT051491 Patents" means the patents and patent applications listed in Schedule 1.

2 **Assignment**

In consideration of the sum of one Euro (€1), receipt of which is hereby acknowledged by Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc., Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. hereby assign to the Designee all of their title in and to the PAT051491 Patents together with all rights, privileges and advantages thereto, including, without limitation, the right to take proceedings and recover damages and obtain all other remedies in respect of past infringements thereof, and the right to claim priority from any patent application therein, to hold unto the Designee absolutely for the full term of the PAT051491 Patents.

3 **Exclusion of Warranties**

Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. grant such title as they may have in the PAT051491 Patents, but exclude any and all warranties (express and/or implied) in relation to the PAT051491 Patents, other than those set out in the 2007 Agreement and in the 2009 Assignment.

4 **Further Assurance**

Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. shall execute all such documents and render all such assistance as may be reasonably required for the purpose of giving full effect to this Assignment, including any documents required to clarify and perfect the chain of title of any of the PAT051491 Patents.

5 **Entire Agreement**

This Assignment is subordinate to the 2007 Agreement and modifies it to the extent that title to the PAT051491 Patents is hereby transferred to Designee. Other than this modification, any other term of this Assignment which is inconsistent with the 2007 Agreement is not applicable to the extent of the inconsistency. Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. acknowledge that they have not been induced to enter into this Assignment by any representation, warranty or undertaking not expressly incorporated into the 2007 Agreement.

6 **Variation**

No variation of this Assignment shall be effective unless in writing and signed by or on behalf of all parties.

7 **Invalidity**

8 If any provision in this Assignment shall be held to be illegal, invalid or unenforceable, in whole or in part, such provision or part shall to that extent be

deemed not to form part of this Assignment but the legality, validity or enforceability of the remainder of this Assignment shall not be affected.

- 7.2 If any illegal, invalid or unenforceable provision would be legal, valid and enforceable if some part of it were deleted or modified, the provision shall apply with whatever deletion or modification is necessary to give effect to the commercial intention of the parties.

8 Governing Law and Submission to Jurisdiction

- 8.1 This Assignment and any non-contractual obligations arising out of it shall be governed by, and construed in accordance with, the laws of Switzerland.

- 8.2 The parties irrevocably agree that the courts of Switzerland shall have exclusive jurisdiction to settle any dispute, whether contractual or non-contractual, which may arise out of or in connection with this Assignment. The parties irrevocably submit to the jurisdiction of such courts and waive any objection to proceedings in any such court on the ground of venue or on the ground that the proceedings have been brought in an inconvenient forum.

9 Execution

The parties may execute this Agreement in multiple counterparts, each of which constitutes an original, and all of which, collectively, constitute only one agreement. The signatures of all of the parties need not appear on the same counterpart.

IN WITNESS whereof this Assignment has been duly executed on the date first set out above.

For and on behalf of Novartis Vaccines and Diagnostics, Inc.

Signature: _____
Name: _____
Title: _____

For and on behalf of Novartis Pharma AG

Signature: _____
Name: _____
Title: _____

Marc Spliagard
Marc Spliagard
authorized signatory

Dr. Christof G. Stachol
Dr. Christof G. Stachol
authorized signatory

For and on behalf of Novartis AG

Signature: _____
Name: _____
Title: _____

SCHEDULE 1
PAT051491 Patents

Schedule 1

Case reference	Country	Filing Number	Filing	Grant Number	Registered Owners (Lia)
PAT051491-AT-EPT01	Austria	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-AU-PCT	Australia	2002214127	29 Oct 2001	2002214127	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD	Australia	2004226909	02 Nov 2004	2004226909	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD02	Australia	2008200977	28 Feb 2008	2008200977	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD03	Australia	2010200611	10 Feb 2010	2010200611	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD04	Australia	2012200299	18 Jan 2012	2012200299	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-AU-PCTD05	Australia	2014274585	11 Dec 2014		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-BE-EPT01	Belgium	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-CA-PCT	Canada	2425303	29 Oct 2001		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-CA-PCTD	Canada	2,881,568			Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-CH-EPT01	Switzerland	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-DE-EPT01	Germany	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-DE-ETD04	Germany	10179737.1	25 Sep 2010	60148256.5	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-DK-EPT01	Denmark	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-EYD	European Procedure	06075446.2	29 Oct 2001		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-ETD02	European Procedure	09004551.9	30 Mar 2009		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-ETD03	European Procedure	10179744.7	25 Sep 2010		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-EP-ETD09	European Procedure	15154238.8			Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-ES-EPT01	Spain	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-FR-EPT01	France	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-FR-ETD04	France	10179737.1	25 Sep 2010	EP2277895	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-GB-EPT01	United Kingdom	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-GB-ETD04	United Kingdom	10179737.1	25 Sep 2010	EP2277895	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-HK-FPR	Hong Kong	11108521.8	15 Aug 2011		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-HK-FPR02	Hong Kong	11107798.8	26 Jul 2011	1153754	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-HK-FPR03	Hong Kong	11107798.6	26 Jul 2011		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-IE-EPT01	Ireland	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-IL-PCT	Israel	154853	29 Oct 2001	154853	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IL-PCTD	Israel	202254	03 Dec 2009		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IL-PCTD02	Israel	211775	29 Oct 2011		Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IL-PCTD03	Israel				Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-IN-PCT	India	461/KOLNP/2003	29 Oct 2001	226459	Chiron Spa.; Craig Venter Institute
PAT051491-IN-PCTD	India	4020/KOLNP/2007	17 Oct 2007		Chiron Spa.; Craig Venter Institute
PAT051491-IN-PCTD02	India				Chiron Spa.; Craig Venter Institute
PAT051491-IT-EPT01	Italy	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCT	Japan	2004-571012	29 Oct 2001	4254931	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD02	Japan	2008-317741	12 Dec 2008	4874323	Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD03	Japan	2011-138927	23 Jun 2011		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD04	Japan	2013-43775	06 Mar 2013		Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-JP-PCTD05	Japan				Novartis Vaccines and Diagnostics S.r.l.; Craig Venter Institute
PAT051491-MX-PCT	Mexico	PA/a/03/003690	29 Oct 2001	276471	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-MX-PCTD	Mexico	MX/a/2007/015135	30 Nov 2007	291635	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute
PAT051491-MX-PCTD02	Mexico	MX/a/2011/000938	24 Jan 2011	303943	Novartis Vaccines and Diagnostics, Inc.; Craig Venter Institute

AT051491-MX- PCT002	Mexico	MX/a/2012/0061 43	29 Nov 2012		Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-MX- PCT004	Mexico	MX/a/2015/001810			Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-NL-EPT01	Netherlands	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l.; J. Craig Venter Institute
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AT051491-NZ- PCT002	New Zealand	560966	27 Aug 2007	560966	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-NZ- PCT003	New Zealand	583028	02 Feb 2010	583028	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
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AT051491-NZ- PCT005	New Zealand	594877	29 Aug 2011	594877	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
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AT051491-SG-PCT	Singapore	200301181.6	29 Oct 2001	95354	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-SG-PCTD	Singapore	200504052.2	27 Jun 2003	165961	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-US-CNT01	United States of	11/434203	16 May 2006	8431139	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-US-CNT02	United States of	11/434127	16 May 2006	7959604	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-US-CNT04	United States of	11/434193	16 May 2006	8137673	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-US-PCT	United States of	10/415182	29 Oct 2001	7939087	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-US-PCTD	United States of	11/434194	16 May 2006	8025890	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-US- PCT002	United States of	13/598657	30 Aug 2012	abandoned	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-US- PCT003	US	14/615,108	5 Feb 2014		Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
AT051491-ZA-PCT	South Africa	2003/2739	29 Oct 2001	2003/2739	Chiron Spa; J. Craig Venter Institute

Legalisation

The undersigned Notary Public of the Canton of Basel-City (Switzerland) Dr. Balthasar Bessenich herewith legalises based on the comparison with doubtless true signatures the signature of the company **Novartis Pharma AG**, in Basel (CHE-106.052.527), Canton of Basel-City (Switzerland), affixed by Ms. Dr. Claudia Götz Stachelin, citizen of Basel, domiciled in Riehen, Canton of Basel-City (Switzerland), and Mr. Dr. Marc Spilisgardt, citizen of Schaffhausen, domiciled in Basel, Canton of Basel-City (Switzerland), both persons having joint signatory power ~~and so~~.

Basel, 02 March 2015.

BR 2015/174

[Signature]
[Signature]
Dr. B. Bessenich
Notar

APOSTILLE

(Convention de la Haye du 6 octobre 1961)

Country Swiss Confederation, Canton of Basel-City
Land Schweizerische Eidgenossenschaft, Kanton Basel-Stadt

This public document
Diese öffentliche Urkunde

has been signed by Dr. iur. Balthasar Bessenich
ist unterschrieben von

acting in the capacity of notary public
in seiner Eigenschaft als

bears the stamp/seal of Bessenich Balthasar
Sie ist versehen mit dem
Stempel/Siegel des/der

Certified / Bestätigt

at / in Basel 6. the / am 02.03.2015

by the Legalisation Office of the Canton of Basel-City
durch das Beglaubigungsbüro des Kantons Basel-Stadt

No. / Nr. 46252 tax / Taxe CHF 20.00

stamp/seal 10. Signature Hanna Lauener
Stempel/Siegel Unterschrift



[Signature]

PATENT

REEL: 038878 FRAME: 0129

NOVARTIS PHARMA AG

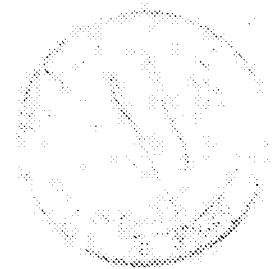
AND

NOVARTIS VACCINES AND DIAGNOSTICS, INC.

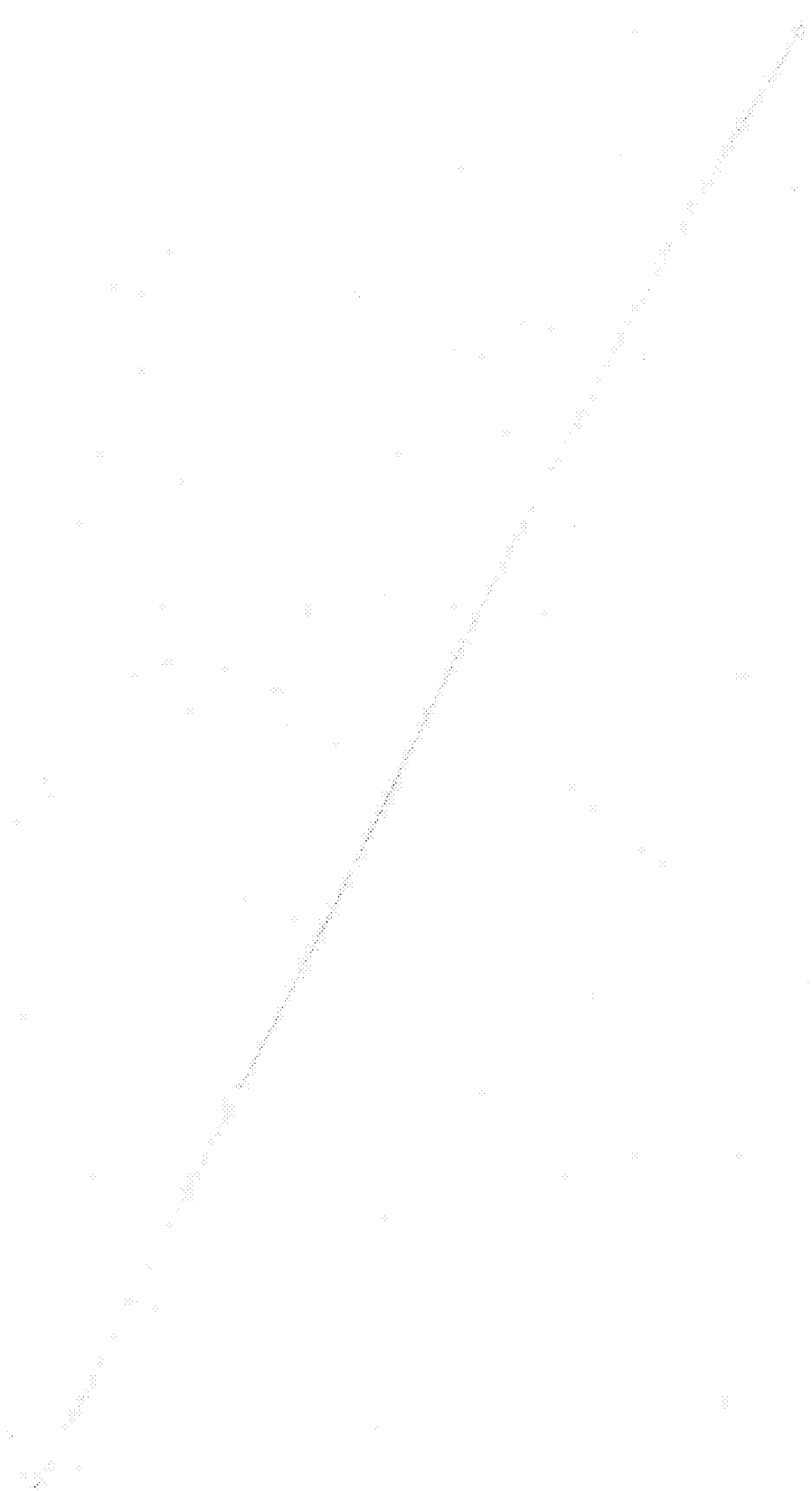
AND

NOVARTIS AG

PATENT ASSIGNMENT AGREEMENT



[Handwritten signature]



Patent Assignment Agreement

This assignment agreement (the "Assignment") is made on 27th February 2015

between:

- (1) NOVARTIS PHARMA AG, a corporation incorporated in Switzerland, having its registered office at Lichtstrasse 35, 4056 Basel, Switzerland, and
 - (2) NOVARTIS VACCINES AND DIAGNOSTICS, Inc., a company incorporated under the laws of Delaware, with an address at 350 Massachusetts Avenue, Cambridge, MA 02139, and
 - (3) NOVARTIS AG, a corporation incorporated in Switzerland, having its registered office at Lichtstrasse 35, 4056 Basel, Switzerland (the "Designee"),
- together the "parties" and each a "party".

Whereas:

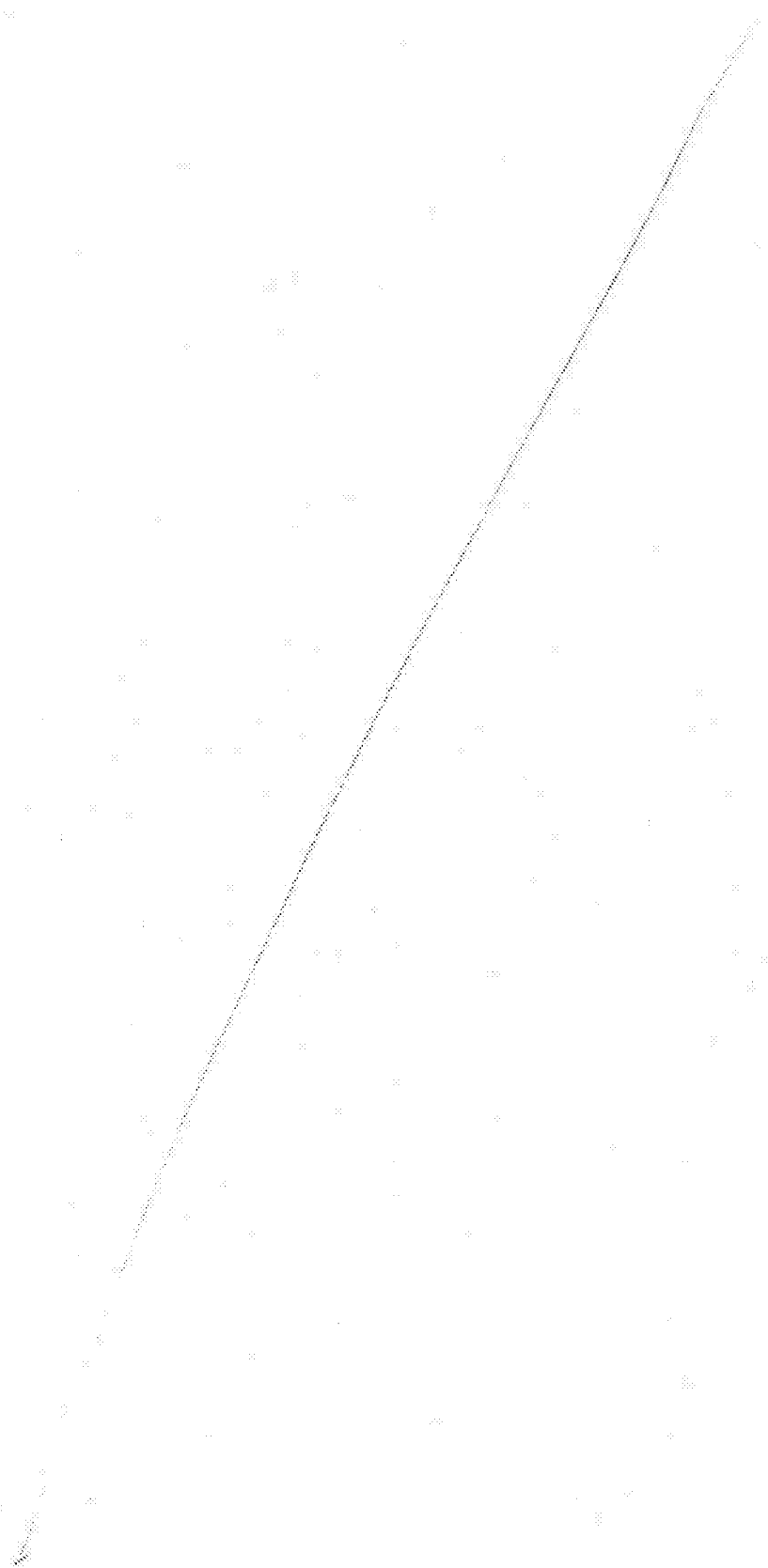
- (A) Under that certain agreement dated 1 April 2007, Novartis Vaccines and Diagnostics, S.r.l. has transferred all right, title, and interest in the PAT051491 Patents (as defined below) to Novartis Pharma AG (the "2007 Agreement") and the 2007 Agreement was effective to transfer all right, title, and interest in the PAT051491 Patents to Novartis Pharma AG in certain countries in which the PAT051491 Patents have been prosecuted;
- (B) Under an assignment dated July 15, 2009 (the "2009 Assignment"), executed because of a change of inventorship in the PAT051491 Patents (as defined below), Novartis Vaccines and Diagnostics, Inc. is a co-owner of the PAT051491 Patents in certain countries;
- (C) Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. now seek to designate Designee to receive and hold title to their rights in the PAT051491 Patents (as defined below), and agree to transfer title in and to the PAT051491 Patents to Designee; and
- (D) The PAT051491 Patents (as defined below) have been prosecuted and developed in the intervening years, and the parties desire to clarify and summarize the assets transferred under the 2007 Agreement such that all right, title and interest vest with Designee.

It is agreed as follows:

1 Interpretation

1.1 In this Assignment:

"PAT051491 Patents" means the patents and patent applications listed in Schedule 1.



2 **Assignment**

In consideration of the sum of one Euro (€1), receipt of which is hereby acknowledged by Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc., Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. hereby assign to the Designee all of their title in and to the PAT051491 Patents together with all rights, privileges and advantages thereto, including, without limitation, the right to take proceedings and recover damages and obtain all other remedies in respect of past infringements thereof, and the right to claim priority from any patent application therein, to hold unto the Designee absolutely for the full term of the PAT051491 Patents.

3 **Exclusion of Warranties**

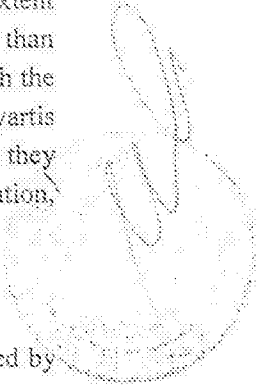
Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. grant such title as they may have in the PAT051491 Patents, but exclude any and all warranties (express and/or implied) in relation to the PAT051491 Patents, other than those set out in the 2007 Agreement and in the 2009 Assignment.

4 **Further Assurance**

Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. shall execute all such documents and render all such assistance as may be reasonably required for the purpose of giving full effect to this Assignment, including any documents required to clarify and perfect the chain of title of any of the PAT051491 Patents.

5 **Entire Agreement**

This Assignment is subordinate to the 2007 Agreement and modifies it to the extent that title to the PAT051491 Patents is hereby transferred to Designee. Other than this modification, any other term of this Assignment which is inconsistent with the 2007 Agreement is not applicable to the extent of the inconsistency. Novartis Pharma AG and Novartis Vaccines and Diagnostics, Inc. acknowledge that they have not been induced to enter into this Assignment by any representation, warranty or undertaking not expressly incorporated into the 2007 Agreement.



6 **Variation**

No variation of this Assignment shall be effective unless in writing and signed by or on behalf of all parties.

7 **Invalidity**

- 7.1 If any provision in this Assignment shall be held to be illegal, invalid or unenforceable, in whole or in part, such provision or part shall to that extent be



deemed not to form part of this Assignment but the legality, validity or enforceability of the remainder of this Assignment shall not be affected.

- 7.2 If any illegal, invalid or unenforceable provision would be legal, valid and enforceable if some part of it were deleted or modified, the provision shall apply with whatever deletion or modification is necessary to give effect to the commercial intention of the parties.

8 Governing Law and Submission to Jurisdiction

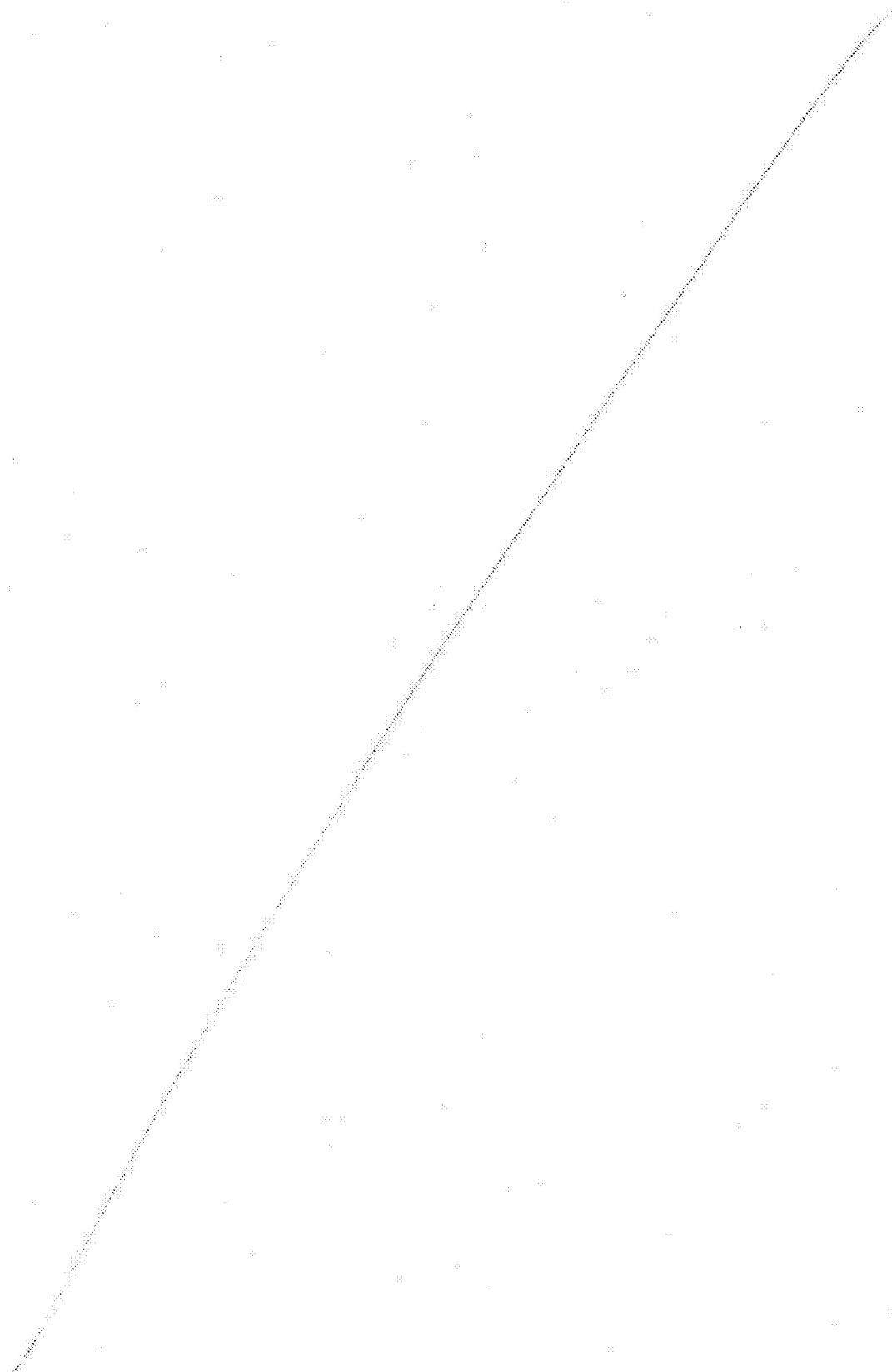
- 8.1 This Assignment and any non-contractual obligations arising out of it shall be governed by, and construed in accordance with, the laws of Switzerland.
- 8.2 The parties irrevocably agree that the courts of Switzerland shall have exclusive jurisdiction to settle any dispute, whether contractual or non-contractual, which may arise out of or in connection with this Assignment. The parties irrevocably submit to the jurisdiction of such courts and waive any objection to proceedings in any such court on the ground of venue or on the ground that the proceedings have been brought in an inconvenient forum.

9 Execution

The parties may execute this Agreement in multiple counterparts, each of which constitutes an original, and all of which, collectively, constitute only one agreement. The signatures of all of the parties need not appear on the same counterpart.

IN WITNESS whereof this Assignment has been duly executed on the date first set out above.

A handwritten signature in dark ink is written over a circular, faint stamp. The signature is slanted and appears to be a stylized name. The stamp is mostly illegible but seems to contain some text around the perimeter.A handwritten signature in dark ink, slanted and stylized, located at the bottom right of the page.



For and on behalf of Novartis Vaccines and Diagnostics, Inc.

Signature: _____

Name: _____

Title: _____

For and on behalf of Novartis Pharma AG

Signature: _____

Name: _____

Title: _____

For and on behalf of Novartis AG

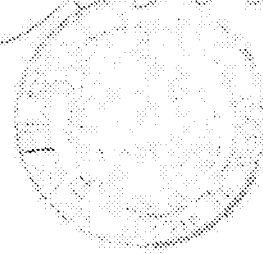
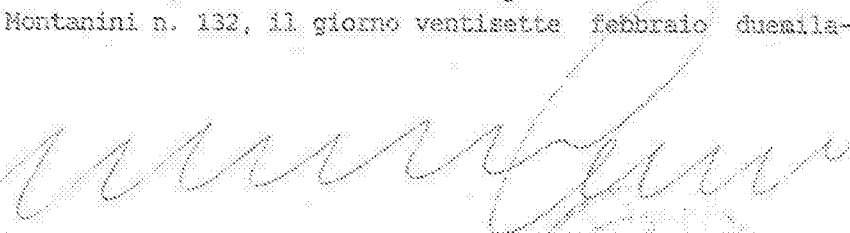
Signature:  _____

Name: STEPHEN EVANS MARTA PAUL

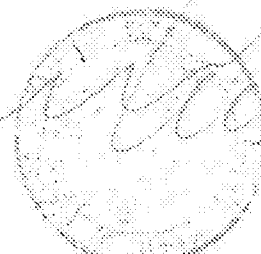
Title: SENIOR PATENT ATTORNEY, Authorized Signatory



Vera è la firma del Signor Evans Stephen John Eves, nato ad Ely (Gran Bretagna e Irlanda del Nord) il 14 giugno 1973, residente in Siena, Via Costa di Sant'Antonio n. 5, Senior Patent Attoreny.
Siena, Via dei Montanini n. 132, il giorno ventisette febbraio duemila-
quindici.



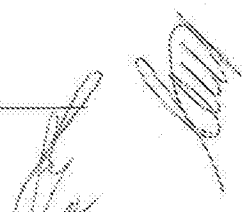
Vera è la firma della Signora Palla Marta, nata a Torino il 26 dicembre 1977, residente a Siena, Via Verdi n. 4, Patent Paralegal.
Siena, Via dei Montanini n. 132, il giorno ventisette febbraio duemila-
quindici.

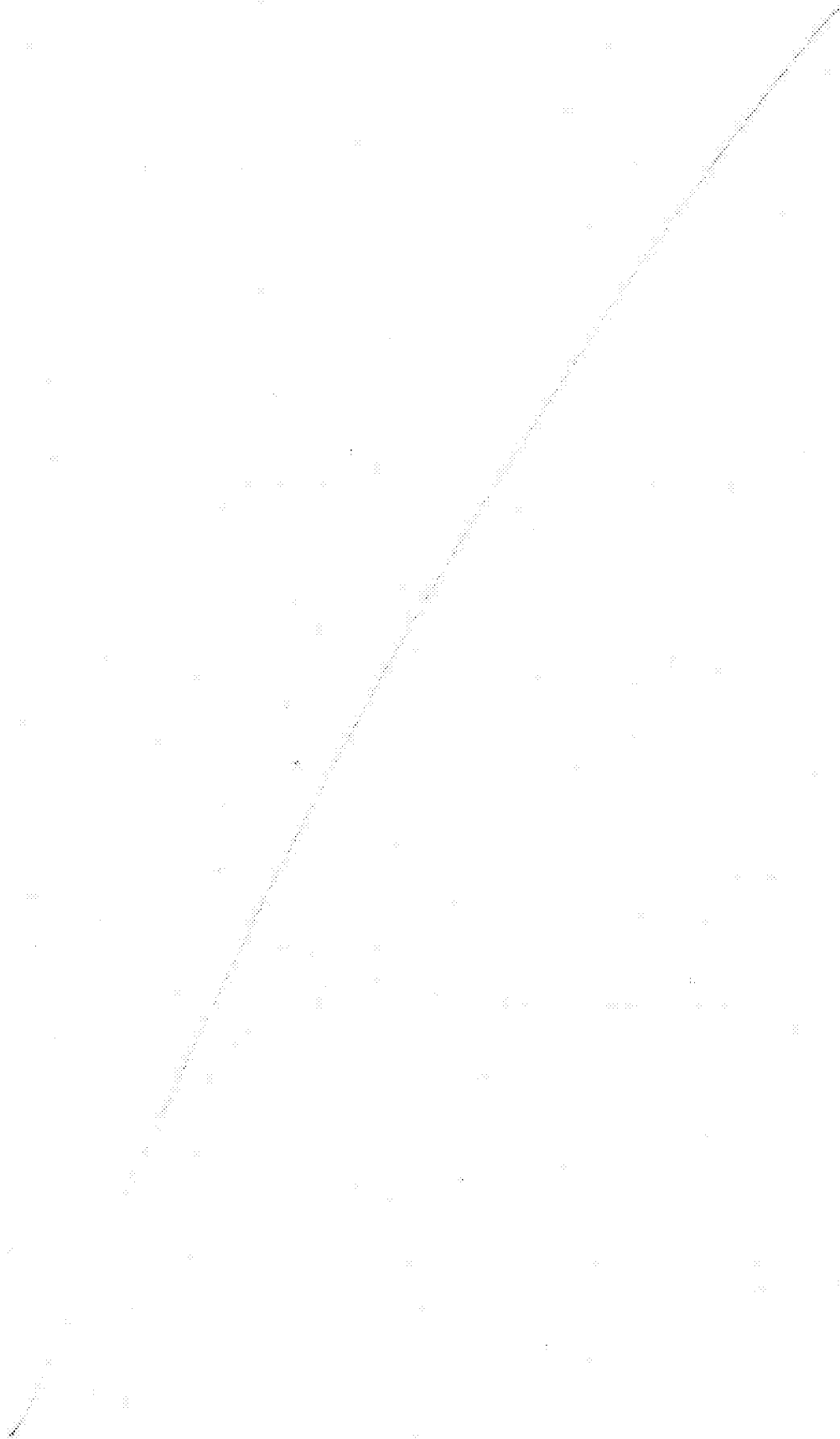


SCHEDULE I
PAT651491 Patents

PRODOTTA DALLA REPUBBLICA
DI SAN MARINO

Apposito	
(Convalida del 14 Marzo del 1951)	
1. Nome	IPUB
2. Tipologia	2. ANNO 1951
3. Data di nascita	1951
4. Data di morte	2. ANNO 1951
5. Data di morte	05 MAR 2015
6. Data di morte	Repubblica. soc
7. Data di morte	25/3/25
8. Data di morte	25/3/25
9. Data di morte	25/3/25
10. Data di morte	25/3/25



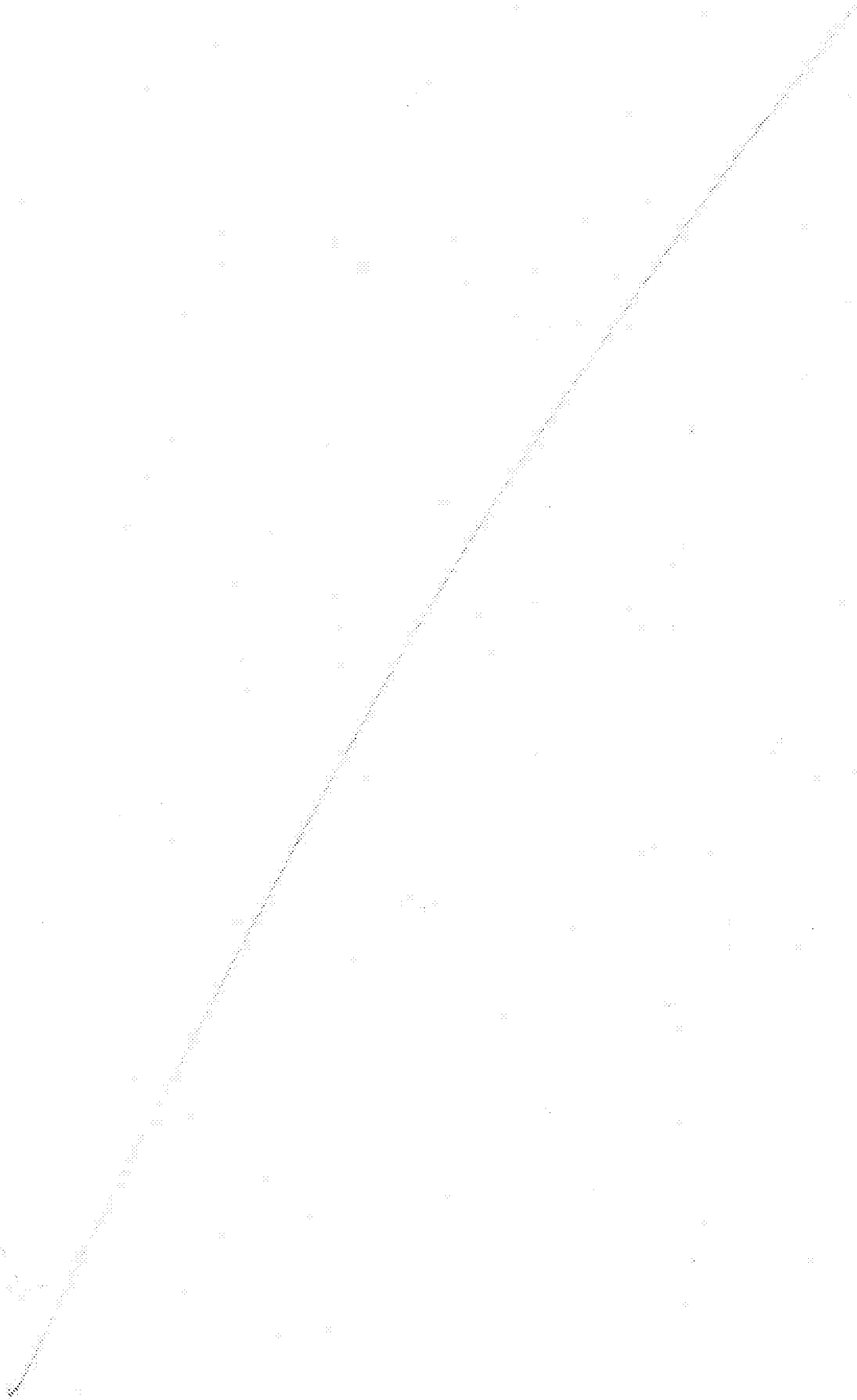


Schedule 1

Case reference	Country	Filing Number	Filing	Grant Number	Registered Owners (List)
PAT051491-AT-EPT01	Austria	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-AU-PCT	Australia	2002214127	29 Oct 2001	2002214127	Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-AU-PCTD	Australia	2004226909	02 Nov 2004	2004226909	Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-AU-PCTD02	Australia	2008200977	28 Feb 2008	2008200977	Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-AU-PCTD03	Australia	2010200811	10 Feb 2010	2010200811	Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-AU-PCTD04	Australia	2012200299	18 Jan 2012	2012200299	Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-AU-PCTD05	Australia	2014274588	11 Dec 2014		Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-BE-EPT01	Belgium	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-CA-PCT	Canada	2425303	29 Oct 2001		Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-CA-PCTD	Canada	2,881,568			Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-CH-EPT01	Switzerland	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-DE-EPT01	Germany	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-DE-ETD04	Germany	10179737.1	25 Sep 2010	60148258.5	Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-DK-EPT01	Denmark	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-EP-ETD	European Procedure	06075446.2	29 Oct 2001		Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-EP-ETD02	European Procedure	09004881.9	30 Mar 2009		Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-EP-ETD03	European Procedure	10179744.7	25 Sep 2010		Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-EP-ETD09	European Procedure	25154238.8			Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-ES-EPT01	Spain	01982584.3	29 Oct 2001	1328543	Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
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PAT051491-JP-PCTD03	Japan	2011-139927	23 Jun 2011		Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-JP-PCTD04	Japan	2013-43775	06 Mar 2013		Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
PAT051491-JP-PCTD05	Japan				Novartis Vaccines and Diagnostics S.r.l./J. Craig Venter Institute
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PAT051491-MX-PCTD	Mexico	MX/a/2007/015135	30 Nov 2007	291635	Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute
PAT051491-MX-PCTD02	Mexico	MX/a/2011/000938	24 Jan 2011	305943	Novartis Vaccines and Diagnostics, Inc./J. Craig Venter Institute

PATENT

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PAT051491-MX-PCTD03	Mexico	MX/a/2012/006143	29 Nov 2012		Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
PAT051491-MX-PCTD04	Mexico	MX/s/2015/001810			Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
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PAT051491-SG-PCTD	Singapore	200504052-2	27 Jun 2005	165981	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
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PAT051491-US-CNT02	United States of	11/434127	16 May 2006	7955604	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
PAT051491-US-CNT04	United States of	11/434199	16 May 2006	8137673	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
PAT051491-US-PCT	United States of	10/415182	29 Oct 2001	7959087	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
PAT051491-US-PCTD	United States of	11/434184	16 May 2006	8025890	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
PAT051491-US-PCTD02	United States of	13/598657	30 Aug 2012	(abandoned)	Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
PAT051491-US-PCTD03	US	14/615,108	5 Feb 2014		Novartis Vaccines and Diagnostics, Inc.; J. Craig Venter Institute
PAT051491-ZA-PCT	South Africa	2003/2739	29 Oct 2001	2003/2739	Chiron SpA; J. Craig Venter Institute

