UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMGEN INC.
Petitioner,

v.

ALEXION PHARMACEUTICALS, INC.
Patent Owner.

Case IPR2019-00741
U.S. Patent No. 9,732,149

DECLARATION OF MICHEL C. NUSSENZWEIG, M.D., Ph.D.

Mail Stop **PATENT BOARD**
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

I, Michel C. Nussenzweig, M.D., Ph.D., hereby declare and say as follows:

I. INTRODUCTION

1. I am over the age of eighteen (18) years and otherwise competent to make this declaration. If called to testify in the above-captioned matter, I could and would testify about the information in this declaration.

2. I was asked to consult in this proceeding regarding the sequencing of genetic material the hybridoma with ATCC designation HB-11625 ("hybridoma HB-11625"), maintained by ATCC, corresponding to the murine antibody sequences, to determine the sequence of the mouse monoclonal antibody "5G1.1." I understand 5G1.1 is the antibody produced from hybridoma HB-11625. (ALXN2074.)

3. This Declaration sets forth my experience, and my review and analysis of the sequencing of genetic material from hybridoma HB-11625 by the laboratory GenScript Inc. located in Piscataway, New Jersey.

4. I am being compensated at my normal rate of $ 1000/hr for the time consulting on this matter. No part of my compensation is dependent on the outcome of this proceeding, and I have no other interest in this proceeding.

II. EXPERIENCE AND QUALIFICATIONS

5. I am a distinguished Zanvil A. Cohn and Ralph Steinman Professor at The Rockefeller University, and head of the Laboratory of Molecular Immunology at The Rockefeller University and a Howard Hughes Medical Institute investigator.

6. My educational background includes me graduating summa cum laude with a B.A. degree from New York University College of Arts and Sciences in 1975. In 1981 and 1982, I received my Ph.D. in cellular immunology and M.D., respectively, from The Rockefeller University and New York University School of Medicine.

7. After I earned my M.D., I went on to complete an internship and residency in internal medicine, and a clinical fellowship in infectious diseases at Massachusetts General Hospital in 1985. From 1986 to 1989, I was a postdoctoral fellow in genetics in the Harvard Medical School laboratory of Philip Leder.

8. After I completed a postdoctoral fellowship, I became an Assistant Professor at The Rockefeller University in 1990, and I became an Associate Professor in 1994, and then a Professor and Senior Physician in 1996.

9. I have received numerous honors and awards, including the Meritorious Career Award from the American Association of Immunologists–Huang Foundation (2004); the Lee C. Howley Sr. Prize for Arthritis Research, (2008); Brazilian Diaspora Award (2015); Rabbi Shai Shacknai Memorial Prize in

Immunology and Cancer Research (2016); Robert Koch Award (2016); AAI-BioLegend Herzenberg Award (2017); Sanofi-Institut Pasteur Award (2017).

10. I am currently a member of numerous honorary and professional societies including the U.S. National Academy of Medicine, the U.S. National Academy of Sciences, the American Academy of Arts and Sciences, and the Brazilian Academy of Sciences; the American Association of Immunologists; the American Medical Association; the New York Academy of Sciences; the American Society for clinical investigation and the American Society for Microbiology.

11. I have published more than 300 original scholarly works as peer-reviewed journals, chapters, reviews and books in the field of immunology. My current research focuses on molecular aspects of the body's innate and adaptive immune responses, and the physiological function and development of dendritic cells.

12. I am the Editor of the Journal of Immunological Methods, and the co-Chair of the Editorial Board of the Journal of Experimental Medicine.

13. A further description of my background, awards, and qualifications can be found in my curriculum vitae attached as an appendix to this declaration. My curriculum vitae is provided in ALXN2027, and attached here as **Appendix A**.

III. SUMMARY OF OPINIONS

14. I have reviewed the Final Report, Antibody Full Length Sequencing of Hybridoma 5G1.1 T175 ("Sequencing Final Report") (ALXN2075) and GenScript's Sequencing Record (ALXN2076) created by GenScript. I also reviewed the proposed sequencing protocol prior to the sequencing (ALXN2087). The documents I reviewed in providing this declaration are listed in the attached **Appendix B**.

15. In my opinion, the sequencing performed by GenScript reported in the Sequencing Final Report was performed by appropriate methods, and the results reported in the Sequencing Final Report are reliable and accurate.

16. The full sequence of 5G1.1, a mouse antibody, from HB-11625 is accurately listed on pages 2-3 of ALXN2075.

17. The method used for sequencing was as follows:

a. I understand based on records I reviewed, specifically GenScript's Sequencing Record (ALXN2076), a GenScript chain of custody log ("Chain of Custody Log") (ALXN2077), and ATCC Packing Slip (ALXN2078), that ATCC shipped five vials of hybridoma HB-11625 to GenScript on Thursday, November 7, 2019, and that these were received by GenScript at their facility in New Jersey on Friday, November 8, 2019. (ALXN2078; ALXN2077.) The vials

were shipped on dry ice, and were received at GenScript by Alan Chau. (ALXN2077.)

b. I understand that on Friday, November 8, 2019, GenScript shipped the samples from their facility in New Jersey to their facility in Nanjing, China, where the sequencing was performed. (ALXN2077.) The cells were shipped by Cindy Wu at GenScript's New Jersey facility and were shipped in a dry shipper that was maintained at -80°C for the duration of the shipment. (ALXN2077.) The cells were received by Tu Huamin at GenScript's facility in Nanjing, China on Tuesday, November 12, 2019, local time. (ALXN2077.)

c. On receipt at GenScript's facility in Nanjing, China, the cells were transferred to YuLing Li, with GenScript's antibody drug discovery department, and stored in a -80°C freezer. (ALXN2077.)

d. Per GenScript's Sequencing Record, hybridoma sequencing on one of the vials of hybridoma HB-11625 obtained from ATCC was performed by YuLing Li at GenScript's facility in Nanjing China from November 13, 2019 through November 15, 2019. (ALXN2076 at 1-4.)

e. According to GenScript's Sequencing Record (ALXN2076) and Final Sequencing Report (ALXN2075), GenScript first extracted RNA from hybridoma HB-11625, and performed reverse transcription to obtain cDNA from the hybridoma cells corresponding to a murine antibody. They then used PCR to

amplify fragments of cDNA corresponding to the murine antibody heavy and light chains. These were cloned into sequencing vectors. Bacteria were transformed with the sequencing vectors containing the murine antibody cDNA inserts, and DNA obtained from the resulting bacterial colonies was sequenced using PCR to identify inserts corresponding to the antibody light and heavy chains and determine the corresponding sequences.

f. The resulting heavy and light chain sequences of the murine (mouse) antibody produced by HB-11625 are provided in the Sequencing Final Report (ALXN2075). Five clones (*i.e.*, cells from five different bacterial colonies) were sequenced for each of the light and heavy chains, to confirm the accuracy of the sequencing. (ALXN2075 at 4.)

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 21st day of November 2019 in the State of New York.

Michel C. Nussenzweig, M.D., Ph.D.

Appendix A

CURRICULUM VITAE

Name: Michel C. Nussenzweig

Date of Birth: February 10, 1955

Education:

1975	B.A. - New York University College of Arts and Sciences
1981	Ph.D. - The Rockefeller University
1982	M.D. - New York University School of Medicine

Clinical Training:

1982-1985	Intern & Resident, Internal Medicine Massachusetts General Hospital
1984-1985	Clinical Fellow, Infectious Diseases Massachusetts General Hospital

Postdoctoral Training:

1986-1989	Harvard Medical School, Department of Genetics

Professional Appointments

1990-1996	Assistant & Associate Professor, The Rockefeller University
1990-1999	Assistant & Associate Investigator, Howard Hughes Medical Institute
1996-present	Professor & Senior Physician, The Rockefeller University
1999-present	Investigator, Howard Hughes Medical Institute
2000-2013	Sherman Fairchild Professor, The Rockefeller University
2013-	Zanvil A. Cohn & Ralph M. Steinman Professor, The Rockefeller University

Honors & Awards

Summa Cum Laude, New York University College of Arts and Sciences - 1975; Phi Beta Kappa, New York University College of Arts and Sciences - 1975; Alpha Omega Alpha, New York University Medical School - 1982; Bertram M. Gesner Memorial Research Award, New York University School of Medicine – 1982; Elected Member American Society of Clinical Investigators – 1997; Solomon A. Berson Award for Basic Science – 2003; American Association of Immunologists Huang Foundation Meritorious Career Award – 2004; Elected Fellow of the American Academy of Arts & Sciences – 2007; Benacerraf Lecture, Harvard Medical School - 2007; Heidelberger-Kabat Lecture, Columbia University - 2008; Lee C. Howley Sr. Prize for Arthritis Research - 2008; Elected Member in the Institute of Medicine of the National Academies – 2009; Elected Member of the National Academy of Sciences USA – 2011; Elected Member of the Brazilian Academy of Sciences – 2011; Nobel Award Lecture for Dr. Ralph Steinman, Nobel Foundation – 2011; Elected Member of Association of American Physicians – 2012; Elected to Practitioners Society of New York – 2014; Landsteiner Lecture, Vienna – 2014; Brazil Diaspora Prize 2015; Georges Kohler Lecture, Freiburg – 2015; Elected to the Spanish Royal Academy-2016; Rabbi Shai Shacknal Prize-2016; Dan H. Campbell Memorial Lecture, Asilomar – 2016; Robert Koch Prize, Berlin – 2016; Hare Memorial Lecture – 2016; Hertzenberg

Prize, American Association of Immunology – 2017; Sanofi-Institut Pasteur Award, Paris – 2017; Amos Memorial Lecture – 2018; Charles Gould Easton Lecture – Toronto 2018; Melvin Cohn Lecture and Award – La Jolla 2019

Teaching:
Immunology, Course Organizer

Institutional:
Member Hospital GCRC Scientific Advisory Committee 1996-2002
Chair, Hospital Seminar Committee 1997-1998
Elected Senior Faculty Representative Academic Council 1999-2001
Member, Institutional Review Board for Biohazards, Radioisotopes, Toxic Chemicals, and Carcinogens 1999-2001
Chair, Animal Care and Use Committee 2000-2011
Member, Immunology Search Committee 2001
Member, Infectious Disease Search Committee 2001
Member, Virology Search Committee 2002
Faculty Advisory Committee for Presidential Search 2002
Member President's Core Planning Group 2004-2005
Member Transgenic Facility Coordinating Committee 2004-
Member Rockefeller University Faculty Search Committee 2005-
Member Rockefeller University Academic Council 2009-2012
Member, Presidential Search Committee 2010 and 2016
President, Rockefeller University Academic Senate 2011-2012
Member, Animal Care and Use Committee 2012-
Director, Christopher H. Browne Center for Immunology and Immune Diseases 2012-
Mid Career Hiring Committee 2012-2016
Chair University Lecture Committee 2013-2015

National and International:
Arthritis Foundation Molecular Immunology study section 1993-1996
NIH Immunobiology Study Section Ad Hoc reviewer 1998-999
NIH NIAID Council Ad Hoc 1998
Organizer, Keystone Symposium on Dendritic Cells 1998
NIH ALY Study Section Ad Hoc Reviewer, 1999
Organizer, Keystone Symposium on B Cells 1999
External Reviewer LMGD NICHD 2000
Damon Runyon Cancer Research Fund Review Committee 2000-2002
American Association of Immunologists Program Committee 2000-2003
March of Dimes Review Committee 1999-2005
NIH ALY Study Section 2001-2006
Organizer, Keystone Symposium on B Cell Biology 2003
The Harvey Society, Council Member 2004-2007
Human Frontiers of Science Review Board 2004-2007
North Shore Hospital Scientific Advisory Board 2004

Chair, NIH ALY Study Section 2005-2006
Member, AAI Awards Committee 2005-2008
NIH NIAID B Cell Immunology for Protective HIV-1 Vaccines Ad Hoc reviewer 2007
Lupus Research Institute Scientific Advisory Board, Co-chair 2008 – 2012
Global HIV Vaccine Enterprise Science Advisory Committee 2008
Member, Pasteur Institute Scientific Council 2008-2016
NIH NIAID AIDS Vaccine Research Subcommittee Member 2009-2012
Scripps Korea Antibody Institute Scientific Advisory Board 2009
Member, Int'l. Program Committee for the 14th International Congress of Immunology (ICI) Osaka 2010
The Henry Kunkel Society, Secretary 2011-2014
Harvard's Children's Hospital Boston, Scientific Advisory Committee 2012-2017
Pew Foundation Scientific Advisory Board for Latin America 2012-2018
Member, Congress Committee for the 15th International Congress of Immunology (ICI) Rome 2013
Organizer, Cold Spring Harbor Symposium on Quantitative Biology—Immunity & Tolerance 2013
Organizer, Keystone Symposium on B Cell Biology 2014
Member, Research Board of the Austrian Academy of Sciences 2018

Editorial:

1996-Present	Editor, The Journal of Experimental Medicine
1999-Present	Editor, The Journal of Immunological Methods
2000-Present	Transmitting Editor, International Immunology
2002-Present	Advisory Editor, Nature Reviews Immunology
2006-Present	Editorial Committee, Annual Review of Immunology

Consultant:

Abgenix, Fremont, CA	Scientific Advisory Board	1998-2003
Zycos, Lexington MA	Scientific Advisory Board	2001-2003
Trubion Seattle WA	Scientific Advisory Board	2004-2009
Celldex, NJ	Scientific Advisory Board	2005-Present
Frontier Bio, China	Scientific Advisroy Board	2017-Present

Professional Memberships:
American Association of Immunologists
American Medical Association
The New York Academy of Sciences
Kunkel Society
Harvey Society
American Society for Clinical Investigation
American Society for Microbiology

Invited Chapters or Reviews

1. Steinman, R.M., Witmer, M.D., **Nussenzweig, M.C.,** Chen, L.L. & Cohn, Z.A. Dendritic Cells: an important new cell type in the mixed leukocyte reaction. In: Kaplan JG, ed. Proc. of the 13th International Leukocyte Culture conference. *Elsevier/North Holland Publ*. Co. 273 (1979)

2. Steinman, R.M., & **Nussenzweig, M.C.** Dendritic cells features and functions. *Immunol. Rev*. 53:127-147 (1980)

3. **Nussenzweig, M.C,** & Steinman, R.M. Surface of dendritic cells. *Immunol. Today* 3:65 (1982)

4. Shimizu, A., Kinashi, T., **Nussenzweig, M.C.,** Tataunobu-Ryushin, M., Leder, P., & Honjo, T. Molecular mechanism for immuno-globulin double-isotope expression. *Cold Spring Harbor Symposia on Quantitative Biology* LIV 175 (1989)

5. Papavasiliou, F., Jankovic, M., Gong, S. & **Nussenzweig, M.C.** Control of immunoglobulin ene rearrangements in developing B cells, review. *Curr. Opin. Immunol.* 9:233-244 (1997)

6. **Nussenzweig, M.C.** Immune responses:Tails to teach a B cell. *Curr. Biology*. 7(6):R355-357 (1997)

7. **Nussenzweig, M.C.** & Allison, J. Lymphocyte activation and effector functions. How signals are integrated in the immune system (Editorial Overview) *Curr. Opin. Immunol.* 9:293-295 (1997)

8. **Nusenzweig, M.C.** Immune Receptor Editing: Revise and Select. *Cell* 95:875-878 (1998)

9. Yu, W., Nagaoka, H., Misulovin, Z., Meffre, E., Suh, H., Jankovic, M., Yannoutsos, N., Casellas, R., Besmer, E., Papavasiliou, F., Qin, X., & **Nussenzweig, M.C.** RAG Expression in B Cells in SecondaryLymphoid Tissues. *Cold Spring Harbor Symposia on Quantitative Biology* Vol. LXIV:207-210, (1999*)*

10. Nagaoka, H., Yu, W. & **Nussenzweig, M.C**. Regulation of RAG expression in developing lymphocytes. *Curr. Opin. Immunol.* 12:187-190 (2000)

11. Meffre, E., Casellas, R. & **Nussenzweig, M.C.** Antibody regulation of B cell development. *Nat. Immunol.* 1(5):379-385 (2000)

12. **Nussenzweig, M.C**. & Golstein, P. Lymphocyte activation and effector functions (Editorial Overview). *Curr. Opin. Immunol.* 12:239-241 (2000)

13. Steinman, R.M., Hawiger, D., & **Nussenzweig, M.C.** Tolerogenic dendritic cells. *Annu. Rev. Immunol*. 21:685-711 (2003)

14. Steinman, R.M., Hawiger, D., Liu, K., Bonifaz, L., Bonnyay, D., Mahnke, K., Iyoda, T., Ravetch, J., Dhodapkar, M., Inaba, K. & **Nussenzweig, M.C.** Dendritic cell function in vivo during the steady state: a role in peripheral tolerance. *Annals NYAS.* 987:15-25 (2003)

15. Fernandez-Capetillo, O., Lee, A., **Nussenzweig, M.C**. & Nussenzweig, A. H2AX: The histone guardian of the genome. *DNA Repair* 3(8-9):959-967 (2004)

16. Berg, L.J. & **Nussenzweig, M.C.** Signals that regulate lymphocyte development and differentiation: Editorial overview. *Curr. Opin. Immunol.* 6(2) (2004)

17. Jankovic, M., Casellas, R., Yannoutsos, N., Wardemann, H, & **Nussenzweig, M.C.** RAGs and regulation of autoantibodies. *Annu. Rev. Immunol.* Apr 22:485-501 (2004)

18. von Boehmer, H. & **Nussenzweig, M.C.** The manipulation of immunity. *EMBO J.* 5(8):766-771 (2004)

19. Ramiro, A.R. & **Nussenzweig, M.C.** Immunology: aid for AID. *Nature* 430:980-981 (2004)

20. **Nussenzweig, M.C**. & Alt, F.W. Antibody diversity: one enzyme to rule them all. *Nat. Med.* 10(12):1304-1305 (2004)

21. Barreto, V.N., Ramiro, A.R. & **Nussenzweig, M.C.** Activation-induced deaminase: controversies and open questions. *Trends Immunol* 26(2):117 (2005)

22. Steinman, R.M., Bonifaz, L., Fujii, S., Liu, K., Bonnyay, D., Yamazaki, S., Pack, M., Hawiger, D., Iyoda, T., Inaba, K. & **Nussenzweig, M.C**. The innate functions of dendritic cells in peripheral lymphoid tissues. *Adv. Exp. Med. Biol.* 560:83-97 (2005)

23. Germain, R.N., Miller, M.J., Dustin, M.L. & **Nussenzweig, M.C.** Dynamic imaging of the immune system: progress, pitfalls and promise. *Nat. Rev. Immunol.* 6(7):497-507 (2006)

24. Ramiro, A.R., **Nussenzweig, M.C**. & Nussenzweig A. Switching on chromosomal translocations. *Cancer Res.* 66(16):7837-7839 (2006)

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26. Ravetch, J.V. & **Nussenzweig, M.C**. Killing some to make way for others. *Nat Immunol.* 8:337-339 (2007)

27. Wardemann, H., & **Nussenzweig, M.C**. B cell self-tolerance in humans. *Adv. Immunol.* 95:83-110 (2007)

28. Downs, J., **Nussenzweig, M.C**. & Nussenzweig, A. Chromatin dynamics and the preservation of genetic information. *Nature* 447:951-958 (2007)

29. Yurasov, S. & **Nussenzweig, M.C**. Regulation of autoreactive antibodies. *Curr Opin. Rheumato.* 19(5):421-426 (2007)

30. Nussenzweig, A. & **Nussenzweig, M.C**. A back-up DNA repair pathway moves to the forefront. *Cell* 131(2):223-225 (2007)

31. Jankovic, M., Nussenzweig, A. & **Nussenzweig, M.C**. Antigen receptor diversification and chromosome translocations. *Nat. Immunol.* 8(8):801-808 (2007)

32. Callen, E., **Nussenzweig, M.C**. & Nussenzweig, A. Breaking down cell cycle checkpoints and DNA repair during antigen receptor gene assembly. *Oncogene* 26(56):7759-7764 (2007)

33. Liu K. **& Nussenzweig, M.C**. Origin and development of dendritic cells. *Immunol. Rev.* 234(1):45-54 (2010)

34. Nussenzweig, A. & **Nussenzweig, M.C.** Origin of chromosomal translocations in lymphoid cancer. *Cell* 141(1):27-38 (2010)

35. Liu, K. & **Nussenzweig, M.C**. Development and homeostasis of Dendritic Cells. DOI: 10.1002/eji.201040501 *Eur. Jour. Of Immunol.* (2010)

36. Mouquet, H. & **Nussenzweig, M.C**. Polyreactive antibodies in adaptive immune responses to viruses. *Cell. Mol. Life Sci.* 102-112 (2011)

37. Pavri, R. & **Nussenzweig, M.C**. AID targeting in antibody diversity. *Adv. in Immunol*. Vol 110:1-26 (2011)

38. Victora, G.D., **Nussenzweig, M.C**. Germinal Centers. *Annu. Rev Immunol* [Epub ahead of print 3/24] (2012)

39. Gazumyan, A., Bothmer, Klein, I.A., **Nussenzweig, M.C.** & McBride, K.M. Activation-induced cytidine deaminase in antibody diversification and chromosome translocation. *Adv Cancer Res.* 113:167-190 (2012)

40. Robbiani, D.F. & **Nussenzweig, M.C**. Chromosome translocation, B cell lymphoma and activation-induced cytidine deaminase. *Annu. Rev. Pathol. Mech. Dis*. doi: 10.1146/annurev-pathol-020712-164004 (2012)

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42. Liu, K. & Nussenzweig, M.C. Dendritic Cells. *Fundamental Immun.* Chapter 16 (2012)

43. Mouquet, H. & Nussenzweig, M.C. HIV: Roadmaps to a vaccine. *Nature* 496(7446):441-442 (2013)

44. Klein, F., Mouquet, H., Dosenovic, P., Scheid, J.F., Scharf, L. & **Nussenzweig, M.C**. Antibodies in HIV-1 vaccine development and therapy. *Science* 341(6151):1199-1204 (2013)
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45. West, A.P., Scharf, L., Scheid, J.F., Klein, F., Bjorkman, P.J. & Nussenzweig, M.C. Structural insights on the role of antibodies in HIV-1 vaccine and therapy. *Cell* 156(4):633-648 (2014)
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PMID: 25567266

47. Halper-Stromberg, A. & **Nussenzweig, M.C.** Towards HIV-1 remission: potential roles for broadly neutralizing antibodies. *J. Clin. Invest.* 126(2);415-423 (2016)
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48. Robbiani, D.F. & **Nussenzweig, M.C.** A new way to diversify antibodies by DNA transposition. *Cell* 164(4):601-602 (2016)
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49. Caskey, M., Klein, F., & **Nussenzweig, M.C.** Broadly Neutralizing Antibodies for HIV-1 Prevention or Immunotherapy. *NEJM* 375(21):2019-2021 (2016)

50. Escolano, A., Dosenovic, P., and **Nussenzweig, M.C.** Progress toward active or passive HIV-1 vaccination. *J. Exp. Med.* 214(1):3-16 (2017)

51. Caskey, M., Klein, F., Nussenzwieg, M. C. Broadly neutralizing anti-HIV-1 monoclonal antibodies in the clinic, *Nature Medicine* 25: 547-543 (2019)

Peer Reviewed Publications:

52. **Nussenzweig, M.C.** & Steinman, R.M. Contribution of dendritic cells to stimulation of the murine syngeneic mixed leukocyte reaction. *J. Exp. Med.* 151(5):1196-1212 (1980)
PMCID: PMC2185855

53. **Nussenzweig, M.C.,** Steinman, R., Gutchinov, B., & Cohn, Z.A. Dendritic cells are accessory cells for the development of anti-trinitrophenyl cytotoxic T lymphocytes. *J. Exp. Med.* 152(4):1070-1084 (1980) PMCID: PMC2185968

54. Steinman, R.M., Witmer, M.D., **Nussenzweig, M.C.,** Chen, L.L., Schlesinger, S.J., & Cohn, Z.A. Dendritic cells of the mouse identification and characterization. *J. Invest. Dermatol*. 75:14-16 (1980)

55. **Nussenzweig, M.C.,** Steinman, R.M., Unkeless, J.C., Witmer, M., Gutchinov, B., & Cohn, Z.A. Studies of the cell surface of mouse dendritic cells and other leukocytes. *J. Exp. Med.* 154:168-187 (1981)

56. Steinman, R.M., Witmer, M.D., **Nussenzweig, M.C.,** Gutchinov, B., & Austyn, J.M. Studies with a monoclonal antibody to mouse dendritic cell. *Transplantation* 31:151 (1981)

57. **Nussenzweig, M.C.,** Steinman, R.M., Witmer, M.D., & Gutchinov, B. A monoclonal antibody specific for mouse dendritic cells. *Proc. Natl. Acad. Sci., USA* 79:161-165 (1982)

58. Steinman, R.M., Gutchinov, B., Witmer, M.D., & **Nussenzweig, M.C.** Dendritic cells are the principal stimulators of the primary mixed leukocyte reaction in mice. *J. Exp. Med.* 157:613-627 (1983)

59. **Nussenzweig, M.C.,** Shaw, A.C., Sinn, E., Danner, D.B., Holmes, K.L., Morse, H.C., & Leder, P. Allelic exclusion in transgenic mice that express the membrane form of immunoglobulin. *Science* 236:816-819 (1987)

60. **Nussenzweig, M.C.,** Shaw., A.C., Sinn, E., Torres, J., & Leder, P. Allelic exclusion in transgenic mice that carry human mutant human immunoglobulin genes. *J. Exp. Med.* 167:1969-1974 (1988)

61. **Nussenzweig, M.C.,** Schmidt, E.V., Shaw, A.C., Sinn, E., Torres, J., Mathey-Prevot, B., Pattengale, P.K. & Leder, P. A human immunoglobulin gene reduces the incidence of lymphomas in c-Myc bearing transgenic mice. *Nature* 336(6198):446-450 (1989)

62. Morton, C.C., **Nussenzweig, M.C**., Sousa, R., Sorenson, G.D., Pettengill, O.S. & Shows, T.B. Mapping and characterization of an X-linked processed gene related to MYCLl. *Genomics* 4:367-375 (1989)

63. Shimizu, A., **Nussenzweig, M.C.,** Tataunobu-Ryushin, M., Leder, P., & Honjo, T. Immunoglobulin double isotype expression by trans-mRNa in a human immunoglobulin transgenic mouse. *Prod. Natl. Acad. Sci. USA*. 86:8020-8023 (1989)

64. Friedlander, R., **Nussenzweig, M.C.,** & Leder, P. Complete nucleotide sequence of the membrane form of the human IgM heavy chain. *Nucleic Acids Res*. 18(14):4278 (1990)

65. Shimizu, A., **Nussenzweig, M.C.,** Han, H., Sanchez, M., & Honjo, T. Trans-splicing as a possible molecular mechanisms for the multiple isotope expression of the immunoglobulin gene. *J. Exp. Med*. 173:1385-1393 (1991)

66. Costa, T., Suh, H-Y., & **Nussenzweig, M.C.** Chromosomal position of rearranging gene segments influences allelic exclusion in transgenic mice. *Proc. Natl. Acad. Sci. USA* 89:2205-2208 (1992)

67. Costa, T., Franke, R.R., Sanchez, M., Misulovin, Z., & **Nussenzweig, M.C.** Functional reconstitution of an immunoglobulin antigen receptor in T cells. *J. Exp. Med.* 175:1669-1676 (1992)

68. Sanchez, M., Misulovin, Z., Burkhardt, A.L., Mahajan, S., Costa, T., Franke, R.R., Bolen, J.B. & **Nussenzweig, M.C.** Signal transduction by immunoglobulin is mediated through Igα and Igβ. *J. Exp. Med.* 178:1049-1055 (1993)

69. Burkhardt, A.L., Costa, T., Misulovin, Z., Stealy, B., Bolen, J.B., & **Nussenzweig, M.C.** Igα and Igβ are functionally homologous to the signaling protein of the T cell receptor. *Molec. & Cell. Biol.* 14(2):1095-1103 (1994)

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Appendix B

APPENDIX B

Exh. No.	Description
ALXN2027	*Curriculum Vitae* of Michel C. Nussenzweig, M.D., Ph.D.
ALXN2074	ATCC Product Sheet for HB-11625
ALXN2075	GenScript, "Final Report – Antibody Full Length Sequencing of Hybridoma 5G1.1 T175," Order Number: U856UEK140-1 (Nov. 15, 2019)
ALXN2076	GenScript Sequencing Record
ALXN2077	Chain of Custody Log
ALXN2078	ATCC Packing Slip