

Biographical Sketch

Dr. Lonberg is currently an Executive in Residence at Canaan Partners. Prior to Canaan, he was Senior Vice President, Oncology Discovery Biology, at Bristol-Myers Squibb, where he led drug discovery efforts for both targeted and immuno-oncology agents. Dr. Lonberg began his career in the biotechnology/ pharmaceutical industry, leading the GenPharm International research group that developed genetically engineered strains of mice with germline configuration human immunoglobulin genes. These transgenic animals have been used to discover more than three dozen clinical-stage human sequence antibodies, including 15 FDA-approved products (golimumab, ustekinumab, ofatumumab, canakinumab, ipilimumab, nivolumab, secukinumab, daratumumab, bezlotoxumab, olaratumab, burosumab, teprotumumab, amivantamab, anifrolumab, and relatlimab). GenPharm International was acquired by Medarex in 1997, and then by Bristol-Myers Squibb in 2009. In 1998, Dr. Lonberg's drug discovery group at Medarex began to focus on antibody therapies that target and modulate immune-attenuating pathways to activate patient immune responses to cancer cells (so-called "checkpoint blockade" therapies). Ipilimumab, which began clinical testing in 2000, was the first-ever checkpoint blockade cancer therapy to enter clinical development and to gain regulatory approval. Ipilimumab, approved in 2011, was also the first drug to demonstrate, in a randomized clinical trial, a survival benefit for patients with metastatic melanoma. A second checkpoint blockade cancer therapeutic, nivolumab, entered clinical development in 2006 and gained regulatory approval in 2014. A third checkpoint blockade cancer therapeutic, relatlimab, entered clinical development in 2013 and gained regulatory approval as a combination product with nivolumab in 2022. Dr. Lonberg received his PhD in Biochemistry and Molecular Biology from Harvard University (Cambridge, MA) in 1985, where he studied under Dr. Walter Gilbert. He was a postdoctoral fellow at Memorial Sloan Kettering Cancer Center (New York, NY) and was elected to the National Academy of Engineering in 2015.

Curriculum Vitae

Name: **Nils Lonberg**

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Education:

<i>Undergraduate:</i>	1974-1977	Reed College
	1977-1978	University of Oregon
	1978-1979	Reed College (no degree)
<i>Graduate:</i>	1979-1985	Harvard University, Ph.D., March 1985
<i>Postdoctoral:</i>	1985-1989	Sloan-Kettering Institute for Cancer Research

Employment:	1990-1994	Senior Scientist GenPharm International, Mountain View, CA
	1994-1997	Director, Molecular Biology GenPharm International, Palo Alto, CA
	1998-2000	Vice President, Scientific Director GenPharm International, San Jose, CA
	2000-2009	Senior Vice President, Scientific Director Medarex, Milpitas, CA
	2009-2019	Senior Vice President, Oncology Discovery Biology Bristol-Myers Squibb, Redwood City, CA
		& Interim Head Oncology Exploratory Clinical Development March, 2012-January, 2013
	2019-present	Executive in Residence, Canaan Partners Menlo Park, CA

Boards:

2019-present	Synthekine, Inc., Board of Directors & Scientific Advisory Board
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2019-present	Bicara Therapeutics, Chairman, Board of Directors
2020-2023	Evolveimmune Therapeutics, Inc., Scientific Advisory Board
2020-present	Bolt Biotherapeutics, Inc., Scientific Advisory Board
2020-present	Biograph55, Board of Directors
2020-present	Compugen, Ltd., Scientific Advisory Board
2021-present	ThirtyFiveBio, Board of Directors
2022-present	Normunity, Scientific Advisory Board

Bibliography:

1. Kowalczykowski SC, **LONBERG N**, Newport JW, Paul LS, von Hippel PH. 1980. On the thermodynamics and kinetics of the cooperative binding of bacteriophage T4-coded gene 32 (helix destabilizing) protein to nucleic acid lattices. *Biophys J* 32: 403-18
2. Kowalczykowski SC, **LONBERG N**, Newport JW, von Hippel PH. 1981. Interactions of bacteriophage T4-coded gene 32 protein with nucleic acids. I. Characterization of the binding interactions. *J Mol Biol* 145: 75-104
3. Newport JW, **LONBERG N**, Kowalczykowski SC, von Hippel PH. 1981. Interactions of bacteriophage T4-coded gene 32 protein with nucleic acids. II. Specificity of binding to DNA and RNA. *J Mol Biol* 145: 105-21
4. **LONBERG N**, Kowalczykowski SC, Paul LS, von Hippel PH. 1981. Interactions of bacteriophage T4-coded gene 32 protein with nucleic acids. III. Binding properties of two specific proteolytic digestion products of the protein (G32P*I and G32P*III). *J Mol Biol* 145: 123-38
5. von Hippel PH, Kowalczykowski SC, **LONBERG N**, Newport JW, Paul LS, Stormo GD, Gold L. 1982. Autoregulation of gene expression. Quantitative evaluation of the expression and function of the bacteriophage T4 gene 32 (single-stranded DNA binding) protein system. *J Mol Biol* 162: 795-818
6. **LONBERG N**, Gilbert W. 1983. Primary structure of chicken muscle pyruvate kinase mRNA. *Proc Natl Acad Sci U S A* 80: 3661-5
7. **LONBERG N**, Gilbert W. 1985. Intron/exon structure of the chicken pyruvate kinase gene. *Cell* 40: 81-90
8. Kowalczykowski SC, Paul LS, **LONBERG N**, Newport JW, McSwiggen JA, von Hippel PH. 1986. Cooperative and noncooperative binding of protein ligands to nucleic acid lattices: experimental approaches to the determination of thermodynamic parameters. *Biochemistry* 25: 1226-40
9. **LONBERG N**, Gettner SN, Lacy E, Littman DR. 1988. Mouse brain CD4 transcripts encode only the COOH-terminal half of the protein. *Mol Cell Biol* 8: 2224-8
10. Clevers H, **LONBERG N**, Dunlap S, Lacy E, Terhorst C. 1989. An enhancer located in a CpG island 3' to the TCR/CD3-epsilon gene confers T lymphocyte-specificity to its promoter. *EMBO J* 8: 2527-35
11. Norment AM, **LONBERG N**, Lacy E, Littman DR. 1989. Alternatively spliced mRNA encodes a secreted form of human CD8 alpha. Characterization of the human CD8 alpha gene. *J Immunol* 142: 3312-9

12. Blumberg RS, Ley S, Sancho J, **LONBERG N**, Lacy E, McDermott F, Schad V, Greenstein JL, Terhorst C. 1990. Structure of the T-cell antigen receptor: evidence for two CD3 epsilon subunits in the T-cell receptor-CD3 complex. *Proc Natl Acad Sci U S A* 87: 7220-4
13. Meade H, Gates L, Lacy E, **LONBERG N**. 1990. Bovine alpha S1-casein gene sequences direct high level expression of active human urokinase in mouse milk. *Biotechnology (NY)* 8: 443-6
14. Taylor LD, Carmack CE, Schramm SR, Mashayekh R, Higgins KM, Kuo CC, Woodhouse C, Kay RM, **LONBERG N**. 1992. A transgenic mouse that expresses a diversity of human sequence heavy and light chain immunoglobulins. *Nucleic Acids Res* 20: 6287-95
15. Tuailon N, Taylor LD, **LONBERG N**, Tucker PW, Capra JD. 1993. Human immunoglobulin heavy-chain minilocus recombination in transgenic mice: gene-segment use in mu and gamma transcripts. *Proc Natl Acad Sci U S A* 90: 3720-4
16. Wang B, Biron C, She J, Higgins K, Sunshine MJ, Lacy E, **LONBERG N**, Terhorst C. 1994. A block in both early T lymphocyte and natural killer cell development in transgenic mice with high-copy numbers of the human CD3E gene. *Proc Natl Acad Sci U S A* 91: 9402-6
17. **LONBERG N**, Taylor LD, Harding FA, Trounstein M, Higgins KM, Schramm SR, Kuo CC, Mashayekh R, Wymore K, McCabe JG, et al. 1994. Antigen-specific human antibodies from mice comprising four distinct genetic modifications. *Nature* 368: 856-9
18. Taylor LD, Carmack CE, Huszar D, Higgins KM, Mashayekh R, Sequar G, Schramm SR, Kuo C-C, O'Donnell SL, Kay RM, Woodhouse CS, **LONBERG N**. 1994. Human immunoglobulin transgenes undergo rearrangement, somatic mutation and class switching in mice that lack endogenous IgM. *International Immunology* 6: 579-91
19. **LONBERG N**. 1994. Transgenic approaches to human monoclonal antibodies. In *The Pharmacology of Monoclonal Antibodies*, pp. 49-101: Springer
20. Harding FA, **LONBERG N**. 1995. Class switching in human immunoglobulin transgenic mice. *Ann N Y Acad Sci* 764: 536-46
21. **LONBERG N**, Huszar D. 1995. Human antibodies from transgenic mice. *Int Rev Immunol* 13: 65-93
22. Wang X, Bornslaeger EA, Haub O, Tomihara-Newberger C, **LONBERG N**, Dinulos MB, Disteché CM, Copeland N, Gilbert DJ, Jenkins NA, Lacy E. 1996. A candidate gene for the amnionless gastrulation stage mouse mutation encodes a TRAF-related protein. *Dev Biol* 177: 274-90
23. Fishwild DM, O'Donnell SL, Bengoechea T, Hudson DV, Harding F, Bernhard SL, Jones D, Kay RM, Higgins KM, Schramm SR, **LONBERG N**. 1996. High-avidity human IgG kappa monoclonal antibodies from a novel strain of minilocus transgenic mice. *Nat Biotechnol* 14: 845-51
24. Wang B, She J, Salio M, Allen D, Lacy E, **LONBERG N**, Terhorst C. 1997. CD3-epsilon overexpressed in prothymocytes acts as an oncogene. *Mol Med* 3: 72-81
25. Donohoe ME, Beck-Engeser GB, **LONBERG N**, Karasuyama H, Riley RL, Jäck HM, Blomberg BB. 2000. Transgenic human lambda 5 rescues the murine lambda 5 nullizygous phenotype. *J Immunol* 164: 5269-76
26. Ishida I, Tomizuka K, Yoshida H, Tahara T, Takahashi N, Ohguma A, Tanaka S, Umehashi M, Maeda H, Nozaki C, Halk E, **LONBERG N**. 2002. Production of human monoclonal and polyclonal antibodies in TransChromo animals. *Cloning Stem Cells* 4: 91-102
27. Keler T, Halk E, Vitale L, O'Neill T, Blanset D, Lee S, Srinivasan M, Graziano RF, Davis T, **LONBERG N**, Korman A. 2003. Activity and safety of CTLA-4 blockade combined with vaccines in cynomolgus macaques. *J Immunol* 171: 6251-9

28. **LONBERG N.** 2005. Human antibodies from transgenic animals. *Nat Biotechnol* 23: 1117-25
29. **LONBERG N.** 2008. Fully human antibodies from transgenic mouse and phage display platforms. *Curr Opin Immunol* 20: 450-9
30. **LONBERG N.** 2008. Human monoclonal antibodies from transgenic mice. *Handb Exp Pharmacol* 181: 69-97
31. **LONBERG N.** 2009. Human Antibodies from Transgenic Mice. In *Therapeutic Monoclonal Antibodies: From the Bench to the Clinic*, ed. Z An, pp. 117-47. Hoboken, New Jersey: John Wiley & Sons, Inc.
32. Wolchok JD, Hodi FS, Weber JS, Allison JP, Urban WJ, Robert C, O'Day SJ, Hoos A, Humphrey R, Berman DM, **LONBERG N**, Korman AJ. 2013. Development of ipilimumab: a novel immunotherapeutic approach for the treatment of advanced melanoma. *Ann NY Acad Sci* 1291: 1-13
33. Berman D, Korman A, Peck R, Feltquate D, **LONBERG N**, Canetta R. 2015. The development of immunomodulatory monoclonal antibodies as a new therapeutic modality for cancer: the Bristol-Myers Squibb experience. *Pharmacol Ther* 148: 132-53
34. Mellman I, Hubbard-Lucey VM, Tontoz MJ, Kalos MD, Chen DS, Allison JP, Drake CG, Levitsky H, **LONBERG N**, van der Burg SH, Fearon DT, Wherry EJ, Lowy I, Vonderheide RH, Hwu P. 2016. De-Risking Immunotherapy: Report of a Consensus Workshop of the Cancer Immunotherapy Consortium of the Cancer Research Institute. *Cancer Immunol Res* 4: 279-88
35. **LONBERG N**, Korman AJ. 2017. Masterful Antibodies: Checkpoint Blockade. *Cancer Immunol Res* 5: 275-81
36. Sangesland M, Ronsard L, Kazer SW, Bals J, Boyoglu-Barnum S, Yousif AS, Barnes R, Feldman J, Quirindongo-Crespo M, McTamney PM, Rohrer D, **LONBERG N**, Chackerian B, Graham BS, Kanekiyo M, Shalek AK, Lingwood D. 2019. Germline-Encoded Affinity for Cognate Antigen Enables Vaccine Amplification of a Human Broadly Neutralizing Response against Influenza Virus. *Immunity* 51: 735-49.e8
37. Amitai A, Sangesland M, Barnes RM, Rohrer D, **LONBERG N**, Lingwood D, Chakraborty AK. 2020. Defining and Manipulating B Cell Immunodominance Hierarchies to Elicit Broadly Neutralizing Antibody Responses against Influenza Virus. *Cell Syst* 11: 573-88.e9
38. Sangesland M, Yousif AS, Ronsard L, Kazer SW, Zhu AL, Gatter GJ, Hayward MR, Barnes RM, Quirindongo-Crespo M, Rohrer D, **LONBERG N**, Kwon D, Shalek AK, Lingwood D. 2020. A Single Human V(H)-gene Allows for a Broad-Spectrum Antibody Response Targeting Bacterial Lipopolysaccharides in the Blood. *Cell Rep* 32: 108065
39. Ronsard L, Yousif AS, Peabody J, Okonkwo V, Devant P, Mogus AT, Barnes RM, Rohrer D, **LONBERG N**, Peabody D, Chackerian B, Lingwood D. 2021. Engineering an Antibody V Gene-Selective Vaccine. *Frontiers in Immunology* 12
40. Korman AJ, Garrett-Thomson SC, **LONBERG N.** 2021. The foundations of immune checkpoint blockade and the ipilimumab approval decennial. *Nature Reviews Drug Discovery* (doi: 10.1038/s41573-021-00345-8)
41. Sangesland M, Torrents de la Pena A, Boyoglu-Barnum S, Ronsard S, Mohamed F, Bracamonte Moreno T, Barnes RM, Rohrer, **LONBERG N**, Ghebremichael M, Kanekiyo M, Ward A, Lingwood D. 2022. Allelic polymorphism controls autoreactivity and vaccine elicitation of human broadly neutralizing antibodies against influenza virus. *Immunity* (<https://doi.org/10.1016/j.immuni.2022.07.006>)
42. Caradonna TM, Ronsard L, Yousif AS, Windsor IW, Hecht R, Bracamonte-Moreno T, Roffler AA, Barnes MM, Rohrer, D, **LONBERG N**, Oguin III, TH, Sempowski GD, Kepler TB, Kuraoka M,

Lingwood D, Schmidt AG. 2022. An epitope-enriched immunogen expands responses to a conserved viral site. *Cell Rep* 41: 111628

Awards, Grants, & Memberships:

National Science Foundation Predoctoral Fellowship,	1979-1982
American Cancer Society Postdoctoral Fellowship,	1985-1988
National Institutes of Health Postdoctoral Fellowship,	1988-1989
National Institutes of Health SBIR Grant (phases I & II),	1991-1994
Member, National Academy of Engineering	2015-present

Issued Patents (*USPTO only*):

1. **H.Meade and N. LONBERG** (1989) Isolation of exogenous recombinant proteins from the milk of transgenic mammals. *U.S. Patent #4,873,316*.
2. **N. LONBERG and R. Kay** (1996) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #5,545,806*.
3. **N. LONBERG and R. Kay** (1996) Transgenic non-human animals capable of producing heterologous antibodies of various isotypes. *U.S. Patent #5,569,825*.
4. **N. LONBERG and R. Kay** (1997) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #5,625,126*.
5. **N. LONBERG and R. Kay** (1997) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #5,633,425*.
6. **N. LONBERG and R. Kay** (1997) Transgenic non-human animals capable of producing heterologous antibodies of various isotypes. *U.S. Patent #5,661,016*.
7. **N. LONBERG and R. Kay** (1997) Transgenic non-human animals capable of producing heterologous antibodies. *European. Patent #0 814 159 A2*
8. **H. Meade and N. LONBERG** (1998) Transgenic non-human mammal milk. *U.S. Patent #5,750,172*.
9. **N. LONBERG and R. Kay** (1998) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #5,770,429*.
10. **N. LONBERG and R. Kay** (1998) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #5,789,650*.
11. **N. LONBERG and R. Kay** (1998) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #5,814,318*.

12. **N. LONBERG and R. Kay** (1999) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #5,874,299*.
13. **N. LONBERG and R. Kay** (1999) Transgenic non-human animals capable of producing heterologous antibodies of various isotypes. *U.S. Patent #5,877,397*.
14. **N. LONBERG and R. Kay** (1999) Transgenic non-human animals capable of producing heterologous antibodies. *Japanese. Patent #2938569*.
15. **N. LONBERG and R. Kay** (2001) High affinity human antibodies and human antibodies against digoxin. *U.S. Patent #6,255,458*.
16. **N. LONBERG and R. Kay** (2001) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #6,300,129*.
17. **J. Buechler, G. Valkirs, J. Gray, and N. LONBERG** (2004) Human antibodies as diagnostic reagents. *U.S. Patent #6,680,209*.
18. **J. Buechler, G. Valkirs, J. Gray, and N. LONBERG** (2004) Human antibodies. *U.S. Patent #6,794,132*. **A. Korman, E. Halk, N. LONBERG, Y. Deo, and T. Keler** (2006) Human CTLA-4 antibodies. *U.S. Patent #6,984,720*.
19. **K. Tomizuka, I. Ishida, N. LONBERG, E. Halk** (2006) Transgenic transchromosomal rodents for making human antibodies. *U.S. Patent #7,041,870*.
20. **N. LONBERG and R. Kay** (2006) Transgenic non-human animals capable of producing heterologous antibodies. *U.S. Patent #7,041,871*.
21. **N. LONBERG, R. Kay, and D. Fishwild** (2006) High affinity human antibodies and human antibodies against human antigens. *U.S. Patent #7,084,260*.
22. **N. LONBERG, J. Buechler, J. Gray, and G. Valkirs** (2006) Human antibodies. *U.S. Patent #7,135,287*.
23. **J. Buechler, G. Valkirs, J. Gray, and N. LONBERG** (2007) Human antibodies as detection reagents. *U.S. Patent #7,189,515*.
24. **N. LONBERG and R. Kay** (2009) Transgenic non-human animals for producing chimeric antibodies. *U.S. Patent #7,501,552*.
25. **K. Tomizuka, I. Ishida, N. LONBERG, and E. Halk** (2009) Transgenic transchromosomal rodents for making human antibodies. *U.S. Patent #7,576,258*.
26. **A. Korman, E. Halk, N. LONBERG, Y. Deo, and T. Keler** (2009) Human CTLA-4 antibodies and their uses. *U.S. Patent #7,605,238*.
27. **N. LONBERG, R. Kay, and D. Fishwild** (2010) Heterologous antibodies which bind CD4. *U.S. Patent #7,722,873*.
28. **K. Tomizuka, I. Ishida, N. LONBERG, and E. Halk** (2010) Transgenic transchromosomal rodents for making human antibodies. *U.S. Patent #7,816,578*.
29. **A. Korman, E. Halk, N. LONBERG, Y. Deo, and T. Keler** (2011) Human CTLA-4 antibodies and their uses. *U.S. Patent #8,017,114*.
30. **N. LONBERG and R. Kay** (2012) Transgenic non-human animals for producing chimeric antibodies. *U.S. Patent #8,158,419*.

31. **N. LONBERG, R. Kay, and D. Fishwild** (2012) Heterologous antibodies which bind CD4. *U.S. Patent #8,231,877*.
32. **N. LONBERG and R. Kay** (2012) Transgenic non-human animals for producing chimeric antibodies. *U.S. Patent #8,293,480*.
33. **A. Korman, E. Halk, N. LONBERG, Y. Deo, and T. Keler** (2012) Human CTLA-4 antibodies and their uses. *U.S. Patent #8,318,916*.
34. **L. Chen, S. Gangwar, V. Guerlavais, N. LONBERG, Q. Zhang** (2014) Chemical linkers with single amino acids and conjugates thereof. *U.S. Patent #8,664,407*.
35. **A. Korman, E. Halk, N. LONBERG, Y. Deo, and T. Keler** (2014) Human CTLA-4 antibodies and their uses. *U.S. Patent #8,784,815*.
36. **K. Tomizuka, I. Ishida, N. LONBERG, and E. Halk** (2014) Transgenic transchromosomal rodents for making human antibodies. *U.S. Patent #8,835,712*.
37. **C. Wang, N. LONBERG, A. Korman, M. Selby, M. Srinivasan, K. Henning, M. Han, G. Chen, R. Huang, I. Chakraborty, H. Huang, S. Wong, H. Li** (2016) Antibodies against glucocorticoid-induced tumor necrosis factor receptor (GITR) and uses thereof. *U.S. Patent #9,228,016*.
38. **K. Tomizuka, I. Ishida, N. LONBERG, and E. Halk** (2016) Transgenic transchromosomal rodents for making human antibodies. *U.S. Patent #9,426,970*.
39. **N. LONBERG and M. Srinivasan** (2016) Optimization of antibodies that bind lymphocyte activation gene-3 (LAG-3), and uses thereof. *U.S. Patent #9,505,839*.
40. **N. LONBERG, A. Korman, B. Barnhart, M. Selby, A. Yamniuk, M. Srinivasan, K. Henning, M. Lei, E. Sega, A. Goodenough, M. Jure-Kunkel, G. Chen, J. Sack, R. Huang, M. Corbett, J. Myers, L. Schweitzer, S. Hatcher, H. Huang, P. Zhang** (2017) Antibodies against CD73. *U.S. Patent #9,605,080*.
41. **D. Rohrer, A. Black, and N. LONBERG** (2017) HCO32 and HCO27 and related examples. *U.S. Patent #9,693,539*.
42. **C. Wang, N. LONBERG, A. Korman, M. Selby, M. Srinivasan, K. Henning, M. Han, G. Chen, R. Huang, I. Chakraborty, H. Huang, S. Wong, H. Li** (2017) Antibodies against glucocorticoid-induced tumor necrosis factor receptor (GITR) and uses thereof. *U.S. Patent #9,745,379*.
43. **A. Norman, W. Ball, N. LONBERG, and D. Williams** (2017) Compositions and methods for treating cocaine-related disorders. *U.S. Patent #9,758,593*.
44. **K. Tomizuka, I. Ishida, N. LONBERG, and E. Halk** (2018) Transgenic transchromosomal rodents for making human antibodies. *U.S. Patent #10,076,103*.
45. **A. Korman, N. LONBERG, D. Fontana, A. Gutierrez, M. Selby, and K. Lewis** (2018) Combination of anti-LAG-3 antibodies and anti-PD-1 antibodies to treat tumors. *U.S. Patent #10,081,681*.
46. **N. LONBERG, A. Korman, B. Barnhart, A. Yamniuk, M. Srinivasan, K. Henning, M. Lei, E. Sega, A. Goodenough, M. Jure-Kunkel, G. Chen, J. Sack, R. Huang, M. Corbett, J. Myers, L. Schweitzer, S. Hatcher, H. Huang, P. Zhang** (2018) Antibodies against CD73 and uses thereof. *U.S. Patent #10,100,129*.
47. **N. LONBERG, A. Korman, B. Barnhart, A. Yamniuk, M. Srinivasan, K. Henning, M. Lei, E. Sega, A. Goodenough, M. Jure-Kunkel, G. Chen, J. Sack, R. Huang, M. Corbett, J. Myers, L. Schweitzer, S. Hatcher, H. Huang, P. Zhang** (2018) Antibodies against CD73. *U.S. Patent #10,167,343*.

48. **N. LONBERG and M. Srinivasan** (2019) Optimization of antibodies that bind lymphocyte activation gene-3 (LAG-3), and uses thereof. *U.S. Patent* #10,266,591.
49. **N. LONBERG and M. Srinivasan** (2019) Optimization of antibodies that bind lymphocyte activation gene-3 (LAG-3), and uses thereof. *U.S. Patent* #10,377,824.
50. **C. Wang, N. LONBERG, A. Korman, M. Selby, M. Srinivasan, K. Henning, M. Han, G. Chen, R. Huang, I. Chakraborty, H. Huang, S. Wong, H. Li** (2019) Antibodies against glucocorticoid-induced tumor necrosis factor receptor (GITR) and uses thereof. *U.S. Patent* #10,465,010.
51. **C. Wang, N. LONBERG, A. Korman, M. Selby, M. Srinivasan, K. Henning, M. Han, G. Chen, R. Huang, I. Chakraborty, H. Huang, S. Wong, H. Li** (2019) Antibodies against glucocorticoid-induced tumor necrosis factor receptor (GITR) and uses thereof. *U.S. Patent* #10,501,550.
52. **A. Norman, W. Ball, N. LONBERG, and D. Williams** (2019) Compositions and methods for treating cocaine-related disorders. *U.S. Patent* #10,501,556.
53. **N. LONBERG, A. Korman, M. Selby, B. Barnhart, A. Yamniuk, M. Srinivasan, K. Henning, M. Han, M. Lei, L. Schweitzer, S. Hatcher, A. Rajpal** (2020) Antibodies comprising modified heavy constant regions. *U.S. Patent* #10,653,791.
54. **X.-T. Wang, A. Olufemi, A. Lewin, A. Korman, M. Selby, C. Wang, H. Huang, K. Henning, N. LONBERG, M. Srinivasan, M. Han, G. Chen, R. Huang, I. Chakraborty, S. Wong, H. Li** (2020) Anti-GITR antibodies for cancer diagnostics. *U.S. Patent* # 10,690,674.
55. **C. Wang, N. LONBERG, A. Korman, M. Selby, M. Srinivasan, K. Henning, M. Han, G. Chen, R. Huang, I. Chakraborty, H. Huang, S. Wong, H. Li** (2021) Antibodies against glucocorticoid-induced tumor necrosis factor receptor (GITR) and uses thereof. *U.S. Patent* # 11,084,881.
56. **C. Wang, N. LONBERG, A. Korman, M. Selby, M. Srinivasan, K. Henning, M. Han, G. Chen, R. Huang, I. Chakraborty, H. Huang, S. Wong, H. Li, B. Barnhart, A. Yamniuk, M. Lei, L. Schweitzer, S. Hatcher, A. Rajpal** (2022) Antibodies against glucocorticoid-induced tumor necrosis factor receptor (GITR). *U.S. Patent* # 11,213,586.
57. **A. Korman, N. LONBERG, D. Fontana, A. Guterrez, M. Selby, and K. Lewis** (2022) Combination of anti-LAG-3 antibodies and anti-PD-1 antibodies to treat tumors. *U.S. Patent* # 11,274,152.
58. **L. Presta, P. Tumeh, N. LONBERG, and O. Duramad** (2022) Composite binding molecules targeting immunosuppressive B cells. *U.S. Patent* # 11,299,551.
59. **N. LONBERG and M. Srinivasan** (2022) Optimization of antibodies that bind lymphocyte activation gene-3 (LAG-3), and uses thereof. *U.S. Patent* # 11,345,752.
60. **N. LONBERG, A. Korman, B. Barnhart, A. Yamniuk, M. Srinivasan, K. Henning, M. Lei, E. Sega, A. Goodenough, M. Jure-Kunkel, G. Chen, J. Sack, R. Huang, M. Corbett, J. Myers, L. Schweitzer, S. Hatcher, H. Huang, P. Zhang** (2022) Antibodies against CD73. *U.S. Patent* # 11,352,440.
61. **D. Rohrer, A. Black, and N. LONBERG** (2022) HCO32 and HCO27 and related examples. *U.S. Patent* # 11,384,363.
62. **L. Presta, P. Tumeh, N. LONBERG, O. Duramad** (2022) Composite binding molecules targeting immunosuppressive B cells. (2022) *U.S. Patent* # 11,299,551.
63. **X. Schebye, D. Chen, A. Rankin, X. Deng, J. Toth, L. Liang, M. HAN, C. Bee, H-A. Truong, Mark J. Selby, N. LONBERG, G. Chen, Richard Y. Huange, K. Deyanova, A. Korman** (2022) Antibodies binding to ILT4. *U.S. Patent* # 11,401,328.

64. **X-T Wang, O. Adlakun, A. Lewin, A. Korman, M. Selby, C. Wang, H. Huang, K. Henning, N. LONBERG, M. Srinivasan, M. Han, G. Chen, R. Huang, I. Chakraborty, S. Wong, H. Li** (2022) Anti-GITR antibodies for cancer diagnostics. *U.S. Patent # 11,408889*.