

CURRICULUM VITAE

Norman L. Lehman

Contact Information

Department of Pathology and Laboratory Medicine
Department of Biochemistry and Molecular Genetics
James Graham Brown Cancer Center
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Education

B.S., Biological Science, University of Southern California, 6/1986
M.S., Pharmaceutical Science, University of Southern California, 6/1994
M.D., University of Southern California Keck School of Medicine, 5/1994
Ph.D., Pharmaceutical Science, Emphasis in Molecular Pharmacology, Dissertation: “Biological and biochemical determinants of the cytotoxic potency of the thymidylate synthase inhibitor Tomudex (ZD1694) in colorectal cancer.” University of Southern California, 12/1998

Professional Training and Positions

General Surgery Intern, Huntington Memorial Hospital, Pasadena CA, 7/1994 – 6/1995
Anatomic and Clinical Pathology Resident, Creighton University, Omaha NE, 8/1997 – 6/2000
Neuropathology Fellow, Stanford University, Palo Alto CA, 7/2000 – 7/2002
Postdoctoral Research Fellow, Stanford University, Palo Alto CA, 7/2000 – 7/2002
Staff Neuropathologist and Instructor, Stanford University, Palo Alto CA, 8/2002–7/2007
Senior Staff Pathologist & Senior Investigator, Henry Ford Hospital, Detroit MI, 8/2007–8/10/12
Director, Neuropathology Section, Henry Ford Hospital, Detroit MI, 3/2008-8/2012
Instructor, Dept. of Biological Sciences, Ferris State University, Big Rapids MI, 8/2012–8/2012
Director of the Electron Microscopy Laboratory, Henry Ford Hosp., Detroit MI, 1/2009–8/2012
Associate Professor of Pathology, Wayne State University, Detroit MI, 9/2009 – 8/2012
Adjunct Associate Professor of Neuroscience, Ohio State Univ., Columbus OH, 10/2012–7/2017
Associate Professor of Pathology, Ohio State Univ., Columbus OH, 9/2012 – 7/29/2017
Director, Division of Neuropathology, Ohio State University, Columbus OH, 9/2012 – 7/29/2017
Associate Editor, Journal of Neuropathology and Experimental Neurology, 6/2013 – 12/2016
Professor of Pathology and Lab Medicine, Biochemistry and Molecular Genetics,
The University of Louisville (UofL), Louisville KY, 8/2017 – present
Vice Chair for Research, Dept. of Pathology and Lab Medicine, UofL, 12/18/2017 – present

Other Affiliations

Member, Stanford University Brain Research Institute, 2002 – 7/2007

Member, Hermelin Brain Tumor Center, Henry Ford Hospital, 2007 – 8/2012

Member, Ohio State University Comprehensive Cancer Center, 2/2014 – 7/2017

Member, James Graham Brown Cancer Center, 8/2017 – present

Honors and Awards

University Scholar, University of Louisville, 12/2017 to present

Kurt Jellinger International Award for Outstanding Scientific Writing in Neuropathology, 7/2009

Career Development Award, National Inst. of Neurological Disorders & Stroke, 7/2003 – 6/2008

NIH Clinical Research Loan Repayment Program, 7/2003 – 6/2007

American Medical Association Seed Grant, Stanford University, 6/2001

Dean's Scholar, University of Southern California Keck School of Medicine, 5/1994

National Society to Prevent Blindness Research Fellowship, UC San Francisco, 6/1992

Merit Graduate Research Fellowship, University of Southern California, 9/1988

Major Clinical and Research Interests

NeuroOncology, Cell Signaling, Muscle Pathology, Neurodegeneration, Ophthalmic Pathology

Certification

American Board of Pathology, Anatomic and Clinical Pathology, 9/2000

Neuropathology, 9/2003, Current medical license in California and Kentucky

Ad Hoc Editorial Reviews

American Journal of Ophthalmology, 1998

Cancer Letters, 2/2015

Pharmacological Research, 2000

Neurobiology of Disease, 2004-2006

Targeted Oncology, 12/2015

British Journal of Dermatology, 2004

Brain Pathology 5/2016

J Neuropath & Exp Neurology, 2007-2009

Expert Opin Investig Drugs, 10/2016

Clinical Neuropathology, 2007

Cancer Chemotherapy and Pharmacology, 10/2021

Cancer Genetics, 6/2018, 4/2022, 8/2022

Cellular and Molecular Life Sciences, 2008, 2010

Journal of Neuro-Oncology, 04/2009, 05/2009, 07/2010, 03/2013, 06/2013, 08/2016, 04/2017 (2), 06/2017, 09/2017 (2), 11/2017, 12/2017, 01/2018, 10/2018, 09/2021(n=16).

American Journal of Pathology, 2009, 2010

Journal of Medicine and Medical Sciences, 2010

Archives of Pathology and Laboratory Medicine, 2010

Oncogene, 3/2012, 7/2012, 4/2018

Disease Markers, 2012

General Hospital Psychiatry, 2013

Tumor Biology, 2013

Journal of Spine and Neurosurgery, 2/2014

Oncotarget, 3/2014

International Journal of Cancer, 4/2014, 8/2014, 3/2017

Molecular Cancer, 6/2014

Journal of Neurochemistry, 6/2014

Experimental Cell Research, 11/2014, 12/2014

British Medical Journal Case Reports, 10/2020, 01/2021

Acta Neuropathologica, 8/2015, 7/2016, 6/2017, 2/2019, 06/2020, 12/2020, 02/2021, 04/2021

Neuro-Oncology, 12/2019, 4/2020, 9/2021, 1/2022, 4/2022

American Heart Journal Plus: Cardiology Research and Practice, 2/2022

Editorial Boards

Journal of Neuro-Oncology, 10/2021-present (n=17)

Diagnostic Pathology, 10/2016 – present (n=13)

Journal of Neuropathology and Experimental Neurology, 7/2011 – 12/2016 (n~50)

Acta Neuropathologica, 7/2009 – 12/2012 (n=30)

Lectures and Presentations

Invited Lecture: "The Cell Cycle Regulator and Potential Oncogene Emi1 is Overexpressed in Neurological Tumors." Stanford University Brain Research Institute Lecture, 4/2003

Invited Lecture: "Misregulation of the Anaphase Promoting Complex/Cyclosome and Genomic Instability in Cancer." Palo Alto VA Health Care System Geriatric Research, Education and Clinical Center (GRECC), 10/11/2006

Invited Lecture: "Cell Cycle Regulation of the Anaphase Promoting Complex in Cancer." Wayne State University Center for Molecular Medicine and Genetics, CMMG Seminar, 1/10/2008

Meeting Platform Presentation: "The cell cycle regulator Emi1 is highly overexpressed in ependymomas, anaplastic astrocytomas and glioblastomas." Annual Meeting, American Association of Neuropathologists, San Antonio, 6/2009

Invited Lecture: "Aurora-A kinase is a potential new biomarker and therapeutic target in gliomas." Pathology Department, University of Chicago, 3/2012

Invited Lecture: "The Ubiquitin Proteasome System in Neuropathology." German Society of Neuropathology and Neuroanatomy. Kurt Jellinger Prize Lecture, Düsseldorf, 9/2009.

Invited Lecture: Brain Tumor Study Group, The Ohio State University, 8/2014

Invited Lecture: "Aurora-A inhibition, a novel therapy effective against intracranial glioblastoma." University of Texas, Southwestern, 10/2014

Invited Lecture and Session Chair for Stem Cells-Tools to Battle Cancer: "Glioma tumor stem cell based models for evaluation of anti-glioma therapeutics." 4th International Conference on Tissue Science and Regenerative Medicine, Rome, Italy, 7/2015

Invited Lecture: "Aurora A inhibitors and glioblastoma," Neuroscience Grand Rounds, University of Louisville, 3/2016

Invited Lecture: "Astroblastoma Update, Including Findings of Contemporary Glioma Markers." Neurosurgery Grand Rounds, University of Utah, 5/2016

Seminar: “The Aurora A inhibitor alisertib and the novel taxane TPI-287 induce synergistic apoptosis in glioblastoma,” The Brown Cancer Center Seminar Series, the University of Louisville, 4/11/2018

Seminar: "Manipulating glioma cell fate with aurora A inhibition," The Department of Biochemistry and Molecular Genetics Seminar Series, the University of Louisville, 10/15/2018

Invited Lecture: “Glioma, from development to treatment.” The University of Nevada, Reno, 12/2019

Teaching

Grand Rounds: Forebrain Development: “The Holoprosencephaly Spectrum.” Stanford University Neurological Surgery Grand Rounds, 2/2001

Grand Rounds: “Overview of the Histopathology of Glial Tumors.” Stanford University Neurological Surgery Grand Rounds, 7/2001

Grand Rounds: “Sengers Syndrome & Mitochondrial Myopathies.” Stanford University Neurology Grand Rounds CPC, 11/2001

Grand Rounds: “Pick’s Disease.” Stanford University Neurology Grand Rounds CPC, 4/2002.

Instructor, medical school molecular cell biology and neuroscience courses, Creighton University, 1999 – 2000

Instructor and Lecturer, pathology resident lecture series, medical student pathology course and laboratory, lecturer, introduction to medicine clinical case correlation, special interdepartmental lectures, Stanford University, 2001 – 2007

Lecturer, Pathology, Neurosurgery, Neurology, Radiology Residents *Neuropathology Lecture Series*, Henry Ford Hospital, 2008 – 2012

Lecturer, Pathology Resident Lecture Series, Ohio State University, 2013 4/2/13 (general neuropath), 8/13/13 (glial tumors), and 8/15/13 (non-glial tumors), 2/3/15 (glial tumors)

Lecturer, Ohio State University, Graduate course Neurosci/Pharm 7050, Neurobiology of Disease, 3/2013, 3/2014

Instructor, OSU, Neuroanatomy, 2/5/2015, 2/19/2015

Lecturer, Pathology Resident Lecture Series, the University of Louisville, 2018-present

Home Institutional Service

Member, Hospital Cancer Committee, Creighton University/St. Joseph Hospital 1999 – 2000

Member, Pathology Graduate Studies Committee, Ohio State University (OSU), 2013 – present

Judge, Oral Presentations, Edward F. Hayes Graduate Research Forum, 2/20/2015

Member, Elections and Appointments Committee, OSU College of Medicine, 7/2015 – 7/2017

Member, Immunohistochemistry Committee, OSU Department of Pathology, 2016 – 7/2017

Judge, Oral Presentations, Pathology Residents and Fellow’s Research Day, UofL. 6/15/2018, 6/14/2019

Judge, Poster Presentations, R25 Summer Cancer Education and Research Program Poster Session, UofL, 8/3/2018

Reviewer, Jewish Heritage Foundation for Excellence in Research, Clinical/Translational Pilot Project Grants for the UofL School of Medicine, 3/2019

National Service

Member, The Cancer Genome Atlas (TCGA) CNS Disease Working Group, 2008 – present
 Associate Editor, Journal of Neuropathology and Experimental Neurology (JNEN),
 Official Journal of the American Association of Neuropathologists, 6/2013 – 12/2016
 Member, Awards Committee, American Association of Neuropathologists, 6/2015 – 6/2018

Organizations

American Medical Association; American Association of Neuropathologists; College of American Pathologists; United States and Canadian Academy of Pathology; American Association for the Advancement of Science; American Association for Cancer Research; American Association for Research in Vision and Ophthalmology; Society for Neurooncology

Publications

Journal Articles

h index = 52 <https://scholar.google.com/citations?user=os-o6cLkiU0C&hl=en>

1. Sak M, Williams BJ, Zumber CT, Al-Kawaaz MNG, Kakar A, Hey AJ, Schier LM, Teer L, Chen J, **Lehman NL**. The CNS-penetrating taxane drug TPI 287 potentiates antiglioma activity of the AURKA inhibitor alisertib *in vivo*. under review, *Cancer Chemother Pharmacol* 2022.
2. Terry M, Wakeman K, Williams BJ, Miller DM, Sak M Abdullaev Z, Pacheco MC, Aldape K, **Lehman NL**, Malignant melanotic nerve sheath tumor with *PRKARIA*, *KMT2C* and *GNAQ* mutations. in revision, *Free Neuropath* 2022 3:21 (2022) doi: <https://doi.org/10.17879/freeneuropathology-2022-3864>.
3. **Lehman NL**, Spassky N, Sak M, Webb A, Zumber CT, Usubalieva A, Alkhateeb KJ, McElroy JP, Maclean KH, Fadda P, Liu T, Gangalapudi V, Carver J, Abdullaev Z, Timmers C, Parker JR, Pierson CR, Mobley BC, Gokden M, Hattab EM, Parrett T, Cooke RX, Lehman TD, Costinean S, Parwani A, Williams BJ, Jensen RL, Aldape K, Mistry AM. Astroblastomas exhibit radial glia stem cell lineages and differential expression of imprinted and X-inactivation escape genes. *Nat Commun* 2022 Apr 19;13(1):2083. doi: 10.1038/s41467-022-29302-8. PMID: 35440587.
4. Alkhateeb KJ, Crane JE, Sak M, Jorgensen CJ, O'Donnell JP, Zumber CT, Wozniak JA, Salazar CR, Parwani AV, **Lehman NL**. Aurora-A kinase is differentially expressed in the nucleus and cytoplasm in normal Müllerian epithelium and benign, borderline and malignant serous ovarian neoplasms. *Diagn Pathol* 2021 Oct 27;16(1):98. doi: 10.1186/s13000-021-01158-4. PMID: 34706741; PMCID: PMC8549328.
5. Petri BJ, Piell KM, South Whitt GC, Wilt AE, Poulton CC, **Lehman NL**, Clem BF, Nystoriak MA, Wysoczynski M, Klinge CM. HNRNPA2B1 regulates tamoxifen- and fulvestrant-sensitivity and hallmarks of endocrine resistance in breast cancer cells. *Cancer Lett* 2021 Jul 14:S0304-3835(21)00342-6. doi: 10.1016/j.canlet.2021.07.015. Online ahead of print. PMID: 34273466
6. Sak M, Zumber CT, King PD, Li X, Mifsud CS, Usubalieva A, Anderson CD, Chesnick HM, McElroy JP, Chakravarti A, Burton EC, **Lehman NL**. Cytotoxic synergy between

- alisertib and carboplatin versus alisertib and irinotecan are inversely dependent on MGMT levels in glioblastoma cells. *J Neurooncol* 2019 Jun;143(2):231-240. doi: 10.1007/s11060-019-03164-5. Epub 2019 Apr 22. PMID: 31011934
7. Todeschini AB, Beer-Furlan A, Montaser AS, Jamshidi AO, Ghalib L, Chavez JA, **Lehman NL**, Prevedello DM. Pituitary carcinomas: review of the current literature and report of atypical case. *Br J Neurosurg* 2019 (Epub ahead of print) PMID: 30836020 doi: 10.1080/02688697.2019.1582750.
 8. **Lehman NL**, Usabalieva A, Lin T, Allen SJ, Tran QT, Mobley BC, McLendon RE, Schniederjan MJ, Georgescu MM, Couce M, Dulai MS, Raisanen JM, Al Abbadi M, Palmer CA, Hattab EM, Orr BA. Genomic analysis demonstrates that histologically-defined astroblastomas are molecularly heterogeneous and that tumors with MN1 alteration exhibit the most favorable prognosis. *Acta Neuropathol Commun* 2019;7(1):42. PMID: 30876455
 9. Russell L, Swanner J, Jaime-Ramirez AC, Wang Y, Banasavadi-Siddegowda Y, Yoo JY, Sizemore GM, Kladney R, Zhang J, **Lehman NL**, Ostrowski M, Hong B, Caligiuri M, Yu J, Kaur B. PTEN expression by an oncolytic herpesvirus directs T-cell mediated tumor clearance. *Nat Commun* 2018;9(1):5006. PMID: 30479334.
 10. Sizemore ST, Zhang M, Cho JH, Sizemore GM, Hurwitz B, Kaur B, **Lehman NL**, Ostrowski MC, Robe PA, Miao W, Wang Y, Chakravarti A, Xia F. Pyruvate kinase M2 regulates homologous recombination-mediated DNA double-strand break repair. *Cell Res* 2018;28(11):1090-1102. PMID: 30297868.
 11. Zumbar CT, Usabalieva A, King PD, Li X, Mifsud CS, Dalton HM, Sak M, Urio S, Bryant WM, McElroy JP, Farmer G, **Lehman NL**. The CNS penetrating taxane TPI 287 and the AURKA inhibitor alisertib induce synergistic apoptosis in glioblastoma cells. *J Neurooncol* 2018;137(3):481-492. PMID: 29396807.
 12. Wang Y, Xu X, Maglic D, Dill MT, Mojumdar K, Ng PK, Jeong KJ, Tsang YH, Moreno D, Bhavana VH, Peng X, Ge Z, Chen H, Li J, Chen Z, Zhang H, Han L, Du D, Creighton CJ, Mills GB, **Cancer Genome Atlas Research N**, Camargo F, Liang H. Comprehensive molecular characterization of the hippo signaling pathway in cancer. *Cell Rep* 2018;25(5):1304-1317 e1305. PMID: 30380420.
 13. Huntoon K, Shaddy S, **Lehman N**, Elder JB. Multiple lesions of skull and cervical spine: a rare presentation of unicameral bone cysts. *BMJ Case Rep* 2018;2018. PMID: 30012676.
 14. Hoadley KA, Yau C, Hinoue T, Wolf DM, Lazar AJ, Drill E, Shen R, Taylor AM, Cherniack AD, Thorsson V, Akbani R, Bowlby R, Wong CK, Wiznerowicz M, Sanchez-Vega F, Robertson AG, Schneider BG, Lawrence MS, Noushmehr H, Malta TM, **Cancer Genome Atlas Network**, Stuart JM, Benz CC, Laird PW. Cell-of-origin patterns dominate the molecular classification of 10,000 tumors from 33 types of cancer. *Cell* 2018;173(2):291-304 e296. PMID: 29625048.
 15. Bailey MH, Tokheim C, Porta-Pardo E, Sengupta S, Bertrand D, Weerasinghe A, Colaprico A, Wendl MC, Kim J, Reardon B, Ng PK, Jeong KJ, Cao S, Wang Z, Gao J, Gao Q, Wang F, Liu EM, Mularoni L, Rubio-Perez C, Nagarajan N, Cortes-Ciriano I, Zhou DC, Liang WW, Hess JM, Yellapantula VD, Tamborero D, Gonzalez-Perez A, Suphavitai C, Ko JY, Khurana E, Park PJ, Van Allen EM, Liang H, **Cancer Genome Atlas Research Network**, Lawrence MS, Godzik A, Lopez-Bigas N, Stuart J, Wheeler D, Getz G, Chen K, Lazar AJ, Mills GB, Karchin R, Ding L. Comprehensive characterization of cancer driver

- genes and mutations. *Cell* 2018;173(2):371-385.e318. PMID: 29625053; *Correction in Cell* 2018;174(4):1034-1035. PMID: 30096302.
16. Berger AC, Korkut A, Kanchi RS, Hegde AM, Lenoir W, Liu W, Liu Y, Fan H, Shen H, Ravikumar V, Rao A, Schultz A, Li X, Sumazin P, Williams C, Mestdagh P, Gunaratne PH, Yau C, Bowlby R, Robertson AG, Tiezzi DG, Wang C, Cherniack AD, Godwin AK, Kuderer NM, Rader JS, Zuna RE, Sood AK, Lazar AJ, Ojesina AI, Adebamowo C, Adebamowo SN, Baggerly KA, Chen TW, Chiu HS, Lefever S, Liu L, MacKenzie K, Orsulic S, Roszik J, Shelley CS, Song Q, Vellano CP, Wentzensen N, **Cancer Genome Atlas Research Network**, Weinstein JN, Mills GB, Levine DA, Akbani R. A comprehensive pan-cancer molecular study of gynecologic and breast cancers. *Cancer Cell* 2018;33(4):690-705.e699. PMID: 29622464.
 17. Campbell JD, Yau C, Bowlby R, Liu Y, Brennan K, Fan H, Taylor AM, Wang C, Walter V, Akbani R, Byers LA, Creighton CJ, Coarfa C, Shih J, Cherniack AD, Gevaert O, Prunello M, Shen H, Anur P, Chen J, Cheng H, Hayes DN, Bullman S, Pedomallu CS, Ojesina AI, Sadeghi S, Mungall KL, Robertson AG, Benz C, Schultz A, Kanchi RS, Gay CM, Hegde A, Diao L, Wang J, Ma W, Sumazin P, Chiu HS, Chen TW, Gunaratne P, Donehower L, Rader JS, Zuna R, Al-Ahmadie H, Lazar AJ, Flores ER, Tsai KY, Zhou JH, Rustgi AK, Drill E, Shen R, Wong CK, **Cancer Genome Atlas Research Network**, Stuart JM, Laird PW, Hoadley KA, Weinstein JN, Peto M, Pickering CR, Chen Z, Van Waes C. Genomic, pathway network, and immunologic features distinguishing squamous carcinomas. *Cell Rep* 2018;23(1):194-212.e196. PMID: 29617660.
 18. **Cancer Genome Atlas Research Network**. Author Correction: Comprehensive molecular profiling of lung adenocarcinoma. *Nature* 2018;559(7715):E12. PMID: 29925941.
 19. Chen H, Li C, Peng X, Zhou Z, Weinstein JN, **Cancer Genome Atlas Research Network**, Liang H. A pan-cancer analysis of enhancer expression in nearly 9000 patient samples. *Cell* 2018;173(2):386-399.e312. PMID: 29625054.
 20. Chiu HS, Somvanshi S, Patel E, Chen TW, Singh VP, Zorman B, Patil SL, Pan Y, Chatterjee SS, **Cancer Genome Atlas Research Network**, Sood AK, Gunaratne PH, Sumazin P. Pan-cancer analysis of lncrna regulation supports their targeting of cancer genes in each tumor context. *Cell Rep* 2018;23(1):297-312.e212. PMID: 29617668.
 21. Ding L, Bailey MH, Porta-Pardo E, Thorsson V, Colaprico A, Bertrand D, Gibbs DL, Weerasinghe A, Huang KL, Tokheim C, Cortes-Ciriano I, Jayasinghe R, Chen F, Yu L, Sun S, Olsen C, Kim J, Taylor AM, Cherniack AD, Akbani R, Suphavitai C, Nagarajan N, Stuart JM, Mills GB, Wyczalkowski MA, Vincent BG, Hutter CM, Zenklusen JC, Hoadley KA, Wendl MC, Shmulevich L, Lazar AJ, Wheeler DA, Getz G, **Cancer Genome Atlas Research Network**. Perspective on oncogenic processes at the end of the beginning of cancer genomics. *Cell* 2018;173(2):305-320.e310. PMID: 29625049.
 22. Ellrott K, Bailey MH, Saksena G, Covington KR, Kandath C, Stewart C, Hess J, Ma S, Chiotti KE, McLellan M, Sofia HJ, Hutter C, Getz G, Wheeler D, Ding L, **Cancer Genome Atlas Research Network**. Scalable open science approach for mutation calling of tumor exomes using multiple genomic pipelines. *Cell Syst* 2018;6(3):271-281.e277. PMID: 29596782.
 23. Gao Q, Liang WW, Foltz SM, Mutharasu G, Jayasinghe RG, Cao S, Liao WW, Reynolds SM, Wyczalkowski MA, Yao L, Yu L, Sun SQ, Chen K, Lazar AJ, Fields RC, Wendl MC, Van Tine BA, Vij R, **Cancer Genome Atlas Research Network**, Chen F, Nykter M,

- Shmulevich I, Ding L. Driver fusions and their implications in the development and treatment of human cancers. *Cell Rep* 2018;23(1):227-238.e223. PMID: 29617662.
24. Ge Z, Leighton JS, Wang Y, Peng X, Chen Z, Chen H, Sun Y, Yao F, Li J, Zhang H, Liu J, Shriver CD, Hu H, **Cancer Genome Atlas Research Network**, Piwnica-Worms H, Ma L, Liang H. Integrated genomic analysis of the ubiquitin pathway across cancer types. *Cell Rep* 2018;23(1):213-226.e213. PMID: 29617661.
25. Huang KL, Mashl RJ, Wu Y, Ritter DI, Wang J, Oh C, Paczkowska M, Reynolds S, Wyczalkowski MA, Oak N, Scott AD, Krassowski M, Cherniack AD, Houlihan KE, Jayasinghe R, Wang LB, Zhou DC, Liu D, Cao S, Kim YW, Koire A, McMichael JF, Huchtagowder V, Kim TB, Hahn A, Wang C, McLellan MD, Al-Mulla F, Johnson KJ, **Cancer Genome Atlas Research Network**, Lichtarge O, Boutros PC, Raphael B, Lazar AJ, Zhang W, Wendl MC, Govindan R, Jain S, Wheeler D, Kulkarni S, Dipersio JF, Reimand J, Meric-Bernstam F, Chen K, Shmulevich I, Plon SE, Chen F, Ding L. Pathogenic germline variants in 10,389 adult cancers. *Cell* 2018;173(2):355-370.e314. PMID: 29625052.
26. Jayasinghe RG, Cao S, Gao Q, Wendl MC, Vo NS, Reynolds SM, Zhao Y, Climente-Gonzalez H, Chai S, Wang F, Varghese R, Huang M, Liang WW, Wyczalkowski MA, Sengupta S, Li Z, Payne SH, Fenyo D, Miner JH, Walter MJ, **Cancer Genome Atlas Research Network**, Vincent B, Eyraas E, Chen K, Shmulevich I, Chen F, Ding L. Systematic analysis of splice-site-creating mutations in cancer. *Cell Rep* 2018;23(1):270-281.e273. PMID: 29617666.
27. Kahles A, Lehmann KV, Toussaint NC, Huser M, Stark SG, Sachsenberg T, Stegle O, Kohlbacher O, Sander C, **Cancer Genome Atlas Research Network**, Ratsch G. Comprehensive analysis of alternative splicing across tumors from 8,705 patients. *Cancer Cell* 2018;34(2):211-224.e216. PMID: 30078747.
28. Knijnenburg TA, Wang L, Zimmermann MT, Chambwe N, Gao GF, Cherniack AD, Fan H, Shen H, Way GP, Greene CS, Liu Y, Akbani R, Feng B, Donehower LA, Miller C, Shen Y, Karimi M, Chen H, Kim P, Jia P, Shinbrot E, Zhang S, Liu J, Hu H, Bailey MH, Yau C, Wolf D, Zhao Z, Weinstein JN, Li L, Ding L, Mills GB, Laird PW, Wheeler DA, Shmulevich I, **Cancer Genome Atlas Research Network**, Monnat RJ, Jr., Xiao Y, Wang C. Genomic and molecular landscape of DNA damage repair deficiency across The Cancer Genome Atlas. *Cell Rep* 2018;23(1):239-254.e236. PMID: 29617664.
29. Korkut A, Zaidi S, Kanchi RS, Rao S, Gough NR, Schultz A, Li X, Lorenzi PL, Berger AC, Robertson G, Kwong LN, Datto M, Roszik J, Ling S, Ravikumar V, Manyam G, Rao A, Shelley S, Liu Y, Ju Z, Hansel D, de Velasco G, Pennathur A, Andersen JB, O'Rourke CJ, Ohshiro K, Jogunoori W, Nguyen BN, Li S, Osmanbeyoglu HU, Ajani JA, Mani SA, Houseman A, Wiznerowicz M, Chen J, Gu S, Ma W, Zhang J, Tong P, Cherniack AD, Deng C, Resar L, **Cancer Genome Atlas Research Network**, Weinstein JN, Mishra L, Akbani R. A pan-cancer analysis reveals high-frequency genetic alterations in mediators of signaling by the TGF-beta superfamily. *Cell Syst* 2018. PMID: 30268436.
30. Liu J, Lichtenberg T, Hoadley KA, Poisson LM, Lazar AJ, Cherniack AD, Kovatich AJ, Benz CC, Levine DA, Lee AV, Omberg L, Wolf DM, Shriver CD, Thorsson V, **Cancer Genome Atlas Research Network**, Hu H. An integrated TCGA pan-cancer clinical data resource to drive high-quality survival outcome analytics. *Cell* 2018;173(2):400-416.e411. PMID: 29625055.

31. Liu Y, Sethi NS, Hinoue T, Schneider BG, Cherniack AD, Sanchez-Vega F, Seoane JA, Farshidfar F, Bowlby R, Islam M, Kim J, Chatila W, Akbani R, Kanchi RS, Rabkin CS, Willis JE, Wang KK, McCall SJ, Mishra L, Ojesina AI, Bullman S, Pedamallu CS, Lazar AJ, Sakai R, **Cancer Genome Atlas Research Network**, Thorsson V, Bass AJ, Laird PW. Comparative molecular analysis of gastrointestinal adenocarcinomas. *Cancer Cell* 2018;33(4):721-735.e728. PMID: 29622466.
32. Malta TM, Sokolov A, Gentles AJ, Burzykowski T, Poisson L, Weinstein JN, Kaminska B, Huelsken J, Omberg L, Gevaert O, Colaprico A, Czerwinska P, Mazurek S, Mishra L, Heyn H, Krasnitz A, Godwin AK, Lazar AJ, **Cancer Genome Atlas Research Network**, Stuart JM, Hoadley KA, Laird PW, Noushmehr H, Wiznerowicz M. Machine learning identifies stemness features associated with oncogenic dedifferentiation. *Cell* 2018;173(2):338-354.e315. PMID: 29625051.
33. Peng X, Chen Z, Farshidfar F, Xu X, Lorenzi PL, Wang Y, Cheng F, Tan L, Mojumdar K, Du D, Ge Z, Li J, Thomas GV, Birsoy K, Liu L, Zhang H, Zhao Z, Marchand C, Weinstein JN, **Cancer Genome Atlas Research Network**, Bathe OF, Liang H. Molecular characterization and clinical relevance of metabolic expression subtypes in human cancers. *Cell Rep* 2018;23(1):255-269.e254. PMID: 29617665.
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Abstracts and Presentations

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Research Support

Ongoing

P20 GM135004 (Yan, Chesney) 01/01/20-12/31/24 0.6 calendar (5%)

National Institutes of Health (NIH) \$11,538,000 total

“Center for Cancer Immunology and Immunotherapy (CCII)”

Program contact: Dr. Ming Lei (leim@mail.nih.gov)

Goals: This is a COBRE Phase 1 application to establish a center of excellence in cancer immunology and immunotherapy at the University of Louisville. Specific Aims are to: (1) Establish the administrative and mentoring infrastructure for the CCII; (2) Create a CCII research core that provides new capabilities while leveraging existing facilities; (3) Support the research and career development of junior investigators in the thematic area; and (4) Develop and initiate a plan for long-term sustainability and growth of the CCII.

Role: CoI

T32- ES011564 (Multi-PIs, David W. Hein/John Wise Sr.)

NIH/NIEHS July 1, 2021 to June 30, 2026

The direct annual directs are \$485,010, total directs are \$2,425,050 and total costs \$2,575,255.

“UofL Environmental Health Sciences Training Program”

Role: Mentoring Faculty

Pending

None

Completed

R01 NS081125 (Lehman N)

NIH/NINDS

9/1/14 – 1/31/21

4 calendar (33.3%)

\$365,877 TC (\$239,868 DC)

“Aurora-A is a novel therapeutic target in glioblastoma”

The goals of these studies are to test the potential efficacy of Aurora-A inhibition as a therapy for glioblastoma alone and in combination with other therapies. We will study the biological mechanisms and molecular determinants of the potential efficacy of Aurora-A inhibitors in vivo in order to both identify potential markers of patient drug response and to rationally design optimal combination therapies of Aurora-A inhibitors with other treatment modalities.

Role: PI

ECCS 1710977 (Sertel K)

National Science Foundation

5/1/17-7/31/20 450,000 (68,925, subaward)

4%

“Polarimetric THz Sensor for Reflectometric Imaging”

Unique properties of the Terahertz (THz) band such as the non-ionizing energy levels of THz waves, coupled with micrometer-scale wavelengths offer key advantages in sensing, spectroscopy, and imaging applications. Cancer margin detection using THz polarimetry will be pursued where material properties of healthy and malignant tissues are very close to each other due to similar bound water content. With the full-polarimetric nature of the proposed sensor, THz images obtained by this sensor exhibit significantly improved contrast and thus conventional THz imaging will be significantly enhanced by the additional degrees-of-freedom afforded by the new sensor. Moreover, the compact sensor topology proposed here will be compatible with endoscopic applications and could likely result in a clinical trial upon the completion of the proposed effort.

Role: Co-PI

R01CA188500 (Xia F and Chakravarti A)

NIH/NCI

9/2/14 – 8/31/17

.... 3%

\$401,992 TC

“Novel functions of pyruvate kinase M2 in DNA double-strand break repair”

The mechanisms underlying GBM resistance to radiation therapy (RT) remain poorly understood and agents that selectively sensitize GBM to RT while sparing normal brain tissue are lacking. Pyruvate kinase M2 (PKM2) is the key cytoplasmic glycolytic enzyme, which is critical GBM tumor cell proliferation and expresses highly in cancer cells but minimally in normal brain tissue. Our laboratory has discovered a novel signaling network which connects the nuclear PKM2 function with homologous recombination (HR)-mediated repair of DNA double-strand breaks (DSBs) and GBM tumor cell resistance to radiation-induced cytotoxicity. Furthermore, our preliminary data revealed that PKM2 accumulates in the nucleus following irradiation and interacts with the critical HR rate-limiting protein, CtIP. Meanwhile, ataxia-telangiectasia mutated (ATM), the prime DNA-damage response protein

kinase, phosphorylates PKM2 and regulates radiation-induced PKM2 nuclear accumulation and PKM2-dependent HR DSB repair. Therefore, we hypothesize that, in addition to controlling cytosolic glycolytic metabolism, nuclear PKM2 responds to novel upstream regulation by ATM to dictate the fate of irradiated GBM cells by promoting the repair of radiation-induced DSBs through enhanced CtIP-directed HR.

Role: Co-Investigator

Samsung Electronics Sponsored Research (Sertel K) 04/2014 – 3/2015 0.48 (4%)
\$147,956

Detection of Alzheimer and Diabetes using Polarimetric THz Sensor

The goals of this study are to test the potential of THz-frequency tissue spectroscopy as a new noninvasive tool for the diagnosis of Alzheimer-type neurodegeneration and other disease states. Since THz waves are sensitive to macromolecular structural differences it may be possible to detect abnormal accumulations of beta-amyloid in Alzheimer disease, or abnormal proteins in tissues in other disease states.

Role: Co-Investigator

Millennium Pharmaceuticals Sponsored Research (**Lehman N**) 9/2012 – 9/2014

“Aurora-A as a therapeutic target in glioblastoma.” \$87,000 DC

The goals of this sponsored research is to perform pre-clinical studies of MLN-8237 as a chemotherapeutic agent in gliomas

Role: PI

HHSN261201000057C (Barnholtz-Sloan) 09/27/10 – 02/23/12 (no cost ext 09/30/14) 0.60
NIH/NCI \$472,560 as needed, 5%

RECOVERY – Networks of Tissue Source Site (TSS) in Support of The Cancer Genome Atlas (TCGA) Program. The goal of this project is to extend the ongoing collaborations within the Ohio Brain Tumor Study to become a prospective network of Tissue Source Sites for accrual of glioma patients.

Role: Co-Investigator

R01 CA138401-02: (Rempel, S) 12/01/10 – 11/30/13 .. as needed 5%
NIH/NCI \$250,000 DC

“HSP27: A modulator and therapeutic target of SPARC-induced glioma invasion”

We hypothesize that the loss of PTEN promotes HSP27 phosphorylation by SPARC, commonly upregulated in GBM. We propose that pHSP27 inhibition in the commonly occurring SPARC-positive, PTEN-deleted GBMs can have a significant impact on inhibiting glioma cell invasion and is an important clinical strategy for glioma patients.

Role: Collaborator

PI2770126M: (Mikkelsen T) 04/01/07 – 06/30/10 2.5%
NIH/NCI SAIC Frederick Subcontract \$70,278 DC

The Cancer Genome Atlas

The Cancer Genome Atlas (TCGA) Pilot Program is a comprehensive and coordinated three-year effort, funded by the National Cancer Institute (NCI) and National Human Genome Research Institute (NHGRI), to accelerate our understanding of the molecular basis of cancer through the application of genomic analysis technologies, including large-scale genome

sequencing. Our institution will be donating Glioblastoma tumor samples to the TCGA Pilot Program.

Role: Consultant

L30CA104100 (**Lehman N**) 07/01/2007 – 06/30/2008

“Cell Cycle Regulation in Cancer”

K08 NS45077-01A1 (**Lehman N**) 08/01/03 – 07/31/08, 08/01/09 – 07/31/11 no cost extension
NIH/NINDS \$168,566 DC 80%

“Control of Genomic Stability by Emi1 and Securin”

The major goals of this project are to examine (1) Binding and structure analysis of the interaction of Emi1 with securin, (2) Examine the role of Emi1 in Chromosome missegregation and genomic instability; and (3) Examine Emi1 expression in human tumors.

Role: PI