Nicholas C. Borcherding, M.D., Ph.D.

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Positions

- 2022–2023 - **Senior Computational Biologist**, Santa Ana Bio — Alameda, CA
- 2023–2024 - **Head of Computational Biology**, Omniscope — Barcelona, Spain
- 2024–Present - **Clinical Assistant Professor of Pathology and Immunology**, Washington University in St. Louis — St. Louis, MO

Education & Training

Education

- 2012 - B.S., Nutritional Sciences (summa cum laude) Iowa State University
- 2014 - M.S., Pathology University of Iowa
- 2020 - M.D., Medicine Carver College of Medicine, University of Iowa
- 2020 - Ph.D., Cancer Biology Carver College of Medicine, University of Iowa

Postgraduate Training

- 2020–2023 - Resident, Clinical Pathology, Washington University School of Medicine
- 2024–Present - Fellow, Histocompatibility and Immunogenetics, Washington University School of Medicine

Professional Licensure

- 2023: Medical License, Missouri, #2022049785 (Active)

Military Experience

- 2007–2013, U.S. Marine Corps, Sergeant , Retired

Consulting & Advisory

- 2022–2023 - **Scientific Advisor**, Omniscope, Barcelona, Spain
- 2024–Present - **Development Consultant**, Columbus Instruments, Columbus, OH
- 2024–Present - **Scientific Advisor**, Epana Bio, Inc, San Francisco, CA

Editorial & Peer Review

Editorial/Review Boards

Human Immunology (Associate Editor, 2026)

Ad Hoc Reviews

Cancer Discovery, Communications Biology, Human Immunology, Journal of Clinical Investigations, Journal of Immunology, Journal of Open Source Software, Journal of Pathology: Clinical Research, Journal of Transplantation, Nephrology Dialysis Transplantation, Nucleic Acids Research, Nucleic Acids Research: Genomics & Bioinformatics, Nature Communications, Nature Immunology, Nature Machine

Intelligence, Nature Methods, PLoS, PLoS Computational Biology, Science, Science Advances, Science Immunology

Service & Committees

Institutional

- **2013–2014**: Graduate Student Senate, University of Iowa
- **2014–2018**: Research Council, University of Iowa
- **2015–2018**: Presidential Charter Committee for Recreational Services, University of Iowa.
- **2016–2017**: LCME Accreditation Review Taskforce, Carver College of Medicine, University of Iowa.
- **2016–2017**: Medical Education Council, Carver College of Medicine, University of Iowa.
- **2019–2020**: Alpha Omega Alpha Selection Committee, Carver College of Medicine, University of Iowa.
- **2024–Present**: AI Faculty Search Committee, Department of Pathology and Immunology, Washington University St Louis.
- **2025–Present**: Residency Recruitment Committee, Department of Pathology and Immunology, Washington University St Louis.
- **2025–Present**: Graduate Fellowship Review, Division of Biology & Biomedical Sciences, Washington University St Louis.
- **2026–Present**: Trainee Research Symposium Planning Committee, Department of Pathology and Immunology, Washington University St Louis.
- **2026–Present**: Graduate Application Review Committee, Division of Biology & Biomedical Sciences, Washington University St Louis.

National

- **2016–2017**: First Aid/USMLErx Student Council
- **2024–Present**: Education Initiatives Committee, American Society for Histocompatibility and Immunogenetics
- **2024–Present**: Abstract Reviewer, American Society for Histocompatibility and Immunogenetics
- **2025–2026**: Inferred Allele Review Sub-committee (IARC), AIRR Community of the Antibody Society
- **2026–Present**: T-Cell Receptor and Immunoglobulin Nomenclature Sub-committee (TR-IG NSC) of the International Union of Immunological Societies (IUIS)
- **2026–Present**: AIRR Community Executive Committee

Mentorship

Research Mentorship

- **Qile Yang**, Undergraduate, 2023–Present: Computational immunology research resulting in two submitted publications
- **Isabel Risch**, MSTP Student, 2024–Present: HLA-B27 TCR profiling
- **Patty Hernandez**, Fellow, 2024–Present: HLA eplet comparison of commercial assays
- **Natty Doilicho**, Surgical Resident, 2025–Present: TCR profiling in solid organ transplant
- **Lysander Elger**, Undergraduate, 2026–Present: Spatial transcriptional profiling in neuropathy

Career Development

- **Haewon Shin**, Graduate Student, 2024–Present: Serving on thesis committee

Awards & Honors

- **2005**: Eagle Scout, Boy Scouts of America
- **2012**: Departmental Scholarly Achievement Award, Department of Food Science and Human Nutrition, Iowa State University
- **2012**: University Graduation Marshall, Iowa State University
- **2012**: Graduation Ceremony Student Address, Department of Human Sciences, Iowa State University
- **2013**: Cancer Center Research Award, Carver College of Medicine, University of Iowa
- **2014**: Richard G. Lynch, MD Award for Pathology Research, Carver College of Medicine, University of Iowa
- **2015**: ProQuest Hall of Scholars
- **2015**: L.B. Sims Outstanding Master's Thesis Award in Biological Sciences, Graduate College, University of Iowa
- **2015**: Richard G. Lynch, MD Award for Pathology Research, Carver College of Medicine, University of Iowa
- **2017**: Richard G. Lynch, MD Award for Pathology Research, Carver College of Medicine, University of Iowa
- **2017**: Cancer Center Research Award, Carver College of Medicine, University of Iowa
- **2017**: Wilderness Medicine Race, Carver College of Medicine, University of Iowa
- **2018**: Hancher-Finkbine Medallion, University of Iowa
- **2018**: Wilderness Medicine Race, Carver College of Medicine, University of Iowa
- **2019**: Alpha Omega Alpha Honor Medical Society, Carver College of Medicine, University of Iowa
- **2020**: Williams L. Roberts Young Investigator Award with Distinction, Academy of Clinical and Laboratory Physicians and Scientists
- **2020**: Special Achievement in Pathology, Iowa Pathology Society
- **2021**: Paul E. Strandjord Young Investigator Award, Academy of Clinical and Laboratory Physicians and Scientists
- **2023**: Emerging Generation Award, American Society for Clinical Investigation
- **2026**: Junior Faculty Award, Academy of Clinical and Laboratory Physicians and Scientists
- **2026**: Outstanding Scientific Achievements by a Young Investigator, Association for Diagnostics & Laboratory Medicine
- **2026**: Early Career Investigator Award, American Society for Histocompatibility and Immunogenetics

Professional Memberships

- **2019–Present**: Member, Alpha Omega Alpha Honor Society
- **2023–Present**: Member, American Board of Pathology
- **2024–Present**: Member, Academy of Clinical Laboratory Physicians and Scientists
- **2024–Present**: Member, American Society for Histocompatibility and Immunogenetics
- **2025–Present**: Member, Division of Biology & Biomedical Sciences, Washington University
- **2025–Present**: Member, Siteman Cancer Center at Barnes-Jewish Hospital
- **2025–Present**: Member, Antibody Society

Software

- **2020**: scRepertoire — Author. Toolkit for single-cell immune repertoire analysis and visualization
- **2020**: escape — Author. Easy single cell analysis platform for enrichment
- **2023**: Trex — Author. T-cell receptor embedding and sequence analysis
- **2023**: Ibex — Author. B-cell receptor embedding and sequence analysis

- **2023**: ClamBake — Author. Metabolic estimation for CLAM cages, licensced to Columbus Instruments
- **2024**: immApex — Author. Tools for Adaptive Immune Receptor Sequence-Based Machine and Deep Learning
- **2025**: immReferent — Author. Reference interface to IMGT and OGRDB for immune receptor and HLA sequences
- **2025**: bHIVE — Author. B-cell Hybrid Immune Virtual Evolution model for artificial immune system simulation
- **2025**: dandelionR — Co-author. Single-cell immune repertoire trajectory analysis in R

Clinical Trials

- **2025–2026**: SPIRIT (Sebia). Industry-sponsored FDA trial to validate an AI tool for aiding in immunosubtraction interpretation. Role: Site Investigator

Research Funding

Institutional

- **2017**: *Targeting mismatch repair for immunotherapy in basal-like breast cancer.* Oberley Seed Grant for Experimental Therapeutics. Role: Co-PI
- **2022-2023**: *Measuring intercellular mitochondria transfer with single-cell sequencing.* Interdivision Translational Research Department of Pathology, Washington University. Role: Co-Investigator
- **2025-2026**: *Identification of novel alloantibody targets in lung transplant recipients using phage display immunoprecipitation and sequencing.* Interdivision Translational Research Department of Pathology, Washington University. Role: Principal Investigator
- **2026-2027**: *Deep Paired TCR Sequencing for Early Detection and Prediction of Kidney Transplant Rejection.* Longer Life Foundation. Role: Principal Investigator

National

- **2015-2016**: *Paracrine non-canonical Wnt signaling in breast cancer.* American Medical Association Foundation Research Seed Grant. Role: Principal Investigator
- **2017-2020**: *Paracrine non-canonical Wnt signaling in breast cancer.* NIH F30 CA206255. Role: Principal Investigator
- **2025-Present**: *Harnessing Single-Cell T Cell-Receptor Sequencing to Accelerate Diagnosis in Inflammatory Arthritis.* Arthritis Research Program Focused Research Award, Department of Defense. Role: Co-Investigator
- **2026-Present**: *Paired TCR Sequencing for Early Diagnosis of Psoriatic Arthritis.* Arthritis National Research Foundation. Role: Principal Investigator
- **2026-Present**: *Deep Paired TCRa Reveals Alloreactive Network Architecture in the Acute Kidney Transplant Window.* American Society for Histocompatibility and Immunogenetics. Role: Principal Investigator

Invited Presentations

Institutional

- **2023**: *Single-cell characterization of the T follicular immune response in COVID-19 vaccination using deep learning.* Physician-Scientist Symposium, St. Louis, MO
- **2023**: *Transcriptional heterogeneity in cancer-associated regulatory T cells is predictive of survival.* Single-Cell RNA Sequencing Symposium, Iowa Institute of Genetics
- **2025**: *Computational approaches to the immune synapse.* Rheumatology Transplational Research

Conference, Washington University in St. Louis, MO

National

- **2016**: *Paracrine regulation of breast cancer tumorigenesis.* Midwestern Association of Graduate Schools Conference, Chicago IL
- **2019**: *Single-cell profiling of cutaneous T-cell lymphoma reveals heterogeneity associated with disease progression.* Society for Investigative Dermatology Meeting, Chicago IL
- **2020**: *Single-cell mRNA sequencing of murine and human alopecia areata identifies immune cell profiles predictive of human disease state.* Academy of Clinical Laboratory Physicians and Scientists Meeting, Iowa City IA
- **2023**: *Single-cell characterization of the T follicular immune response in COVID-19 vaccination using deep learning.* Single Cell Club Montreal Meeting
- **2025**: *AI for predicting the specificity of TCR.* ASHI Annual Meeting, Orlando FL
- **2025**: *Bridging Biology and Bytes: The World of Computational Immunology.* Department of Immunology Grand Rounds, Mayo Clinic, Rochester MN
- **2026**: *Pre-Transplant T Cell Receptor Network Topology Predicts Kidney Allograft Outcome Independet of HLA Mismatch.* ACLPS Annual Meeting, St Louis, MO
- **2026**: *Pre-Transplant T Cell Receptor Network Topology Predicts Kidney Allograft Outcome Independet of HLA Mismatch.* AIRR-VIII Annual Meeting, New Haven, CT

Conference Abstracts

- **2014**: **Borcherding, N.**, Kusner, D., Kolb, R., Xie, Q., & Zhang, W.. *Wnt5a/ROR1 Axis in Triple Negative Breast Cancer Progression and Potential Therapy.* American Association for Cancer Research Annual Meeting, San Diego, CA
- **2014**: Kolb, R., Liu, Y., Xie, Q., **Borcherding, N.**, Li, W., & Zhang, W.. *Inflammasome activation in obesity-associated breast cancer progression.* American Association for Cancer Research Annual Meeting, San Diego, CA
- **2014**: Xie, Q., **Borcherding, N.**, Kolb, R., & Zhang, W.. *CD177, A novel metastasis suppressor of breast cancer.* American Association for Cancer Research Meeting, San Diego, CA
- **2015**: Kolb, R., **Borcherding, N.**, Liu, Y., Yuan, F., Xie, Q., Sutterwala, F., & Zhang, W.. *NLRC4 inflammasome promotes breast cancer progression in diet-induced obese mice.* American Association for Cancer Research Annual Meeting, Philadelphia, PA
- **2015**: **Borcherding, N.**, Kusner, D., Kolb, R., Xie, Q., & Zhang, W.. *Paracrine Wnt5a signaling inhibits the expansion of tumor-initiating cells via Ryk/TGF R/Smad2.* ASCI/AAP/APSA Joint Meeting, Chicago, IL
- **2016**: Schaefer, K.A., Toral, M., Velez, G., Cox, A., Baker, S., **Borcherding, N.**, Colgan, D.F., Smits, M.M., Bondada, V., Mashburn, C.B., Yu, C., Geddes, J., Tsang, S.H., Bassuk, A.G., & Mahajan, V.B.. *Calpain-5 expression in the retina localizes to photoreceptor synapses.* FASEB Conference on the Biology of Calpains in Health and Disease, Big Sky, MT
- **2016**: Kolb, R., Phan, L., **Borcherding, N.**, Liu, Y., Yuan, F., Janowski, A.M., Xie, Q., Markan, K., Li, W., Potthoff, M., Fuentes-Mattei, E., Ellies, L., Knudson, M., Lee, M., Yeung, S., Cassel, S., Sutterwala, F., & Zhang, W.. *Obesity-induced Nlrc4 inflammasome promotes angiogenesis in breast cancer.* AACR Special Conference: The Function of Tumor Microenvironment in Cancer, San Diego, CA
- **2017**: **Borcherding, N.**, Jo, S., & Zhang, W.. *Targeting mismatch repair for basal-like breast cancer.* Cancer Biology Training Consortium Annual Meeting, Portland, OR
- **2017**: Feagle, T., **Borcherding, N.**, & Hoffmann, D.. *Students Prefer 3D Anatomy Videos for Prelab Preparation Compared to Traditional Resources and Usage is Related to Class Performance.*

Experimental Biology Conference, Chicago, IL

- **2017**: Kolb, R., Kluz, P., Wei, T.Z., Bormann, N., **Borcherding, N.**, Markan, K., Pothoff, B., Tan, N.S., Sutterwala, F., & Zhang, W.. *IL-1 promotes obesity-driven breast cancer progression through the upregulation of Angptl4 in adipocytes.* Inflammation-driven Cancer: Mechanisms to Therapy Keystone Symposia, Keystone, CO
- **2018**: **Borcherding, N.**, Bormann, N., & Zhang, W.. *Using data analytics to predict and improve cancer immunotherapy response.* American Physician Scientist Association Midwest Regional Meeting, Iowa City, IA
- **2019**: Vishwakarma, A., **Borcherding, N.**, Chementi, M., Vishwakarma, P., Nepple, K., Salem, A., Jenkins, R.W., Zhang, W., & Zakharia, Y.. *Mapping immune landscape in clear cell renal carcinoma by single-cell genomics.* AACR Special Conference on Tumor Immunology and Immunotherapy, Boston, MA
- **2019**: **Borcherding, N.**, Voigt, A., Liu, V., Link, B.K., Zhang, W., & Jabbari, A.. *Single-cell profiling of cutaneous T-cell lymphoma reveals underlying heterogeneity associated with disease progression.* Society for Investigative Dermatology Annual Meeting, Chicago, IL
- **2020**: **Borcherding, N.**. *Combining single-cell and AIRR data.* Adaptive Immune Receptor Repertoire Society Annual Meeting
- **2020**: Rauckhorst, A.J., **Borcherding, N.**, Kraus, A.S., Scerbo, D., & Taylor, E.B.. *Preserving the in vivo metabolome and energy-sensitive phosphoproteome requires rapid freezing of tissue samples.* Metabolomics Association of North America Annual Meeting
- **2020**: **Borcherding, N.**, Crotts, S., Ortolan, L., Bormann, N., & Jabbari, A.. *Single-cell mRNA sequencing of murine and human alopecia areata identifies immune cell profiles predictive of human disease state.* Academy of Clinical Laboratory Physicians and Scientists Annual Meeting, Iowa City, IA
- **2020**: Renavikar, P., Sinha, S., Brate, A., Crawford, M., **Borcherding, N.**, Steward, S., & Karandikar, N.. *Immune suppressive deficit in human Tc1 cells secondary to IL-12-induced pathways.* Academy of Clinical Laboratory Physicians and Scientists Annual Meeting, Iowa City, IA
- **2020**: Hoffmann, D., Feagle, T., & **Borcherding, N.**. *Virtual Anatomy Videos for Pre-Lab Preparation: Does Usage Correlate with Grade Outcomes.* Experimental Biology Annual Meeting, San Diego, CA (Canceled due to COVID-19)
- **2020**: Cole, K., Councilman, K., Zhang, W., & **Borcherding, N.**. *WNT/ -Catenin Signaling Correlates with Improved Survival in Luminal A Breast Cancer.* USCAP Annual Meeting, Los Angeles, CA
- **2021**: Lasrado, N., **Borcherding, N.**, Arugmugam, R., Starr, T.K., & Reddy, J.. *Dissecting the complexity of heart infiltrates in post-infectious myocarditis induced with CVB3 infection by single-cell RNA sequencing analysis.* American Association of Immunologists Annual Meeting
- **2021**: **Borcherding, N.**, Henderson, N., Ortolan, L., Liu, V., Link, B.K., Mangold, A., & Jabbari, A.. *Comprehensive transcriptional and clonotypic analysis of peripheral blood in Sezary syndrome reveals novel expression markers and shifting gene profiles associated with treatment.* Society for Investigative Dermatology Annual Meeting
- **2021**: **Borcherding, N.**, Henderson, N., Ortolan, L., Liu, V., Link, B.K., Mangold, A., & Jabbari, A.. *Comprehensive transcriptional and clonotypic analysis of peripheral blood in Sezary syndrome reveals novel expression markers and shifting gene profiles associated with treatment.* United States and Canada Academy of Pathology Annual Meeting
- **2023**: Melero, J., Colom-Sanmartí, B., Mendizabal-Sasieta, A., Perron, U., Grzelak, M., Pravdyvets, D., Soto, M., Nieto, J., Vidal, S., Tejpar, S., **Borcherding, N.**, Planas-Rigol, E., & Heyn, H.. *Integrated modeling of T cell repertoires to identify clonotype signatures of ICI response.* ESMO Immuno-Oncology Congress

- **2023**: **Borcherding, N**., Jia, W., Giwa, R., Field, R.L., Moley, J.R., Kopecky, B., Chan, M., Yang, B., Sabio, J., Walker, E., Osorio, O., Bredemeyer, A., Pietka, T., Alexander-Brett, J., Morley, S.C., Artyomov, M., Abumrad, N., Schilling, J., Lavine, K., Crewe, C., & Brestoff, J.R.. *Dietary lipids inhibit mitochondria transfer to macrophages to divert adipocyte-derived mitochondria into the blood.* American Society for Clinical Investigation Annual Meeting
- **2023**: **Borcherding, N**., Leckie-Harre, A., Wu, H., Humphreys, B., & Malone, A.. *Autoencoder, a Novel Computational Tool to Score T Cell Clones Demonstrates Biopsy T Cell Clones Are Not Represented in Peripheral Blood.* American Transplant Congress Annual Meeting
- **2024**: Heyn, H., Melero, J., Deuner, G., Baraibar, I., Grzelak, M., Caratú, G., García-Durán, C., Grau, F., García-Illescas, D., Fariñas, L., Paula Nieto, P., Morabito, S., Rotem, A., Casbas-Hernandez, P., Gros, A., Tabernero, J., Oaknin, A., Nieto, J., **Borcherding, N**., & Élez, E.. *Liquid biopsy tracking of immunotherapy-induced T cell dynamics in MSS colorectal and endometrial tumors.* ESMO Congress Annual Meeting
- **2024**: Melero, J., Sentís, I., Cebria-Xart, A., Caratu, G., Grzelak, M., Soto, M., Rodríguez-Hernández, C., Mendizabal-Sasieta, A., Maspero, D., Pascual, A., Perez, J., Galan, R., **Borcherding, N**., Nieto, J., Avgustinova, A., & Heyn, H.. *Spatio-temporal tracking of therapy-induced T cell immunity against pediatric rhabdoid tumors.* Innovations in Single Cell Omics
- **2024**: Melero, J., Grzelak, M., Pravdyvets, D., Soto, M., Mendizabal-Sasieta, A., Perron, U., **Borcherding, N**., & Heyn, H.. *Ultra deep single-cell T cell receptor sequencing for cancer therapeutics and prognosis.* LSX World Congress Annual Meeting
- **2024**: Melero, J., Colom-Sanmartí, B., Mendizabal-Sasieta, A., Perron, U., Grzelak, M., Pravdyvets, D., Soto, M., Nieto, J., Vidal, S., Tejpar, S., **Borcherding, N**., Planas-Rigol, E., & Heyn, H.. *Integrated modeling of T cell repertoires to identify clonotype signatures of ICI response.* Immuno-Oncology Summit Europe
- **2024**: Planas-Rigol, E., Melero, J., Colom-Sanmartí, B., Bonfill-Teixidor, E., Arias, A., Grzelak, M., Pravdyvets, D., Sant, M., Martelotto, L., **Borcherding, N**., Heyn, H., & Seoane, J.. *Quantification of Brain Metastasis-Infiltrating T cells in Blood Using Ultra-Deep Single-Cell T Cell Repertoire Sequencing.* American Association for Cancer Research Annual Meeting
- **2025**: **Borcherding, N**., Martens, G., Taniguchi, M., & Liu, C.. *A Robust AUC-Based Method for Eplet Calling in HLA Single Antigen Bead Assays: Reducing Variability and Enhancing Cohort-Level Profiling.* Histocompatibility and Immunogenetics Annual Meeting
- **2025**: **Borcherding, N**., Dajles, A., Martens, G., Clark, D., Taniguchi, M., & Liu, C.. *Developing Flow Cytometry Crossmatch Thresholds: A Statistical Evaluation for Clinical Crossmatching Data.* Histocompatibility and Immunogenetics Annual Meeting

Textbooks or Chapters

- **2016**: Schalinske, K., **Borcherding, N**., Rowling, M.. *Advanced Nutrition and the Regulation of Metabolism.* ISBN: 978-1-5165-1468-7
- **2019**: Zhang, W., **Borcherding, N**., Kolb, R.. *IL-1 signaling in the tumor microenvironment. Tumor Microenvironment.* ISBN: 978-3-030-34025-4
- **2020**: Kolb, R., **Borcherding, N**., Zhang, W.. *Understanding and targeting human cancer regulatory T cells to improve cancer therapy. T Regulatory Cells in Health and Disease.* ISBN: 978-3-030-34025-4

Publications

1. Smazal AL, **Borcherding NC**, Anderegg AS, Schalinske KL, Whitley EM, Rowling MJ. Dietary resistant starch prevents urinary excretion of 25-hydroxycholecalciferol and vitamin D-binding protein in type 1 diabetic rats. The Journal Of Nutrition. 2013;143(7):1123-8. PMID:23677864

2. Zhang W, Tan W, Wu X, Poustovoitov M, Strasner A, Li W, **Borcherding N**, Ghassemian M, Karin M. A NIK-IKK module expands ErbB2-induced tumor-initiating cells by stimulating nuclear export of p27/Kip1. Cancer Cell. 2013;23(5):647–59. PMID:23602409
3. **Borcherding N**, Kusner D, Liu G, Zhang W. ROR1, an embryonic protein with an emerging role in cancer biology. Protein & Cell. 2014;5(7):496–02. PMID:24752542
4. Reed SM, Hagen J, Muniz VP, Rosean TR, **Borcherding N**, Sciegienka S, Goeken JA, Naumann PW, Zhang W, Tompkins VS, Janz S, Meyerholz DK, Quelle DE. NIAM-deficient mice are predisposed to the development of proliferative lesions including B-cell lymphomas. Plos One. 2014;9(11):e112126. PMID:25393878
5. Wu X, Zhang W, Font-Burgada J, Palmer T, Hamil AS, Biswas SK, Poidinger M, **Borcherding N**, Xie Q, Ellies LG, Lytle NK, Wu L, Fox RG, Yang J, Dowdy SF, Reya T, Karin M. Ubiquitin-conjugating enzyme Ubc13 controls breast cancer metastasis through a TAK1-p38 MAP kinase cascade. Proceedings Of The National Academy Of Sciences Of The United States Of America. 2014;111(38):13870-5. PMID:25189770
6. **Borcherding N**, Bormann N, Kusner D, Kolb R, Zhang W. Transcriptome analysis of basal and luminal tumor-initiating cells in ErbB2-driven breast cancer. Genomics Data. 2015;4:119–22. PMID:26167451
7. **Borcherding N**, Kusner D, Kolb R, Xie Q, Li W, Yuan F, Velez G, Askeland R, Weigel RJ, Zhang W. Paracrine WNT5A Signaling Inhibits Expansion of Tumor-Initiating Cells. Cancer Research. 2015;75(10):1972–82. PMID:25769722
8. Mahauad-Fernandez WD, **Borcherding NC**, Zhang W, Okeoma CM. Bone marrow stromal antigen 2 (BST-2) DNA is demethylated in breast tumors and breast cancer cells. Plos One. 2015;10(4):e0123931. PMID:25860442
9. Xie Q, Klesney-Tait J, Keck K, Parlet C, **Borcherding N**, Kolb R, Li W, Tygrett L, Waldschmidt T, Olivier A, Chen S, Liu G, Li X, Zhang W. Characterization of a novel mouse model with genetic deletion of CD177. Protein & Cell. 2015;6(2):117–26. PMID:25359465
10. Kolb R, Phan L, **Borcherding N**, Liu Y, Yuan F, Janowski AM, Xie Q, Markan KR, Li W, Potthoff MJ, Fuentes-Mattei E, Ellies LG, Knudson CM, Lee M, Yeung SJ, Cassel SL, Sutterwala FS, Zhang W. Obesity-associated NLRC4 inflammasome activation drives breast cancer progression. Nature Communications. 2016;7:13007. PMID:27708283
11. Kusner D, **Borcherding N**, Zhang W. Paracrine WNT5A signaling in healthy and neoplastic mammary tissue. Molecular & Cellular Oncology. 2016;3(1):e1040145. PMID:27308558
12. Schaefer KA, Toral MA, Velez G, Cox AJ, Baker SA, **Borcherding NC**, Colgan DF, Bondada V, Mashburn CB, Yu C, Geddes JW, Tsang SH, Bassuk AG, Mahajan VB. Calpain-5 Expression in the Retina Localizes to Photoreceptor Synapses. Investigative Ophthalmology & Visual Science. 2016;57(6):2509–21. PMID:27152965
13. **Borcherding N**, Bormann NL, Voigt AP, Zhang W. TRGAted: A web tool for survival analysis using protein data in the Cancer Genome Atlas. F1000research. 2018;7:1235. PMID:30345029
14. **Borcherding N**, Cole K, Kluz P, Jorgensen M, Kolb R, Bellizzi A, Zhang W. Re-Evaluating E-Cadherin and -Catenin: A Pan-Cancer Proteomic Approach with an Emphasis on Breast Cancer. The American Journal Of Pathology. 2018;188(8):1910–20. PMID:29879416
15. **Borcherding N**, Kolb R, Gullicksrud J, Vikas P, Zhu Y, Zhang W. Keeping Tumors in Check: A Mechanistic Review of Clinical Response and Resistance to Immune Checkpoint Blockade in Cancer. Journal Of Molecular Biology. 2018;430(14):2014–29. PMID:29800567
16. Fleagle TR, **Borcherding NC**, Harris J, Hoffmann DS. Application of flipped classroom pedagogy to the human gross anatomy laboratory: Student preferences and learning outcomes. Anatomical Sciences Education. 2018;11(4):385–96. PMID:29283505
17. Fleagle TR, **Borcherding NC**, Harris J, Hoffmann DS. Erratum: Application of flipped class-

room pedagogy to the human gross anatomy laboratory: Student preferences and learning outcomes. Anatomical Sciences Education. 2018;11(4):429. PMID:29966047
18. Liu Q, Kulak MV, **Borcherding N**, Maina PK, Zhang W, Weigel RJ, Qi HH. A novel HER2 gene body enhancer contributes to HER2 expression. Oncogene. 2018;37(5):687–94. PMID:29035388
19. Sinha S, **Borcherding N**, Renavikar PS, Crawford MP, Tsalikian E, Tansey M, Shivapour ET, Bittner F, Kamholz J, Olalde H, Gibson E, Karandikar NJ. An autoimmune disease risk SNP, rs2281808, in SIRPG is associated with reduced expression of SIRP and heightened effector state in human CD8 T-cells. Scientific Reports. 2018;8(1):15440. PMID:30337675
20. Vikas P, **Borcherding N**, Zhang W. The clinical promise of immunotherapy in triple-negative breast cancer. Cancer Management And Research. 2018;10:6823–33. PMID:30573992
21. Xiu Y, Dong Q, Li Q, Li F, **Borcherding N**, Zhang W, Boyce B, Xue H, Zhao C. Stabilization of NF- B-Inducing Kinase Suppresses MLL-AF9-Induced Acute Myeloid Leukemia. Cell Reports. 2018;22(2):350–58. PMID:29320732
22. Bi J, Yang S, Li L, Dai Q, **Borcherding N**, Wagner BA, Buettner GR, Spitz DR, Leslie KK, Zhang J, Meng X. Metadherin enhances vulnerability of cancer cells to ferroptosis. Cell Death & Disease. 2019;10(10):682. PMID:31527591
23. **Borcherding N**, Voigt AP, Liu V, Link BK, Zhang W, Jabbari A. Single-Cell Profiling of Cutaneous T-Cell Lymphoma Reveals Underlying Heterogeneity Associated with Disease Progression. Clinical Cancer Research : An Official Journal Of The American Association For Cancer Research. 2019;25(10):2996–05. PMID:30718356
24. Kolb R, Kluz P, Tan ZW, **Borcherding N**, Bormann N, Vishwakarma A, Balcziak L, Zhu P, Davies BS, Gourronc F, Liu L, Ge X, Jiang B, Gibson-Corley K, Klingelhutz A, Tan NS, Zhu Y, Sutterwala FS, Shen X, Zhang W. Obesity-associated inflammation promotes angiogenesis and breast cancer via angiopoietin-like 4. Oncogene. 2019;38(13):2351–63. PMID:30518876
25. Liu Q, **Borcherding N**, Shao P, Cao H, Zhang W, Qi HH. Identification of novel TGF- regulated genes with pro-migratory roles. Biochimica Et Biophysica Acta. Molecular Basis Of Disease. 2019;1865(12):165537. PMID:31449970
26. Pandey G, **Borcherding N**, Kolb R, Kluz P, Li W, Sugg S, Zhang J, Lai DA, Zhang W. ROR1 Potentiates FGFR Signaling in Basal-Like Breast Cancer. Cancers. 2019;11(5). PMID:31137681
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