

NICHOLAS BORCHERDING, M.S.

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St Louis, MO 63139

Education

Medical Doctorate University of Iowa, Iowa City, IA	June 2014 – May 2020
Cancer Biology, Ph.D. University of Iowa, Iowa City, IA	June 2016 – May 2020
Pathology, M.S. University of Iowa, Iowa City, IA	August 2012 – June 2014
Nutritional Science, B.S. Iowa State University, Ames, IA	January 2009 – May 2012

Appointments

Clinical Pathology Resident Physician Scientist Training Program (PSTP) Department of Pathology and Immunology Washington University, St Louis, MO	July 2020 – Present
Research Adjunct Appointment Department of Dermatology University of Iowa, Iowa City, IA	May 2020 – Present
Graduate Research Assistant Program: Cancer Biology Graduate Program, Ph.D. Mentor: Dr. Weizhou Zhang Department of Pathology University of Iowa, Iowa City, IA	June 2016 – December 2018
Graduate Research Assistant Program: Pathology Graduate Program, M.S. Mentor: Dr. Weizhou Zhang Department of Pathology University of Iowa, Iowa City, IA	August 2012 – June 2014
Undergraduate Research Assistant Mentor: Dr. Matthew Rowling and Dr. Kevin Schalinske Department of Food Science and Human Nutrition Iowa State University, Ames, IA	May 2010 – August 2012
Louise Rosenfeld Undergraduate Research Intern Mentor: Dr. Matthew Rowling Department of Food Science and Human Nutrition Iowa State University, Ames, IA	August 2011 – December 2011

Publications

1. Crawford, M.P., Sinha, S., Renavikar, P.S., **Borcherding, N.**, & Karandikar, N. (2020). Novel role for the T-helper 17 signature cytokine IL-17: CD4 resistance to immune suppression. *PNAS*. PMID: 32719138.
2. **Borcherding, N.**, Crotts, S.B., Ortolan, L.S., Bormann, N.L., Jabbari, A. (2020). A transcriptomic atlas of murine and human alopecia areata identifies immune cell profiles predictive of human disease state. *Journal of Clinical Investigations Insights*. PMID: 32453712.
3. Vikas, P.*, **Borcherding, N.***, Chennamadhani, A., Garje, R. (2020). Therapeutic potential of combining PARP inhibitor and immunotherapy in solid tumors. *Frontiers in Oncology*. PMID: 32457830. *co-primary authors
4. Kluz, P.N., Kolb, R., Xie, Q., **Borcherding, N.**, Liu, Q., Wang, L., Zhang, Y., Li, W., Stipp, C., Gibson-Corley, K.N., Zhao, C., Qi, H.H., Bellizzi, A., Tao, A.W., Sugg, S., Weigel, R.J., Shen, X., Zhang, W. (2020). Cancer cell-intrinsic function of CD177 in attenuating β -Catenin signaling. *Oncogene*. PMID: 32042113.
5. **Borcherding, N.***, Bormann, N., & Kraus, G. (2020). scRepertoire: A R-based toolkit for single-cell immune receptor analysis. *F1000Research*. PMID: 32789006. *first and corresponding author
6. Liu, Q., **Borcherding, N.**, Shao, P., Maina, P., Zhang, W., & Qi, H. (2019) Contribution of synergism between PHF8 and HER2 signaling to breast cancer development and drug resistance. *EBioMedicine*. PMID: 31923801.
7. Xiu, Y., Qianze Dong, Q., Fu, L., Bossler, A., Tang, X., Boyce, B., **Borcherding, N.**, Byrd, J., Leidinger, M., Sardina, J.L., Xue, H., Li, Q., Feldman, A., Aifantis, I., Boccalatte, F., Khoury, J., Wang, W., Hu, S., Yuan, Y., Wang, E., Yuan, J., Colgan, J., Habelhah, H., Waldschmidt, T., Muschen, M., & Zhao, C. (2019). Concurrent activation of NF- κ B and Notch signaling is sufficient to induce B cell transformation and enables B-myeloid conversion. *Blood*. PMID: 31697816
8. Wu, V., Kiriazov, B., Koch, K., Gu, V., Beck, A., **Borcherding, N.**, Li, T., Addo, P., Wehrspan, Z., Zhang, W., Braun, T., Brown, B., Band, V., Band, B., Kulak, M., & Weigel, R. (2019). A TFAP2C Gene Signature is Predictive of Outcome in HER2-positive Breast Cancer. *Molecular Cancer Research*. PMID: 31619506
9. Bi, J., Yang, S., Li, L., Dai, Q., **Borcherding, N.**, Wagner, B.A., Buettner, G.R., Spitz, D.R., Leslie, K.K., Zhang, J., & Meng, X. (2019). Metadherin (MTDH) Enhances Vulnerability of Cancer Cells to Ferroptosis. *Cell Death and Disease*. PMID: 31527591.
10. Liu, Q.*, **Borcherding, N.***, Shao, P., Cao, H., Zhang, W., & Qi, H. (2019). Identification of novel TGF- β regulated genes with pro-migratory roles. *Molecular Basis of Disease*. PMID: 31449970 *co-primary authors
11. Pandey, G.*, **Borcherding, N.***, Kolb, R., Kluz, P., Li, W., Sugg, S., Zhang, J., Lai, D., & Zhang W. (2019). ROR1 potentiates FGFR signaling in basal-like breast cancer. *Cancers*. PMID: 31137681. *co-primary authors
12. **Borcherding, N.**, Voigt, A., Liu, V., Link, B.K., Zhang, W., & Jabbari, A. (2019) Single-cell profiling of cutaneous T-cell lymphoma reveals underlying heterogeneity associated with disease progression. *Clinical Cancer Research*. PMID: 30718356
13. Kolb, R., Kluz, P., Wei, T.Z., **Borcherding, N.**, Bormann, N., Balczak, L., Zhu, P., Davies, B., Gourronc, F., Gibson-Corley, K., Klingelutz, A., Tan, N.S., Sutterwala, F., Vishwakarma, A., Liu, L., Ge, X., Jiang, B., Zhu, Y., Shen, X., & Zhang, W. (2019). Obesity-associated inflammation promotes angiogenesis and breast cancer via angiopoietin-like 4. *Oncogene*. PMID: 30518876
14. Vikas, P., **Borcherding, N.**, & Zhang, W. (2019). The Clinical Promise of Immunotherapy in Triple-Negative Breast Cancer. *Clinical Management and Research*. PMID:30573992
15. **Borcherding, N.**, Bormann, N., Voigt, A., & Zhang, W. (2018). TRGAted: A web tool for survival analysis using protein data in the Cancer Genome Atlas. *F1000Research*. PMID: 30345029
16. **Borcherding, N.***, Cole, K.*, Kluz, P., Pandey, G., Jorgensen, M., Kolb, R., Bellizzi, A., & Zhang, W. (2018). Reevaluating E-Cadherin and β -Catenin: A pan-cancer proteomic approach with emphasis on breast cancer. *American Journal of Pathology*. PMID: 29879416 *co-primary authors
17. **Borcherding, N.**, Kolb, R., Gullicksrud, J., Vikas, P. Zhu, Y., & Zhang, W. (2018). Keeping tumors in check: A mechanistic review of clinical response and resistance to immune checkpoint blockade in cancer. *Journal of Molecular Biology*. PMID: 29800567.

18. Sinha, S., **Borcherding, N.**, Renavikar, P., Crawford, M., & Karandikar. (2018). Autoimmune disease risk SNP rs2281808 in *Sirpy* is associated with heightened effector state and greater cytotoxic potential in human CD8 T-cells. *Scientific Reports*. PMID: 30337675.
19. Xiu, Y., Li, Q., Li, F., Boyce, B., **Borcherding, N.**, Xue, X., & Zhao, C. (2017). Stabilization of NF- κ B-inducing kinase suppresses MLL-AF9-induced acute myeloid leukemia. *Cell Reports*. PMID: 29320732.
20. Liu, Q., Kulak, M., **Borcherding, N.**, Maina, P., Zhang, W., Weigel, R., & Qi, H. (2017). A novel *HER2* gene-body enhancer contributes to *HER2* expression. *Oncogene*. PMID: 29035388.
21. Fleagle, T., **Borcherding, N.**, & Hoffmann, D. (2017) A series of Custom 3D Anatomy Videos to Improve Preparation for Gross Anatomy Lab Dissection. *Anatomical Science Education*. PMID: 29283505
22. Kolb, R., Phan L., **Borcherding, N.**, Liu, Y., Yuan, F., Janowski, A.M., Xie, Q., Markan, K.R., Li, W., Potthoff, M.J., Fuentes-Mattei, E., Knudsen, M., Lee, M., Yeung, S., Cassel, S., Sutterwala, F., & Zhang, W. (2016). Obesity-associated NLRC4 inflammasome activation drives breast cancer progression. *Nature Communications*. PMID: 27708283.
23. **Borcherding, N.***, Rudolph, M.*, Tierney, A.*, Vyn, & R., Hoffmann. (2016) Content evaluation, usage profile and student preferences related to a medical student wiki for student-authored learning resources. *Medical Science Educator*: 1-10. *co-primary authors
24. Kusner, D.*, **Borcherding, N.***, & Zhang, W. (2016) Paracrine WNT5A signaling in the mammary healthy and neoplastic mammary tissue. *Molecular & Cellular Oncology*. PMID: 27308558. *co-primary author
25. **Borcherding, N.**, Bormann, N., Kusner, D., Kolb R., & Zhang, W. (2015) Transcriptome analysis of basal and luminal tumor-initiating cells in ErbB2-driven breast cancer. *Genomic Data*. PMID: 26167451.
26. Schaefer, K., Toral, M., Velez, G., Cox, A., Baker, S., **Borcherding, N.**, Colgan, D., Bondada, V., Mashburn, C., Yu, C., Geddes, J., Tsang, S., Bassuk, A., & Mahajan, V. (2016). Calpain-5 expression in the retina localizes to photoreceptor synapses. *Investigative Ophthalmology and Visual Science*. PMID: 27152965.
27. **Borcherding, N.***, Kusner, D.*, Kolb, R., Xie, Q., Li, W., Yuan, F., Velez, G., Askeland, R., Weigel, R.J., & Zhang, W. (2015). Paracrine WNT5A Signaling Inhibits Expansion of Tumor-Initiating Cells. *Cancer Research*. PMID: 25769722. *co-primary authors
28. Mahauad-Fernandez, W.D.*, **Borcherding, N. C.***, Zhang, W., & Okeoma, C.M. (2015). Bone Marrow Stromal Antigen 2 (BST-2) DNA Is Demethylated in Breast Tumors and Breast Cancer Cells. *PLoS One*. PMID: 25393878. *co-primary authors
29. Reed, S.M., Hagen, J., Muniz, V.P., Rosean, T.R., **Borcherding, N.**, Sciegienka, S., Goeken, J.A., Naumann, P.W., Zhang, W., Tompkins, V.S., Janz, S., Meyerholz, D.K., & Quelle, D.E. (2014). NIAM-deficient mice are predisposed to the development of proliferative lesions including B-cell lymphomas. *PLoS One*. PMID: 25393878
30. 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. H., Li, X., & Zhang, W. (2015). Characterization of a novel mouse model with genetic deletion of CD177. *Protein & Cell*. PMID: 25359465
31. **Borcherding, N.**, Kusner, D., Liu, G. H., & Zhang, W. (2014). ROR1, an embryonic protein with an emerging role in cancer biology. *Protein Cell*. PMID: 24752542.
32. Wu, X., Zhang, W., Font-Burgada, J., Palmer, T., Hamil, A. S., Biswas, S. K., Poidinger, M., **Borcherding, N.**, Xie, Q., Ellies, L. G., Lyle, N. K., Wu, L. W., Fox, R. G., Yang, J., Dowdy, S. F., Reya, T., & Karin, M. (2014). Ubiquitin-conjugating enzyme Ubc13 controls breast cancer metastasis through a TAK1-p38 MAP kinase cascade. *Proceedings of the National Academy of Science*. PMID: 25189770.
33. Smazal, A. L.*, **Borcherding, N. C.***, Andereg, A. S., Schalinske, K. L., Whitley, E. M., & Rowling, M. J. (2013). Dietary resistant starch prevents urinary excretion of 25-hydroxycholecalciferol and vitamin D-binding protein in type 1 diabetic rats. *Journal of Nutrition*. PMID: 23677864. *co-primary authors
34. Zhang, W., Tan, W., Wu, X., Poustovoitov, M., Strasner, A., Li, W., **Borcherding, N.**, Ghassemian, M., & Karin, M. (2013). A NIK-IKK α module expands ErbB2-induced tumor-initiating cells by stimulating nuclear export of p27/Kip1. *Cancer Cell*. PMID: 23602409.

Submitted Manuscripts

1. Fujiwara, Y., Torphy, R.J., Miller, E.N., **Borcherding, N.**, Zhang, W., Schulick, R.D., & Zhu, Y. (2020). The BigLen/GPR171 pathway suppresses T cell activation and limits antitumor immunity.
2. **Borcherding, N.**, Crawford, M., & Karandikar, N. (2020) IL-17 cytokines preferentially act on naïve CD4+ T cells.
3. **Borcherding, N.**, Vishwakarma, A. Voigt, A.P., Nepple, K., Salem, A., Jenkins, R.W., Zhang, W., Zakharia, Y. (2020) Mapping Immune Landscape in Clear Cell Renal Carcinoma by single-cell genomics.
4. Mathew, N.R., Jayanthan, J.K, Smirnov, I, Robinson, J.L. Axelsson, H., Nakka, S.S., Emmanouilidi, A., Czarnewski, P., Yewdell, W.T., Lebrerio-Fernandez, C, Bernasconi, V., Harandi, A.M, Lycke, N., **Borcherding, N.**, Yewdell, J.W., Greiff, V., Bemarker, M., & Angeletti, D., (2020) Single-cell BCR and RNA analysis after respiratory virus infection reveals spatiotemporal dynamics of antigen-specific B cell response.
5. Merritt, N., Garcia, K. Rajendran, D., Lin, Z.Y., Zhang, X., Mitchell, K., **Borcherding, N.**, Fullenkamp, C., Chimenti, M., Gingras, A.C., Harvey, K., & Tanas, M. (2020) TAZ-CAMTA1 and YAP3-TFE3 modulates the basal TAZ/YAP transcriptional program by recruiting the ATAC histone acetyltransferase complex.
6. **Borcherding, N.**, Jethava, Y., Vikas, P. (2020). The potential of repurposing anti-cancer drugs for COVID-19.
7. Renavikar, P.S., Sinha, S., Brate, A.A., **Borcherding, N.**, Crawford, M.P., Steward-Tharp, S., & Karandikar, N. (2020). IL-12-mediated induction of immune suppressive deficit during CD8+ differentiation.
8. Kolb, R., **Borcherding, N.**, & Zhang, W. (2020). Understanding and targeting human cancer regulatory T cells to improve cancer therapy.
9. Kolb, R., De, U., Khan, S., Luo, Y., Kim, M., Yu, H., Wu, C., Zhang, X., Zhang, X., **Borcherding, N.**, Zheng, G., Zhou, D., & Zhang, W. (2020). Targeting tumor-infiltrating regulatory T cells by PROTAC-mediated degradation of BCL-XL.
10. Gu, V.W., Cho, E., Thompson, D.T., Cassady, V., **Borcherding, N.**, Koch, K.E., Wu, V.T., Lorenzen, A.W., Kulak, M.V., Williams, T., Zhang, W., Weigel, R.J. (2020). AP-2γ is Required for Maintenance of Pluripotent Mammary Stem Cells.
11. Cheng, Y., **Borcherding, N.**, Ogunsakin, A., Lemke-Miller, C.D., Gibson-Corley, K.N., Rajan, A., Wongpattaraworakul, W., Chan, C.H., Salem, A.K., Weiner, G.J., Simons, A.L. (2020). The anti-tumor effects of cetuximab in combination with motolimod are T cell dependent and vary based on sex.
12. **Borcherding, N.***, Ahmed, K.A.* , Voigt, A.P., Vishwakarma, V., Kolb, R., Kluz, P., Pandey, P., De, U., Kim, M., Drashansky, T., Helm, E.Y., Zhang, X., Gibson-Corley, K.N., Klesney-Tait, J., Zhu, Y., Lu, J., Lu, J., Huang, X., Cheng, J., Avram, D., Zhou, D., Bacher, R., Zheng, S., Wu, X., Zakharia, Y., Weizhou Zhang, W. (2020). Understanding the heterogeneity and potentially targeting of human tumor-infiltrating regulatory T cells. *co-primary authors

Textbooks or Chapters

- Zhang, W., **Borcherding, N.**, Kolb, R. (2019) IL-1 signaling in the tumor microenvironment. Tumor Microenvironment. New York City, NY: Springer International Publishing. ISBN: 978-3-030-34025-4.
- Schalinske, K. & **Borcherding, N.** (2016). Advanced Nutrition and the Regulation of Metabolism. San Diego, CA: *Cognella Academic Publishing*. ISBN: 978-1-5165-1468-7

Software

- **Borcherding, N.** and Andrews, J. (2020). Escape: Easy single cell platform for enrichment. DOI: 10.18129/B9.bioc.escape.
- **Borcherding, N.** (2020). Scone: Single-cell operation for neat enrichment. DOI: 10.5281/zenodo.3714898.
- **Borcherding, N.** (2020). scRepertoire, an R-based toolkit for single-cell immune profiling. DOI:10.5281/zenodo.3612216.

- **Borcherding, N.** (2017). TRGAted, using TCGA protein-level data for large-scale survival analysis. R Shiny App. DOI:10.5281/zenodo.1323828.

Presentations

Invited Presentations

- **Borcherding, N.**, Crotts, S., Ortolan, L., Bormann, N., & Jabbari, A. (2020, May). Single-cell mRNA sequencing of murine and human alopecia areata identifies immune cell profiles predictive of human disease state. Presented at the Academy of Clinical Laboratory Physicians and Scientists Annual Meeting in Iowa City, IA.
- **Borcherding, N.**, Voigt, A., Liu, V., Link, B.K., Zhang, W., & Jabbari, A. (2019, May) Single-cell profiling of cutaneous T-cell lymphoma reveals underlying heterogeneity associated with disease progression. Presented at the Society for Investigative Dermatology Annual Meeting in Chicago, Illinois.
- **Borcherding, N.**, Transcriptional Heterogeneity in cancer-associated regulatory T cells is predictive of survival. Presented at the Single-Cell RNA sequencing Symposium by the Iowa Institute of Genetics, Iowa City, Iowa.
- **Borcherding, N.** Paracrine Regulation of Breast Cancer Tumorigenesis. (2016, April). Presented at the Midwestern Association of Graduate Schools Annual Conference in Chicago, Illinois.

Research Presentations

- **Borcherding, N.**, Jo, S., Zhang, W. Targeting mismatch repair in immunotherapy for basal-like breast cancer (2017, January). Presented at the Holden Comprehensive Center Translational Conference at the University of Iowa.
- **Borcherding, N.** The Potential Dichotomous Functions of β -Catenin in Breast Cancer Molecular Subtypes (2016, November). Presented at the MCB seminar at the University of Iowa.
- **Borcherding, N.** Paracrine Regulation of Breast Cancer Tumorigenesis. (2016, March). Presented at the Jakobsen Graduate Conference for the University of Iowa.
- **Borcherding, N.** The potential of noncanonical WNT as a target for triple-negative breast cancer. (2015, July). Presented at the University of Iowa MSTP Annual Retreat.
- **Borcherding, N.** Aptamer-siRNA chimera generation for T regulatory cell inhibition. (2014, August). Presented at the University of Iowa MSTP Annual Retreat.
- **Borcherding, N.** Noncanonical Wnt Signaling in Breast Cancer Initiation and Progression. (2014, May). Presented in fulfillment of Department of Pathology Graduate Program thesis requirements.
- **Borcherding, N.**, Kusner, D., Kolb R., Li W., Zhang W. (2014, April). ROR1/WNT5a axis role in breast cancer initiation and progression. Presented at the Department of Pathology Graduate Research Seminar.
- **Borcherding, N.**, Xie Q., Kolb R., Li W., Zhang W. (2013, November). Wnt5a, a basal-specific tumor suppressor in ErbB2+ Breast Cancer. Presented at the Department of Pathology Graduate Research Seminar.
- **Borcherding, N.**, Xie Q., Kolb R., Li W., Zhang W. (2013, April). Characterization of Tumor-initiating Cell population in HER2+ Breast Cancer. Presented at the Department of Pathology Graduate Research Seminar.
- **Borcherding, N.**, Xie Q., Li W., Zhang W. (2012, November). Genetic Signature of ErbB2+ Cell of Origin(s). Presented at the Department of Pathology Graduate Research Seminar.

Abstracts

National or Regional Conference Abstracts

- **Borcherding, N.**, Crotts, S., Ortolan, L., Bormann, N., & Jabbari, A. (2020, May). Single-cell mRNA sequencing of murine and human alopecia areata identifies immune cell profiles predictive of human

disease state. Presented at the Academy of Clinical Laboratory Physicians and Scientists Annual Meeting in Iowa City, IA.

- Renavikar, P., Sinha, S., Brate, A., Crawford, M., **Borcherding, N.**, Steward, S. & Karandikar, N. (2020, May). Immune suppressive deficit in human Tc1 cells secondary to IL-12-induced pathways. Presented at the Academy of Clinical Laboratory Physicians and Scientists Annual Meeting in Iowa City, IA.
- Hoffmann, D., Feagle, T., & **Borcherding, N.** (2020, April). Virtual Anatomy Videos for Pre-Lab Preparation: Does Usage Correlate with Grade Outcomes. Accepted to Experimental Biology Annual Meeting in San Diego, CA. (Canceled due to COVID-19).
- Cole, K., Councilman, K., Zhang, W., & **Borcherding N.** (2020, March). WNT/ β -Catenin Signaling Correlates with Improved Survival in Luminal A Breast Cancer. Presented at the USCAP Annual Meeting in Los Angeles, CA.
- **Borcherding, N.**, Voigt, A., Liu, V., Link, B.K., Zhang, W., & Jabbari, A. (2019, May) Single-cell profiling of cutaneous T-cell lymphoma reveals underlying heterogeneity associated with disease progression. Presented at the Society for Investigative Dermatology Annual Meeting in Chicago, IL.
- **Borcherding, N.**, Bormann, N., Zhang, W. (2018, January). Using data analytics to predict and improve cancer immunotherapy response. Presented at the American Physician Scientist Association Midwest Regional Meeting in Iowa City, IA.
- **Borcherding, N.**, Jo, S., Zhang, W. (2017, October). Targeting mismatch repair for basal-like breast cancer. Presented at the Cancer Biology Training Consortium Annual Meeting in Portland, OR.
- 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. Presented at the annual Experimental Biology Conference in Chicago, IL.
- Kolb, R., Kluz, P., Wei, T.Z., Bormann, N., **Borcherding, N.**, Markan, K., Pothoff, B., Tan, N.S., Sutterwala, F., & Zhang W. (2017, February). IL-1 β promotes obesity-driven breast cancer progression through the upregulation of Angptl4 in adipocytes. Presented at Inflammation-driven Cancer: Mechanisms to Therapy Keystone Symposia in Keystone, CO.
- 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. (2016, June). Calpain-5 expression in the retina localizes to photoreceptor synapses. Presented at the FASEB Conference for The Biology of Calpains in Health and Disease in Big Sky, MT.
- Kolb, R., Phan, L., **Borcherding, N.**, Liu, Y., Yuan, F., Janowski, A.M., Xie, Q., Markanm K., Li, W., Pothoff, M., Fuentes-Mattei, E., Ellies, L., Knudson, M., Lee, M., Yeung, S., Cassel, S., Sutterwala, F., & Zhang, W. (2016, January). Obesity-induced Nlr4 inflammasome promote angiogenesis in breast cancer. Presented at the AACR Special Conference: The Function of Tumor Microenvironment in Cancer in San Diego, CA.
- Kolb, R., **Borcherding, N.**, Liu, Y., Yuan, F., Xie, Q., Sutterwala, F., Zhang, W. (2015, April). NLRC4 inflammasome promotes breast cancer progression in diet-induced obese mice. Presented at the American Association for Cancer Research Annual Meeting in Philadelphia, PA.
- **Borcherding, N.**, Kusner, D., Kolb, R., Xie, Q., Zhang, W. (2015, April). Paracrine Wnt5a signaling inhibits the expansion of tumor initiating cells via Ryk/TGF β R/Smad2. Presented at the ASCI/AAP/APSA Annual Joint Meeting in Chicago, IL.
- **Borcherding, N.**, Kusner, D., Kolb, R., Xie, Q., Zhang, W. (2014, April). Wnt5a/ROR1 Axis in Triple Negative Breast Cancer Progression and Potential Therapy. Presented at the American Association for Cancer Research Annual Meeting in San Diego, CA.
- Kolb, R., Liu, Y., Xie, Q., **Borcherding, N.**, Li, W., Zhang, W. (2014, April). Inflammasome activation in obesity-associated breast cancer progression. Presented at the American Association for Cancer Research Annual Meeting in San Diego, CA.
- Xie, Q., **Borcherding, N.**, Kolb, R., Zhang, W. (2014, April). CD177, A novel Metastasis Suppressor of Breast Cancer. Presented at the American Association for Cancer Research Meeting, San Diego, CA.

Teaching Experience

Medical School:

Liaison Committee – University of Iowa

- 2014 MED 8123, "Foundations of Cellular Life." Drs. Darren Hoffmann and Nathan Swaile.

Medical Tutor

- 2015 MED 8124, "Mechanisms of Health and Disease I" Drs. Andy Russo and Brad Gelbach

Small Group Facilitator

- 2017 MED 8222, "Medicine and Society III"
- 2016 MED 8222, "Medicine and Society III"

Other Activities

- 2020 Panelist for Trainee-to-Trainee Pathology PSTP Panel
AAMC Subcommittee Physician Scientist Postgraduate Training
- 2018 Presenter, Targeting Cancer Mini Medical School
Carver College of Medicine, University of Iowa
- 2017 Performance and Accreditation Tracker Developer
Carver College of Medicine, University of Iowa
- 2015-17 Medical School Curriculum Development Assistant,
Carver College of Medicine, University of Iowa
- 2015 Teaching Your Research Workshop,
Graduate College, University of Iowa
- 2015-16 Undergraduate Research Festival Poster Judge,
Iowa Center for Research by Undergraduates, University of Iowa

Undergraduate University:

Undergraduate Teaching Assistant - Iowa State University

- 2012 FSHN 492, "Research Concepts in Human Nutrition." Dr. Matthew Rowling
- 2011 FSHN 360, "Advanced Human Nutrition and Metabolism." Dr. Kevin Schalinske
- 2011 FSHN 265, "Nutrition for a Healthy and Active Lifestyle." Dr. Matthew Rowling

Committees

National

- 2016-17 First Aid/USMLE-Rx Student Council

University

- 2019-20 Alpha Omega Alpha Selection Committee
Carver College of Medicine, University of Iowa
- 2018-19 Presidential Charter Committee Review
University of Iowa Graduate and Professional Student Government
- 2016-17 LCME Accreditation Review Taskforce, Carver College of Medicine, University of Iowa
Member, Standard 6: Competencies, Curricular Objectives, and Curricular Design
- 2016-17 Medical Education Council, Carver College of Medicine, University of Iowa
Served on the Committee for Biomedical Informatics Integration
- 2016-17 Student Education Council, Carver College of Medicine, University of Iowa
- 2015-18 Presidential Charter Committee for Recreational Services, University of Iowa
Graduate Student Member
Chair of Committee 2017-2018
- 2014-18 University of Iowa Research Council
Graduate Student Member
Served on the Research Reward Subcommittee (2014)
Served on the Undergraduate Research Subcommittee (2014-15)

- 2013-16 Served on the Research Efficiency Subcommittee (2016)
Graduate and Professional Student Government, University of Iowa
Serving on the Grants Committee
- 2013-14 Graduate Student Senate, University of Iowa
Department of Pathology Senator
Served on the Jakobsen Graduate Conference Committee
- 2011-12 College of Human Sciences Council, Iowa State University
Served on the Grant and Service Committee

Departmental

- 2014-15 Retreat and Research Conference Committee
Medical Scientist Training Program, University of Iowa
- 2011-12 Undergraduate Seat on the Technology Committee, Iowa State University
Department of Food Science and Human Nutrition

Professional Memberships

National

- 2020- Member
United States and Canadian Academy of Pathology
- 2014- Full Member
American Physician Scientist Association
- 2014-20 Member
American Medical Student Association
- 2014- Student Member
American Association for the Advancement of Science
- 2014- Member in Training
American Society of Clinical Oncology
- 2013- Associate Member
American Association of Cancer Research

Invited Manuscript Review

- Biomedicines, 2020
- Member, Review Board, Cancers, 2020
- Cancer Research, AACR Journal 2019
- Journal of Medical Internet Research, JMIR Journal, 2019

Institutional/Regional

- 2014-20 Trainee Member
Holden Comprehensive Cancer Center, University of Iowa Carver College of Medicine
Member of Cancer Immunology and Immunotherapy Program
- 2014-20 Member
Iowa Medical Society

Funding Awards

Research Funding

National

- 2017-20 NIH F30 CA206255 (Principle Investigator)
Title: The role of paracrine WNT5A/Ryk in ErbB2-driven tumorigenesis,
Award Amount: \$151,150
- 2015-16 American Medical Association Foundation Research Seed Grant (Principle Investigator)
Title: Paracrine non-canonical Wnt signaling in breast cancer

- 2014-17 Award Amount: \$4,895
NIH T32 GM007337, University of Iowa, Medical Science Training Program

Institutional

- 2017 Oberley Seed Grant for Experiment Therapeutics (Co-Principal Investigator)
Title: Targeting mismatch repair for immunotherapy in basal-like breast cancer,
Award Amount: \$20,000
- 2015 Graduate and Professional Student Government Research Grant (Principle Investigator)
Title: Wnt5a/Ryk axis in breast cancer,
Award Amount: \$1,460

Travel Funds

- 2017 Holden Comprehensive Cancer Center Travel Award
- 2015 Graduate and Professional Student Government Travel Award
- 2014 Executive Council for Professional and Graduate Students Travel Award
- 2014 Holden Comprehensive Cancer Center Travel Award

Other Funds

- 2015 Carver College of Medicine Curriculum Improvement, Award Amount: \$5000

Recognitions

Research Awards

- 2020 Williams L. Roberts Young Investigator Award with Distinction
Academy of Clinical and Laboratory Physicians and Scientists
- 2018 Finalist, Graduate Research Excellence Award in Biological Sciences
Vice President of Research and Economic Development, University of Iowa
- 2017 Richard G. Lynch, MD Award for Pathology, Medical Student Research Day
Carver College of Medicine, University of Iowa
- 2017 Research Poster Award Winner, Holden Comprehensive Cancer Center Annual Retreat
University of Iowa Hospitals and Clinics
- 2017 External Fellowship Supplemental Award
University of Iowa, Carver College of Medicine
- 2016 Member, ProQuest Hall of Scholars
- 2015 Distinguished Thesis Award, Biological/Life Science
Midwestern Association of Graduate Schools
- 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, Medical Student Research Day
Carver College of Medicine, University of Iowa
- 2015 AAAS/Science Program for Excellence in Science Nominee
- 2014 Richard G. Lynch, MD Award for Pathology, Medical Student Research Day
Carver College of Medicine, University of Iowa
- 2013 Research Poster Award Winner, Holden Comprehensive Center Annual Retreat
University of Iowa Hospitals and Clinics
- 2012 Departmental Scholarly Achievement Award
College of Human Sciences, Iowa State University
- 2011 Louise Rosenfeld Undergraduate Research Internship
College of Human Sciences, Iowa State University

Academic Awards

- 2020 Teaching Distinction
Carver College of Medicine, University of Iowa

- 2020 Special Achievement in Pathology
Carver College of Medicine, University of Iowa
- 2019 Alpha Omega Alpha Honor Medical Society Induction
Carver College of Medicine, University of Iowa
- 2018 Hancher-Finkbine Medallion for Leadership, Learning and Loyalty
University of Iowa
- 2012 Graduated Summa Cum Laude
Iowa State University
- 2012 University Graduation Marshall
Iowa State University
- 2012 Graduation Ceremony Student Address
College of Human Sciences, Iowa State University
- 2011 Cardinal Key Honor Society Induction
Iowa State University
- 2010 Kappa Omicron Nu Academic Honor Society Induction
Served as President (2011) and Treasurer (2010)

Other Awards

- 2018 Wilderness Medicine Race Winner
Carver College of Medicine, University of Iowa
- 2017 Wilderness Medicine Race Winner
Carver College of Medicine, University of Iowa
- 2017 Health Science Research Week Cover Art Winner
Carver College of Medicine, University of Iowa
- 2014 Second Place, Research Challenge Essay Contest
Carver College of Medicine, University of Iowa
- 2005 Eagle Scout Award

Military Experience

Sergeant, Infantry

May 2007 – May 2013

United States Marine Corps

- Served in Operation Iraqi Freedom II
- Served as Platoon Sergeant, Squad Leader, Fire Team leader

September 2007 – Sept 2008

Promotions:

- 2007 Private First Class (PFC)
- 2008 Lance Corporal
- 2011 Corporal
- 2012 Sergeant

Training:

- 2011 Operation Javelin Thrust, Bridgeport, CA
- 2011 Mountain Warfare Training Center, Bridgeport, CA
- 2007 Mojave Viper, 29 Palms, CA
- 2007 School of Infantry, Camp Pendleton, CA
- 2007 Marine Corp Recruit Training, San Diego, CA