OMB No. 3145-0279 (Expiration Date 10/31/2026)

NIH BIOGRAPHICAL SKETCH COMMON FORM

Name: Lawson, Devon Ann

Persistent Identifier (PID) of the Senior/Key Person: https://orcid.org/0000-0003-1692-0517

Position Title: Associate professor

Organization and Location: University of California, Irvine, Irvine, California, United States

PROFESSIONAL PREPARATION

INSTITUTION AND LOCATION	DEGREE	Start Date	Completion Date	FIELD OF STUDY
University of California, San Francisco, San Francisco, California, United States	Other (OTH)	09/2009	09/2015	Breast cancer metastasis; genomics
University of California, Los Angeles, Los Angeles, California, United States	Doctor of Philosophy (PHD)	09/2002	09/2008	Cancer biology; Stem cells
University of California, Davis, Davis, California, United States	Bachelor of Science (BS)	09/1998	06/2002	Biological sciences; genetics

Appointments and Positions

2021 - present Associate professor, University of California, Irvine, Irvine, California, United States
2015 - 2021 Assistant professor, University of California, Irvine, Irvine, California, United States

Products

Products Closely Related to the Proposed Project

1. Evans KT, Blake K, Longworth A, Coburn MA, Insua-Rodríguez J, McMullen TP, Nguyen QH, Ma D, Lev T, Hernandez GA, Oganyan AK, Orujyan D, Edwards RA, Pridans C, Green KN, Villalta SA, Blurton-Jones M, Lawson DA. Microglia promote anti-tumour immunity and suppress breast cancer brain metastasis. Nat Cell Biol. 2023 Dec;25(12):1848-1859. PubMed Central PMCID: PMC11414741.
2. Kumar T, Nee K, Wei R, He S, Nguyen QH, Bai S, Blake K, Pein M, Gong Y, Sei E, Hu M, Casasent AK, Thennavan A, Li J, Tran T, Chen K, Nilges B, Kashikar N, Braubach O, Ben Cheikh B, Nikulina N, Chen H, Teshome M, Menegaz B, Javaid H, Nagi C, Montalvan J, Lev T, Mallya S, Tifrea DF, Edwards R, Lin E, Parajuli R, Hanson S, Winocour S, Thompson A, Lim B, Lawson DA, Kessenbrock K, Navin N. A spatially resolved single-cell genomic atlas of the adult human breast. Nature. 2023 Aug;620(7972):181-191. PubMed Central PMCID: PMC11443819.
3. Davis RT, Blake K, Ma D, Gabra MBI, Hernandez GA, Phung AT, Yang Y, Maurer D, Lefebvre AEYT, Alshetaiwi H, Xiao Z, Liu J, Locasale JW, Digman MA, Mjolsness E, Kong M, Werb Z, Lawson DA. Transcriptional diversity and bioenergetic shift in human breast cancer metastasis revealed by single-cell RNA sequencing. Nat Cell Biol. 2020 Mar;22(3):310-320. PubMed PMID: 32144411.
4. Lawson DA, Kessenbrock K, Davis RT, Pervolarakis N, Werb Z. Tumour heterogeneity and metastasis at single-cell resolution. Nat Cell Biol. 2018 Dec;20(12):1349-1360. PubMed Central PMCID: PMC6477686.
5. Lawson DA, Bhakta NR, Kessenbrock K, Prummel KD, Yu Y, Takai K, Zhou A, Eyob H, Balakrishnan S, Wang CY, Yaswen P, Goga A, Werb Z. Single-cell analysis reveals a stem-cell program in human metastatic breast cancer cells. Nature. 2015 Oct 1;526(7571):131-5. PubMed Central PMCID: PMC4648562.

Other Significant Products Highlighting Contributions to Science

1. Ma D, Hernandez GA, Lefebvre AEYT, Alshetaiwi H, Blake K, Dave KR, Rauf M, Williams JW, Davis RT, Evans KT, Longworth A, Masoud MYG, Lee R, Edwards RA, Digman MA, Kessenbrock K, Lawson DA. Patient-derived xenograft culture-transplant system for investigation of human breast cancer metastasis. Commun Biol. 2021 Nov 5;4(1):1268. PubMed Central PMCID: PMC8571269.
2. Lawson DA, Zong Y, Memarzadeh S, Xin L, Huang J, Witte ON. Basal epithelial stem cells are efficient targets for prostate cancer initiation. Proc Natl Acad Sci U S A. 2010 Feb 9;107(6):2610-5. PubMed Central PMCID: PMC2823887.
3. Lawson DA, Xin L, Lukacs RU, Cheng D, Witte ON. Isolation and functional characterization of murine prostate stem cells.

Proc Natl Acad Sci U S A. 2007 Jan 2;104(1):181-6. PubMed Central PMCID: PMC1716155.

4. Xin L, Lawson DA, Witte ON. The Sca-1 cell surface marker enriches for a prostate-regenerating cell subpopulation that can initiate prostate tumorigenesis. Proc Natl Acad Sci U S A. 2005 May 10;102(19):6942-7. PubMed Central PMCID: PMC1087514.
5. Nguyen QH, Pervolarakis N, Blake K, Ma D, Davis RT, James N, Phung AT, Willey E, Kumar R, Jabart E, Driver I, Rock J, Goga A, Khan SA, Lawson DA, Werb Z, Kessenbrock K. Profiling human breast epithelial cells using single cell RNA sequencing identifies cell diversity. Nat Commun. 2018 May 23;9(1):2028. PubMed Central PMCID: PMC5966421.

Certification:

I certify that the information provided is current, accurate, and complete. This includes, but is not limited to, information related to current, pending, and other support (both foreign and domestic) as defined in 42 U.S.C. § 6605.

In accordance with Section 10632 of the CHIPS and Science Act of 2022 (42 U.S.C. § 19232), each individual identified as a senior/key person must certify that they are not a party to a malign foreign talent recruitment program.

Research Security Training Requirement for Federal Award Personnel: In accordance with Section 10634 of the CHIPS and Science Act of 2022 (42 U.S.C. § 19234), each individual identified as a senior/key person must certify that they have completed the requisite research security training that meets the requirements specified in Item 2 of Important Notice No. 149 within 12 months prior to proposal submission.

Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§287, 1001, 1031 and 31 U.S.C. §§3729-3733 and 3802.

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NIH BIOGRAPHICAL SKETCH SUPPLEMENT

Name: Lawson, Devon Ann

Persistent Identifier (PID) of the Senior/Key Person: https://orcid.org/0000-0003-1692-0517

Position Title: Associate professor

Organization and Location: University of California, Irvine, Irvine, California, United States

Personal Statement

I am an Associate Professor at the University of California, Irvine. My appointment is the Department of Physiology and Biophysics within the School of Medicine. I have affiliations with several interdepartmental research units, including the Cancer Research Institute, the Center for Complex Biological Systems, the Stem Cell Research Center, and the Institute for Immunology. I hold a leadership role within the NCI-designated Chao Family Comprehensive Cancer Center, serving as co-leader of the UCI Breast Disease Oriented Team (DOT), where I have developed a collaborative network of clinicians and basic scientists for translational breast cancer research and community outreach. I did my graduate training in prostate cancer under the mentorship of Dr. Owen Witte at UCLA, and postdoctoral fellowship in Dr. Zena Werb's lab at UCSF, where I did pioneering work utilizing early single cell technologies to study breast cancer metastasis. My laboratory continues to be at the forefront of this field. We have published a high-impact review (Nat Cell Biol, 2018) and two research articles where we found a metabolic shift from glycolysis to mitochondrial oxidative phosphorylation (OXPHOS) is critical for metastasis. Our expertise in breast epithelial stem cell and single cell biology led to our involvement in the Chan-Zuckerberg Initiative's (CZI) Human Cell Atlas (HCA) project, where we worked with a group of international laboratories to generate a comprehensive, multidimensional atlas of the human breast. Our first paper was published in 2018 (Nguyen et al., Nat Commun), and our landmark paper was published in 2023 (Kumar, Nee, Wei, et al., Nature). This dataset serves as a reference atlas of the human breast for future studies of breast disease, and represents a major contribution to the field. Finally, my laboratory leveraged our expertise in single cell genomics and metastasis to launch a project studying the immune response to breast cancer brain metastasis (BCBM), where we found that brain-resident microglia are a central coordinator of anti-tumor immunity and suppress breast cancer brain metastasis (Evans et al., Nature Cell Biology, 2023). We currently have two pre-prints following up on this study available on bioRxiv (Insua-Rodriguez et al., 2026; McMullen et al., 2026).

I have been closely involved in the IDCR T32 training program, where I currently serve on the executive committee and teach in the Cancer Biology course and the journal club. I have a successful record of mentoring trainees at diverse educational levels. I have trained 9 doctoral students, four postdoctoral fellows, >30 undergraduates, and nearly a dozen high school students. My students have made several notable achievements that are a testament to my success as a mentor. My graduate students have been awarded T32 fellowships in Immunology, Neuroimmunology, and Systems Biology (T32 CA009054, T32GM136624, T32 AI060573). I have also had two graduate students and one postdoc appointed to this IDCR T32 training program. Two of my students were awarded NIH/NCI F30 and F31 fellowships. Most of my postdocs are still in training, but my first postdoc recently received the prestigious NIH/NCI K99/R00 pathway to independence award. Therefore, I have a proven track record of providing a productive, rigorous and well-rounded training environment.

Honors

2020 - 2024	American Cancer Society Research Scholar Award, American Cancer Society
2020 - 2022	V scholar award, V Foundation
2019 - 2019	Susan G. Komen Pink Tie Honoree, Susan G. Komen
2016 - 2019	Career Transition Award (K22) 1K22CA190511-01A1, NIH/NCI
2011 - 2014	Department of Defense Postdoctoral Scholar, CMDRP Breast Cancer Research Program (BCRP), Award number W81XWH-11-1-0742
2009 - 2010	T32 Postdoctoral Fellowship, NIH/NCI T32 CA108462-07, National Cancer Institute
2007 - 2008	Graduate Division Dissertation Year Fellowship Award, University of California, Los Angeles
2004 - 2007	T32 Graduate Student Fellowship (T32 CA09056), National Cancer Institute

Contributions to Science

1. # Mechanisms of breast cancer progression and metastasis

The main focus of my laboratory is to investigate the fundamental mechanisms of breast cancer metastasis. During my postdoc, I was an early adopter of single cell transcriptomic methods, and used them to show for the first time that metastatic cells display a stem cell-like program during metastatic seeding. My laboratory at UCI went on to publish a follow up paper using single-cell RNA sequencing, which found that cancer cells shift their metabolism during metastasis, from glycolysis to mitochondrial OXPHOS. To determine whether OXPHOS was functionally important for metastasis, we developed a culture-transplant system that enables robust propagation of PDX tumor cells for metastasis assays in vivo. We used this method to find that OXPHOS inhibition severely attenuates metastatic seeding, showing that OXPHOS is functionally critical for metastasis. We have also particularly focused on mechanisms of breast cancer metastasis to the brain. Brain metastasis results in rapidly mortality and represents a major clinical unmet need in breast cancer. We have focused on studying the role of microglia, the main immune cell of the brain, and CNS immunity in the regulation of brain metastasis. In our first study, we found that brain resident microglia are central coordinators of anti-tumor immunity in the CNS. We found that they mount a potent pro-inflammatory response, and are critical to promote the adaptive immune response and suppress brain metastasis. This work challenged prior dogma from glioma research that microglia are universally immune suppressive and tumor-promoting, opening up new opportunities for therapeutic targeting of microglia to treat brain metastasis.

2. # Epithelial stem cells and cellular differentiation in breast development

I have made important contributions to understanding stem cells and epithelial differentiation in breast development. While a postdoc, I made critical contributions to studies showing the Wnt signaling mediator LGR5 marks mammary stem cells, and that Wnt signaling is regulated by Matrix Metallproteinase 3 (MMP3). My expertise in single-cell analysis and breast biology led to my laboratory's involvement in the Human Cell Atlas project funded by the Chan-Zuckerberg initiative. In 2018, we were awarded a multi-PI pilot grant to optimize single-cell sequencing technologies and generate a pilot atlas of the healthy human breast. My lab co-authored a first iteration of our work on this project in 2018, where we described breast cellular diversity and identified a new luminal epithelial cell type. This to a larger multi-PI CZI seed network grant for $4M for an ambitious project to generate a comprehensive, multi-dimensional, spatially resolved atlas by profiling breast tissue. The goal of this project was to describe cellular heterogeneity in the breast, and use the map as a reference atlas to understand changes that occur in diseases such as breast cancer. We completed our major installment of this project this year and published it in Nature. We made several notable discoveries, including a rich diversity of resident immune cells in healthy breast tissues, and the discovery of multiple previously unrealized epithelial cell states. This work represents a major contribution to the field, and led to increased understanding of mammary development and diseases of the breast.

3. # Prostate stem cells in cancer initiation

My work as a doctoral student identified stem cells as an origin of prostate cancer. As it was an emerging field at the time, there were no standardized methods for identifying stem cells or functional assays to characterize them. I therefore developed several key in vitro and in vivo assays for clonogenic assessment of stem and progenitor cell potential. I used these assays to develop a FACS-based protocol for sorting stem and differentiated cells, and identified the peri-urethral space as the prostate stem cell niche. This sorting paradigm has become the gold standard in the field, and has been utilized and cited thousands of times. This advance also allowed me to address the role of stem cells in prostate cancer initiation. Using my FACS-based protocol, I found that stem cells produced malignant disease with much greater efficiency than more differentiated cells. This paved the way for studies that have demonstrated differences in the tumor-initiating potential of basal and luminal prostate cell types, and how the disease manifests differently depending on the cell of origin. These studies have greatly impacted our basic biological understanding of the disease and stimulated new ideas for therapeutic development

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