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

NIH BIOGRAPHICAL SKETCH COMMON FORM

Name: Barron, Annelise Emily

Persistent Identifier (PID) of the Senior/Key Person: https://orcid.org/0000-0002-0735-6873

Position Title: W.M. Keck Associate Professor

Organization and Location: Bioengineering, Stanford University, Stanford, California, United States

PROFESSIONAL PREPARATION

INSTITUTION AND LOCATION	DEGREE	Start Date	Completion Date	FIELD OF STUDY
University of California, San Francisco, California, United States	Postdoctoral Fellow	01/1996	12/1996	Pharmaceutical Chemistry
ACLARA BioSciences, Inc, Hayward, California, United States	Postdoctoral Fellow	01/1995	12/1995	Molecular Biotechnology
University of California, Berkeley, California, United States	DOCTOR OF PHILOSOPHY	01/1990	12/1995	Chemical Engineering; Biophys/Biochem Minor
University of Washington, Seattle, Washington, United States	BACHELOR OF SCIENCE	06/1986	06/1990	Chemical Engineering

Appointments and Positions

2007 - present	W.M. Keck Associate Professor, Bioengineering, Stanford University, Stanford, California, United States
2006 - 2007	Full Professor (tenured), Chemical & Biological Engineering, Northwestern University, Evanston, Illinois, United States
2003 - 2006	Associate Professor (tenured), Chemical & Biological Engineering, Northwestern University, Evanston, Illinois, United States
1997 - 2003	Assistant Professor (tenure-track), Chemical Engineering, Northwestern University, Evanston, Illinois, United States
1996 - 1996	NIH-NRSA Postdoctoral Fellow, Pharmaceutical Chemistry, University of California, San Francisco, California, United States
1995 - 1995	Postdoctoral Researcher, ACLARA BioSciences, Hayward, California, United States
1990 - 1995	Graduate Student and Ph.D. Candidate (Research and Teaching Assistant), Chemical Engineering, University of California, Berkeley, California, United States

Products

Products Closely Related to the Proposed Project

1. Barron AE, Lin JS, Ryder MI, Bergman P. The dysregulation of innate immunity by Porphyromonas gingivalis in the etiology of Alzheimer's disease. J Intern Med. 2026 Mar;299(3):328-348. PubMed Central PMCID: PMC12869014.
2. Zielke C, Nielsen JE, Lin JS, Barron AE. Between good and evil: Complexation of the human cathelicidin LL-37 with nucleic acids. Biophys J. 2024 Jun 4;123(11):1316-1328. PubMed Central PMCID: PMC11163296.
3. Aloul KM, Nielsen JE, Defensor EB, Lin JS, Fortkort JA, Shamloo M, Cirillo JD, Gombart AF, Barron AE. Upregulating Human Cathelicidin Antimicrobial Peptide LL-37 Expression May Prevent Severe COVID-19 Inflammatory Responses and Reduce Microthrombosis. Front Immunol. 2022;13:880961. PubMed Central PMCID: PMC9134243.
4. De Lorenzi E, Chiari M, Colombo R, Cretich M, Sola L, Vanna R, Gagni P, Bisceglia F, Morasso C, Lin JS, Lee M, McGeer PL, Barron AE. Evidence that the Human Innate Immune Peptide LL-37 may be a Binding Partner of Amyloid-β and Inhibitor of Fibril Assembly. J Alzheimers Dis. 2017;59(4):1213-1226. PubMed Central PMCID: PMC5611894.
5. Lee M, Shi X, Barron AE, McGeer E, McGeer PL. Human antimicrobial peptide LL-37 induces glial-mediated neuroinflammation. Biochem Pharmacol. 2015 Mar 15;94(2):130-41. PubMed PMID: 25686659.

Other Significant Products Highlighting Contributions to Science

1. Nielsen JE, Alford MA, Yung DBY, Molchanova N, Fortkort JA, Lin JS, Diamond G, Hancock REW, Jenssen H, Pletzer D, Lund R, Barron AE. Self-Assembly of Antimicrobial Peptoids Impacts Their Biological Effects on ESKAPE Bacterial Pathogens. ACS Infect Dis. 2022 Mar 11;8(3):533-545. PubMed Central PMCID: PMC8962514.
2. Lin JS, Bekale LA, Molchanova N, Nielsen JE, Wright M, Bacacao B, Diamond G, Jenssen H, Santa Maria PL, Barron AE. Anti-persister and Anti-biofilm Activity of Self-Assembled Antimicrobial Peptoid Ellipsoidal Micelles. ACS Infect Dis. 2022 Sep 9;8(9):1823-1830. PubMed Central PMCID: PMC9469094.
3. Shamloo S, Defensor E, Ciari P, Ogawa G, Vidano L, Lin JS, Fortkort JA, Shamloo M, Barron AE. The anti-inflammatory effects of photobiomodulation are mediated by cytokines: Evidence from a mouse model of inflammation. Front Neurosci. 2023;17:1150156. PubMed Central PMCID: PMC10115964.
4. Wardell SJT, Yung DBY, Nielsen JE, Lamichhane R, Sørensen K, Molchanova N, Herlan C, Lin JS, Bräse S, Wise LM, Barron AE, Pletzer D. A biofilm-targeting lipo-peptoid to treat Pseudomonas aeruginosa and Staphylococcus aureus co-infections. Biofilm. 2025 Jun;9:100272. PubMed Central PMCID: PMC12005307.
5. Chongsiriwatana NP, Lin JS, Kapoor R, Wetzler M, Rea JAC, Didwania MK, Contag CH, Barron AE. Intracellular biomass flocculation as a key mechanism of rapid bacterial killing by cationic, amphipathic antimicrobial peptides and peptoids. Sci Rep. 2017 Dec 1;7(1):16718. PubMed Central PMCID: PMC5711933.

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.

Certified by Barron, Annelise Emily in SciENcv on 2026-06-10 17:43:40

NIH BIOGRAPHICAL SKETCH SUPPLEMENT

Name: Barron, Annelise Emily

Persistent Identifier (PID) of the Senior/Key Person: https://orcid.org/0000-0002-0735-6873

Position Title: W.M. Keck Associate Professor

Organization and Location: Bioengineering, Stanford University, Stanford, California, United States

Personal Statement

Since 2007 I have been a tenured Associate Professor at Stanford in the Department of Bioengineering, which crosses the Schools of Medicine and of Engineering. As context for the present application, I myself have adhered to a very low-carbohydrate ketogenic diet (KD) since January 2020. The KD quickly cured my own Type 2 Diabetes, transforming my health for the better; and I also noticed that the KD created a remarkable state of profound calm and focus that I had not experienced before. This spurred my deep interest in working with Dr. Shebani Sethi and Dr. Michael Snyder to understand the KD's mechanisms of action in improving human mental, emotional, metabolic, and immune system states. Chronic high blood glucose dysregulates innate immunity, and this has become my particular focus. This clinical trial of the KD against serious mental illness will expand on my lab's current and prior work focused on the role of LL-37 expression-mediated innate immune modulation to prevent infection-associated neurodegenerative and neuroinflammatory diseases.

Recently I have held an NIH Pioneer Award (2020-2025) aimed at developing new approaches to prevent and treat innate immune dysregulation and neuroinflammation precipitating Alzheimer's dementia. In that work, we identified a natural, endogenous human peptide that prevents ABeta amyloid formation, and is also anti-infective: LL-37. Also, since 2017 I have taught a graduate-level course in Immunology with a focus on human innate immunity, in which these are major themes. My prior work in the pioneering development of biomimetic peptoids (sequence-specific oligo-N-substituted glycines as structural, functional, and mechanistic mimics of natural antimicrobial peptides (AMPs) has proven my ability to take novel research projects from initial concept to full success. The development of LL-37-mimetic peptoids as stable anti-infectives has spanned my faculty career from innovative concept to repeated successful demonstrations in animal models.

Recently, we showed that our broad-spectrum antimicrobial peptoids function as potent, broad-spectrum antivirals, including against SARS-CoV-2, HSV-1, and HBV (and—not yet published—also Dengue, VEEV, EBV, and Ebola). We have also extensively shown that they are excellent antibacterial, antifungal, antiparasitic, and antibiofilm agents. This body of work is significant for this project, given the known linkage between viral reactivations of neurotropic viruses and serious mental illnesses including bipolar disorder, major depressive disorder, and schizophrenia. The proposed human clinical trial of the KD against serious mental illness will, no doubt, reveal profound effects of the KD on the phenotypes of human innate immune cells, the activation of the NLRP3 inflammasome, and the oral/gut pathobiome burden in affected persons.

In the past I have served as PI for multiple NIH R01 grants with topics in bioanalysis, peptide biophysics, and protein biomimicry, including two competitively renewed R01s, one of which was an NIH PECASE award. I have 190+ peer-reviewed publications (H-index 61) and have mentored and graduated 42 Ph.D. students. I am focused now on understanding any and all approaches that help to optimize human innate immunity and thus prevent or treat neurocognitive and neuropsychiatric disorders.

Honors

2025	Invited lecture, Dept. of Clinical Microbiology & Immunology, Karolinska Institutet, Stockholm, Sweden
2024	Invited Lecturer at the Viktor Mutt Symposium, Nobel Forum in Stockholm, Sweden, at the Karolinska Institutet
2023	Plenary Lecture, Peptide Therapeutics Symposium
2022	The Oskar Fischer Prize (global essay contest to state the true cause of Alzheimer’s Disease), University of Texas at San Antonio
2020	Recipient of NIH Pioneer Award to study innate immune system dysregulation and dementia, NIH
2019	Invited to give the Kornis Lecture, University of New South Wales
2018	Plenary Lecture, International Meeting on Antimicrobial Peptides
2018	Plenary Lecture, Molecular Foundry, Lawrence Berkeley Nat'l Lab

2017	Invited Lecture, IAGG 2017 World Congress of Gerontology and Geriatrics, Symposium on the Role of Microbes in Alzheimer's Disease
2015	Invited Participant, Nobel Symposium
2014	Keynote Lecturer, CE Pharm 2014
2012	Invited lecturer, 2012 Peptide Engineering Meeting
2011	Invited lecture, American Society for Biochemistry & Molecular Biology
2008	Invited lecturer, National Academy of Engineering Japan-America Frontiers of Engineering
2008	Keynote lecture, 26th Int'l Symposium on Microscale Biosepara

Contributions to Science

1. Natural human host defense peptide LL-37 as an anti-amyloid agent: I made the unique discovery of sequence-specific binding of the human host defense peptide LL-37 to the Aβ amyloid peptide, which led me to develop and investigate a novel Alzheimer's Disease mechanistic hypothesis. I postulated that the inactivation of innate immune proteins and host defense peptides by P. gingivalis-associated virulence factors is one significant cause of Alzheimer's Disease, which may be treated with mimics of LL-37 that can address the Pg infection while simultaneously preventing amyloid formation, and/or by the upregulation of endogenous LL-37 expression in the human body. In 2017 we showed that the Alzheimer's-associated peptide Aβ may accumulate in the brain as the result of chronic deactivation or under-expression of its natural endogenous binding partner, the human innate immune peptide LL-37. Thus—as opposed to removing Aβ—an effective prevention of (or treatment for) Alzheimer's could be either upregulating LL-37 expression or mimicking its activities. We have shown in vitro that LL-37 binds tightly and sequence-specifically to Aβ, blocking Aβ fibril formation, and have recent Drosophila melanogaster data showing this LL-37/Aβ interaction also occurs in vivo. Later, we showed that LL-37 also binds amyloid peptide IAPP. We are studying methods to upregulate the analogous murine host defense peptide (CRAMP) in vivo, work that was funded by a 2020 NIH Pioneer Award, and which is still ongoing. My ideas related to LL-37 and amyloid diseases were recognized by an invitation to the 2015 Nobel Symposium on this topic in Stockholm, Sweden, and two subsequent invitations to speak at the Karolinska. I have proven my ability to establish diverse and productive collaborations related to host defense peptides, innate immunity, and the treatment of infections and Alzheimer's Disease, as can be seen by my publications.

2. Biomimetic lung surfactant protein mimics: Infants born prematurely require the instillation of exogenous "lung surfactant"—a complex mixture of surface-active proteins with lipids and cholesterol—to take their first breath. This substance, which greatly reduces pulmonary surface tension, is expensive and in limited supply; to date, only first-world countries have access to it, to save premature infants. The surface-active proteins that enable its function cannot be expressed in bacteria; when isolated from natural sources (such as minced calf lungs) they tend to misfold and aggregate, shortening shelf life and increasing expense. My laboratory successfully created conformationally and proteolytically stable mimics of lung Surfactant Proteins B and C, as well as an ideal biomimetic lipid mixture, and formulated a stable biomimetic surfactant, which has been successfully tested in animals (our peptoid-based mimics of Surfactant Protein C provided oxygenation equivalent to naturally derived surfactant). This project was funded by an NIH NHLBI grant 2 R01 HL067984 (3/15/06 - 3/14/11) on which I served as the sole PI.

3. Hydrogels for Culture and Transplantation of Stem Cells and Pancreatic β-Islets: In a series of collaborative projects, my laboratory provided advanced hydrogel materials for clinicians seeking technology to allow the successful transplantation of stem cells for wound healing applications, or pancreatic islet cells for the treatment of Type I diabetes. Various types of water-soluble polymer systems were used as the bases for these biomimetic hydrogels, and we found multiple useful materials tailored to stem cells and/or islets.

4. ELFSE (End-Labeled Free-Solution Electrophoresis): In work completed in 2012, later developed by IntegenX, Inc. for forensic genotyping, my laboratory developed a novel, bioconjugate approach to DNA sequencing and genotyping involving chemical tethering of genetically engineered protein "drag-tags" to DNA sequencing or genotyping fragments. Protein-DNA conjugation, with our uniquely designed protein drag-tags, allowed DNA to be analyzed efficiently by capillary or microchip electrophoresis in free solution, in the absence of a viscous gel material, which is difficult to load into capillaries. This project was funded by NIH NHGRI grant R01 HG002918-01 (9/1/03¬8/31/07), on which I was sole PI, and was successful in achieving its goals.

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