

Lindsay N. Hayes, Ph.D.

Johns Hopkins University
600 North Wolfe Street, Meyer 4-136
Baltimore, MD 21287

Cell: (417) 766-5400
Email: lhayes14@jh.edu
Website: <https://lindsaynhayes.github.io/>

I. TRAINING AND EMPLOYMENT

Clovis Community College , Fresno, CA Adjunct Instructor, STEM & Computer Science <i>Biol-12 Research in Biology</i>	2022 - present
Johns Hopkins University , Baltimore, MD Research Associate, Department of Neuroscience <i>Microglia Dysfunction in Mouse Models of Neuropsychiatric Disorders</i>	2018 - present
Johns Hopkins University , Baltimore, MD Postdoctoral Fellow, Department of Psychiatry <i>Inflammation in Neuropsychiatric Disorders</i> Advisor: Dr. Akira Sawa, M.D., Ph.D.	2012 - 2018
Brown University , Providence, RI Ph.D., Neuroscience <i>Temporal Control of Sonic Hedgehog Signaling for Midbrain Dopamine Neuron Development</i> Advisors: Dr. Sohyun Ahn, Ph.D (NIH) and Dr. Mark Zervas, Ph.D. (Brown)	2006 - 2012
Evangel University , Springfield, MO B.S. Chemistry (Major) and Mathematics (Minor)	2002 - 2006

II. FUNDING, AWARDS, FELLOWSHIPS

<u>Funding</u> Center for Advancement of HIV Neurotherapeutics (PI: Hayes) JHU/NIMH <i>Persistent HIV viral transcripts in brain-derived immune cells in NeuroHIV</i>	08/2022
Center for Novel Therapeutics for HIV-Associated Cognitive Disorders (PI: Hayes) JHU/NIMH <i>Isolation of brain-derived myeloid cells in NeuroHIV</i>	07/2021
<u>Awards</u> Brown University & NIH Graduate Student Retreat Award Summa Cum Laude Graduate, Evangel University	2009 2006
<u>Research Fellowships</u> Undergraduate Research Fellow, Evangel University Department of Science and Technology, Advisor: Dr. Steve Badger, Ph.D.	2005 - 2006
NSF-Undergraduate Research Fellow Award, Loyola University Department of Chemistry, Advisor: Dr. Duarte Mota de Freitas, Ph.D.	2005
NSF-Undergraduate Research Fellow Award, University of Kansas Department of Chemistry, Advisor: Dr. Jon Tunge, Ph.D.	2004

III. PUBLICATIONS

#Foresee (maiden name), *equal contribution, †Senior Author

1. **Hayes LN**, An K, Carloni E, Li F, Vincent E, Paranjpe M, Trippaers C, Dölen G, Goff LA, Ramos A, Kano SI, Sawa A. (2022) *Prenatal immune stress blunts microglia reactivity, impairing neurocircuitry*. **Nature** (2022). In Press [link](#)
2. Carloni E, Ramos A, **Hayes LN**[†]. (2021) *Developmental Stressors Induce Innate Immune Memory in Microglia and Contribute to Disease Risk*. **International Journal of Molecular Sciences**. 22(23), 13035 [link](#)
3. Xiao MF, Roh SE, Zhou J, Chien CC, Lucey BP, Craig MT, **Hayes LN**, Coughlin JM, Leweke FM, Jia M, Xu D, Zhou W, Talbot C, Arnold DB, Staley M, Jiang C, Reti IM, Sawa A, Pelkey KA, McBain CJ, Savonenko A, Worley P. A biomarker-authenticated model of schizophrenia implicating NPTX2 loss of function. (2021) **Scientific Advances**. 26;7(48):eabf6935 [link](#)
4. Mueller FS, Richetto J, **Hayes LN**, Zambon A, Pollak D, Sawa A, Meyer U, Weber-Stadlbauer U. (2019) *Influence of poly(I:C) variability on thermoregulation, immune responses and pregnancy outcomes in mouse models of maternal immune activation* **Brain Behavior Immunity**. 80,406-418 [link](#)
5. Fukudome D, **Hayes LN***, Faust TE*, Foss CA*, Kondo MA*, Lee BJ, Saito A, Kano SI, Coughlin JM, Kamiya A, Pomper MG, Sawa A, Niwa M. (2018) *Translocator protein (TSPO) and stress cascades in mouse models of psychosis with inflammatory disturbances*. **Schizophrenia Research**. 197, 492-497. [link](#)
6. Nucifora LG, Tanaka T, **Hayes LN**, Kim M, Lee BJ, Matsuda T, Nucifora FC, Sedlak T, Mojtabai R, Eaton WW, Sawa A. (2017) *Reduction in plasma glutathione in psychosis associated with schizophrenia and bipolar disorder in translational psychiatry*. **Translational Psychiatry**. 7(8): e1215. [link](#)
7. Coughlin JM*, **Hayes LN***, Tanaka T*, Xiao M, Yolken RH, Worley P, Leweke FM, Sawa A (2017) *Reduced superoxide dismutase-1 (SOD1) in cerebrospinal fluid of patients with early psychosis in association with clinical features*. **Schizophrenia Research**. 183, 64-69. [link](#)
8. Tanaka T*, Matsuda T*, **Hayes LN***, Yang S, Rodriguez K, Severance EG, Yolken RH, Sawa A, Eaton WW. (2017) *Infection and inflammation in schizophrenia and bipolar disorder*. **Neuroscience Research**. 115, 59-63. [link](#)
9. **Hayes LN***, Shevelkin A*, Zeldon M, Steel G, Chen PL, Obie C, Pulver A, Avramopoulos D, Valle D, Sawa A*, Pletnikov MV* (2016) *Neuregulin 3 knockout mice exhibit behaviors consistent with psychotic disorders*. **Molecular Neuropsychiatry** 2(2), 79-87. [link](#)
10. Coughlin JM, Wang Y, Ambinder EB, Ward RE, Minn I, Vranesic M, Kim PK, Ford CN, Higgs C, **Hayes LN**, Schretlen DJ, Dannals RF, Kassiou M, Sawa A, Pomper MG (2016) *In vivo markers of inflammatory response in recent-onset schizophrenia: a combined study using [(11)C]DPA-713 PET and analysis of CSF and plasma*. **Translational Psychiatry** 6,e777. [link](#)
11. **Hayes LN**, Severance EG, Leek J, Leweke FM, Yolken RH, Sawa A (2014) *Inflammatory molecular signature associated with infectious agents in psychosis*. **Schizophrenia Bulletin**. 40(5), 963-972. [link](#)
12. **Hayes L**, Ralls S, Wang H, Ahn S. (2013). *Duration of Shh signaling contributes to mDA neuron diversity*. **Developmental Biology**. 374:1, 115-126. [link](#)
13. **Hayes L**, Zhang Z, Albert P, Zervas M, Ahn S. (2011). *The Timing of Sonic Hedgehog and Gli1 Expression Segregates Midbrain Dopamine Neurons*. **Journal of Comparative Neurology**. 519:15, 3001-3018. [link](#)
14. Brown A, Machan JT, **Hayes L**, Zervas M. (2011) *Molecular organization and timing of Wnt1 expression define cohorts of midbrain dopamine neuron progenitors in vivo*. **Journal of Comparative Neurology**. 519:15, 2978-3000. [link](#)
15. Carney R, Mangin JM, **Hayes L**, Mansfield K, Sousa V, Gord F, Machold R, Ahn S, Gallo V, Corbin J. (2010). *Sonic hedgehog expressing and responding cells generate neuronal diversity in the medial amygdala*. **Neural Development**. 5:14. [link](#)
16. Devore M, **Foresee L**[#], Michno N, Badger S. (2006). *Determination of Environmental Conditions of Four Greene County Caves*. **Transactions of the Missouri Academy of Science**. 40, 22-29.
17. Li K, **Foresee LN**[#], Tunge JA. (2005). *Trifluoroacetic Acid-Mediated Hydroarylation: Synthesis of Dihydrocoumarins and Dihydroquinolones*. **Journal of Organic Chemistry**. 70, 2881-2883. [link](#)
18. Tunge JA, **Foresee LN**[#]. (2005). *Mechanistic Studies of Fujiwara Hydroarylation. C-H Activation versus Electrophilic Aromatic Substitution*. **Organometallics**. 24(26), 6440-6444. [link](#)

IV. Preprints

1. **Hayes LN**, An K, Carloni E, Li F, Vincent E, Paranjpe M, Dölen G, Goff LA, Ramos A, Kano SI, Sawa A. (2021) *Prenatal immune stress induces a prolonged blunting of microglia activation and impacts striatal connectivity.* bioRxiv. 2021.12.27.473694 doi:10.1101/2021.12.27.473694 [link](#)
2. Ramos A, Ishizuka K, Namkung H, **Hayes LN**, Saito A, Sengupta A, Srivastava R, Calva C, Hayashida A, Elkins N, Palen T, Carloni E, Tsujimura T, Gallego JA, Robinson DG, Malhotra AK, Ikemoto S, Rais R, Slusher BS, Niwa M, Saitoh T, Takimoto E, Sawa A. (2022) *The nuclear GAPDH-HMBG cascade in cortical microglia regulates cognitive flexibility* bioRxiv. 2022.06.21.497065 doi:10.1101/2022.06.21.497065

V. PRESENTATIONS

A. Invited Talks

- 2022 Johns Hopkins University, Molecular and Comparative Pathobiology Departmental Seminar. Title: *Microglia Contributions to Immune Mechanism in Psychosis*. Baltimore, MD
- 2022 CSHL Workshop, Schizophrenia and Related Disorders. Title: *Microglia Contributions to Immune Mechanism in Psychosis*. Cold Spring Harbor, NY
- 2019 Johns Hopkins Perinatology, Neonatology Monthly Colloquium. Title: *Neuroimmune Interactions from Development to Mature Brain Function*. Baltimore, MD
- 2016 The 22nd Annual Stanley Meeting. Title: *Maternal Stress Alters Microglia Responsiveness: Influence on Brain Function and Behavior*. Baltimore, MD

B. Abstracts Selected for Oral Presentation [as a presenter]

1. **Hayes LN**, An K, Carloni E, Li F, Vincent E, Paranjpe M, Trippaers C, Dölen G, Goff LA, Ramos A, Kano SI, Sawa A. (2022) *Prenatal immune stress induces a prolonged blunting of microglia reactivity that impairs striatal connectivity.* Keystone: Neuro-Immune Interactions in the Central Nervous System
2. **Hayes LN**, An K, Vincent E, Paranjpe M, Bless L, Chang AJ, Diaz C, Dölen G, Kano SI, Ramos A, Goff LA, Sawa A (2021) *Prenatal immune stress induces a prolonged blunting of microglia activation and neuronal connectivity.* EMBO Microglia Workshop (Flash Talk)
3. **Hayes LN**, An K, Vincent E, Paranjpe M, Bless L, Chang AJ, Diaz C, Dölen G, Kano SI, Ramos A, Goff LA, Sawa A (2019) *Prenatal immune stress induces a prolonged blunting of microglia activation and impacts social behavior and neuronal connectivity.* Glia Biology: Functional Interactions Among Glia and Neurons Gordon Research Seminar
4. **Hayes LN**, An K, Vincent E, Paranjpe M, Kim M, Chang AJ, Diaz C, Ramos A, Goff LA, Sawa A (2018) *Early maternal stress diminishes microglia reactivity and striatum connectivity.* Baltimore Brain Series October 30, 2018
5. **Hayes LN**, An K, Paranjpe M, Kim M, Vincent E, Goff LA, Sawa A (2018) *Early Maternal Stress Alters Microglia Responsiveness to Activation and Impacts Striatal Circuit Function and Behaviors.* EMBO Microglia meeting.
6. **Hayes LN**, An K, Barodia S, Moore J, Kim S-H, Jaaro-Peled H, Fukudome D, Faust T, Niwa M, Sawa A. (2015) *Alterations in adolescent stress cascades in genetic and environmental mouse models of major mental illness and the implications on adult behavioral deficits.* Society for Neuroscience Meeting.
7. Coughlin JM, Tanaka T, Ford CN, Kim PK, **Hayes LN**, Marsman A, Barker PB, Sawa A. (2015) *Alterations in markers associated with oxidative stress, inflammation, and protein misfolding in patients with recent onset psychosis.* Society for Biological Psychiatry
8. **Hayes LN**, Sawa A. (2015) *Angiotensin Signaling in Development and Pathology of Immune-Associated Psychosis.* International Congress on Schizophrenia Research.
9. **Hayes LN**, Sawa A. (2014) *Inflammation in schizophrenia patients and maternal immune activation new insights from the angiotensin pathway.* Neuroscience Department Lecture Series
10. **Hayes LN**, Sawa A. (2014) *Angiotensin signaling as a key regulator of neuroinflammation: a role in developmental psychotic disease.* Society for Neuroscience Meeting
11. **Hayes LN**, Alkhunaizi F, Sawa A. (2013) *Molecular and cellular characterization of microglia-like cells derived from patients with schizophrenia and their implications for the developmental insult hypothesis.* Society for Neuroscience

12. **Hayes LN**, Zhang Z, Albert P, Zervas M, Ahn S. (2011). *The Timing of Sonic Hedgehog and Gli1 Expression Segregates Midbrain Dopamine Neurons*. Keystone Symposium on Neurodegeneration
 13. **Hayes LN**, Ahn S. (2009) *Not all dopamine neurons are alike: How early Sonic Hedgehog signaling may influence later diversity*. NIH Neurobiology Interest Group
- C. Select Conference Abstracts for Poster Presentation
1. **Hayes LN**, An K, Vincent E, Paranjpe M, Kim M, Chang AJ, Diaz C, Ramos A, Goff LA, Sawa A (2018) *Early maternal stress diminishes microglia reactivity and striatum connectivity*. Glia-Neuron Interaction in Developing Circuits Rockefeller University
 2. **Hayes LN**, An K, Kim M, Nardou R, Chang AJ, Dolen G, Sawa A. (2017) *Microglia priming through maternal immune stress influences brain function and behavior*. Society for Neuroscience
 3. Nucifora LG, Tanaka T, **Hayes LN**, Kim M, Lee BJ, Matsudo T, Nucifora FC, Sedlak T, Mojtabai R, Eaton W, Sawa A. (2017) *Reduction of plasma glutathione in psychosis associated with schizophrenia and bipolar disorder in translational psychiatry*. Society for Neuroscience
 4. **Hayes LN**, An K, Vincent E, Paranjpe M, Nardou R, Kim M, Dolen G, Goff LA, Sawa A. (2017) *Microglia priming by early maternal stress diminishes immune responsiveness and task switching*. Neuro-Immune Axis: Reciprocal Regulation in Development, Health, and Disease Cell Symposia
 5. **Hayes LN**, Diaz C, Nardou R, Chang A, Dolen G, Sawa A. (2016) *Developmental deficits in microglia influence brain function and behavior*. Keystone Symposia, Microglia in the Brain
 6. Niwa M, **Hayes LN**, Tanaka T, Faust T, Fukudome D, Cash-Padgett T, Jaaro-Peled H. (2015) *Oxidative Stress in the Pathophysiology of Psychiatric Disorders: Studies of Patient Biospecimens and Animal Models*. ACNP 54th Annual Meeting
 7. Coughlin JM, Wang Y, Tanaka T, Ma S, **Hayes LN**, Pomper MG, Sawa A. (2014) *Probing molecular markers of inflammation and oxidative stress in patients with early stage schizophrenia: A combined study of CSF and PET-based imaging*. ACNP 53rd Annual Meeting
 8. **Hayes LN**, Kim J, Sawa A. (2014) *Angiotensin signaling in schizophrenia patients and mice after maternal immune activation: Potential molecular regulator of neuroinflammation*. Cold Spring Harbor Glia in Health and Disease
 9. **Hayes LN**, Zervas M, Ahn S. (2011) *The progenitors in the ventral mesencephalon mutually regulate the induction and cessation of Shh and Gli1 expression for proper dopamine neuron specification*. Society for Neuroscience Meeting
 10. **Hayes LN**, Zervas M, Ahn S. (2009) *Linking the Shh and Gli1 lineages to dopamine neuron diversity: Discovering how the subtypes and circuits are established in the adult*. Society for Neuroscience Meeting
 11. Carney R, **Hayes LN**, Sousa V, Mansfield K, Fishell G, Machold R, Ahn S, Corbin, J. (2009) *Genetic specification of neuronal diversity in the medial amygdala*. Society for Neuroscience Meeting
 12. **Hayes LN**, Zervas M, Ahn S. (2008) *Sonic hedgehog signaling contributes to midbrain dopamine neuron development*. Society for Neuroscience Meeting

VI. TEACHING EXPERIENCE

Co-Instructor, Research in Biology (Biol-12) Clovis Community College	2021 - 2022
Lead Teaching Assistant, Practical Genomics Workshop JHU, Center for Computational Genomics	2021
Instructor, Neuroscience: A Single Cell Story Johns Hopkins University Winter 2020 Intersession	2020
Teaching Assistant, Practical Genomics Workshop JHU, Center for Computational Genomics	2019
Guest Lecturer, Chemistry for Health Sciences	2006
Teaching Assistant for General and Organic Chemistry	2003 - 2006

VII. STUDENT MENTORSHIP

Supervised 3 graduate students	
Chloë Trippaers, <i>Visiting Graduate Fellow</i> , co-author on 1 publication	2021 - 2022
Amedeo Primerano MD, <i>Visiting Medical Fellow</i>	2015
Anna J. Chang, Ph.D., <i>JHU Rotation Graduate Student</i>	2013
Mentored 2 research technicians for 2 years	
Elisa Carloni, <i>post-baccalaureate student</i> , co-author on 2 publication	2019 - 2021
Fangze Li, <i>post-baccalaureate student</i> , co-author on 1 publication	2019 - 2021
Guided 3 students in summer research programs for undergraduates	
Taechawidd Nantawisarakul, <i>PSTAR Summer Student</i>	2015
Carolyn Diaz, <i>PSTAR Summer Student</i>	2013
Molly Pfeifer, D.V.M., <i>NIH Summer Student</i>	2010
Trained 4 undergraduates	
Lena Bless, <i>JHU Undergraduate</i>	2017 - 2018
Manish Paranjpe, <i>JHU Undergraduate</i> , co-author on 1 publication	2017 - 2018
Minjung Kim, <i>JHU Undergraduate</i> , co-author on 1 publication	2015 - 2017
Fatimah Alkhunaizi, M.D., <i>JHU Undergraduate</i>	2012 - 2013

VIII. LEADERSHIP

Invited Ad Hoc Reviewer	2013 - present
Schizophrenia Bulletin, Schizophrenia Research, Brain Behavior Research, Experimental Neurology, Frontiers in Neuroscience, Translational Psychiatry	
Admissions Committees	
Johns Hopkins Psychiatry Summer Research and Training Program (PSTAR)	2012 - 2014
Brown-NIH Graduate Partnership Program (GPP)	2010 - 2011
Program Organizer:	
Schizophrenia Center Monthly Seminar Series	2021 - present
Brown Graduate Partnership Program In-House Seminar Series	2008 - 2011
Annual NIH Graduate Student Retreat	2008

IX. OUTREACH

Co-Instructor, Research in Biology (Biol-12)	2021 - 2022
Clovis Community College, Fresno CA	
<i>Course-based Undergraduate Research Experience</i>	
Students were primarily Hispanic and/or first-generation college students. Course provides technical and practical skills to prepare students for funded research internships.	
Lecturer, Lunch-n-Learn Seminar Series	2016
JHU, Psychiatry Summer Research and Training Program	
<i>Clinical and Basic Science Career Development and Research Trajectories</i>	
Students were from teaching universities that had less access to research opportunities. Program provided research opportunities, clinical shadowing, and career development mentorship.	
Keynote speaker, STEM Honors Conference	2014
Ozarks Technical Community College, Springfield, MO	
<i>Research Opportunities for Community College STEM Students</i>	
Students were from low socioeconomic environments and/or first-generation college students. Symposium highlighted trajectories into STEM careers and identify research opportunities.	