EXPERT AFFIDAVIT OF KATHRYN LAMP, PH.D.

I, Dr. Kathryn Lamp, state that the following is true to the best of my knowledge, information, and belief, and that I hold the opinions set forth in this report to a reasonable degree of professional certainty:

1. My name is Dr. Kathryn Lamp and I am an experimental psychologist and behavioral neuroscientist.
2. I received a bachelor's degree in psychology from Christopher Newport University and a doctoral degree in experimental psychology from the University of Montana. I will receive a law degree from the University of Maryland Francis King Carey School of Law in May of 2026. I will graduate from law school with certificates in health law and criminal law.
3. I am the Senior Researcher and Research Librarian for the CLBB NeuroLaw Library at the Center for Law, Brain, and Behavior at Massachusetts General Hospital.
4. Based on my education, training, and professional experience, I have an understanding of neuroscience, brain development, and the neuroscience of substance use and addiction.
5. A current copy of my Curriculum Vitae is attached as Exhibit "A".
6. I have never communicated with the defendant or any individuals involved in this case. Any statements I make are based on current scientific literature and are not specific to the defendant nor constitute recommendations regarding the defendant.
7. Substance use disorders ("SUD" or "SUDS") represent a growing public health concern in the United States. A substance use disorder is defined as repetitive substance use and substance-seeking behavior despite harmful consequences.[1]
8. While approximately 17% of people in the United States aged 12 or older have a diagnosed SUD, approximately 63% of people in jail and approximately 58% of people in prison have a diagnosed SUD.[2]
9. Despite the disproportionately high representation of people with SUD in jails and prisons, people in jails and prisons have limited access to treatment for SUDs, resulting in

[1] M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75.
[2] S. Hess, L. Sherley, & M. Allen (2024). Substance use disorder in justice-involved populations. *Montana Legislative Fiscal Division*.

high rates of substance use relapse, criminal recidivism, and death by overdose after release from incarceration due to the consequences of untreated SUD.[3]

10. The general framework for understanding SUD has shifted from a moral-centric ("moral failures") model to a neurobiological-centric ("medical") model, reflecting an evolution in the understanding of the complex relationships between genetic, developmental, and environmental factors that influence SUD.[4]
11. In fact, recent scientific studies have shown that genetic factors may account for as much as 50% of the risk for addiction and co-occurring mental conditions, and heightened stress levels increase the likelihood of developing an SUD.[5]
12. The neurobiological framework for understanding SUD has established that all SUD share altered function, or dysfunction, across three major brain circuits: the mesolimbic dopamine pathway, the stress pathway, and the prefrontal cortex.[6]
13. The mesolimbic dopamine pathway in the brain is responsible for releasing dopamine in the brain, creating positive associations between a person's behavior and the results of behaviors. Substance use results in an overactivity in this pathway, creating strong positive associations between substance use and feelings of reward for users.[7]
14. Over time, repeated and long-term substance use results in a decrease in activation of the mesolimbic dopamine pathway during activities with natural rewards, such as eating and exercise. This often results in a person seeking further substance use in an attempt to experience positive feelings.[8]
15. Repeated and long-term substance use also results in experiences of withdrawal during non-use, and these periods of non-use result in hyperactivity in the stress pathway of the brain. This hyperactivity in the stress pathway of the brain results in heightened emotional reactivity, reduced sensitivity to non-drug rewards, and increased sensitivity to external stressors.[9]
16. Substance use also changes the prefrontal cortex in the brain, which is responsible for decision-making, impulse control, and future planning. Studies showing brain imaging of

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[3] *Id*.

[4] N.D. Volkrow & M. Boyle (2018). Neuroscience of addiction: relevance to prevention and treatment. *Am J of Psychiatry*, 175(8), 729 – 740; K.S. Murnane, A.N. Edinoff, E.M. Cornett, & A.D. Kaye (2023). Updated perspectives on the neurobiology of substance use disorders using neuroimaging. *Subst Abuse Rehabil*, 14, 99 – 111. doi: 10.2147/SAR.S362861.

[5] *Id***.**

[6] N.D. Volkrow & M. Boyle (2018). Neuroscience of addiction: relevance to prevention and treatment. *Am J of Psychiatry*, 175(8), 729 – 740.

[7] S. Prasad, P.S. Mathew, B.J. Piper, K. Kaur, M. Tian, & P. Mathew (2023). The neurobiology of methamphetamine addiction and the potential to reduce misuse through conjugate vaccines targeting toll-like receptor 4. *Cureus*, 15(6); M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75; N.D. Volkrow & M. Boyle (2018). Neuroscience of addiction: relevance to prevention and treatment. *Am J of Psychiatry*, 175(8), 729 – 740.

[8] M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75.

[9] N.D. Volkrow & M. Boyle (2018). Neuroscience of addiction: relevance to prevention and treatment. *Am J of Psychiatry*, 175(8), 729 – 740; S. Prasad, P.S. Mathew, B.J. Piper, K. Kaur, M. Tian, & P. Mathew (2023). The neurobiology of methamphetamine addiction and the potential to reduce misuse through conjugate vaccines targeting toll-like receptor 4. *Cureus*, 15(6); M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75.

people with SUD have shown that these individuals have reduced activity in the prefrontal cortex, resulting in impaired decision making, lack of impulse control, and difficulty planning for the future.[10]

17. The combination of increased activity and sensitivity in regions of the brain responsible for emotional responding with decreased activity and sensitivity in regions of the brain responsible for decision-making and self-control results in individuals with SUD choosing to continue seeking and using substances despite foreseeable short-term and long-term adverse consequences.[11]
18. The intoxication phase of substance use involves intense and prolonged activation of the dopamine system in the brain, resulting in feelings of euphoria due to a transient increase in dopamine in the brain.[12]
19. This connection between using a substance and the resulting feeling of euphoria creates a strong positive association for the user between substance use and feelings of pleasure and reward.[13]
20. The withdrawal phase of substance use involves both a significant drop in dopamine and serotonin in the brain and a sharp increase in stress-related neurotransmitters such as norepinephrine.[14]
21. This marked shift in neurotransmitter activity during withdrawal often triggers negative mood, stress, and anxiety.[15]
22. The craving or preoccupation phase of substance use is caused by impaired functioning in the parts of the brain associated with executive functioning, decision-making, and impulse control.[16]

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[10] K.S. Murnane, A.N. Edinoff, E.M. Cornett, & A.D. Kaye (2023). Updated perspectives on the neurobiology of substance use disorders using neuroimaging. *Subst Abuse Rehabil*, 14, 99 – 111. doi: 10.2147/SAR.S362861; M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75.

[11] M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75.

[12] S. Prasad, P.S. Mathew, B.J. Piper, K. Kaur, M. Tian, & P. Mathew (2023). The neurobiology of methamphetamine addiction and the potential to reduce misuse through conjugate vaccines targeting toll-like receptor 4. *Cureus*, 15(6).

[13] M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75; N.D. Volkrow & M. Boyle (2018). Neuroscience of addiction: relevance to prevention and treatment. *Am J of Psychiatry*, 175(8), 729 – 740.

[14] S. Prasad, P.S. Mathew, B.J. Piper, K. Kaur, M. Tian, & P. Mathew (2023). The neurobiology of methamphetamine addiction and the potential to reduce misuse through conjugate vaccines targeting toll-like receptor 4. *Cureus*, 15(6); K.S. Murnane, A.N. Edinoff, E.M. Cornett, & A.D. Kaye (2023). Updated perspectives on the neurobiology of substance use disorders using neuroimaging. *Subst Abuse Rehabil*, 14, 99 – 111. doi: 10.2147/SAR.S362861; M. Bozkurt (2022) Neuroscientific basis of treatment for substance use disorders. *Arch of Neuropsychiatry*, 59 (Suppl 1), S75.

[15] N.D. Volkrow & M. Boyle (2018). Neuroscience of addiction: relevance to prevention and treatment. *Am J of Psychiatry*, 175(8), 729 – 740; K.S. Murnane, A.N. Edinoff, E.M. Cornett, & A.D. Kaye (2023). Updated perspectives on the neurobiology of substance use disorders using neuroimaging. *Subst Abuse Rehabil*, 14, 99 – 111. doi: 10.2147/SAR.S362861.

[16] S. Prasad, P.S. Mathew, B.J. Piper, K. Kaur, M. Tian, & P. Mathew (2023). The neurobiology of methamphetamine addiction and the potential to reduce misuse through conjugate vaccines targeting toll-like receptor 4. *Cureus*, 15(6).

23. This impaired functioning results in greater difficulty with resisting cravings for substances and greater difficulty with controlling impulses to engage in substance use and substance-seeking behaviors.[17]
24. The neuroscience of substance use clearly demonstrates that substance use and substance use disorder involve both short-term and long-term altered functioning in a person's brain. Substance use is not a moral failing but rather a chronic medical condition with organic and predictable changes in brain activity and functioning resulting from substance use.
25. The neuroscientific framework for understanding substance use and substance use disorder clearly refutes punitive measures which criminalize disease, strongly supporting evidence-based treatment and prevention in its place.

Respectfully Submitted

Kathryn Lamp, PhD

[17] L.S. Paludetto, L.L.A. Florence, J. Torales, A. Ventriglio, & J.M. Castadelli-Maia (2024). Mapping the Neural Substrates of Cocaine Craving: A Systematic Review. *Brain Sciences*, 14(4) 329; K.S. Murnane, A.N. Edinoff, E.M. Cornett, & A.D. Kaye (2023). Updated perspectives on the neurobiology of substance use disorders using neuroimaging. *Subst Abuse Rehabil*, 14, 99 – 111. doi: 10.2147/SAR.S362861.

KATHRYN G. LAMP, PH.D.

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EDUCATION

Juris Doctor, *Anticipated May 2026*
The University of Maryland, Baltimore- Carey School of Law, Baltimore, MD

Doctor of Philosophy, Experimental Psychology, *2014*
The University of Montana, Missoula, MT

Master of Arts, Experimental Psychology, *2012*
The University of Montana, Missoula, MT

Bachelor of Arts with Honors, Psychology, *2008*
Christopher Newport University, Newport News, VA

EXPERIENCE

The Center for Law, Brain & Behavior, Harvard University, Cambridge, MA
Senior Research Associate, *Center for Law, Brain, and Behavior Neurolaw Library (March 2024 – present)*

Serve as the senior researcher in cultivating the library's online collection of case law, law review articles, amicus briefs, and scientific articles concerning jurisprudence on juvenile criminal law, developmental neuroscience, and the application of relevant neuroscience knowledge to criminal law. Collaborated with Atlanta-based website development team Monogram to help launch the Center's online NeuroLaw Library in June 2024. The NeuroLaw Library provides AI-mediated resources and training for judges, attorneys, legislators, policy analysts, advocates, people who are incarcerated, students, and academics in the following core areas: juvenile and emerging adult justice, the neuroscience of trauma, sentencing reform, and the aging brain. Brought NeuroLaw Library website into compliance with the Web Content Accessibility Guidelines under the Americans with Disabilities Act. Supervised summer research assistants (June – August 2025) in continued cultivation and development of the neurolaw library with specific focus on a Science of Substance Use module.

University of Maryland, Baltimore-School of Nursing, Baltimore, MD
Associate Director for Academic Success, *Office of Academic & Career Success (January 2023 – present)*
Assistant Director, *Student Success Center (January 2017 – January 2023)*

Provide professional advising to entry-to-practice nursing students in the BSN and graduate level MSN-E programs with a focus on developing student resiliency, access and use of resources, and advocacy. Design and deliver study skills workshops. Document student progress and the impact of student support programs. Develop and continually improve peer tutor and supplemental instruction programs using quantitative data analysis. Provide individualized academic coaching to students.
Supervised and mentored student leaders in both programs.

<u>*Special projects*</u>:

- Revised structure of supplemental instruction to be more learner-centric with a focus on interactive learning with increased collaboration between student leaders and course instructors.
- Initiated data analysis projects on effectiveness of academic support programs provided by the Student Success Center
- Presented data on effectiveness of supplemental instruction program at International Conference on Supplemental Instruction in 2018
- Accepted to present data on effectiveness of revised supplemental instruction program at International Conference on Supplemental Instruction in June 2020 (*conference canceled due to COVID-19)*

- Earned College Reading & Learning Association's International Tutor Training Program Certification for the UMSON Peer Tutoring Program (Certification Valid May 2020 – May 2021)
- Collaboration on quantitative analysis of correlation between entrance criteria and persistence in graduate entry-to-practice program
- Initiated collaboration with UMB Campus Wellness Hub to deliver "Study With Your Brain in Mind" workshops to UMB students from all professional programs
- Managed office in director's medical absence

University of Maryland, Baltimore @ the Universities at Shady Grove, Rockville, MD
Academic Support Coordinator *(August-December 2016)*

Provided individualized academic coaching to students. Documented student progress and the impact of student support program. Coordinated guided study session program in collaboration with Center for Academic Success. Mentored peer tutors and collaborated with Center for Academic Success in supervision of peer tutoring program. Advanced to Assistant Director position at Baltimore campus within six months.

Educational Connections, Fairfax, VA
Professional Test-Prep Tutor (December 2014-September 2016)

Conducted SAT and ACT test preparation tutoring with high school students. Developed and implemented customized tutoring sessions for students and families based on their strengths and needs. Documented student progress. Utilized skills and knowledge of learning and neuroscience to influence planning.

RESEARCH EXPERIENCE

Senior Research Associate & Research Librarian, Center for Law, Brain & Behavior NeuroLaw Library
(March 2024 – present)

- Responsible for curation of digital library containing case law, amicus briefs, scientific and law review articles, and learning modules on topics related to neuroscience and the law.
- Key role in launching the digital NeuroLaw Library in June of 2024 with the Juvenile Justice and Adolescent and Young Adult Neuroscience module.
- Supervised a research team developing a Substance Use module for launch in Summer 2025.

Dissertation: "*The Effect of Fluoxetine on Self-Control in Betta splendens*" (2013-2014)

- Researched and wrote proposal for research study, ran subjects for study, collected, verified, and analyzed data (using Microsoft Excel and SPSS). Served in a leadership role in organizing weekly lab meetings and training research assistants to run subjects for study and collect data.

Master's Project: "*The Effect of Photocycle on Self-Control in Betta splendens*" (2011-2012)

- Researched and wrote proposal for research study, ran subjects for study, collected, verified, and analyzed data (using Microsoft Excel and SPSS), served in a leadership role in organizing weekly lab meetings and recruiting and training research assistants to run subjects for study and to collect data.

Project Lead: CNU Animal Behavior Lab (2007-2008)
Research Assistant: CNU Animal Behavior Lab (2005-2008)

- Researched and wrote proposals for current research projects in the lab, assisted in organizing groups for other research benches in the laboratory, assisted in managing weekly lab meetings, and trained new members of the laboratory.

PRESENTATIONS

Tabashneck, S. and **Lamp, K.** (2025)**.** "*Intro to the CLBB NeuroLaw Library Project.*" Presented at the Workshop on Science-Informed Decision Making at Harvard Law School, Cambridge, MA, June 11 – 13, 2025.

Tabashneck, S., **Lamp, K.,** and Reed, L. (2025). "*Law Meets Neuroscience: Inside the CLBB NeuroLaw Library."* Presented at The Law & Neuroscience Works in Progress Workshop in January 2025.

Lamp, K. and King, C. (2018) "*Comparing the Effectiveness of Modified Supplemental Instruction to Peer Tutoring Across Two Entry-to-Practice Nursing Programs*." Presented at the 10th International Conference on Supplemental Instruction held May 24-26, 2018 in Seattle, WA

TEACHING EXPERIENCE

University of Montana, Missoula

Instructor (online), Fundamentals of Learning (Fall 2012, Spring 2013, Fall 2013, Spring 2014)
Instructor (face to face), Social Psychology (Summer 2012)
Instructor (face to face), Fundamentals of Learning (Fall 2010, Spring 2011, January 2011 (winter term)
Teaching Assistant, Introductory Psychology (Fall 2009, Spring 2010, Fall 2011, Spring 2012)

TEACHING AWARDS

University of Montana, Missoula

Awarded: Graduate Student Teaching Award for Outstanding Contributions to Undergraduate Education (2014)
Awarded: Best Practices in Online Instruction (2011)

OTHER AWARDS & HONORS

Awarded: In Recognition of Outstanding Achievement and Stellar Contributions to the Center for Law, Brain, and Behavior NeuroLaw Library, Center for Law, Brain, & Behavior, Massachusetts General Hospital, Harvard Medical School (2024)

PROFESSIONAL WORKSHOPS

Lamp, K. (2019, 2018, 2017, 2016). "*Study with Your Brain in Mind*". Workshop presented as part of the Stress Busters Series held by the University of Maryland Office of Educational Support and Disability Services.

Lamp, K. (2018, 2017). "*Note-Taking Workshop*". Workshop held by the University of Maryland Office of Educational Support and Disability Services.

LEADERSHIP

- ***President's Student Leadership Institute*** (August 2023 – May 2024) Selected from University of Maryland-Baltimore students to complete year-long leadership program focusing on the core values of the University
- ***USGA Senator, University of Maryland Carey School of Law, University Student Government Association*** (August 2023 – December 2023) Represented UMB law student interests at monthly USGA meetings and presented USGA reports to law student leadership members at Student Bar Association meetings
- ***Student Disability Advisory Group, Office of Educational Support and Disability Services, University of Maryland Baltimore*** (January 2023 – May 2023) Served as a student representative meeting with the Office of Educational Support and Disability Services to collaborate on student services, supports, and resources for students with disabilities
- ***Emerging Leaders*** (2018-2019 Cohort) Completed year-long course. Selected from among university staff | University of Maryland, Baltimore, Office of Organization and Employee Development
- ***Chair,*** Sunshine Committee, Office of Student and Academic Services, UMB School of Nursing (2017- 2021; January 2024 – present)

PROFESSIONAL AFFILIATIONS AND SERVICE

Wellness Committee, UMB Carey School of Law (August 2021 – present)
NASPA (Student Affairs Administrators in Higher Education) Member (March 2019 – March 2020)
Americorps VISTA Member (July 2008-July 2009)
Psi Chi (The National Honor Society in Psychology) (2007-2008 Treasurer, CNU Chapter)

OTHER CONTRIBUTIONS TO THE PROFESSION

Reviewer for Peer-Reviewed Books and Journals:

Routledge (Book Proposal Reviewer, 2022)

SPECIAL SKILLS/TRAINING

- **Technology & Research:** Advanced skills in Microsoft Word, Excel, PowerPoint, research methods, and statistical analyses. Proficient in Access.

- **Mental Health First Aid (**Training completed July 2022**):** Trained in assisting person(s) experiencing mental health or substance use-related crises. Training included knowledge of risk factors and warning signs for mental health and addiction concerns, strategies for how to assist someone in both crisis and non-crisis situations, and how and where to find resources.