**CURRICULUM VITAE**

**Melissa Kane, Ph.D.**

**BIOGRAPHICAL**

**Home Address:**

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**EDUCATION and TRAINING**

**Undergraduate**

2001 –2004

Cornell University Ithaca, NY

B.S.

Animal Science

**Graduate:**

2007 – 2011

University of Chicago

Chicago, IL

Ph.D.

Microbiology

(Tanya Golovkina, PhD, advisor)

**Postgraduate:**

2012 – 2018

Rockefeller University/ Aaron Diamond AIDS Research Center

New York, NY

Postdoctoral Fellow

Retrovirology

(Paul Bieniasz, PhD, advisor)

**APPOINTMENTS and POSITIONS**

2019 – Present Assistant Professor, The University of Pittsburgh School of Medicine, Department of Pediatrics, Division of Infectious Diseases

2019 – Present Assistant Professor, Center for Microbial Pathogenesis, UPMC Children’s Hospital of Pittsburgh

2019 – 2020 Director, Children’s Hospital of Pittsburgh Retrovirus Laboratory Program

2019 – Present Visiting Assistant Professor, The University of Pittsburgh School of Medicine, Department of Immunology (secondary appointment)

**MEMBERSHIPS in PROFESSIONAL and SCIENTIFIC SOCIETIES**

2017 –2018 New York Academy of Sciences (NYAS)

2022 – Present American Society for Microbiology (ASM)

**HONORS**

2011 Best Dissertation Award in the Biological Sciences Division for 2011-2012 – University of Chicago

2014 Young Investigator Award, Conference on Retroviruses and Opportunistic Infections

2015 Ruth L. Kirschstein National Research Service Award, NIH F32

2017 Andy Kaplan Prize in Retrovirology, Cold Spring Harbor Retrovirology

2020 Gilead Sciences Research Scholars Award

**PUBLICATIONS**

***Original Peer Reviewed Articles***

1. Zhang, R.Z., Mele, V., Robben, L., **Kane, M.**, *Genetic differences between 129S substrains affect antiretroviral immune responses.* J Virol. 97(5):e0193022. PMID: 37093008
2. **Kane, M.\*,** Mele, V., Liberatore, R., Bieniasz, P.D. 2020. *Inhibition of spumavirus gene expression by PHF11*. PLoS Pathogens 16(7):e1008644. PMCID: PMD7390438. \*-Co-corresponding author
3. Cullum, E., Dikiy, S., Beilinson, H.A., **Kane, M.,** Veinbachs, A., Beilinson, V.A., Denzin, L.K., Chervonsky, A.V., Golovkina, T. 2020. *Genetic control of neonatal immune tolerance to an exogenous retrovirus.* J Virol. 94(24):e01608-20. PMID: 32999021

I generated the initial congenic lines for the mapping of *vic2*, outlined the manuscript, and edited the manuscript.

1. Schmidt, F., Keele, B.F., Del Prete, G.Q., Voronin, D. Fennessey, M., Soll, S., **Kane, M.,** Raymond, A., Gifford, R.J., KewalRamani, V., Lifson, J.D., Bieniasz, P.D., Hatziioannou, T. 2019. *Derivation of simian tropic HIV-1 infectious clone reveals virus adaptation to a new host.* PNAS. 116(21):10504-10509. PMID: 31048506

I generated the constructs for the expression of human, rhesus, and pigtailed macaque Mx2 genes for testing sensitivity of adapted viruses to Mx2 restriction and edited the manuscript.

1. **Kane, M.,** Rebensburg, S., Takata, M., Zang, T.M., Yamashita, M., Kvaratskhelia, M., Bieniasz, P.D. 2018. *Nuclear pore heterogeneity affects HIV-1 infection and the antiviral activity of Mx2.* eLife:e35738. PMID: 30084827.
2. **Kane, M\*.,** Deiss, F., Chervonsky, A.V., Golovkina, T. 2018. *A single locus controls interferon gamma-independent antiretroviral neutralizing antibody responses.* J Virol*.* PMID: 29875252\*- Corresponding author
3. Denzin, L.K., Khan, A.A., Virdis, F., Wilks, J., **Kane, M.**, Beilinson, H., Dikiy, S., Case, L.K., Roopenian, D., Witkowski, M., Chervonsky, A.V., Golovkina, T. 2017. Neutralizing antibody responses to viral infections are linked to the non-classical MHC class II gene *Ob*. Immunity 47(2):310-322.e7. PMID: 28813660.

I generated and phenotyped the vast majority of the congenic lines in Figure 1 that were used to narrow the critical region containing the *vic1* gene.

1. **Kane, M\*.,** Zang, T.M\*., Rihn, S.J\*., Zhang, F., Kueck, T., Alim, M., Schoggins, J., Rice, C.M., Wilson, S.J., Bieniasz, P.D. 2016. *Identification Interferon-Stimulated Genes with Antiretroviral Activity.* Cell Host Microbe 20(3):392-405. PMID: 27631702. \*-These authors contributed equally
2. Busnadiego, I., **Kane, M.,** Rihn, S., Preugschas, H., Hughes, J., Blanco-Melo, D., Strouvelle, V., Zang, T., Willett, B., Boutell, C., Bieniasz, P.D., and Wilson, S.J. 2014 *Host and viral determinants of Mx2 antiretroviral activity*. J Virol 88(14)7738-52. PMID:24760893

I generated the data demonstrating that nuclear pore localization of Mx2 is a common feature of primate, but not canine or ovine Mx2s and used chimeras between human and canine Mx2 in which the N-terminal nuclear localization sequences are exchanged to demonstrate the importance of nuclear localization.

1. **Kane, M.,** Yadav, S.S., Bitzegeio, J., Kutluay, S.B., Zang, T., Wilson, S.J., Schoggins, J.W., Rice, C.M., Yamashita, M., Hatziioannou, T., Bieniasz, P.D. 2013. *MX2 is an interferon-induced inhibitor of HIV-1 infection*. Nature 502:563-6. PMID: 24121441
2. [Beyer, A.R](http://www.ncbi.nlm.nih.gov/pubmed?term=Beyer%20AR%5BAuthor%5D&cauthor=true&cauthor_uid=23135726)., [Bann, D.V](http://www.ncbi.nlm.nih.gov/pubmed?term=Bann%20DV%5BAuthor%5D&cauthor=true&cauthor_uid=23135726)., [Rice, B](http://www.ncbi.nlm.nih.gov/pubmed?term=Rice%20B%5BAuthor%5D&cauthor=true&cauthor_uid=23135726)., [Pultz, I.S](http://www.ncbi.nlm.nih.gov/pubmed?term=Pultz%20IS%5BAuthor%5D&cauthor=true&cauthor_uid=23135726)., [**Kane, M**](http://www.ncbi.nlm.nih.gov/pubmed?term=Kane%20M%5BAuthor%5D&cauthor=true&cauthor_uid=23135726)**.,** [Goff, S.P](http://www.ncbi.nlm.nih.gov/pubmed?term=Goff%20SP%5BAuthor%5D&cauthor=true&cauthor_uid=23135726)., [Golovkina, T.V](http://www.ncbi.nlm.nih.gov/pubmed?term=Golovkina%20TV%5BAuthor%5D&cauthor=true&cauthor_uid=23135726)., [Parent, L.J](http://www.ncbi.nlm.nih.gov/pubmed?term=Parent%20LJ%5BAuthor%5D&cauthor=true&cauthor_uid=23135726). 2012. *Nucleolar trafficking of the mouse mammary tumor virus gag protein induced by interaction with ribosomal protein L9*. J Virol 87:1069-82, PMID: 23135726.

For this study, I generated confocal images of the MMTV-Gag entering the nucleus of newly infected cells.

1. **Kane, M.,** Case, L.K., Kopaskie, K., Kozlova, A., MacDearmid, C., Chervonsky, A.V., Golovkina, T.V. 2011. *Successful virus transmission depends on microbiota*. Science 334:245-9. PMID: 21998394.
2. **Kane, M**., Case, L.K., Wang, C., Yurkovetskiy, L., Dikiy, S., Golovkina T.V. 2011. *Innate Immune Sensing of Retroviral Infection via Toll-like Receptor 7 Occurs upon Viral Entry.* Immunity 35:135-145. [PMID: 21723157.](http://www.ncbi.nlm.nih.gov.libproxy.lib.unc.edu/pmc/articles/mid/NIHMS425326/)
3. **Kane, M.,** Case, L.K., Golovkina T.V. 2011. *Vital role for CD8+ cells in controlling retroviral infections.* J Virol 85:3415-3423. PMID: 21248041.
4. Velez MG, **Kane, M.,** Liu S, Gauld SB, Cambier JC, Torres RM, Pelanda R. 2007. *Ig allotypic inclusion does not prevent B cell development or response.* J Immunol 179:1049-57. PMID: 17617597

I tested the ability of allotype included B cells to generate a specific response against sheep red blood cell antigens. I developed an ELISPOT protocol *de novo* in order to obtain this data.

***Reviews and Commentaries***

1. Zhang, R.Z., and **Kane, M**. 2023. *Insights into the role of HIV-1 Vpu in modulation of NF-κB signaling pathways.* mBio 10.1128/mbio.00920-23 *in press* PMID:37409832 [Invited commentary]*.*
2. **Kane, M.,** Golovkina, T. *Mapping viral susceptibility loci in mice*. 2019. Ann Rev Virol. 6(1):525-546. PMID: 31567067 [Review].
3. **Kane, M.,** Golovkina, T. 2012. *Realities of Virus Sensing*. Microbes Infect 14:1017-25. PMID: 22750677 [Review].
4. **Kane, M.,** and Golovkina, T. 2010. *Common threads in persistent viral infections.* J Virol 84:4116-4123. PMID: 19955304 [Review].

***Abstracts***

1. 2014 - Oral Presentation, *Mx2, an interferon-induced inhibitor of HIV-1 infection*. Conference on Retroviruses and Opportunistic Infections
2. 2015 - Oral Presentation, *The role of nuclear pore components and nuclear transport factors in the subcellular localization and antiviral activity of Mx2.* Cold Spring Harbor Laboratory Retroviruses Meeting
3. 2017 - Andy Kaplan Prize Presentation, *Nuclear pore heterogeneity affects HIV-1 infection and the antiviral activity of Mx2.* Cold Spring Harbor Laboratory Retroviruses Meeting
4. 2017 - Oral Presentation, *Nuclear pore heterogeneity affects HIV-1 infection and the antiviral activity of Mx2.* West Coast Retroviruses Meeting
5. 2018 - Oral Presentation, *Nuclear pore heterogeneity affects HIV-1 infection and the antiviral activity of Mx2.* Keystone Symposia - Cells vs. Pathogens: Intrinsic Defenses and Counter Defenses
6. 2018 - Oral Presentation, *Inhibition of spumaretrovirus replication by the interferon stimulated gene PHF11*. 12th International Foamy Virus Meeting
7. 2020 – Oral Presentation *Inhibition of spumaretrovirus gene expression by PHF11*. Cold Spring Harbor Laboratory Retroviruses Meeting.

Session Chair: Viral Gene Expression Session

1. 2022 – Oral Presentation *Precise manipulation of nuclear pore complexes to validate the function of individual Nups in HIV-1 infection and Mx2 activity.* Cold Spring Harbor Laboratory Retroviruses Meeting.

Session Chair: Pathogenesis/Endogenous Retroviruses

1. 2022 – Poster Presentation*Determinants for Mx2-mediated inhibition of specific nuclear import pathways.* Cold Spring Harbor Laboratory Retroviruses Meeting.
2. 2022 – Oral Presentation *GTPase activity of Mx2 affects viral specificity and inhibition of specific nuclear import pathways*. International Workshop on Retroviral Pathogenesis.

Session Chair: Virus Life Cycle, Persistence, and Therapeutics

1. 2023 – Oral Presentation *Virus specificity and nucleoporin requirements for Mx2 activity are affected by GTPase function and capsid-CypA interactions*. Conference on Retroviruses and Opportunistic Infections
2. 2023 – Poster Presentation *Effects of the cyclophilin homology domain of RanBP2 on HIV-1 infection and Mx2 activity.* Cold Spring Harbor Laboratory Retroviruses Meeting.
3. 2023 – Poster Presentation *Determinants for Mx2-mediated inhibition of specific nuclear import pathways.* Cold Spring Harbor Laboratory Retroviruses Meeting.
4. 2023 – Oral Presentation *Virus specificity and nucleoporin requirements for Mx2 activity are affected by GTPase function and capsid-CypA interactions.* Cold Spring Harbor Laboratory Retroviruses Meeting.
5. 2023 – Oral Presentation *Effects of the cyclophilin homology domain of RanBP2 on HIV-1 infection and Mx2 activity.* 7th International Conference on Retroviral Integration.

Session Chair: Nuclear import of HIV-1 cores/preintegration complexes

**PROFESSIONAL ACTIVITIES**

**Teaching**

2008 Teaching Assistant – Host Pathogen Interactions Graduate Course – Dr. Alexander Chervonsky, University of Chicago

15 graduate students, led 10 hour-long journal club discussions and three two-hour long exam preparation sections.

2009 and 2011 Teaching Assistant – Introduction to Virology – Dr. Tatyana Golovkina, University of Chicago

10-20 undergraduate and 5-10 graduate students, two lectures given each year, led 10 hour-long journal club discussions, supervised and graded graduate student mock-grant applications, wrote and graded exams, held office hours for student assistance

2010 Teaching Assistant – Introduction to Virology – Dr. Lucia Rothman-Denes, University of Chicago

40 graduate students, wrote and graded exams, held office hours for student assistance

2008 – 2011 Mentored undergraduate and graduate students in the Golovkina laboratory in positional cloning and anti-retroviral immunity projects

2012 – 2018 Mentored an undergraduate summer volunteer, two high school summer research program students, research technicians, and two rotation students in the Bieniasz laboratory

2014 – 2018 Private tutoring of high school and college students in biology, biochemistry, microbiology, mathematics, essay writing, and test preparation

**Graduate Student Teaching**

2021 Comprehensive Microbiology, Lecturer and Examiner, Barriers to Infection

2022 - present Comprehensive Microbiology, Lecturer and Examiner, Viral Evolution

**Thesis Committees**

2021 Masters Thesis Committee Member, Emerson Boggs, Infectious Disease

2022 - Present PhD Thesis Committee Member, Zac Ingram, Program in Microbiology and Immunology

**Mentoring**

2019 Undergraduate Student Mentor, Anisha Verma, CHP Summer Research Internship Program

2021 Undergraduate Student Mentor, Ram Goli, CHP Summer Research Internship Program

2021 - present Graduate Student Mentor, Robert Zhang, Program in Microbiology and Immunology PhD student

 One first author publication (PMID: 37093008)

 Two posters presented at international conferences

 One oral presentation at international conference

 Appointed to Viral Persistance and Pathogenesis T32

2022 Undergraduate Student Mentor, Mariah Cashbaugh, PMI Summer Undergraduate Research Program

2023 High School Student Mentor, Oluwatobiloba Olaore, UPMC Hillman Academy

**RESEARCH**

***Current Grant Support***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1R01AI150988-01A1 | Functionally defining HIV-host interactions during the early HIV-1 lifecycle | Sub-award PI15% | 2020-2025 | NIH/NIAID$172,510/year  |
| 1R01AI162172-01A1 | Inhibition of lentiviral nuclear import pathways by Mx2 | PI46% | 2021-2026 | NIH/NIAID$388,425/year |
| 16903 | Genetic basis for interferon-gamma-independent antiviral antibody production | PI0% | 2023-2024 | CHP Research Advisory Committee$46,000/year |
| Pending | The role of cytoplasmic ring nucleoporins in lentivirus infection | PI15% | 2023-2024 | PCHPI/NIH$175,000/year |

***Prior Grant Support***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| F32 AI116263-01 | Mechanism of lentiviral inhibition by Mx2 | PI100% | 2015-2018 | NIH/NIAID |
| Pilot Award | Genetic basis for interferon-gamma-independent antiviral antibody production | PI0% | 2020-2021 | RK Mellon Institute$50,000/year |
| SRA00001198 | Mechanism of inhibition of viral nuclear import pathway by Mx2 | PI10% | 2020-2022 | Gilead Sciences$65,000/year |

**Journal Refereeing**

2014 – Present *Journal of Virology; Journal of Acquired Immune Deficiency Syndromes; AIDS Research and Human Retroviruses; mBIO; PLoS Biology; Virology; Cell Reports; PLoS Pathogens; Science Advances; EMBO*

**Current Research Interests**

Genetic and immunological basis for protective antiretroviral immune responses.

Innate immune detection of viral infection and investigation of novel signaling pathways underlying antiviral adaptive immune responses.

Molecular details underlying the direct inhibition of retroviral replication by restriction factors.

Interaction between the HIV-1 capsid, the nuclear pore complex, cellular nuclear transport factors, and the innate immune effector, Mx2.

**Seminars and Invited Lectureships**

***Invited seminars***

2018 Boston College Department of Biology

2019 Loyola University Chicago Department of Microbiology and Immunology

2019-2023 Guest Lecturer, University of Chicago Virology Course (annual)

2020 U.S.-Japan Cooperative Medical Sciences Program (USJCMSP) 22nd International Conference on Emerging Infectious Diseases (EID) in the Pacific Rim (unable to attend due to COVID-19)

2022 University of North Carolina at Chapel Hill Department of Microbiology and Immunology

2022 University of Chicago Department of Microbiology and Immunology

2023 2023 Palm Springs Symposium on HIV/AIDS “New Frontiers in HIV Research”

2023 Loyola University Chicago Department of Microbiology and Immunology

**Service**

***University and Medical School Service***

2020-present Maintenance of TAGCenter Dropbox for Rangos Research Center for the research community to submit samples to Transnetyx for genotyping without incurring shipping costs.

2020-2021 Comprehensive Exam Committee, Program in Microbiology and Immunology

2021-present Admissions Committee, Program in Microbiology and Immunology

April 2023 Review Committee – Children’s Trust

***National Service***

July 2022 NIH ad hoc reviewer – HIV Molecular Virology, Cell Biology, and Drug Development Study Section

March 2023 NIH SEP reviewer – NIH Postdoctoral Research Training (PRAT) Program

July 2023 NIH ad hoc reviewer – HIV Molecular Virology, Cell Biology, and Drug Development Study Section