

Keyla Santos Guedes de Sá

Pathogenic Autoantibodies · Neuroimmunology · Translational Immunology

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Advancing The Understanding of Pathogenic Autoantibodies to Transform the Diagnosis and Treatment of Neurological Autoimmune Diseases

SUMMARY

I am an immunologist passionate about understanding how pathogenic autoantibodies drive disease and using that knowledge to improve patients' lives. My research integrates human studies with cutting-edge laboratory approaches, spanning in vitro assays, in vivo mouse models, and high-throughput proteomics, to reveal the mechanisms of neuroimmune pathology. In my future lab, I will build a collaborative, interdisciplinary environment that bridges human and bench science, applying a patient-centered approach with the potential to directly advance the clinical understanding, diagnosis, and treatment of neurological autoimmune diseases.

RESEARCH EXPERIENCE

Postdoctoral Fellow

Mentor: Akiko Iwasaki

February 2023 - Present

Department of Immunobiology, Yale School of Medicine, USA

- Led collaborative studies across three different areas of study (Neuroscience, Immunology and Data Science) to investigate the presence of autoantibodies in Long COVID and other post-acute infection syndromes using proteomics, passive transfer mouse models and tissue-based immunofluorescence.
- Designed and implemented high-throughput screening approaches to identify and validate pathogenic autoantibodies targets.
- Investigating the effector function of autoantibodies in Long COVID using mouse models, cellular and molecular biology techniques.

Ph.D student

Advisor: Dario Zamboni, Ph.D.

July 2018 – November 2022

Ribeirão Preto School of Medicine (FMRP) – USP, Brazil

- Elucidated mechanisms by which inflammasome pathways regulate host immune responses during viral (Influenza A virus, SARS-CoV-2) and parasitic (Leishmania) infections.
- Demonstrated that Gasdermin-D activation promotes NLRP3 inflammasome activation and host resistance to Leishmania infection.
- Investigated pulmonary inflammation and viral replication in fatal COVID-19 cases, identifying distinct immunopathological patterns.

Master student

Advisor: Antonio Carlos Rosario Vallinoto, Ph.D.

February 2016 – January 2018

Institute of Biomedical Sciences, UFPA, Brazil

- Investigated innate immune receptor and interferon signaling gene expression in viral infections.
- Utilized molecular biology techniques including RNA extraction, qPCR, sanger sequence and genotyping assays.

Undergraduate research

Advisor: Antonio Carlos Rosario Vallinoto, Ph.D.

February 2012 – January 2016

Institute of Biomedical Sciences, UFPA, Brazil

- Conducted genetic profiling to evaluate associations between IL-28B polymorphisms and HTLV infection outcomes.
- Performed DNA extraction, PCR and sequencing analysis.

EDUCATION

Ph.D. in Cellular and Molecular Biology

Universidade de São Paulo

Thesis: Inflammasome activation: its importance in leishmaniasis, influenza, and COVID-19

Thesis Advisor: Dario Simões Zamboni

November 2022
Ribeirão Preto, Brazil

M.S. in Biology of Infectious and Parasitic Agents

Universidade Federal do Pará

Thesis: Evaluation of the Expression Profile of Toll-Like Receptor 3 and Interferon Lambda 3 Genes

Thesis Advisor: Antonio Carlos Rosário Vallinoto

January 2018
Belém, Brazil

B.S. in Biomedicine

Universidade Federal do Pará

Thesis: Genetic Profile of IL-28B in Patients with Human T-Cell Lymphotropic Virus (HTLV)

Thesis Advisor: Antonio Carlos Rosário Vallinoto

March 2016
Belém, Brazil

HONORS & AWARDS

- 2024 AAI Trainee Poster Award (\$300)**
Description: Awarded to trainees whose poster presentations were judged to be exceptional among conference submission
The American Association of Immunologists
 2024
- USP 2023 Outstanding Thesis Award**
Description: Recognizes the most distinguished doctoral thesis in the Biological Sciences among graduates of the University of São Paulo
Universidade de São Paulo
 2023
- Young Talent Award in Life Sciences (\$920.51)**
Description: National award recognizing outstanding undergraduate students in Latin America with exceptional academic performance and research achievements in the life sciences
Brazilian Society of Biochemistry and Molecular Biology & Cytiva
 2022
- Honorable Mention in the Newton Freire-Maia award in Human and Medical Genetics, and Pharmacogenetics**
Description: Awarded to trainees whose poster presentations were judged to be exceptional among conference submission
Brazilian Society of Genetics
 2022
- AAI-IUIS Travel Award; AAI Introductory Course of Immunology (\$2,000)**
Description: Awarded to early-career immunologists from developing countries with strong academic and research potential to support participation in the AAI Introductory Course of Immunology.
The American Association of Immunologists
 2017
- Scientific and Technological Initiation Award**
Description: Honorable Mention awarded to outstanding undergraduate research projects at the Federal University of Pará (UFPA), selected for excellence in quality, originality, and impact
Universidade Federal do Pará - UFPA
 2015

RESEARCH GRANTS & FELLOWSHIPS

Contributed to the R01 (1R01NS146603-01) under review

National Cancer Institute, NIH
2025 - Present

Title: Probing the Pathogenic Roles of Autoantibodies in Neuro-Post-Acute Infection Syndromes

PI: Akiko Iwasaki, Ph.D. and Leying Guan, Ph.D.

Role: Lead Student Researcher - Conceived and wrote the full proposal in collaboration with the PI, generated preliminary data, and participated in all stages of the submission process.

Pew Latin American Fellowship 2023 (\$130,000)

The Pew Charitable Trust
February 2024 – January 2026

Title: Immunopathological Mechanisms of COVID-19-Associated Neurological Symptoms

Role: Principal Investigator

Description: Highly competitive award granted to only 10 fellows selected from applicants across Latin America

Ph.D. Fellowship (\$42,092.32)

São Paulo Research Foundation - FAPESP
January 2019- November 2022

Title: The Role of Gasdermin-D in Inflammasome Activation in Response to *Leishmania (L.) amazonensis* Infection

Role: Principal Investigator

Description: Prestigious fellowship awarded to support doctoral research in Brazil, based on academic merit and the scientific quality of the proposed project.

Young Talents for Science Fellowship (\$883.68)

CAPES, Brazilian Ministry of Education
2012

Title: Evaluation of the IL-28B Gene rs8103142 Polymorphism in Carriers of Human T-Cell Lymphotropic Virus Type 1 (HTLV-1)

Role: Principal Investigator

Description: National fellowship program recognizing outstanding undergraduate students in Brazil with exceptional academic performance and research potential. Provided financial support and early research training opportunities

TEACHING AND MENTORING

Guest Lecturer – Cellular Immunology, Graduate Program in Biology of Infectious and Parasitic Agents (BAIP)

Universidade Federal do Pará - UFPA
2024

Description: Delivered an online lecture on “Immunology of T CD8⁺ cells” to postgraduate students enrolled in the Cellular Immunology course

Teaching Workshop - Yale Poorvu Center for Teaching and Learning Workshops

Yale University
2024 - Present

Description: Participating in a series of workshops on evidence-based teaching practices, active learning strategies, and inclusive pedagogy to enhance undergraduate and graduate-level instruction.

Teaching Assistant – Histology, Ribeirão Preto Medical School (FMRP)

University of São Paulo - USP
2022

Description: Assisted in teaching and laboratory instruction for undergraduate courses in Nutrition and Speech Therapy

Teaching Assistant – *Basic Virology*, Institute of Biomedical Sciences (ICB) **Universidade Federal do Pará - UFPA**
2017

Description: Assisted in teaching and laboratory instruction for undergraduate courses in Biomedicine and Biology

Students Mentored

- 1 High school student at Yale
- 6 Undergrad students at UFPA
- 2 Undergrad student at USP
- 2 Undergrads students at Yale
- 2 Postgraduates at Yale
- 1 Rotation MD student at Yale
- 1 Rotation PhD student at Yale
- 1 Rotation MD/PhD student at Yale

PUBLICATION

First Author Publication

1. **de Sá KSG**, Amaral LA, Rodrigues TS, Caetano CCS, Becerra A, Batah SS, Lopes FT, de Oliveira IM, Lopes LS, Almeida L, Mota CM, Oliveira S, Wada DT, Koenigk-Santos M, Martins RB, Rosales RRC, Arruda E, Fabro AT, Zamboni DS. Pulmonary inflammation and viral replication define distinct clinical outcomes in fatal cases of COVID-19. **PLoS Pathog**. 2024 Jun;20(6):e1012222. [PMID: 38838044](#).
2. **de Sá KSG**, Amaral LA, Rodrigues TS, Ishimoto AY, de Andrade WAC, de Almeida L, Freitas-Castro F, Batah SS, Oliveira SC, Pastorello MT, Fabro AT, Zamboni DS. Gasdermin-D activation promotes NLRP3 activation and host resistance to Leishmania infection. **Nat Commun**. 2023 Feb 24;14(1):1049. [PMID: 36828815](#).
3. **Guedes de Sá KS**, Amoras EDSG, Conde SRSDS, Queiroz MAF, Cayres-Vallinoto IMV, Ishak R, Vallinoto ACR. Intrahepatic TLR3 and IFNL3 Expressions Are Associated with Stages of Fibrosis in Chronic Hepatitis C. **Viruses**. 2021 Jun 9;13(6). [PMID: 34207750](#).
4. **de Sá KS**, Santana BB, de Souza Ferreira TC, Sousa RC, Caldas CA, Azevedo VN, Feitosa RN, Machado LF, de Oliveira Guimarães Ishak M, Ishak R, Vallinoto AC. IL28B gene polymorphisms and Th1/Th2 cytokine levels might be associated with HTLV-associated arthropathy. **Cytokine**. 2016 Jan;77:79-87. [PMID: 26546777](#).
5. **Sá KS**, Pires-Neto Ode S, Santana BB, Gomes ST, Amoras Eda S, Conde SR, Demachki S, Azevedo VN, Machado LF, Martins-Feitosa RN, Ishak Mde O, Ishak R, Vallinoto AC. Toll-like receptor 3 gene polymorphisms are not associated with the risk of hepatitis B and hepatitis C virus infection. **Rev Soc Bras Med Trop**. 2015 Mar-Apr;48(2):136-42. [PMID: 25992926](#).

Collaboration

1. Kwon DI, Mao T, Israelow B, **Santos Guedes de Sá K**, Dong H, Iwasaki A. Mucosal unadjuvanted booster vaccines elicit local IgA responses by conversion of pre-existing immunity in mice. **Nat Immunol**. 2025 Jun;26(6):908-919. [PMID: 40360777](#)
2. Rodrigues TS, Caetano CCS, **de Sá KSG**, Almeida L, Becerra A, Gonçalves AV, Lopes LS, Oliveira S, Mascarenhas DPA, Batah SS, Silva BM, Gomes GF, Castro R, Martins RB, Avila J, Frantz FG, Cunha TM, Arruda E, Cunha FQ, Nakaya H, Cunha LD, Fabro AT, Louzada-Junior P, de Oliveira RDR, Zamboni DS. CASP4/11 Contributes to NLRP3 Activation and COVID-19 Exacerbation. **J Infect Dis**. 2023 Jun 15;227(12):1364-1375. [PMID: 36763010](#).

3. da Costa SDSVÁ, Monteiro JC, Viegas APDV, **de Sá KSG**, da Cruz SR, Lima SS, Vallinoto IMVC, Costa IB, Vallinoto ACR. Prevalence of JC and BK Polyomavirus Infection in Patients with Chronic Kidney Disease in the State of Pará, Brazil. **Trop Med Infect Dis**. 2022 Dec 23;8(1). [PMID: 36668916](#)
4. de Almeida L, da Silva ALN, Rodrigues TS, Oliveira S, Ishimoto AY, Seribelli AA, Becerra A, Andrade WA, Ataíde MA, Caetano CCS, **de Sá KSG**, Pelisson N, Martins RB, de Paula Souza J, Arruda E, Batah SS, Castro R, Frantz FG, Cunha FQ, Cunha TM, Fabro AT, Cunha LD, Louzada-Junior P, de Oliveira RDR, Zamboni DS. Identification of immunomodulatory drugs that inhibit multiple inflammasomes and impair SARS-CoV-2 infection. **Sci Adv**. 2022 Sep 16;8(37):eabo5400. [PMID: 36103544](#)
5. Costa TJ, Potje SR, Fraga-Silva TFC, da Silva-Neto JA, Barros PR, Rodrigues D, Machado MR, Martins RB, Santos-Eichler RA, Benatti MN, **de Sá KSG**, Almado CEL, Castro ÍA, Pontelli MC, Serra L, Carneiro FS, Becari C, Louzada-Junior P, Oliveira RDR, Zamboni DS, Arruda E, Auxiliadora-Martins M, Giachini FRC, Bonato VLD, Zachara NE, Bomfim GF, Tostes RC. Mitochondrial DNA and TLR9 activation contribute to SARS-CoV-2-induced endothelial cell damage. **Vascul Pharmacol**. 2022 Feb;142:106946. [PMID: 34838735](#).
6. Batah SS, Benatti MN, Siyuan L, Telini WM, Barboza JO, Menezes MB, Nadai TR, **Sá KSG**, Vaswani CM, Gupta S, Zamboni DS, Wada DT, Calado RT, Oliveira RDR, Louzada-Junior P, Auxiliadora-Martins M, Veras FP, Cunha LD, Cunha TM, Luppino-Assad R, Balancin ML, Morais SS, Martins RB, Arruda E, Chahud F, Santos MK, Cetlin AA, Cunha FQ, Dos Santos C, Capelozzi VL, Fukuoka J, Achcar RD, Fabro AT. COVID-19 bimodal clinical and pathological phenotypes. **Clin Transl Med**. 2022 Jan;12(1):e648. [PMID: 35075808](#).
7. Potje SR, Costa TJ, Fraga-Silva TFC, Martins RB, Benatti MN, Almado CEL, **de Sá KSG**, Bonato VLD, Arruda E, Louzada-Junior P, Oliveira RDR, Zamboni DS, Becari C, Auxiliadora-Martins M, Tostes RC. Heparin prevents in vitro glycocalyx shedding induced by plasma from COVID-19 patients. **Life Sci**. 2021 Jul 1;276:119376. [PMID: 33781826](#).
8. Rodrigues TS, **de Sá KSG**, Ishimoto AY, Becerra A, Oliveira S, Almeida L, Gonçalves AV, Perucello DB, Andrade WA, Castro R, Veras FP, Toller-Kawahisa JE, Nascimento DC, de Lima MHF, Silva CMS, Caetite DB, Martins RB, Castro IA, Pontelli MC, de Barros FC, do Amaral NB, Giannini MC, Bonjorno LP, Lopes MIF, Santana RC, Vilar FC, Auxiliadora-Martins M, Luppino-Assad R, de Almeida SCL, de Oliveira FR, Batah SS, Siyuan L, Benatti MN, Cunha TM, Alves-Filho JC, Cunha FQ, Cunha LD, Frantz FG, Kohlsdorf T, Fabro AT, Arruda E, de Oliveira RDR, Louzada-Junior P, Zamboni DS. Inflammasomes are activated in response to SARS-CoV-2 infection and are associated with COVID-19 severity in patients. **J Exp Med**. 2021 Mar 1;218(3). [PMID: 33231615](#).
9. de Lima ABF, **Sá KSG**, Torres MKDS, da Silva Soares L, Resques HR, Azevedo VN, Martins Feitosa RN, Monteiro JC, Rangel da Silva ANM, Ribeiro ALR, Oliveira-Filho AB, Vallinoto ACR, Machado LFA. Low prevalence of human pegivirus 1 (HPgV-1) in HTLV-1 carriers from Belém, Pará, North Region of Brazil. **PLoS One**. 2020;15(5):e0232783. [PMID: 32369533](#).
10. de Carvalho RVH, Silva ALN, Santos LL, Andrade WA, **de Sá KSG**, Zamboni DS. Macrophage priming is dispensable for NLRP3 inflammasome activation and restriction of *Leishmania amazonensis* replication. **J Leukoc Biol**. 2019 Sep;106(3):631-640. [PMID: 31063608](#).
11. Braço ILJ, **de Sá KSG**, Waqasi M, Queiroz MAF, da Silva ANR, Cayres-Vallinoto IMV, Lima SS, de Oliveira Guimarães Ishak M, Ishak R, Guerreiro JF, Vallinoto ACR. High prevalence of human T-lymphotropic virus 2 (HTLV-2) infection in villages of the Xikrin tribe (Kayapo), Brazilian Amazon region. **BMC Infect Dis**. 2019 May 22;19(1):459. [PMID: 31117977](#).
12. de Miranda BKB, **de Sá KSG**, da Silva ANR, Feitosa RNM, Cayres-Vallinoto IMV, Ishak R, Vallinoto ACR. GBV-C/HIV-1 coinfection is associated with low HIV-1 viral load and high CD4(+) T lymphocyte count. **Arch Virol**. 2017 Nov;162(11):3431-3438. [PMID: 28780631](#).

13. Vallinoto AC, Aguiar S, **Sá KG**, Freitas FB, Ferreira G, Lima SS, Hermes RB, Machado LF, Cayres-Vallinoto I, Ishak M, Ishak R. Prevalence and risk behaviour for human immunodeficiency virus 1 infection in Marajó Island, Northern Brazil. **Ann Hum Biol**. 2016 Jul;43(4):397-404. PMID: 27241798.
14. Vallinoto AC, Santana BB, **Sá KS**, Ferreira TC, Sousa RC, Azevedo VN, Feitosa RN, Machado LF, Ishak MO, Ishak R. HTLV-1-Associated Myelopathy/Tropical Spastic Paraparesis Is Not Associated with SNPs rs12979860 of the IL-28B Gene. **Mediators Inflamm**. 2015;2015:804167. PMID: 26609200.
15. Pires-Neto Ode S, **de Sá KS**, Santana BB, Gomes ST, Amoras Eda S, Conde SR, Demachki S, Azevedo VN, Martins-Feitosa RN, Ishak Mde O, Ishak R, Vallinoto AC. Lack of Association between Polymorphisms of the TLR4 Gene and Infection with the Hepatitis B and C Viruses. **Mediators Inflamm**. 2015;2015:150673. PMID: 26347404.

Pre-Prints and Under Review

1. **Santos Guedes de Sa K**, Silva J, Bayarri-Olmos R, Brinda R, Alec Rath Constable R, Colom Diaz PA, Kwon DI, Rodrigues G, Wenxue L, Baker C, Bhattacharjee B, Wood J, Tabacof L, Liu Y, Putrino D, Horvath TL, Iwasaki A. A causal link between autoantibodies and neurological symptoms in long COVID. **medRxiv**. 2024 Jun 19. PMID: 38947091. **Under review at Cell**
2. M. Angel D, Luhung I, **Santos Guedes de Sa K**, Peccia J. The Susceptibility of Airborne SARS-CoV-2 to Far-UVC Irradiation. **bioRxiv**. 2025 June 11.
3. M. Angel D, Luhung I, **Santos Guedes de Sa K**, Peccia J. SARS-CoV-2 Aerosol Susceptibility to Bipolar Ion Disinfection. **Under review at ACS journals**. 2025 August 09.
4. Bhagchandani SH, Ehrenzeller S, Pires IS, Chaudhary N, Booth JC, **Sá SGK**, Kwon D, Li S, Olszowka A, Hudak A, Fischer S, Bayarri-Olmos R, Sengupta S, Irvine DJ, Iwasaki A. Bioactive Enhanced Adjuvant Chemokine Oligonucleotide Nanoparticles for Mucosal Vaccine against Genital Herpes. **Under review at Science Immunology**. 2025 July 25.

ACADEMIC SERVICE & LEADERSHIP

Manuscript Reviewer – Provided peer review for *Biomarkers in Medicine*, *International Journal of Molecular Sciences*, *Trends in Molecular Medicine*, *Virulence*, and *Viruses*.

Contributed as a co-reviewer for *Journal of Clinical Medicine* (with Akiko Iwasaki).

Professional Memberships – Active member of the American Association of Immunologists, Brazilian Society of Immunology, and Brazilian Society of Virology.

President, Academic Center of Biomedicine (CABM), Universidade Federal do Pará (2014)
Led student representation for the Biomedicine program, organized academic events, and coordinated outreach initiatives.

MEDIA COVERAGE

Podcast Guest, *Yale Journal of Biology and Medicine*

Released April 7, 2025

Episode: “The Immunology of Long COVID: An Interview with Dr. Lindsay McAlpine and Dr. Keyla Sá”

Podcast Guest, *After the Fact* – Pew Charitable Trusts

Released August 9, 2024

Episode: “From Lab to Life: What AI Tells Us About Long COVID”

Instagram Live Guest, Brazilian Society for Biochemistry and Molecular Biology (SBBq)
Topic: “My Research and Scientific Career”

December 11, 2024

Interviewee, *Folha de S.Paulo* – Science Section

Released April 21, 2023

Article: “Leishmaniasis parasite manipulates the body’s defenses to keep replicating, study shows”

REFERENCE

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HHMI Investigator
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Universidade Federal do Pará
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