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**Lalit Kumar Beura, BVSc, M.S., Ph.D.**  
Assistant Professor, Department of Molecular Microbiology & Immunology  
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### **Education**

Ph.D. 2006-2011  
Molecular Virology, University of Nebraska, Lincoln, Nebraska  
Advisor: Dr. Fernando A. Osorio

M.S. 2004-2006  
Biotechnology, Indian Institute of Technology, Roorkee, Uttaranchal, India  
Advisor: Dr. BMJ Pereira

BVSc & AH 1998-2004  
Orissa University of Agriculture and Technology, Bhubaneswar, India

### **Training and Employment**

Assistant Professor 2019-present  
*Department of Molecular Microbiology & Immunology, Brown University, Providence, RI*

Senior Research Associate with Dr. David Masopust 2017-2019  
*Department of Microbiology & Immunology, University of Minnesota, Minneapolis, MN*

Post-doctoral Associate with Dr. David Masopust 2011-2017  
*Department of Microbiology & Immunology, University of Minnesota, Minneapolis, MN*

Research Assistant with Dr. Fernando Osorio 2006-2011  
*School of Veterinary and Biomedical Sciences, University of Nebraska, Lincoln, NE*

### **Publications**

Tucker, C.G., Mitchell, J.S., Martinov, T., Burbach, B.J., **Beura, L.K.**, Wilson, J.C., Dwyer, A.J., Singh, L., Spanier, J.A., Mescher, M.F., Fife, B.T. Adoptive T-cell therapy with IL-12-preconditioned low-avidity T cells prevents exhaustion and results in enhanced T-cell activation, enhanced tumor clearance, and decreased risk for autoimmunity. (2020) *J Immunol.* 205(5):1449-1460.

Hamilton, S. E., Badovinac, V. P., **Beura L. K.**, Pierson, M. J., Jameson, S. C., Masopust, D., Griffith, T. S. New insights into the immune system using dirty mice. (2020) *J Immunol.* 205(1):3-11.

Stolley, J. M., Johnston, T. S., Soerens, A. G., **Beura, L. K.**, Rosato, P. C., Joag, V., Wijeyesinghe, S. P., Langlois, R. A., Osum, K. C., Mitchell, J. S., and Masopust, D. Retrograde migration supplies resident memory T cells to the lung draining lymph node after influenza infection. (2020) *J Exp Med.* 2020 Aug 3;217(8): e20192197. doi: 10.1084/jem.20192197.

Fonseca, R. F.\*, **Beura, L. K.\***, Quarnstrom, C. Q.\*, Ghoneim, H., Fan, Y., Zebley, C. C., Scott, M. C., Fares-Frederickson, N. J., Wijeyesinghe, S., Thompson, E. A., Borges da Silva, H., Vezys, V., Youngblood, B., Masopust, D. Developmental plasticity allows outside-in immune responses by resident memory T cells. (2020) *Nature Immunology.* Apr;21(4):412-421 \* Equal contribution

Walsh, D. A., Borges da Silva, H., **Beura, L. K.**, Peng, C., Hamilton, S. E., Masopust, D., Jameson, S. C. The Functional Requirement for CD69 in Establishment of Resident Memory CD8<sup>+</sup> T Cells Varies with Tissue Location. (2019) *J Immunol*. Aug 15;203(4):946-955.

Hirai, T., Zenke, Y., Yang, Y., Bartholin, L., **Beura, L. K.**, Masopust, D., Kaplan, D.H. Keratinocyte-Mediated Activation of the Cytokine TGF- $\beta$  Maintains Skin Recirculating Memory CD8<sup>+</sup> T Cells. (2019) *Immunity*. 50(5):1249-1261.

**Beura, L. K.**, Fares-Frederickson, N. J., Steinert, E. M., Scott, M. C., Thompson, E. A., Fraser, K. A., Schenkel, J. M., Vezys, V., Masopust, D. CD4<sup>+</sup> resident memory T cells dominate immunosurveillance and orchestrate local recall responses. (2019) *J Exp Med*. May 6;216(5):1214-1229.

Thompson, E. A., Mitchell, J. M., **Beura, L. K.**, Mrass, P., Torres, D., Pierson, M. J., Cannon, J. L., Masopust, D., Fife, B. T., Vezys, V. Interstitial migration of CD8 $\alpha\beta$  T cells in the small intestine is dynamic and is dictated by environmental cues. (2019) *Cell Rep*. 12;26(11):2859-2867.

Vangay, P., Johnson, A. J., Ward, T. L., Al-Ghalith, G. A., Shields-Cutler, R. R., Hillmann, B. M., Lucas, S. K., **Beura, L. K.**, Thompson, E. A., Till, L. M., Batres, R., Paw, B., Pergament, S. L., Saenyakul, P., Xiong, M., Kim, A. D., Kim, G., Masopust, D., Martens, E. C., Angkurawaranon, C., McGready, R., Kashyap, P. C., Culhane-Pera, K. A., Knights, D. (2018) US immigration westernizes the human gut microbiome. *Cell*. 175(4):962-972.

Borges da Silva, H., **Beura, L.K.**, Wang, H., Hanse, E., Gore, R., Scott, M., Walsh, D. A., Block, K. A., Fonseca, R., Yan, Y., Hippen, K., Blazer, B. R., Masopust, D., Kelekar, A., Vulchanova, L., Hogquist, K., Jameson, S. C. (2018) The purinergic receptor P2RX7 directs metabolic fitness of long-lived memory CD8<sup>+</sup> T cells. *Nature*. 559(7713):264-268.

Steinert, E. M. \*, Thompson, E. A. \*, **Beura, L. K.**, Adam, O. A., Mitchell, J. S., Guo, M., Breed, E. R., Sjaastad, F. V., Vezys, V., Masopust, D. (2018) Cutting Edge: Evidence for Nonvascular Route of Visceral Organ Immunosurveillance by T Cells. *J Immunol*. 201(2):337-342. \* Equal contribution

Buggert, M., Nguyen, S., Salgado-Montes de Oca, G., Bengsch, B., Darko, S., Ransier, A., Roberts, E. R., Del Alcazar, D., Brody, I. B., Vella, L. A., **Beura, L.**, Wijeyesinghe, S., Herati, R. S., Del Rio, Estrada. P. M., Ablanedo-Terrazas, Y., Kuri-Cervantes, L., Sada Japp, A., Manne, S., Vartanian, S., Huffman, A., Sandberg, J. K., Gostick, E., Nadolski, G., Silvestri, G., Canaday, D. H., Price, D. A., Petrovas, C., Su, L. F., Vahedi, G., Dori, Y., Frank, I., Itkin, M. G., Wherry, E. J., Deeks, S. G., Najj, A., Reyes-Terán, G., Masopust, D., Douek, D. C., Betts, M. R. (2018) Identification and characterization of HIV-specific resident memory CD8<sup>+</sup> T cells in human lymphoid tissue. *Sci Immunol*. 1;3(24). pii: eaar4526.

**Beura, L. K.**, Wijeyesinghe, S., Thompson, E. A., Macchietto, M. G., Rosato, P. C., Pierson, M. J., Schenkel, J. M., Mitchell, J. M., Vezys, V., Fife, B. T., Shen, S., Masopust, D. (2018). T cells in non-lymphoid tissues give rise to lymph node resident memory T cells. *Immunity*. 48(2):327-338.

**Beura, L. K.**, Mitchell, J. M., Thompson, E. A., Schenkel, J. M., Mohammed, J., Wijeyesinghe, S., Fonseca, R. F., Burbach, B. J., Hickman, H. D., Vezys, V., Fife, B. T., Masopust, D. (2018). Intravital mucosal imaging of resident memory CD8<sup>+</sup> T cell shows tissue-autonomous recall responses that amplify secondary memory. *Nature Immunology*. 19(2):173-182.

**Beura, L. K.**, Jameson, S. C., Masopust, D. (2017). Is a human CD8 T-cell vaccine possible, and if so what would it take? CD8 T cell vaccines: To B or not to B? *Cold Spring Harbor Perspectives in Biology*. doi: 10.1101/cshperspect. a028910.

Staley, C., Kaiser, T., **Beura, L. K.**, Hamilton, M. J., Weingarden, A. R., Bobr, A., Kang, J., Masopust, D., Sadowsky, M. J., Khoruts, A. (2017). Stable engraftment of human microbiota into mice with a single oral gavage following antibiotic conditioning. *Microbiome*. 1;5(1):87.

**Beura, L. K.**, Rosato, P. C., Masopust, D. (2017). Implications of resident memory T cells for transplantation. *Am J Transplant*. 17(5): 1167-1175.

Rosato, P. C., **Beura, L. K.**, Masopust, D. (2017). Tissue resident memory T cells and viral immunity. *Curr Opin Virol*. 22:44-50.

Fiege, J., **Beura L. K.**, Burbach, B. J., Shimizu, Y. (2016). Adhesion and degranulation promoting adapter protein (ADAP) promotes CD8 T cell differentiation and resident memory formation and function during an acute infection. *J Immunol*. 197(6): 2079-89.

Reese, T. A, Bi, K., Kambal, A., Filali-Mouhim, A., **Beura, L. K.**, Bürger, M. C., Pulendran, B., Sekaly, R. P., Jameson, S. C., Masopust, D., Haining, W. N., Virgin H. W. (2016) Sequential Infection with Common Pathogens Promotes Human-like Immune Gene Expression and Altered Vaccine Response. *Cell Host Microbe*. 11; 19 (5): 713-9.

**Beura, L. K.**, Hamilton, S. E., Bi, K., Schenkel, J. M, Odumade, O., Casey, K. A., Thompson, E. A., Fraser, K. A, Rosato, P. C., Filali-Mouhim, A., Sekaly, R. P., Jenkins, M. K., Vezys, V., Haining, W. N., Jameson, S., Masopust, D. (2016) Recapitulating adult human immune traits in laboratory mice by normalizing environment. *Nature*. 532 (7600): 512-6.

Schenkel, J. M\*, Fraser, K. A\*, Casey, K. A., **Beura, L. K.**, Vezys, V., Masopust, D. (2016) IL-15 independent maintenance of tissue resident and boosted effector memory CD8 T cells. *J Immunol*. 196 (9): 3920-26. \* Equal contribution

Thompson, E. A., **Beura, L. K.**, Nelson, C, E., Anderson, K. G., Vezys, V. (2016) Shortened intervals during heterologous boosting preserve memory CD8 T cell function but compromise longevity. *J Immunol*. 196 (7): 3054-63.

Mohammed, J., **Beura, L. K.**, Bobr, A., Astry, B., Chicoine, B., Kashem, S. K., Igyártó, B. Z., Matte, C., Bartholin, L., Kaplan, A., Sheppard, D., Bridges, A. G., Shlomchik, W. D., Masopust, D., Kaplan, D. H. (2016) Stromal cells control epithelial residence of DC and memory T cells by regulated activation of TGF- $\beta$ . *Nature Immunology*. 17(4): 414-21.

Steinert, E. M.\* , Schenkel, J. M.\* , Fraser, K. A., **Beura, L. K.**, Manlove, L. S., Igyártó, B. Z., Southern, P. J., Masopust, D. (2015) Quantifying memory CD8 T cells reveals regionalization of immunosurveillance. *Cell*. 7; 161(4): 737-49. \* Equal contribution

**Beura, L. K.**, Masopust D. (2015) Infected cells call their killers to the scene of the crime. *Immunity*. 17; 42(3): 399-401.

**Beura, L. K.**, Anderson, K. G., Schenkel, J. M., Locquiao, J. J., Fraser, K. A., Vezys, V., Pepper, M., and Masopust, D. (2015) Lymphocytic choriomeningitis virus persistence promotes effector like memory differentiation and enhances mucosal T cell distribution. *J Leukoc Biol*. 97(2): 217-25.

Schenkel, J. M., Fraser, K. A, **Beura, L. K.**, Pauken, K. E, Vezys, V., Masopust, D. (2014). T cell memory. Resident memory CD8 T cells trigger protective innate and adaptive immune responses. *Science*, 346(6205):98-101.

**Beura, L. K.**, Masopust D. (2014). SnapShot: resident memory T cells. *Cell*. 157(6):1488-1488.

Anderson, K. G., Mayer-Barber, K., Sung, H., **Beura, L. K.**, James. B. R., Taylor, J. J., Qunaj, L., Griffith, T. S., Vezys, V., Barber, D. L., Masopust, D. (2014). Intravascular staining for discrimination of vascular and tissue leukocytes. *Nat Protoc*, 9(1):209-22.

Dinh, P. X., **Beura, L. K.**, Das, P. B., Panda, D., Das, A., and Pattnaik, A. K. (2012). Induction of Stress Granule (SG)-Like Structures in Vesicular Stomatitis Virus-Infected Cells. *J. Virology*, 87(1): 372-83.

**Beura, L. K.**, Subramaniam, S., Vu, H. L., Kwon, B. J., Pattnaik, A. K., and Osorio, F. A. (2012). Identification of amino acid residues important for anti-IFN activity of porcine reproductive and respiratory syndrome virus non-structural protein 1. *Virology*. 433 (2): 431-9.

Subramaniam, S., **Beura, L. K.**, Kwon, B. J., Pattnaik, A. K., and Osorio, F. A. (2012). Amino acid residues in the non-structural protein 1 of porcine reproductive and respiratory syndrome virus involved in down-regulation of TNF- $\alpha$  expression in vitro and attenuation in vivo. *Virology*, 432(2): 241-9.

Casey, K. A.\*, Fraser, K. A.\*, Schenkel, J. M.\*, Moran, A., Abt, M. C., **Beura, L. K.**, Lucas, P. J., Artis, D., Wherry, E. J., Hogquist, K., Vezys, V., Masopust, D. Antigen-independent differentiation and maintenance of effector-like resident memory T cells in tissues. *J. Immunology*, 88(10): 4866-75. \* Equal contribution

**Beura, L. K.**, Dinh, P. X., Pattnaik, A. K., and Osorio, F. A. (2011). Cellular poly(C) binding protein 1 and 2 interact with porcine reproductive and respiratory syndrome virus non-structural protein 1 $\beta$  and support viral replication. *J. Virology*, 85:12939–12949.

Dinh, P. X., **Beura, L. K.**, Panda, D., Das, A., and Pattnaik, A. K. (2011). Antagonistic effects of cellular poly(c) binding proteins on vesicular stomatitis virus gene expression. *J. Virology*, 85:9459-71.

Subramaniam, S., Kwon, B. J., **Beura, L. K.**, Kuszynski, C. A., Pattnaik, A. K., and Osorio, F. A. (2010). Porcine reproductive and respiratory syndrome virus non-structural protein 1 suppresses tumor necrosis factor-alpha promoter activation by inhibiting NF-kB and Sp1. *Virology*, 406(2): 270-9.

Panda, D., Dinh, P. X., **Beura, L. K.**, and Pattnaik, A. K. (2010). Induction of Interferon and Interferon Signaling Pathways by Replication of Defective Interfering Particle RNA in Cells Constitutively Expressing Vesicular Stomatitis Virus Replication Proteins. *J. Virology*, 84:4826-4831.

**Beura, L. K.**, Sarkar, S. N., Kwon, B. J., Subramaniam, S., Jones, C., Pattnaik, A. K., and Osorio, F. A. (2010). Porcine Respiratory and Syndrome Virus nonstructural protein 1beta modulates host innate immune response by antagonizing IRF3 activation. *J. Virology*, 84: 1574-1584.

### **Honors and awards**

- 2020 AAI Early Career Faculty Travel Grant (AAI, Hawaii) Cancelled due to COVID-19
- 2020 Searle Scholar Award, Kinship Foundation (Chicago)
- 2019 AAI-Thermo Fisher Trainee achievement Award (AAI, San Diego)
- 2017 American Association of Immunologists Travel Award (AAI, Washington DC)
- 2010 Susan Ann Smith Mills Award (SVMBS, UNL)

- 2009 Larrick/Whitmore Research Travel Award (UNL)
- 2009 Veterinary Virology club student travel Award (ASV, Vancouver)
- 2008 Widaman Trust Distinguished Graduate Assistant Award (UNL)
- 2006-07 Chancellors' Doctoral Fellowship (UNL)

### **Invited lectures**

- 2020 (December) University of Montreal, Department of Microbiology, Infectiology and Immunology (Host: Dr. Nathalie Labrecque)
- 2020 (November) Women & Infant's Hospital, Providence, RI
- 2020 University of Nebraska, Nebraska Center for Virology symposium (postponed)
- 2019 Laboratory of Infectious Diseases, NIH, Bethesda, Washington DC
- 2019 University of Kansas Medical Center, Kansas City, KS
- 2019 University of Utah, Salt Lake City, UT
- 2019 Brown University, Providence, RI
- 2019 Laboratory of Viral Diseases, NIH, Bethesda, Washington DC
- 2018 Autoimmune Related Disease Association (AARDA) colloquium, Washington DC
- 2018 Ohio state University, Columbus, OH
- 2018 University of Washington, Seattle, WA
- 2018 University of Massachusetts Medical School, Worcester, MA
- 2018 Mucosal Systems Meeting, Santa Rosa, CA
- 2016 Basic Science in Transplantation (BeST) Meeting, Ft. Lauderdale, FL

### **Funding**

#### *Current:*

1. Computational biology of human disease COBRE pilot award 01/01/20-12/31/20  
"Transcriptional diversity of female reproductive tract resident memory T cells" \$30,000  
Center for computational biology of human disease, Brown University  
Role: PI
2. Searle Scholars award 07/01/20-06/30/23  
"Adaptation of resident memory CD8 T lymphocytes in the reproductive mucosa" \$300,000 (3 years) Searle scholars' program, Chicago, IL  
Role: PI
3. Salomon award 07/01/20-06/30/21  
"Promoting immunity against ovarian cancer by stimulating intratumoral pathogen-specific resident memory T cells" \$15,000  
OVPR, Brown University  
Role: PI
4. COVID-19 seed award 07/01/20-06/30/21  
"Using androgen to dampen immune mediated pathogenesis in coronavirus infected males"  
\$15,000  
OVPR, Brown University  
Role: PI

### **Teaching**

2020 Spring: BIOL 1600, Development of Vaccines to Infectious Diseases, Guest lecturer, Student enrolled ~60. Taught 1 class per semester.

## **Service**

### To the University

- Faculty trainer in Pathobiology graduate program, 2019-present.
- Faculty trainer in Molecular and Cellular Biology graduate program, 2019-present.
- Member of interviewing panel for prospective Pathobiology students, 2020-present.
- Member of interviewing panel for prospective MCB students, 2020-present.

### To the Profession

- Ad hoc reviewer for journals, 2019-present: Mucosal Immunology, Reviews in Medical Virology, Immunology and Cell Biology, Cell Reports, Journal of Hepatology, IScience
- Ad hoc reviewer for funding agencies, 2019-present: Cancer Research UK, National Environment Research Council-UK

### To the Community

- 2017-present: Member, American Association of Immunology
- 2019-present: Member, Society of Mucosal Immunology

## **Mentoring**

### Graduate Thesis Research

- Farha J. Mithila, MCB graduate program student.  
Research Project: T cell differentiation in the reproductive mucosa  
Accomplishments: Supported by MCB T32 training grant

### Rotating Graduate Students

- 2019 Ola Hasan, Pathobiology graduate program student.  
Farha J. Mithila, MCB graduate program student.
- 2020 Rebecca Yunker, Pathobiology graduate program student.

### Ph.D. Thesis Committee

- Shanelle Reilly, MCB graduate program student. Principle Advisor: Laurent Brossay, 2019-present.
- Alex Jordon, Pathobiology graduate program student. Principle Advisor: Amanda Jamieson, 2019-present.
- Maryam Bonakdar, Pathobiology graduate program student. Principle Advisor: Shipra Vaishnava, 2019-present.

### Undergraduate Students

- Elena Jin, Undergraduate Researcher, 2019-present
- Bryan Kwon, Undergraduate Researcher, 2020-present

Research Technicians

- Corrine Perloski, 2019-2020
- Maria Armillei, 2020-present