LAKSHMI TULASI SUNKARA, B.V.Sc. (DVM), M.V.Sc., Ph.D.

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Education

2008 – 2011	**Ph.D.** from Department of Animal Science, Oklahoma State University, Stillwater, OK Dissertation title: **Enhancing Chicken Innate Immunity and Disease Resistance by Boosting Host Defense Peptide synthesis**. GPA: 3.86 / 4.0
2001 – 2003	**M.V.Sc.** from Department of Livestock Production and Management, College of Veterinary Science, Hyderabad, India Thesis title: Performance of Broilers on Diets Containing Improved Sorghum Cultivars (Sorghum Bicolor) GPA: 8.96 / 10.0
1996 – 2001	**B.V.Sc. & A.H**. in Veterinary Science & Animal Husbandry (DVM equivalent), College of Veterinary Science, Hyderabad, India GPA: 7.46 / 10.0

Experience

Oct. 2019 – Present **Staff Scientist,** Clemson Center for Human Genetics, Clemson University, Greenwood, SC.

May. 2016 – Jun. 2017 **Postdoctoral Research Associate,** Avian Diseases, and Oncology laboratory, USDA, East Lansing, MI

Jan. 2014 – Feb. 2016 **Research Assistant Professor**, Department of Animal Science, Oklahoma State University, Stillwater, OK

Jan. 2012 – Dec. 2013 **Postdoctoral Research Associate**, Department of Animal Science, Oklahoma State University, Stillwater, OK

Jan. 2008 – Dec. 2011 **Graduate Research Associate**, Department of Animal Science, Oklahoma State University, Stillwater, OK

Jan. 2007 – Dec. 2007 **Graduate Research Assistant**, Department of Poultry Sciences, Texas A&M University, College Station, TX

Jan. 2005 – Dec. 2006 **Clinical Veterinarian**, Department of Animal Husbandry, India

Dec. 2003 – Dec. 2004 **Microbiologist**, Veterinary Biological Research Institute, India to identify different microbes from sick animals

Jan. 2001 – Dec. 2003 **Graduate Research Assistant**, Department of Livestock Production and Management, College of Veterinary Science, India

June 2001 – Nov. 2001 **Intern, Veterinary Biological Research Institute**, Indian Council of Agricultural Research, Andhra Pradesh, India

Research Grants

- ***Innovad, Inc., Belgium*** (http://www.innovad-global.be): Impact of Butyrate-based Products on Growth Promotion, Antimicrobial Peptide Expression, and Intestinal Microflora Balance in Broiler Chickens. March 1, 2014 – June 30, 2015. $40,006 PI: Sunkara, L.T.; co-PI: G. Zhang.
- ***CASNR/OAES Undergraduate Research Scholars grant:*** Efficacy of ButyrateBased Products in Host Defense Peptide Induction, Growth Promotion, and Intestinal Health. Fall 2014 – Spring 2015. $1000 PI: Sunkara, L.T.

Peer-Reviewed Publications

1. **Sunkara, L. T.,** Syed Mudasir Ahmad, Mohammad Heidari. 2019. RNA-seq analysis of viral gene expression in the skin of Marek's disease virus infected chicken. Veterinary Immunology and Immunopathology 213 (2019) 109882.
2. Wentao Lyu, Zhuo Deng, **L.T. Sunkara**, Sage Becker, Kelsy Robinson, Robert Matts, G. Zhang. 2018. High Throughput Screening for Natural Host Defense PeptideInducing Compounds as Novel Alternatives to Antibiotics. Front. Cell. Infect. Microbiol. | doi: 10.3389/fcimb.2018.00191.
3. W. Lyu, A.R.Curtis**, L.T.Sunkara**, G. Zhang. 2015. Transcriptional Regulation of Antimicrobial Host Defense Peptides. Current Protein and Peptide Science 16 (7), 672-679.
4. **Sunkara, L.T.,** A.R.Curtis, G. Zhang. 2015. Biology, expression, and regulation of host defense peptides: A minireview. Adv. Anim. Vet. Sci 3 (3s), 9-20.
5. K. Dhama, M. Swaminathan, S.S. Jacob, M. Singh, K. Karthik, A.R Tiwari, **L.T. Sunkara**, Y.S. Malik, R.K.Singh. 2015. Effect of immunomodulation and immunomodulatory agents on health with some bioactive principles, modes of action

and potent biomedical applications. International Journal of Pharmacology 11 (4), 253290.

6. K.Dhama, M. Kesavan, K. Karthik, Amarpal, R Tiwari, **L.T. Sunkara**, R.K. Singh. 2015. Neuroimmunomodulation Countering Various Diseases, Disorders, Infections, Stress and Aging. International Journal of Pharmacology 11 (2), 76-94.
7. K.Dhama, R. Tiwari, R.U. Khan, S.Chakraborty, M.Gopi, K.Karthik, M.Saminathan, P.A. Desingu, **L.T. Sunkara**. 2014. Growth promoters and novel feed additives improving poultry production and health, bioactive principles, and beneficial applications: The trends and advances: A review. International Journal of Pharmacology, 129-159.
8. Bommineni, Y.R., G.H. Pham, **L.T. Sunkara**, M. Achanta, and G. Zhang. 2014. Immune regulatory activities of fowlicidin-1, a cathelicidin host defense peptide. *Molecular Immunology* 59: 55– 63.
9. **Sunkara, L.T.,** X. Zeng, A. Curtis and G. Zhang. 2014. Cyclic AMP synergizes with butyrate in promoting β-defensin 9 expression in chickens. *Molecular Immunology* 57: 171-180.
10. Zhang.G, and **L.T. Sunkara.** 2014. Invited review: avian antimicrobial host defense peptides: from biology to therapeutic applications. *Pharmaceuticals* 7: 220247.
11. Jiang, W., **L.T. Sunkara**, X. Zeng, Z. Deng, S.M. Myers and G. Zhang. 2013. Differential regulation of human cathelicidin LL-37 by free fatty acids and their analogs. *Peptides* 50:129-138.
12. Zeng, X., **L.T. Sunkara,** W. Jiang, M. Bible, S. Carter, X. Ma, S. Qiao, and G. Zhang. 2013. Induction of porcine host defense peptide gene expression by short-chain fatty acids and their analogs. *PLoS One* 8: e72922.
13. **Sunkara, L.T.,** W. Jiang, and G. Zhang. 2012. Modulation of antimicrobial host defense peptide gene expression by free fatty acids. *PLoS One* 7: e49558.
14. Achanta, M., **L.T. Sunkara,** D. Gan, Y.R. Bommineni, W. Jiang, and G. Zhang. 2012. Tissue expression and developmental regulation of chicken cathelicidin antimicrobial peptides. *Journal of Animal Science and Biotechnology* 3: 1-7.
15. **Sunkara, L.T.,** Achanta M., N.B. Fry, G. Dai, W. Jiang, Y.R. Bommineni, and M.G. Kaiser, S. Lamont, H.S. Lillehoj, A. Baker, R.G. Teeter, and G. Zhang. 2011. Butyrate enhances disease resistance of chickens by inducing antimicrobial host defense peptide gene expression. *PLoS One* 6: e27225.
16. Bommineni, Y.R., M. Achanta, J. Alexander, **L.T. Sunkara,** J.W. Ritchey, and G. Zhang. 2010. A fowlicidin-1 analog protects mice from lethal infections induced by methicillin-resistant *Staphylococcus aureus. Peptides* 31: 1225-1230.

17. **Tulasi, S.L.*,** A.R. Reddy, G.R. Reddy, V.L.K. Prasad, M.V.L.N. Raju, C.L.N. Rao, B.V.S. Reddy, P. P. Rao, and D. Ramachandraiah. 2004. Performance of broilers on Sorghum based Diets. *International Sorghum and Millets Newsletter* 45: 3740. (*Changed to current name, L.T. Sunkara, since 2008 due to marriage).
18. **Sunkara, L. T.,** Mohammad Heidari, and John Dunn. 2018. Protection efficacy of rMd5DMeqDvTR, a double deletion mutant Marek's disease virus and its effect on bursal atrophy and viral replication in the skin of infected birds. (Submitted to Journal of Virology).

Meeting Abstracts

1. **Sunkara, L.T.,** N.B. Fry, R. Yang, Y.R. Bommineni, M. Achanta, and G. Zhang. 2008. Butyrate Enhances Disease Resistance of Chickens by Inducing Antimicrobial Host. Defense Peptide Gene Expression. *Proceedings of the 89th Annual CRWAD Conference*, Chicago, IL.
2. **Sunkara, L.T.,** N.B. Fry, M. Achanta, G. Dai, Y.R. Bommineni, and G. Zhang. 2009. Short-Chain Fatty Acids Enhance Disease Resistance of Chickens by Inducing Host Defense Peptide Synthesis. *Annual BMBGSA Graduate Research Symposium*, OSU, Stillwater, OK
3. Bommineni, Y., M. Achanta, G.H. Pham, J. Alexander, **L.T. Sunkara**, G. Dai, J.W. Ritchey, and G. Zhang. 2009. A Fowlicidin-1 Peptide Analog Protects and Prevents Mice from Lethal MRSA Infections. *Gordon Research Conference on Antimicrobial Peptides*, Galveston, TX.
4. **Sunkara, L.T.,** and G. Zhang. 2011. Short-Chain Fatty Acids Enhance Disease Resistance of Chickens by Inducing Antimicrobial Host Defense Peptide Gene Expression. *Annual BMBGSA Graduate Research Symposium*, OSU, Stillwater, OK.
5. **Sunkara, L.T.,** W. Jiang, M. Achanta, and G. Zhang. 2011. Modulation of Antimicrobial Host Defense Peptide Gene Expression by Free Fatty Acids. *Proceedings of the 92nd Annual CRWAD Conference*, Abst. # 65P, Chicago, IL.
6. Lynch, S. **L. T. Sunkara**, and G. Zhang. 2012. Augmentation of host defense peptide gene expression and disease resistance of chickens by intestinal microbial metabolites. 13th Annual Research Symposium of Summer Student Research Training Program, Center for Veterinary Health Sciences, Oklahoma State University, Stillwater, OK.
7. Zhang, G., **L. T. Sunkara,** X. Zeng, W. Jiang, and A. Curtis. 2012. Development of Immune Boosting Dietary Supplements as Alternatives to Antibiotics. International Symposium on Alternatives to Antibiotics, Paris, France. Sep 25-28, 2012.
8. Jiang, W., **L. T. Sunkara**, and G. Zhang. 2013. Short-chain fatty acids induce LL-37 synthesis in human cells. 24th Annual Research Symposium, Oklahoma State University, Stillwater, OK.
9. **Sunkara, L.T.,** W. Jiang, and G. Zhang. 2013. **Role of histone acetylation**, cAMP signaling, and mitogen-activated protein kinase pathways in butyrate-induced host defense

peptide gene expression in chicken HD11 macrophage cells. American Association of Immunologists Annual Meeting (Immunology 2013), Honolulu, Hawaii. May 3-7, 2013.

10. Keller, S. L., **L. T. Sunkara**, G. Zhang. 2013. Synergistic induction of chicken host defense peptides between butyrate and sugars. 14th Annual Research Symposium of Summer Student Research Training Program, Center for Veterinary Health Sciences, Oklahoma State University, Stillwater, OK.
11. Kelsy Robinson, **L. T. Sunkara**, and Glenn Zhang. 2016. Regulation of host defense peptide expression and barrier function by butyrate and FSK in broiler chicks. Poultry Science Association 105th Annual Meeting, New Orleans, Louisiana.
12. Kelsy Robinson, Hong Li, Long Zhang, Ryan Arsenault, Lakshmi Sunkara, Brian Cougar1, and Glenn Zhang. 2017. Molecular mechanisms of synergistic enhancement of chicken innate immunity and barrier function by butyrate and forskolin. Poultry Science Association 105th Annual Meeting, Orlando, Florida.

Honors and Awards

2013	Junior Scientist Travel Award, American Association of Veterinary Immunologists to attend Immunology 2013 Conference (American Association of Immunologists Annual Meeting), Honolulu, HI
2011	Poster Presentation Award, 1st Place, American Association of Veterinary Immunologists at the 92nd Annual Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL
2011	**Travel Award**, Graduate and Professional Student Government Association (GPSGA), Oklahoma State University to attend the Annual Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL
2008-2010	**Sitlington Enriched Graduate Scholarship**, College of Agricultural Sciences and Natural Resources, OK State University, Stillwater, OK
2008	**Travel Awards**, Graduate Professional Student Government Association (GPSGA), Oklahoma State University to attend the Annual Conference of Research Workers in Animal Diseases (CRWAD), Chicago, IL

Professional Affiliations

2014 – Present	American Society of Animal Science (ASAS)
2012 – 2016	American Association of Immunologists (AAI)
2012 – 2016	American Association of Veterinary Immunologists (AAVI)
2003 – Present	Veterinary Council of India (Andhra Pradesh Veterinary Council)
2011 – 2014	American Society for Microbiology (ASM)

2008 – 2016	Conference of Research Workers in Animal Diseases (CRWAD)
2009 – 2014	American Association for the Advancement of Science (AAAS)
2013 – 2014	Sigma Xi
2007 – 2008	Poultry Science Association (PSA)

Major Technical Expertise

- *Cell culture:* Culture of bacteria, virus, and mammalian cell lines as well as isolation and culture of primary cells, *ex vivo* culture of tissue explants and development of experimental infections with certain virus or bacteria
- *Molecular techniques:* Western/protein blotting, Isolation of DNA and RNA, DNA cloning, RNA interference (siRNA, shRNA), gene over-expression, , PCR, RT-PCR, real-time PCR, whole genome and RNA sequencing including short and long reads using Illumina Novaseq6000 and PacBio Sequel II, SDS-PAGE, Chemiluminescence, gene deletion and cite directed mutagenesis, transfection, Luciferase reporter assay, Lentiviral transduction, Immunoprecipitation, CRISPR/CAS9 editing, etc.
- *Computing and statistical analysis skills:* Primer3, and IDT Oligo Analyzer, Bio-Rad MyiQ5, Applied Biosystem 7500 fast, Quant studio 7 Flex software), Microsoft word, Excel, PowerPoint etc., GraphPad Prism, SAS, EndNote, BD Cell Quest Pro-software, Flowjo, Cyflogic, NCBI BLAST, BLAT, MAFFT, MUSCLE, ConSurf, SWISSMODEL, PROSITE, PyMOL, Base Space etc.
- *Protein production and purification:* production of IgG1 and IgM proteins from Hybridomas. Isolation, purification, immunoprecipitation, and conjugation of proteins with different fluorochromes
- *Animal skills:* Handling, bleeding, anesthesia, euthanasia, tissue collection, and other common postmortem procedures with chickens and mice.
- *Cellular and Serological techniques*: ELISA, Agar gel immunodiffusion, Hemagglutination, Hemagglutination inhibition, serum neutralization, histone deacetylase inhibition assay, Immunofluorescence, oxidative burst assay, phagocytosis assay, flow cytometry, lymphocyte proliferation assay, etc.
- *Instruments/ Equipment:* NovaSeq 6000, PacBio Sequel II, Agilent 2100 Bioanalyzer and Nanodrop for nucleic acid measurement, Blue Pippin, TapeStation, Agilent Bioanalyzer, Covaris ME220, Different PCR machines including Bio-Rad MyiQ5, Applied Biosystem 7500 fast, Quant studio 7 and 3, DNA engine/ Gradient PCR machines, Gel electrophoresis chambers, Protein electrophoresis and blotting equipment, Miltenyi Biotech OctoMACS separator, centrifuges, sonicators, anaerobic chambers, microbiological hoods, Spectrophotometer, MicroPulser™ Electroporator, Flow cytometry equipment, MALDI-TOFF, Fluorescent microscopes, General microscopes, Chemiluminescence western blot imaging systems, Bench scale bioreactors/flasks, plate shakers, incubators, plate readers, etc.

Courses Assisted as Teaching Assistant (Jan. 2007 at Texas A &M; Jan 2008 to Dec. 2011 at OSU)

- Techniques in Animal Molecular Biology (ANSI 5573)
- Application of Biotechnology in Animal Science (ANSI 4843)
- Animal Genetics (ANSI 3433)
- Animal Reproduction (ANSI 3443)
- Poultry Science (POSC 429, POSC 333)

Workshops/ Training Attended

2009 MALDI-TOF Mass spectrometry and Proteomics Workshop, Department of Biochemistry and Molecular Biology, Oklahoma State University, Stillwater, OK

2009 Institutional Animal Care and Use Committee (IACUC) Training, OSU

2005 Office Administration and Welfare Program, Regional Animal Husbandry Training Center, Department of Animal Husbandry, Andhra Pradesh, India

2005 Basic Course in Artificial Insemination, State Animal Husbandry Training Center, Mandapeta, Department of Animal Husbandry, Andhra Pradesh, India

2005 Field Oriented Surgical Techniques and Anesthesia, District Training Program, Department of Animal Husbandry, Andhra Pradesh, India

2005 Revamping Delivery System, Dr. MCR Human Resource, Development Institute of Andhra Pradesh, India

2004 Office Procedures through DVD Technology, District Training Program, Department of Animal Husbandry, Andhra Pradesh, India