

Curriculum Vitae

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RESEARCH PROFILE

My name is Mrs. L. Lakshman Kumar (ORCID ID: 0000-0003-0619-9164) am currently a full-time research scholar (Thesis submitted) in the Department of Biochemistry at Sri Venkateswara University, Tirupati, India. My research interests include biochemistry, microbiology, and immunology. In this regard, I focus on the role of selenium and its deficiency in animal models such as chicks and rodents. Moreover, I developed a functional food of novel designer eggs named Selenium-enriched eggs. These eggs are recommended for selenium-deficient rats to prevent cardiovascular diseases, improved immuno-deficiency, and male infertility. I published two research articles in top scientific journals of *Nature Journals* and recently filed one *Patent* to **India Patent Office**. In addition, I identified eleven bacterial strains of *Bacillus* by 16rRNA sequences and this data was submitted to *NCBI*. Furthermore, I participated in national and international workshops (*Max-Planck Institute*), symposiums, seminars, and conferences of *EMBL*. Finally, I work to identify areas in which multi-disciplinary translational team approaches can be employed to address important health care and environmental questions and needs. This draws on my personal research experiences with all levels of researcher.

ACADEMIC EDUCATION

- 2015-2022** **Doctor of Philosophy in Biochemistry**, Sri Venkateswara University, Tirupati, Andhra Pradesh-517502, India.
Thesis Title: “Production and characterization of selenium eggs in chicks and their efficacy study in selenium-deficient rats”
(Thesis submitted).
- 2005-2007** **Master of Science in Biochemistry**, Sri Venkateswara University, Tirupati, Andhra Pradesh-517502, India.
- 2004-2001** **Bachelor of Science in Biotechnology**, Sri Venkateswara University, Tirupati, Andhra Pradesh-517502, India.

RESEARCH / EMPLOYMENT HISTORY

2015-2022 Research Scholar (Full-Time), Department of Biochemistry,
Sri Venkateswara University, Tirupati, Andhra Pradesh, India.

Patents

2021 Patent application (provisional) filed to Indian Patent Office

Title: A chick Feed

Inventors: Lakshman Kumar Lingamgunta

Recent Publication and Presentation List

- 2020** Prabhakar Yellanur Konda, Vijayakumar Poondla, Krishna Kumar Jaiswal, Sreenivasulu Dasari, Reddemma Uyyalal, Venkata Prasad Surtineni, Janardhan Yadav Egi, Anthony Johnson Antony Masilamani, Lakshmi Bestha, Sreenath Konanki, Muthukumaran Muthulingam, **Lakshman Kumar Lingamgunta¹² et al.** **Pathophysiology of high fat diet induced obesity: impact of probiotic banana juice on obesity associated complications and hepatosteatosi**s. **Nature Scientific Reports, 10:16894, (2020).** <https://doi.org/10.1038/s41598-020-73670-4>.
- 2018** Sreenivasulu Basha, **Lakshman Kumar Lingamgunta²**, Jayakumar Kannali, Swarna Kumari Gajula, Ramesh Bandikari, Sreenivasulu Dasari, Veena Dalavai, Paramageetham Chinthala, Prasada Babu Gundala, Peera Kutagolla and Vinodh Kumar Balaji. **Subsurface Endospore-Forming Bacteria Possess Biosealant Properties.** **Nature Scientific Reports, 8:6448, (2018).** [https://doi: 10.1038/s41598-018-24730-3](https://doi.org/10.1038/s41598-018-24730-3).

Gene Bank Submission to NCBI

- 2018** Bacterial strains by molecular identification of 16S ribosomal RNA Gene, Partial Sequencing submitted in NCBI (National Center for Biotechnology Information).

Work entitled as

“16S rRNA sequences of culturable of bacteria isolated from salt ponds of Nellore District, A.P., India”

Gene Bank with Accession number Details:

MH458765, MH458766, MH458767, MH458768, MH458769, MH458770, MH458771, MH458772, MH458775, and MH458776.

Authors Details:

L. Lakshman Kumar, Department of Biochemistry, Vasudeva Reddy, N., Department of Biotechnology, Sreenivasulu, B., Department of Microbiology, Suresh, G., Department of Civil Engineering and Sudha Rani, C, Department of Civil Engineering.

SCIENTIFIC ACTIVITIES AND ACHIEVEMENTS

Fellowships / Awards

2015 8th Rank in the Ph.D. entrance examination (SVU-RESET) of Sri Venkateswara University, Tirupati, A.P., India.

2011 Graduate Aptitude Test (GATE) qualified

Workshops

2021 12th Max Quant Summer School “Computational Mass Spectrometry-Based Proteomics”, to be held from June 21-25. – *Virtual*.

Plenary Speakers: Ruedi Aebersold (ETH-Zurich), Steven P. Gygi (Harvard Medical School).

Course Details:

- Max Quant basic II, Perseus Introduction (Lecture).
- NGS, Perseus Plug-in programming (Tutorials).
- Translating proteomic data into biological knowledge: Implication for experimental design.
- Multi-Omics profiling; Computational opportunities for single-cell proteomics
- PTM proteomic tutorials.

2020 Basics of Crispr/Cas9 an Minicourse authorized by Jackson Laboratory, USA, to be held from March 29.

2019 Hands on “Mouse Microinjection & Crispr/Cas9 workshop organized by National Centre for Biological Science (NCBS), Bangalore, to be held from October 21-25.

Speakers: Aurelie Jory (Lily), NCBS, Franciscus (Frank) van der Hoeven (DKFZ), Ronald Nauman, Group Leader of the Transgenic Core Facility at Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany.

Course Details:

- Basics on mouse transgenesis technology and latest updates on genome engineering technologies (Crispr/Cas9; ultra-superovulation: oocyte electroporations) (lecture & demos).
- Embryo Transfer pipette design and embryo handling (Lab practical).
- Proper Microscope settings & Kohler Alignment (Lectures and Lab practical).
- Mouse oocyte / Embryo harvesting and in vitro culture (Lectures and Lab practical)
- Microinjection and embryo holding pipette design, pulling and forging (Lab practical).
- Mouse 1cell & 2cell embryo microinjection (Pronuclear and cytoplasmic) & embryo electroporation– Lab practical.
- mES cell microinjections into mouse 8-cell embryos & Blastocysts. (Demos & practicals).
- Oviduct & uterine embryo transfer (Lab practical / demonstrations).
- Male vasectomy- (Demonstration and lab practicals)
- Laboratory Animal Ethics & 3Rs in Genome Editing procedures in Mice.
- Colony Management and Animal Donor breeding strategies - Crispr/Cas Legal and Licensing procedures and MTA consideration.

2017 Introductory Course on Flow cytometry from Indian Institute of Madras, Chennai, to be held from May 25-26.

Speakers: Prof. D. Karungaran, Indian Institute of Madras, Madras, India.

Course Details:

- Basics of Flow cytometry; Clinical and Research applications in Flow cytometry, Apoptosis assay demonstration, Cell cycle assay demonstration, and DNA QC analysis.

Symposium

2018 Symposium and Inauguration of National Cryo-EM facility to be held on January 24-25, at InStem-National Center for Biological Sciences (NCBS), Bangalore.

Speakers: Richard Henderson LMB (Noble laureate 2017), Werner kuhlbrandt, Cambridge, Greg McMullan, MPI Frankfurt.

Conferences

2021 22nd EMBL Science and Society Conference: One health: integrating human, animal and environmental health – *Virtual*.

Seminar

2017 National seminar on genomic and cultural variation of Indian population: An appraisal of health and diseases susceptibility –Sri Venkateswara University, Tirupati, Andhra Pradesh, India.

Professional Membership

2017 Indian Science Congress

Extracurricular activities

2016 Volunteer in Indian Science Congress

2017 Volunteer in All India Vice Chancellor Conferences

2019 Volunteer in WWF-India

Computer Software skills

Microsoft Office (Word, Excel, PowerPoint, Outlook)

Statistical Software IBM SPSS version 20, Graph Pad Prism 8

Languages skills

English, Japanese (JLPT-N5 basics), Telugu, and Tamil.

PERSONAL DETAILS

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DECLARATION

I hereby declare that the above furnished information is true to the best of my knowledge.

Place: Tirupati, India

Yours sincerely

Date: May 9, 2022

L. Lakshman Kumar
(L. Lakshman Kumar)

SUMMARY OF DOCTORAL THESIS

Title : Production and characterization of selenium eggs in chicks and their efficacy study in selenium-deficient rats

My scientific research began in the role of selenium biochemistry in animals and humans. Selenium (Se) is an essential trace element for human and animal nutrition. It plays a pivotal role in antioxidants, on reproduction, immune function, health, and productivity have been studied over the last few decades. On the other side, selenium deficiency greatly diminishes the body's antioxidant capacity, thus inducing oxidative stress, which results in cardiovascular disease, male infertility, immuno-deficiency and neurodegenerative diseases in humans. Therefore, to avoid Se deficiency and fulfil the Se requirement of livestock animals and humans, feeds are always supplemented with Se inorganic and organic forms.

Based above findings, to avoid selenium deficiency.

I worked on two animal models, including 1) chicks and 2) Rodents.

1) Chicks Model:

I used different dietary Se sources such as inorganic form and organic form. Inorganic form, selenium is mainly from sodium selenite (SS), and organic selenium is from selenium probiotics. Selenium-enriched yeast (Probiotic diet) was obtained from yeast strain of *Saccharomyces cerevisiae*, cultivated on a medium enriched with sodium selenite which bio-transformed into organic form by yeast cells, ensuring a high concentration of organic selenium. Therefore, the Se-enriched yeast (SY) diet considers an organic Se.

The chick was randomly allotted into three dietary treatment groups: control (basal diet) and two experiment diet groups (inorganic Se- SS and organic Se - SY). Each group contains 30 birds with three replicates in 15 different cages (two birds per cage). The birds were fed a basal diet and sodium selenite (SS) and selenium-enriched yeast (SY) of experimental diet added to corn-soybean only for eight weeks and one dose of Newcastle disease vaccine (NDV) of $10^{6.0}$ EID₅₀ was given as half-dose via intraocular (I/O) and another half-dose onto intranasal (I/N) routes.

In my invention found that dietary Se-enriched yeast (SY) supplementation at 0.3 mg Se/kg diet could meet the Se requirement of laying chickens for optimum growth and more positive effects on laying and reproductive performances, improved egg quality, and enhanced gene expression of eggshell biomineralization, increased Se deposition in eggs, increased serum antioxidant capacity associated with protection against Newcastle disease virus (NDV) from oviduct infection and reduced egg damage when compared to inorganic selenium and control diet.

2) Rodent Model:

To test dietary selenium-enriched whole egg, we selected adult male Wistar rats, an aged group of 11-12 weeks and weighing 180-190 g. This study used the control diet, the selenium-deficient (SD) diet, and the selenium-enriched whole egg (SEWE) diet. Before that, we established the induction of selenium deficiency in rats. In this connection, rats were fed with a selenium-deficient diet for six weeks to deplete their selenium stores and to adjust their baseline selenium status in the SD group. After that, rats were fed with a selenium-enriched whole eggs (SEWE) diet for four weeks.

Our laboratory noticed that rats fed with a Se-enriched whole eggs diet improved body weight gain and organ indices and significantly elevated Se status in blood, liver and other organs. Like-wise, Se-biomarker were also elevated.

a) Effect of dietary selenium deficiency on the rat heart tissues

We studied the effect of a Se-deficient diet on cardiomyocytes under selenium deficiency conditions. In our study, we observed that rats treated with a dietary selenium deficiency diet caused a decrease in cardiac markers, namely, CK-MB, AST, ALT, LDH, cardiac troponins T and I levels. Similarly, a decrease in plasma cholesterol levels, triacylglycerol, free fatty acid, phospholipids, LDL-C, VLDL-C and a significant increase in HDL-C in SD rats. Selenium-deficient diet-induced myocardial membrane damage and accumulation of lipid hydroperoxides in heart tissues. In addition, we noticed that heart mitochondrial enzyme activities such as Isocitrate dehydrogenase (ICDH), succinate dehydrogenase (SDH), malate dehydrogenase (MDH), alpha-keto dehydrogenase (α -KDH), and NADH dehydrogenase were lowered. Further, lowered calcium levels in heart tissues and decreased membrane-bounded ATPase Na^+/K^+ -ATPase and Mg^{2+} -ATPase, and Ca^{2+} -ATPase. The apoptotic gene expression of *cytochrome C*, and *Caspase 3* were increased *Bax*, and *Bcl-2* expression was down-regulated.

Dietary selenium deficiency causes a marked increase in ROS generation that exceeds the antioxidant enzymes physiological capacity. Finally, these enzymes' exhausts reduce their activity and thereby decrease the activity of *Nrf2*. The nuclear factor *Nrf2* stimulated by dietary selenium deficiency-induced oxidative stress in the cardiovascular system binds to ARE, regulating ARE-mediated gene expression. Like-wise *HO-1*, and *Keap1* gene expression were also decreased in heart tissue.

b) Prevention of oxidative stress and improved cardiomyocytes functionality in SD rats treated with Se-enriched whole egg diet

In our study, we investigated that rats fed a dietary Se-enriched whole egg resulted in decreased cardiac markers enzymatic activities and improved plasma lipid profiles. The restores of heart mitochondrial enzyme activities, membrane-bounded enzymatic ATPase and regulation of apoptotic and oxidative stress markers in heart tissues in SD rats.

c) Effect of dietary selenium deficiency in the rat testis

In our lab, we observed that rats treated with dietary selenium-deficiency induced resulted in reduced daily sperm production, motility, and viable sperm parameters. Additionally, there were lowered steroidogenic enzymatic markers such as 3β -HSD and 17β -HSD in testis and associated with suppressed serum testosterone levels. The gene expression of *SelP*, *GPx 4*, and *apoER2* was down-regulated in the testicular tissues in SD rats.

d) Effect of dietary selenium-enriched whole egg in the rat testis

We demonstrated that rats treated with a dietary Se-enrich whole egg diet caused improved daily sperm production, motility, and viable sperm parameters. Additionally, there were significantly increased steroidogenic enzymatic markers such as 3β -HSD and 17β -HSD in testis and associated with improved serum testosterone levels. The gene expression of *SelP*, *GPx 4*, and *apoER2* was up-regulated in the testicular tissues in experimental rats.

e) Effect of dietary selenium on the immuno-system

We studied SD rats shown suppressed innate and humoral immunity. Conversely, SEWE-diet treated rats exhibited improved innate and humoral immunity.

RESEARCH ACHIEVEMENTS



2015

I scored 8th Rank in Research Entrance Examination in Biochemistry from Sri Venkateswara University, Tirupati-517502, Andhra Pradesh, India.

2016

In 2016, after my Ph. D. admission, I will have a chance to meet with professors and research scholars with different backgrounds in area of research. As the time approached, Prof. C. Paramageetham, in the Department of Microbiology at S. V. University, India. I joined his research team and worked on extremophiles. We also investigated the molecular identification of isolates and their morphological and biochemical characterization, growth studies of isolates at different temperature were studied.

2018

I published the *Nature Scientific Report* title “**Biosealant subsurface endospore-forming bacteria that possess biosealant properties**” this year.

I collaborate with Prof. C. Sudha Rani, Department of Civil Engineering, from my home university. I am very interested in Extremophiles culturable bacteria isolated from the Nellore District salt ponds, A.P., India. We identified eleven bacterial strains by molecular identification of 16S ribosomal RNA Gene, Partial Sequencing. This work was titled “**16S rRNA sequences of culturable bacteria isolated from salt ponds of Nellore District, A.P., India**” submitted to NCBI (National Center for Biotechnology Information).

Gene Bank with accession no as MH458765, MH458766, MH458767, MH458768, MH458769, MH458770, MH458771, MH458772, MH458775, and MH458776.

(**Authors Details:** L. Lakshman Kumar (Department of Biochemistry), Vasudeva Reddy, N., (Department of Biotechnology), Sreenivasulu, B., (Department of Microbiology) Suresh, G. (Department of Civil Engineering) and Sudha Rani, C (Department of Civil Engineering).

2020

Recently, I contributed to research work with my lab senior, Dr Prabhakar Yellanur Konda from Krijan Biotech, India, focused on the Production of Pectin extraction from ripened Banana peel wastes by Pectinase enzymes. We investigated the effects of *Saccharomyces cerevisiae* probiotic yeast fermented from pectinase treated probiotic banana juice (PPBJ) on obesity induced by a high-fat diet (HFD) for 20 weeks prone to develop hyperglycemia, hyperinsulinemia, hyperleptinemia, hypertriglyceridemia, and hepatic steatosis. Finally, it described the action of PPBJ in the prevention and management of obesity-induced insulin resistance, type 2 diabetes (T2D), anti-oxidative stress with antioxidant activity, and anti-hepatic steatosis effect by the modulation of intestinal microbiota with pectinase treated probiotic banana juice. This work was published recently in *Nature Scientific Reports* titled **“Pathophysiology of high fat diet induced obesity: impact of probiotic banana juice on obesity associated complications and hepatosteatosis”**. This investigation is the evidence suggesting the potential therapeutic action of pectinase treated probiotic banana juice on HFD induced obesity, obesity-associated insulin resistance lipid peroxidation, and hepatic steatosis prevention and treatment.

2021

My doctoral work was drafted and filed to Indian Patent Office.

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REFERENCES

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