

Sathish Kumar Natarajan

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RESEARCH AREAS

- Studying the mechanism of liver failure and the role of 3-hydroxy fatty acids in causing placenta and liver lipotoxicity during acute fatty liver of pregnancy
- Determine the mechanism of palmitoleate protection against Zika Virus-induced endoplasmic reticulum stress and apoptosis in placental trophoblasts
- Determine the lipotoxic role of saturated free fatty acids to placental trophoblast during maternal obesity

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	COMPLETION DATE	FIELD OF STUDY
University of Nebraska Medical Center, Omaha, NE	Postdoc	07/2015	Mechanism of cholangiocyte lipoapoptosis
University of Nebraska-Lincoln, Lincoln, NE	Postdoc	07/2012	Proline and pipecolate metabolism
Dr. MGR Medical University, Chennai, TN, India	PhD	10/2008	Biomedical Sciences
University of Madras, Chennai, TN, India	MS	05/2001	Biochemistry
University of Madras, Chennai, Tamilnadu (TN), India	BS	05/1999	Biochemistry

Positions and Employment

- 2016 - Assistant Professor, University of Nebraska-Lincoln, Lincoln, NE
- 2018- Graduate Committee Member, Department of Nutrition & Health Sciences, University of Nebraska-Lincoln, NE
- 2021- Adjunct Assistant Professor, Division of Medical Nutrition Education, College of Allied Health Professions, University of Nebraska Medical Center

Other Experience and Professional Memberships

- 2014 - Member, American Association for the Study of Liver Disease
- 2014 - ad hoc reviewer, Well-Being Women Foundation, London, UK
- 2016 ad hoc reviewer, NSF Graduate Research Fellowship Program
- 2016 - ad hoc reviewer, National Defense Society for Engineering Graduate Fellowship Evaluation Panel and Department of Defense
- 2016 - Member, Nebraska Center for Prevention of Obesity Diseases
- 2016 - Member, Redox Biology Center, UNL
- 2016 - Member, American Society for Nutrition
- 2016 - Member, Society for the Study of Reproduction
- 2017 - Editor-in-Charge, Journal 'Diabetes'
- 2018- Member, Nebraska Center for Virology, UNL
- 2019 - Member, Child Health Research Institute, UNMC
- 2021 ad hoc reviewer, NSF Graduate Research Fellowship Program Panelist

Honors

- 2004 Shakuntala Amir Chand Prize, Indian Council of Medical Research, Government of India
- 2006 Young Scientist Travel Award, 20th IUBMB Conference
- 2015 Travel Award to attend American Association for the Study of Liver Disease (AASLD) and Industry Colloquium, Novel Targets and Therapies in Liver Disease
- 2016 Thematic Best Poster Award, American Society for Biochemistry and Molecular Biology (ASBMB)

INVITED TALKS (*reverse chronological order*)

Palmitoleate protects against Zika virus-induced endoplasmic reticulum stress and apoptosis in placental trophoblasts, **Department of Biochemistry and Molecular Biology Seminar Series, University of Nebraska Medical Center**, November 2020

Mechanism of Insulin Resistance, Glucose Transporters and Type 2 Diabetes, Virtual Presentation to **Life science Discussion Forum of Botany4U**, an online platform for the students of life sciences. <https://botany4u.com/>. The presentations are available in the following weblink <https://youtu.be/BmLVISyLwLU>

Palmitoleate protects against Zika virus-induced endoplasmic reticulum stress and apoptosis in placental trophoblasts, **Complex Biosystems Seminar Series, University of Nebraska-Lincoln**, Sept. 2020

Saturated Free Fatty Acid induce trophoblast lipoapoptosis, Department of Pediatrics, University of Colorado, Anschutz Medical Campus, October 2019

Palmitoleate protects against 3-hydroxy fatty acid-induced retinal pigment epithelial lipoapoptosis, **University of Missouri-Columbia, MO**, 2019

Mechanism of 3-hydroxy fatty acid-induced hepatocyte lipoapoptosis, **University of Missouri-Columbia, MO**, 2018

Cholangiocyte Lipoapoptosis in Non-alcoholic Fatty Liver Disease (NAFLD). **Redox Biology Center**, University of Nebraska-Lincoln, 2017

Mechanism of 3-hydroxy fatty acid-induced placental trophoblast and hepatocyte lipoapoptosis. **Department of Animal Science**, University of Nebraska-Lincoln, 2017

Preparations to become an assistant professor, **Postdoctoral Advisory Council workshop**, University of Nebraska-Lincoln, 2018

Role of Cholangiocyte Injury in Non-Alcoholic Fatty Liver Disease. Department of Biology, **University of Nebraska-Omaha**, 2014

Tips for Succeeding in Academia: Preparations to become an assistant professor at the **Midwest Graduate Career Fair**, Nebraska Innovation Campus, Lincoln, NE, 2016

Cholangiocyte Lipoapoptosis in Non-alcoholic Fatty Liver Disease at the Sigma **XI** Scientific Club meeting, **University of Nebraska Medical Center**, Omaha, NE, 2016

Editorial Boards

- Consulting Editor to *Journal of Hepatic Medicine: Evidence and Research* 2015 - 2018
- Editor-in-charge to *Journal Diabesity* 2017– present
- Guest Editor for a special issue “Novel Therapeutic Nutrient Molecules” in *Biomedicine* 2020– present

SELECTED PUBLICATIONS Natarajan lab members were underlined.

1. Muthuraj PG, Pattnaik A, Sahoo PK, Islam MT, Pattnaik AK, Byrareddy SN, Hanson C, Anderson-Berry A, **Natarajan SK***. Palmitoleate protects against Zika virus-induced placental trophoblast apoptosis. (Submitted to Biomedicines). **2021**. *Corresponding author
2. **Natarajan SK***, Bruett T, Muthuraj PG, Sahoo PK, Power J, Mott JL, Hanson C, Anderson-Berry A. Saturated Free Fatty Acids induce Placental Trophoblast Lipoapoptosis. *PlosOne* **2021**, Apr 22; 16(4): e0249907. doi: 10.1371/journal.pone.0249907. eCollection 2021. PMID: 33886600 *Corresponding author
3. Woodard V, Thoene M, Van Ormer M, Thompson M, Hanson C, **Natarajan, SK**, Mukherjee M, Yuil-Valdes A, Nordgren TM, Ulu A, Jackson KH, Anderson-Berry, A. Intrauterine Transfer of Polyunsaturated Fatty Acids in Mother–Infant Dyads as Analyzed at Time of Delivery. *Nutrients* **2021**, 13, 996. PMID: 33293682 <https://doi.org/10.3390/nu13030996>
4. Muthuraj PG, Sahoo PK, Kraus M, Bruett T, Annamalai AS, Pattnaik A, Pattnaik AK, Byrareddy SN, **Natarajan SK***. Zika virus Infection Induces Endoplasmic Reticulum Stress and Apoptosis in Placental Trophoblasts. *Cell Death Discov.* **7**, 24 (2021). <https://doi.org/10.1038/s41420-020-00379-8>. PMID: 33500388 *Corresponding author
5. Muthuraj PG, **Natarajan, SK***. Fetal Programming in Maternal Obesity. *Diabetes* **2020**; 6(3): 36-39. DOI:10.15562/diabetes.2020.71. Review *Corresponding author
6. Thoene M, Van Ormer M, Lyden E, Thompson M, Yuil-Valdes A, **Natarajan SK**, Mukherjee M, Nordgren TM, Furtado, Anderson-Berry A, Hanson C, Snowden J. Inflammatory Compounds and Fat-Soluble Nutrients in Mother-Infant Dyads at Time of Delivery. *Pediatr Res (2020)* Dec 8. doi: 10.1038/s41390-020-01302-8. Online ahead of print.
7. Liu B, Lu Y, Chen X, Muthuraj PG, Li X, Pattabiraman M, Zempleni J, Kachman SD, **Natarajan SK**, Yu J. Protective Role of Shiitake Mushroom-Derived Exosome-Like Nanoparticles in D-Galactosamine and Lipopolysaccharide-Induced Acute Liver Injury in Mice. *Nutrients*. **2020** Feb 13; 12(2):477. doi: 10.3390/nu12020477. PMID: 32069862.
8. Thoene M, VanOrmer M, Yuil-Valdes AG, Bruett T, **Natarajan SK**, Mukherjee M, Thompson M, Nordgren TM, Lippevelde WV, Overby, NC, Adu-Bonsaffoh K, Anderson-Berry A, Hanson C. Fat-Soluble Nutrients and Omega-3 Fatty Acids as Modifiable Factors Influencing Preterm Birth Risk. *Placenta*. 2020 Sep 1; 98:38-42. doi: 10.1016/j.placenta.2019.12.002. PMID: 33039030.
9. Ulu A[#], Sahoo PK[#], Yuil-Valdes AG, Mukherjee M, VanOrmer M, Muthuraj PG, Thompson M, Anderson-Berry A, Hanson CK, **Natarajan SK***, Nordgren TM*. Omega-3 fatty acid-derived resolving D2 regulates human placental vascular smooth muscle and extravillous trophoblast activities. *Int. J. Mol. Sci.* 2019 Sep 7; 20(18):4402. doi: 10.3390/ijms20184402. PMID: 31500240. *Co-corresponding author. #Equal contributions.
10. Annamalai A, Pattnaik A, Sahoo B, Guinn, Z, Bullard B, Weaver E, Steffen D, **Natarajan SK**, Petro T, Pattnaik A. An Attenuated Zika Virus Encoding Non-Glycosylated Envelope (E) and Non-Structural Protein 1 (NS1) Confers Complete Protection against Lethal Challenge in a Mouse Model Vaccines (Basel). **2019** Sep 12; 7(3):112. doi: 10.3390/vaccines7030112. PMID: 31547297.
11. Kim Y, **Natarajan SK**, Chung S. Gamma-tocotrienol attenuates the hepatic inflammation and fibrosis by suppressing endoplasmic reticulum stress in mice. *Mol. Nutr. Food Res.* **2018** Nov; 62(21): e1800519. Doi: 10.1002/mnfr.201800519. PMID: 30183139.

12. **Natarajan SK**, Ibdah JA, Role of 3-hydroxy fatty acid-induced hepatic lipotoxicity in acute fatty liver of pregnancy. *Int. J. Mol.Sci.* **2018**, 19, 322. PMID: 29361796. **Invited Review**
13. Wehrkamp CJ, **Natarajan SK**, Mohr AM, Phillippi MA, Mott JL. miR-106b-responsive gene landscape identifies regulation of Kruppel-like factor family. *RNA Biology* **2018** Mar 4; 15(3): 391-403. PMID: 29286255.
14. Annamalai A, Pattnaik A, Sahoo B, Muthukrishnan E, **Natarajan SK**, Steffen D, Vu H, Delhon G, Osorio F, Petro T, Xiang S, Pattnaik A. Zika Virus Encoding Non-Glycosylated Envelope Protein is Attenuated and Defective in Neuroinvasion. *J. Virol.* **2017**. Sep 20 pii: JVI.01348-17. doi: 10.1128/JVI.01348-17. PMID: 28931684.
15. **Natarajan SK***, Stringham BA, Mohr AM, Wehrkamp CJ, Lu S, Phillippi MA, Harrison-Findik D, Mott JL. FoxO3 increases miR-34a to cause palmitate-induced cholangiocyte lipoapoptosis. *J. Lipid Res.* **2017** May; 58(5):866-875. PMID: 28250026. ***Corresponding author.**

Book Chapter

1. Mohr A, Sahoo PK, Muthuraj PG, Spriet MR, Mott JL, **Natarajan SK***. Epigenetics, Noncoding RNAs, and Gene Expression. **Comprehensive Foodomics, 2020** Chapter 00021. Elsevier Publications.
***Corresponding author.** Editor/Contributor: Alejandro Cifuentes, Epigenetics & Noncoding RNA Section Editor: Juan Cui

ADVISOR FOR GRADUATE STUDENTS

Philma Glora Muthuraj, doctoral student, *Role: Primary Advisor* 2017- present

Philma is elucidating the protective role of palmitoleate against Zika Virus-induced placenta, and fetal brain damage using *in vitro* and *in vivo* approaches.

Prakash Kumar Sahoo, doctoral student, *Role: Primary Advisor* 2017- present

Prakash is determining the mechanism of 3-hydroxy fatty acid-induced placental trophoblast necroptosis and published a first authored manuscript in International Journal Medical Sciences.

Kyung Ho Park, *Role: Primary Advisor* 2019-Aug 20

Graduated with master's degree in August 2020.

Kyung Ho conducted research on the metabolic benefits of plant-based n-3 polyunsaturated fatty acids on brown thermogenesis in collaboration with Dr. Soonkyu Chung.

Mona Hadidi, *Role: Primary Advisor* 2018-Aug 19

Graduated with master's degree in August 2019.

Mona conducted research on the lipotoxic role of 3-hydroxy fatty acids in retinal pigment epithelial cells. Mona is currently preparing two manuscript from her study for publications.

MENTOR FOR UNDERGRADUATE STUDENTS

Jenna Whitmore

Undergraduate student from NE Wesleyan University, studying the protective role of n-3 fatty acids against particulate matter-induced inflammation in placental trophoblasts.

Jillian Power

Undergraduate student, working on pro-apoptotic function of Forkhead family of transcription factor, FoxO3 in saturated free fatty acid-induced placental trophoblast damage during maternal obesity. Jillian has been awarded UCARE assistantship from UNL for 2019-20 academic year and ARD undergraduate research award.

Madison Kraus

Undergraduate student, worked on Zika virus-induced apoptosis in retinal pigment epithelial cells. Madison is awarded with Undergraduate Creative Education and Research Experience (UCARE) assistantship from UNL for 2018-19 and 2019-20 academic years and Milton Mohr Scholarship from UNL.

Taylor Heng

Taylor is now enrolled in professional program in veterinary medicine and will graduate in 2021 in the UNL-Iowa State University.

Sarah Dutt

Sarah is now a senior in Nutrition Sci. & Dietetics program. She volunteered in my lab to learn cell culture and aseptic techniques in fall 2017. She is now working with Ken Nickerson at the School of Biological Sciences, UNL.

Taylor Bruett

Taylor was funded by the UCARE program on 3-hydroxy fatty acid-induced trophoblast lipoapoptosis UNL to work in the lab during summer of 2016. Taylor joined my lab in April 2019 as lab technician.

Yihang Zhao

Visiting Undergraduate student from the Northwest Agriculture and Forestry University Scholars, Yangling, China. Yihang worked on elucidating the protective role of Betaine protection against palmitate-induced trophoblast lipoapoptosis.