BIOGRAPHICAL SKETCH

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NAME: Gulia-Nuss, Monika

eRA COMMONS USER NAME (agency login): MGULIA

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Maharshi Dayanand University, Rohtak, Haryana	BS	03/1997	Medical Sciences
Maharshi Dayanand University, Rohtak, Haryana	PHD	04/2006	Biosciences
University of Arkansas for Medical Sciences, Little Rock, AR	Postdoctoral Fellow	03/2007	Developing transgenic Aedes aegypti
University of Georgia, Athens, GA	Postdoctoral Fellow	03/2013	Insulin signaling in mosquito reproduction
Purdue University, W. Lafayette, IN	Other training	08/2015	Tick population biology/ Genomics

A. Personal Statement

Long term interest of my research program is to understand neuroendocrinology of disease vectors in order to identify new candidates for vector control. My work for the past 15+ years has focused on many aspects of invertebrate biology. In particular, I have worked the role(s) of neurohormones- insulin-like peptides and ovary ecdysteroidogenic hormone in mosquito reproduction and parasite development within Aedes aegypti. In addition, I have identified anti-mosquito antibodies that affect malaria parasite transmission blocking activity, mosquito lifespan, and fecundity in Anopheles stephensi. Although the majority of my published work has focused on mosquito biology, I have significantly expanded my expertise in tick biology. For last three years, I have been working on functional genomics and population biology of deer tick, Ixodes scapularis. My recent publications demonstrate my emerging expertise. My knowledge of genomics, biochemistry, molecular cell biology, and cell signaling, apply equally well to both the mosquito and the ticks because many of the physiological outcomes are highly conserved. My background in arthropod biology and genomics provides a strong basis for designing and directing the proposed studies. I have enlisted the help of carefully chosen co-investigators (Harrell and Thangamani) whose expertise will strengthen the project team. Thus, our group is very well positioned to carry out these studies successfully, and I believe that I am the appropriate person to lead this research effort.

B. Positions and Honors

Positions and Employment

2012 - 2013 Assistant Research Scientist, UNIVERSITY OF GEORGIA
2013 - 2015 Research Associate, PURDUE UNIVERSITY
2016 - Assistant Professor, UNIVERSITY OF NEVADA RENO

Other Experience and Professional Memberships

2002 -	Life Memeber, Society for Immunology and Immunopath
2007 -	Member, Entomological Society of America
2007 - 2010	Member, American Society of Tropical Medicine and Hygiene
2009 - 2012	Member, American Mosquito Control Association
2014 -	Member, Scientific Advisory Working Group, VectorBase

Honors

2014	Invited Speaker, Functional Genomics, Commonwealth Scientific and Industrial Research Organization (CSIRO), Canberra, Australia
2015	Invited Distinguished Speaker, Science Conclave, Ch. Bansi Lal University, India

C. Contribution to Science

1. 1. I am a senior author on Ixodes scapularis genome paper, the first tick genome accepted for publication. Using genome wide single nucleotide polymorphism (SNP) markers I studied I. scapularis population biology to understand the population structure of this tick in Eastern (North and South) and mid-western United States. My work confirmed that Southern ticks are moderately variable from Northern and Midwestern ticks; however, they are same species. We used RNAi to begin to understand the tick-Langat virus interactions.

   a. Gulia-Nuss, M., Nuss, A.B., Meyer, J.M., Waterhouse, R.M, M., Roe, RM., Sonenshine, DE., Sattelle, DB., Miller, JR., Walenz, B.P., Koren, S., Hostetler, J.B., Thiagarajan, M., Joardar, V.S., Hannick, L.I., Bidwell, S., Megy, K., Hammond, M.P., Young, S., Zeng, Q., Walker, J., Bhide, K., Lang, E.G., Thimmapuram, J. Abrudan, J.L., Almeida, F.C., Ayllón, N., Bissinger, B.W., Bonzon-Kulichenko, E., Caffrey, D.R., Caimano, M.J., Croset, V., Driscoll, T., Gilbert, D., Gillespie, J.J., Giraldo-Calderón, G.I., Grabowski, J.M., Jiang, D., Khalil, S.M.S., Kim, D., Kocan, K.M., Koči, J., Kuhn, R.J., Kurtti, T.J., Lang, E.G., Kennedy, R.C., Kwon, H., Perera, R., Qi, Y., Radolf, J.D., Sakamoto, J.M., Sánchez-Gracia, A., Severo, M.S., Silverman, N., Šimo, L., Tojo, M., Tornador, C., Van Zee, J.P., Vázquez, J., Vieira, F.G., Villar, M., Wespiser, A.R., Yang, Y., Zhu, J., Arensburger, P., Pietrantonio, P.V., Barker, S.C., Shao, R., Zdobnov, E.M., Ribeiro, J.M., Hauser, F., Grimmelikhuijzen, C.J.P., Park, Y., Lees, K., Rozas, J., Benton, R., Pedra, J.H.F., Nelson, D.R., Unger, M.F., Tubio, J.M.C., Tu, Z., Robertson, H.M., , Fuente, J., Shumway, M., Sutton, G., Wortman, J.R., Lawson, D., Wikel, S.K., Nene, V.M., Fraser, C.M., Collins, F.H., Birren, B., Nelson, K.E. and Caler, E. Hill, C.A., Genome sequences of the Lyme disease tick, Ixodes scapularis reveal molecular signatures of geographic structure and parasitic lifestyle. Nature Comms (Accepted)

   b. Monika Gulia-Nuss, Jason Meyer and Catherine Hill. Tick chromosome mapping. In: Protocols for Cytogenetic Mapping of Arthropod Genomes. Ed: Igor Sharakov. CRC Press publishing

2. Insulin signaling in mosquitoes regulates several physiological outputs. Our work showed for the first time that one of the insulin-like peptides, ILP 3, binds specifically to insulin receptor in Aedes aegypti. In addition, my work also showed the role of insulin signaling in blood digestion in mosquitoes and confirmed the cross talk between insulin and Target of Rapamycin (TOR) signaling in blood digestion. This expanded our knowledge of role of insulin signaling in diverse physiological processes in mosquitoes.

   a. Gulia-Nuss M, Elliot A, Brown MR, Strand MR. Multiple factors contribute to anautogenous reproduction by the mosquito Aedes aegypti. J Insect Physiol. 2015 Nov;82:8-16. PubMed PMID: 26255841; PubMed Central PMCID: PMC4630150.

   b. Gulia-Nuss M, Robertson AE, Brown MR, Strand MR. Insulin-like peptides and the target of rapamycin pathway coordinately regulate blood digestion and egg maturation in the mosquito Aedes aegypti. PLoS One. 2011;6(5):e20401. PubMed PMID: 21647424; PubMed

Central PMCID: PMC3103545.

c. Wen Z, Gulia M, Clark KD, Dhara A, Crim JW, Strand MR, Brown MR. Two insulin-like peptide family members from the mosquito Aedes aegypti exhibit differential biological and receptor binding activities. Mol Cell Endocrinol. 2010 Oct 26;328(1-2):47-55. PubMed PMID: 20643184; PubMed Central PMCID: PMC2957182.

d. Brown MR, Clark KD, Gulia M, Zhao Z, Garczynski SF, Crim JW, Suderman RJ, Strand MR. An insulin-like peptide regulates egg maturation and metabolism in the mosquito Aedes aegypti. Proc Natl Acad Sci U S A. 2008 Apr 15;105(15):5716-21. PubMed PMID: 18391205; PubMed Central PMCID: PMC2311378.

3. Ovary ecdysteroidogenic hormone (OEH) has been implicated in inducing ovaries to produce ecdysteroids for egg development. OEH co-expresses with ILP 3 in medial neurosecretory cells. Decapitation or insulin receptor knock down results in low ecdysteroid levels and no egg maturation. OEH, therefore, seem to work through insulin signaling. However, our work showed that OEH works independently of the insulin receptor. Furthermore, we showed that OEH is the major activator of egg maturation in autogenous mosquitoes. These studies opened up significant new understanding of mosquito reproduction

   a. Gulia-Nuss M, Elliot A, Brown MR, Strand MR. Multiple factors contribute to anautogenous reproduction by the mosquito Aedes aegypti. J Insect Physiol. 2015 Nov;82:8-16. PubMed PMID: 26255841; PubMed Central PMCID: PMC4630150.

   b. Dhara A, Eum JH, Robertson A, Gulia-Nuss M, Vogel KJ, Clark KD, Graf R, Brown MR, Strand MR. Ovary ecdysteroidogenic hormone functions independently of the insulin receptor in the yellow fever mosquito, Aedes aegypti. Insect Biochem Mol Biol. 2013 Dec;43(12):1100-8. PubMed PMID: 24076067; PubMed Central PMCID: PMC3885182.

   c. Gulia-Nuss M, Eum JH, Strand MR, Brown MR. Ovary ecdysteroidogenic hormone activates egg maturation in the mosquito Georgecraigius atropalpus after adult eclosion or a blood meal. J Exp Biol. 2012 Nov 1;215(Pt 21):3758-67. PubMed PMID: 22811249; PubMed Central PMCID: PMC3470065.

4. My postdoctoral work established the role of Doublesex transcription factor in expression of female specific hexamerin protein in mosquito larvae. In addition, my PhD work led to identification of several antigens from mosquito tissues for malaria transmission blocking as well as effects on Anopheles stephensi survival and fecundity.

   a. Totten DC, Vuong M, Litvinova OV, Jinwal UK, Gulia-Nuss M, Harrell RA 2nd, Beneš H. Targeting gene expression to the female larval fat body of transgenic Aedes aegypti mosquitoes. Insect Mol Biol. 2013 Feb;22(1):18-30. PubMed PMID: 23241066; PubMed Central PMCID: PMC4101173.

   b. Gulia-Nuss M, Mundhalia A, Gakhar SK. Effect of anti-fat body antibodies on reproductive capacity of mosquito Anopheles stephensi and transmission blocking of Plasmodium vivax. Indian J Exp Biol. 2011 Jul;49(7):479-82. PubMed PMID: 21800498.

   c. Suneja A, Gulia M, Gakhar SK. Blocking of malaria parasite development in mosquito and fecundity reduction by midgut antibodies in Anopheles stephensi (Diptera: Culicidae). Arch Insect Biochem Physiol. 2003 Feb;52(2):63-70. PubMed PMID: 12529861.

   d. Gulia M, Gakhar SK, Adak T. Alterations in polypeptides pattern in malaria vector Anopheles stephensi, fed upon immunized blood causing fecundity reduction. Indian J Exp Biol. 2003 Jan;41(1):94-6. PubMed PMID: 15267145.

D. Research Support

Completed Research Support

----, Monsanto Research Grant Award Gulia-Nuss (PI) 11/01/13-10/01/14

Identifying novel targets for pest control: elucidating the function of orphan proteins of the Acari (ticks and mites)
The goal of this program was to identify novel targets for tick controls using RNAi.
Role: CPI

NA, Ellison Medical Foundation-Training Innovations in Parasitological Studies Grant 12/01/11-
Gulia-Nuss (PI) 03/01/12
Blocking filarial nematodes development in mosquitoes
The goal of this program was to establish collaboration in India to study the role of mosquito insulin signaling in nematode parasite Wuchereria bancrofti development
Role: PI