

## PAUL J. LINSER, Ph.D.

Professor of Anatomy and Cell Biology, Neuroscience, Microbiology and Cell Science, Entomology and Biology



My research has branched several times from an early interest in the role that cell communication plays in regulating neural development. In that early context, I developed expertise in many technical approaches as well as credentials in specific elements of gene regulation and molecular physiology. Today there are three main directions in the lab: The Physiology of the mosquito alimentary canal; the neurological pathologies that lead to hearing loss with aging in mammals; the evolution of functional compartmentalization in basal metazoans (Ctenophores).

The mosquito alimentary canal project will produce two or more publications in 2016 (one currently in revision) as the products of graduate student Daniel Dixon's efforts focused on the roles and expression patterns of carbonic anhydrase enzymes in the pupating and adult mosquito. We had hoped that these publications would emerge sooner but a number of difficulties slowed things down a bit. Daniel graduated with a Ph.D. in Microbiology and Cell Science in December of 2015. He has accepted a position as the Molecular Biologist for the Anastasia Mosquito Control District in north Florida. The project which involves the age-related loss of hearing focuses on the primary neurological and ion-regulatory tissues of the cochlea and is a collaboration with Shinichi Someya of the University of Florida Aging Institute. Our first publication is in revision, and we have hired new staff to fill the needs of the two NIH grants that support this project.

The research aimed at detailing physiological compartmentalization in Ctenophores has carbonic anhydrase and the metabolically interactive bicarbonate ion transporter family at its center. A pre-proposal has been submitted to the NSF and new faculty member and expert phylogenomicist Joseph Ryan and I have already collaborated in constructing a phylogeny of the major target genes related to this specific metabolic pathway. The coming year will see the publication of new research papers and perhaps another major review article regarding the mosquito project. An NIH proposal with colleagues from the Colorado State University was submitted but rejected in 2014. The hearing-loss project will also see its first publication or two with me as a co-investigator. The Ctenophore project has expanded to include the Cnidarian *Nematostella vectensis*. With the collaboration of Dr. Leslie Babonis, next gen sequencing and in situ hybridization analyses have revealed dynamic patterns of carbonic anhydrase gene expression during embryonic development of *Nematostella*. I hope to translate these new and exciting findings into a model of the compartmentalization of carbonic anhydrases and ion transporters in basal metazoans.

### Education:

1977 Ph.D. (Developmental Biology), University of Cincinnati  
1974 B.S. (Biology), University of Cincinnati

### Professional Experience:

2012 Appointed to Editorial Board of *Psyche*  
2010-Present Appointed to the Florida Coordinating Council for Mosquito Control  
2006 Organized the 7<sup>th</sup> International Conference on the Carbonic Anhydrases  
2005-Present Affiliate Professor of Entomology and Nematology, University of Florida  
2001-Present Affiliate Professor of Fisheries and Aquatic Sciences, University of Florida  
2000-Present Professor of Anatomy and Cell Biology, University of Florida,  
Whitney Laboratory for Marine Bioscience  
1994-1997 Coordinator, Whitney Laboratory Undergraduate Intern Program  
1994-Present Affiliate Professor of Neuroscience, University of Florida  
1992-Present Affiliate Professor of Zoology, University of Florida  
1989-1990 National Eye Institute (NIH) Visiting Professor  
1987-2000 Associate Professor of Anatomy and Cell Biology, University of Florida,  
Whitney Laboratory for Marine Bioscience

1982-1987 Assistant Professor, University of Florida, Whitney Laboratory for Marine Bioscience  
1982-1987 Assistant Professor of Anatomy, University of Florida  
1980-1982 Assistant Professor, University of Chicago, Department of Biology  
1977-1980 Postdoctoral Fellow (NIH), University of Chicago  
1974-1976 Graduate Teaching Assistant, University of Cincinnati  
1974 Research Associate, Cincinnati Children's Hospital Clinical Research Center  
1973 Undergraduate Research Fellow, University of Cincinnati

#### **Membership in Professional Societies:**

American Society for Tropical Medicine and Hygiene  
The International Society for Developmental Biologists  
International Brain Research Organization  
The Society for Developmental Biology

#### **Recent Publications (2010-Present):**

Tokar, D., van Ekeris, L., **Linser**, P.J., Ochrietor, J.D. (2016) Characterization of the expression of Basigin gene products within the Pineal Gland of mice. *Cell Mol Neurobiol*; November.doi:10.1007/s10571-016-0441-5

Han, C., Ding, D., Lopez, M-C., Manohar, S., Zhang, Y., Kim, M-J., Park, H-J., White, K., **Linser**, P., Tanokura, M., Leeuwenburgh, C., Baker, H.V., Salvi, R., Someya, S. Effects of long-term exercise on age-related hearing loss in mice. (2016) *J Neuroscience* JN-RM-2493-16R1, in press.

Han, C., **Linser**, P., Park, H-J., Kim, M-J., White, K., Vann, J.M., Ding, D., Prolla, T.A., Someya, S. (2016) Sirt1 deficiency protects cochlear cells and delays the early onset of age-related hearing loss in C57BL/6 mice. (2016) *Neurology of Aging* 43 58-71.

Linser, PJ and Dinglasan, RR. Insect gut structure, function, development and target of biological toxins. *Advances Insect Physiol* 47: 1-37, 2014.

Tsujimoto, H., Liu, K., Linser, P.J., Agre, P., Rasgon, J.L. Organ-specific splice variants of Aquaporin water channel AgAQP1 in the malaria mosquito *Anopheles gambiae*. *Plos One* 8(9):e75888, 2013.

White, B.J., Kundert, P.N., Turissini, DA., VanEkeris, L., Linser, P.J., Besansky, N.J. *J. Exp Biol* 216:3433-41, 2013

Corena-McLeod M., Walss-Bass C., Oliveros, A., Gordillo Villegas, A., Ceballos C., Charlesworth, C.M., Madden, B., Linser, P.J., VanEkeris, L., Smith, K., Richelson E. *Plos One*. 2013 May 14;8(5):e52147.doi:10.1371/journal.pone.0052147. Print 2013.

Hua, G., Zhang, Q., Zhang, R., Abdullah, A.M., Linser, P.J., Adang, M.J. AgCAD2 cadherin in *Anopheles gambiae* larvae is a putative receptor of Cry11Ba toxin of *Bacillus thuringiensis* subsp. *jegathesan*. *Insect Biochem. Mol. Biol.* 43:551-62, 2013.

Linser, P.J., Neira Oviedo, M., Hirata, T., Seron, T.J., Smith, K.E., Piermarini, P.M., Romero, M.F. Slc4-like anion transporters of the larval mosquito alimentary canal. *J. Insect Physiol.* 58:551-62, 2012.

Xiang, M.A., Linser, P.J., Price, D.A., Harvey, W.R. Localization of two Na<sup>+</sup>- or K<sup>+</sup> - H<sup>+</sup> antiporters, AgNHA1 and AgNHA2, in *Anopheles gambiae* larval Malpighian tubules and the functional expression of AgNHA2 in yeast. *J. Insect Physiol.* 58:570-79, 2012.

Hirata, T., Czapar, A., Brin, L.R., Haritonova, A., Bondeson, D.P., Linser, P.J., Cabrero, P., Dow, J.A.T., Romero, M.F. Ion and solute transport by prestin in *Drosophila* and *Anopheles*. *J. Insect Physiol.* 58:563-69, 2012.

Sterling, K.M., Okech, B.A., Xiang, M.A., Linser, P.J., Price, D.A., VanEkeris, L., Becnel, J.J., Harvey, W.R. High affinity  $^3\text{H}$ -phenylalanine uptake by brush border membrane vesicles from whole larvae of *Aedes aegypti* (AaBBMVw). *J. Insect Physiol.* 58: 580-89, 2012.

Harvey, W.R., Okech, B.A., Linser, P.J., Becnel, J.J., Ahearn, G.A., and Sterling, K.M. H<sup>+</sup> V-ATPase-energized transporters in brush border membrane vesicles from whole larvae of *Aedes aegypti*. *J. Insect Physiol.* 56: 1377-1389, 2010.

Ochrietor, J.D., Moroz, T.P., and Linser, P.J. The 2M6 antigen is a Muller cell-specific intracellular membrane-associated protein of the sarcolemmal-membrane-associated protein family and is also TopAP. *Mol. Vis.* 16; 961-969, 2010.

Vo, M., Brown, D.T., Linser, P.J. and Bowers, D.F. Organ Assoc. Muscles in *Aedes albopictus* (Diptera; Culicidae) respond differentially to Sinbis virus. *J. Med. Entomol.* 47: 215-225, 2010.

Smith, K.E., VanEkeris, L., Valenti, M., Raymond, S., Smith, P., and Linser, P.J. Physiological and pharmacological characterization of the anopheline rectum shows redistribution in function in response to varying salinity. *Comp. Biochem. Physiol. C*, 157: 55-62, 2010.

Harvey, W.R., Okech, B.A., Linser, P.J., Becnel, J.J., Ahearn, G.A., Sterling, K.M. H<sup>+</sup>-V-ATPase-energized transporters in brush border membrane vesicles from whole larvae of *Aedes aegypti*. *J. Insect. Physiol.* 56: 1377-1389, 2010.

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Linser is co-investigator on two funded NIH R01 (NIDCD) grants with Shinichi Someya (of the Aging Institute at UF) as the PI. Start date on R01DC012552 was 07/01/13 and end date is 06/30/18. The second project started on April 1, 2015 and ends on March 31, 2020. The project ID is R01DC014437.