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BIOGRAPHICAL SKETCH

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Jeffery Alan Plunkett, Ph.D.

eRA COMMONS USER NAME (credential, e.g., agency login): JPLUNKETT

POSITION TITLE: PROFESSOR

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Miami University, Oxford, OH	BA	08/1986	Microbiology
Georgia State University, Atlanta, GA	Ph.D.	05/1995	Neurobiology

A. Personal Statement

My passion for science has always been driven by the establishment of hypotheses at the basic science level to understand more complex larger scope issues that relate to ameliorating a problem that is seen by clinicians' everyday, central nervous system (CNS) trauma. I began my research career at the University of Florida under the direction of Dr. Paul Linser. This is where I began to study the role that cell-cell interactions play in guiding the fate of cells. This early work as a 20 something researcher/student led to a publication and sparked my interest to pursue neuroscience research as a career. During graduate school, I studied nerve-muscle interactions in invertebrates in the laboratory of Dr. W.W. Walthall at Georgia State University. This work led to 3 publications. I did 2 years postdoctoral work in the laboratory of Dr. John Bixby studying nerve-muscle interactions in vertebrates. In my second 2-year post-doc I moved to the Miami Project to Cure Paralysis at the University of Miami School of Medicine to study pain and inflammation following spinal cord injury in the laboratories of Dr. John Bethea and Dr. Robert Yezierski. This is where I met a collaborator in this grant Dr. Martin Oudega from the Miami Project. Through many late-night discussions as post-docs, he inspired me to move into regeneration research. At the time of my last post-doc I had developed an interest in the role that chondroitin sulfate proteoglycans (CSPGs) play in the prevention of regeneration in mammalian model systems. In 2002, having finished a UM NIH Neuroscience Training Program and a Paralyzed Veterans of America Fellowship, I set out to start my own lab. The selection to go to a small school such as St. Thomas University was a deliberate move in which I could pursue both research and teaching. St. Thomas, having just received a 6 million dollar NASA foundation grant to stimulate inner-city students into science related fields was the ticket I needed to start my lab. St. Thomas had given me the availability of space to develop a laboratory with a start-up of over 300K. I soon bought most everything needed to start my lab included a Zeiss fluorescent microscope, centrifuges, PCR and gel electrophoresis equipment among many other things. Along the way I kept my collaboration with Dr. Oudega and was

productive in developing undergraduate-based student (St. Thomas only had an undergraduate Bio program at the time) abstracts. At St. Thomas I began to develop my research program in CNS trauma in zebrafish. Adult zebrafish like many teleosts and urodele amphibians, and unlike mammals, regenerate certain CNS pathways following trauma to the spinal cord and brain. This data is not a new discovery and dates back to the 1950s and 60s. Having studied CSPGs, my first hypothesis was based upon the evidence that CSPGs play a major role in the prevention of CNS regeneration in mammals. My hypothesis was "given the ability for CNS regeneration seen in adult zebrafish, CNS localized CSPGs would be absent or reduced in order to allow for regeneration". To our surprise, I was able to present evidence at the protein and mRNA levels, that common inhibitory CSPGs found in mammals are present in adult zebrafish CNS and somehow did not prevent regeneration. This initial work led to a 5-year Department of Defense (DOD) grant to investigate the role CSPGs play or don't play in the regenerative abilities seen in the fish. I was PI of this grant with Dr. Oudega serving as Co/PI. This work led to 3 publications and much of this work formed the basis of the studies we are proposing today.

During this time of developing my research program and teaching both lower and upper level biology courses, I needed a student population that could do the work in my lab. For the first 11 years of my employment at St. Thomas we only granted a BS in Biology. Even today, our Master's program in Biology is only a pre-professional school prep program that does not include research students in the program. My laboratory research has been built with a group of uniquely qualified undergraduate students of which many are first generation collage graduates from minority backgrounds. I have supervised over 50 such students and of those students, 80% have been placed into graduate, medical, dental, veterinary, pharmacy and physical therapy schools. St. Thomas graduates from my laboratory have enrolled and/or graduated from the University of Michigan School of Medicine, University of Miami School of Medicine, University of Florida School of Medicine, NYU Dental, Morehouse School of Medicine, Penn State University School of Medicine, University of Detroit Mercy Dental, University of Alabama, University of South Dakota, Nova Southeastern University DO and Pharmacy Programs, and Palm Beach State Pharmacy School. Two of my recent graduates have obtained entry to the highly competitive NIH post-baccalaureate program in the NIH laboratories of Dr. David Goldman and Dr. Herbert Geller.

B. Positions and Honors

1985-1986	Undergraduate Research Assistant, Miami University, Oxford, OH
1986-1988	Research Technician, University of Florida, Whitney Lab
1988-1989	Postbaccalaureate Student, University of Florida
1988-1990	Grass Foundation Fellows Education Program Participant
1989-1990	Research Technician, University of Florida, Whitney Lab
1990-1995	Graduate Teaching Assistant And Graduate Student, Georgia State University
1995-1997	NIH Postdoctoral Fellow, University of Miami School of Medicine, Department of Molecular and Cellular Pharmacology, Miami, FL
1997-1998	Postdoctoral Associate, University of Miami School of Medicine, The Miami Project to Cure Paralysis, Miami, FL
1998-2001	Lois Pope LIFE Postdoctoral Fellow, University of Miami School of Medicine, The Miami Project to Cure Paralysis, Miami, FL
1999-2000	NIH Postdoctoral Fellowship, Neuroscience Program, University of Miami School of Medicine, The Miami Project to Cure Paralysis, Miami, FL
2000-2002	Adjunct Faculty, Broward Community College, Ft. Lauderdale, FL

2000-2002 Spinal Cord Research Foundation Fellowship, University of Miami School of Medicine, The Miami Project to Cure Paralysis, Miami, FL
2002-2011 Assistant Professor of Biological Sciences, St. Thomas University, Miami FL
2011-2014 Associate Professor of Biological Sciences, Biology Program Chair, St. Thomas University, Miami FL
2011-2012 FIPSE (Fund for the Improvement of Post-secondary Education) Teacher Leader Initiative, Project Educator
2014-present Professor of Biological Sciences, Biology Graduate Program Chair, St. Thomas University, Miami FL

Honors

1990 Graduate Teaching Assistantship, Georgia State University
1990 Full tuition scholarship, Georgia State University
1993 Dissertation Grant Award, Georgia State Research Foundation
1995-1997 NIH Postdoctoral Fellowship, Department of Molecular and Cellular Pharmacology, University of Miami School of Medicine
1998-2001 Lois Pope LIFE Postdoctoral Fellowship, The Miami Project to Cure Paralysis, University of Miami School of Medicine
1999-2000 NIH Postdoctoral Training Fellowship, Neuroscience Program, University of Miami School of Medicine, The Miami Project to Cure Paralysis, Miami, FL
2000-2001 Spinal Cord Research Foundation (SCRF) fellowship through the Paralyzed Veterans of America
2003 Summer Research Grant Recipient, St. Thomas University Foundation

C. Contribution to Science

1) My early work involved the study of cell-cell interactions and their role in early eye development. This work began to trigger my interest in the neurosciences. Through this work I developed techniques that allowed petri dish culture of whole chick embryo in order to deliver drugs to the into the extraembryonic membrane spaces that surround the embryo. This drug delivery method allowed for concentrated delivery over a period of time to the developing eye. This work was later used as a technique in my work as a post-doctoral student in the Bixby Laboratory and resulted in my first publication.

A) Linser PJ, **Plunkett JA** (1989) A role for carbonic anhydrase in early eye morphogenesis. Inv Ophth and Vis Sci. 30(4):783-785.

2) In my graduate studies in the Walthall Lab at Georgia State University, my focus was on nerve-muscle interactions during development in *C. elegans*. Using laser microsurgery I was able to ablate a specific set of muscle targets and demonstrate that neurons branched in response to a loss of target. This work demonstrated at the cellular level a potential mechanism by which neurons evolved branching patterns to innervate limbs in lower organisms. This work led to the publication of three papers as a graduate student.

A) Walthall WW, Li L, **Plunkett JA,** Hsu CY (1993) Changing synaptic specificites in the nervous system of Caenorhabditis elegans: Differentiation of the DD motoneurons. J Neuro Biol 24(12):1589-1599.
B) Walthall WW, **Plunkett JA** (1995) Genetic transformation of the synaptic pattern of a motoneuron class in Caenorbabditis elegans. J Neurosci 15(2):1035-1043.

C) **Plunkett JA,** Simmons RB, Walthall WW (1996) Dynamic interactions and the morphological development of the D motoneurons in Caenorhabditis elegans. Dev Biol. 175:154-165.

3) In my post-doctoral studies I continued my focus on nerve-muscle interactions and also developed an interest in peripheral nerve injury, transplantation of cells into the into the injury site and neuro-inflammation. First, in the laboratory of John Bixby, I studied the role of nerve muscle interactions in the ciliary ganglion of chickens. Using techniques developed during my early years I was able to surgically remove the early embryonic eye and chemically isolate interactions through the delivery of drugs. This work resulted in a publication in the Journal of Neuroscience.

A) **Plunkett JA,** Baccus S, Bixby JL (1998) Differential regulation of synaptic vesicle protein genes by target and synaptic activity. J Neurosci 18(15)5832-5838.

In my second post-doctoral experience I moved to the Miami Project to Cure Paralysis. I first studied neuropathic pain and how transplantation of genetically engineered cells might alleviate this condition. I developed genetically engineered cells to deliver specific anti-nociceptive molecules and transplanted the cells into peripheral nerve injuries. This work produced five publications that I was involved with.

A) Eaton MJ, **Plunkett JA,** Karmally S*, Montanez K (1998) Changes in GAD and GABA immunoreactivity in the spinal dorsal horn after peripheral nerve injury and promotion of recovery by lumbar transplant of imortalized serotonergic precursors. J Chem Neuroanat 16:57-72.

B) Eaton MJ, **Plunkett JA**, Martinez MA, Lopez T, Karmally S*, Cejas P, Whittemore SR (1999) Transplants of neuronal cells bio-engineered to synthesize GABA alleviate chronic neuropathic pain. Cell Transplant 8(1):87-101.

C) Eaton MJ, Karmally S*, Martinez MA, **Plunkett JA**, Lopez T, Cejas P, (1999) Lumbar transplant of neurons genetically modified to secrete galanin reverse pain-like behaviors after partial sciatic nerve injury. JPNS 4:281-293.

D) **Plunkett JA**, Martinez M, Lopez TL, Karmally S*, McKillop J*, Eaton MJ (1999) Characterization and transplantation of a genetically engineered galanin secreting neuronal cell line. Brain Res. 848: A32.

E) Cejas P, Martinez MA, Karmally S*, McKillop M*, McKillop J*, **Plunkett JA**, Oudega M , Eaton MJ (2000) Lumbar transplant of neurons genetically modified to secrete BDNF attenuate allodynia and hyperalgesia after sciatic nerve constriction. Pain 86:195-210.

During this time I obtained a post-doctoral training fellowship and focused my studies on neuro-inflammation and pain in the laboratories of John Bethea and Robert Yezierski. I studied IL-10 and this is where I honed my molecular biology skills studying gene expression profiles. This work resulted in one publication.

A) **Plunkett JA,** Yu CG, Easton JM, Bethea JR, Yezierski RP (2001) Effects of interleukin-10 (IL-10) on pain behavior and gene expression following excitotoxic spinal cord injury in the rat. Exp Neurol 169: 144-154.

4) As a faculty member I joined St. Thomas University for several reasons. First, I was given the opportunity to develop my own laboratory. And secondly, I was able to influence young minds through teaching. The early years were a struggle however, I was soon able to develop my laboratory to study the role that chondroitin sulfate

proteoglycans (CSPGs) play in the regenerative abilities seen in the zebrafish. I was first to demonstrate that CSPGs are present in the CNS of the fish and despite the presence, axotomized neurons regenerate. Through a fortunate set of events in 2009 that eventually led to an appropriation driven DOD grant application, I was able in conjunction with Dr. Martin Oudega to obtain 2.4 mil in research dollars for my study. In this work I developed an adult neuronal stem-progenitor cell culture system from adult zebrafish brainstem cells. The development of mature neurons from this culture after seven days has allowed me to develop approaches to study the role of CSPGs in neuronal growth and stem cell differentiation. This work with the support of the DOD funds has led to 3 recent publications.

A) Vajn K, **Plunkett JA**, Tapanes-Castillo A, Oudega M (2013) Axonal regeneration after spinal cord injury in zebrafish and mammals: differences, similarities, translation. Neurosci Bull 29(4):402-10.

B) Tapanes-Castillo A, Shabazz F, M'boge M*, Vajn K, Oudega M, **Plunkett JA** (2014) Characterization of a novel primary culture system of adult zebrafish brainstem cells. J Neuroscience Methods 223:11-19.
(* = Undergrad. Student)

C) Vajn K, Suler D, **Plunkett JA**, Oudega M (2014) Temporal profile of endogenous spinal cord repair in the adult zebrafish. nPlos One, Aug 26; 9(8).

D. Additional Information

FUNDED RESEARCH PROGRAMS COMPLETED DURING THE LAST 8 YEARS
2009-2010 NIH EARDA PILOT Award $20,000.00 Role of CSPGs in CNS regenerative capabilities in Zebrafish neurons.

2009-2014 United States Department of Defense Award # W81XWH-11-1-0645. $2.43 mil. Molecular Determinants Fundamental to Axon Regeneration after SCI.

ABSTRACTS (Past year) (*= undergraduate student lead author)
Fernando M*, Badillo A**,** Oudega M, **Plunkett JA**, (2017) Analysis of putative stem and neural progenitor cell populations following traumatic brain injury in adult zebrafish. *Undergraduate poster presentation 50th Annual Winter Conference on Brain Research

Solano A*, Sands R, Mangels S, Oudega M, **Plunkett JA,** (2017) *In vitro* applications of a primary brainstem culture system from adult zebrafish. *Undergraduate poster presentation 50th Annual Winter Conference on Brain Research

Fernando M*#, Badillo A, Perez K, Banos R, Oudega M, Plunkett JA, (2017) The role of putative stem and neural progenitor cell populations following traumatic brain injury in adult zebrafish. * Undergraduate poster presentation Florida Academy of Sciences, # 1st Place, Michael Fernando "Best Undergraduate Poster Award.