

## **Interview with Dr. Amanda Hernan of the University of Vermont**

Chinmayi Balusu

I was able to interview Dr. Amanda Hernan, PhD, post-doctoral research associate at the University of Vermont's College of Medicine. Dr. Hernan's postdoctoral project involves understanding the mechanisms of cognitive deficits after seizures in brains with malformations. Specifically, the project is utilizing single unit and local field potential recordings during cognitive tasks in order to try to understand how coordinating firing of neurons between and within networks in the prefrontal cortex and hippocampus are altered. Dr. Hernan was awarded the NIH transition to independence award, and she will soon be researching the role of neuropeptides, especially melanocortin peptides, in improving cognitive outcome and underlying neural networks after early life seizures.

**Chinmayi Balusu: "How did you become interested in neuroscience, especially epilepsy and developmental neuroscience?"**

**Dr. Amanda Hernan:** "I've been interested in science for as long as I can remember. My dad is an aerospace engineer, and my step dad is a psychologist, so I had two fantastic role models growing up who both actively encouraged me to pursue my interest. My stepdad had a subscription to *Nature* and *Science* and used to give them to me to read. I remember the covers of the *Nature* and *Science* when the human genome project had been completed and how exciting that was. For a while, I wanted to be a geneticist. It wasn't until I was in high school that I found myself gravitating towards neuroscience. In college I solidified my interest in neuroscience through lab experience, although at that point I thought I wanted to study neurodegeneration. It wasn't until my third year in graduate school that I joined a pediatric epilepsy lab and fell in love with developmental neuroscience."

**Chinmayi: "I know that you will soon be researching neuropeptides through the NIH transition to independence K22 award in order to learn more about improving cognitive outcome after seizures early on in life. Is there a certain reason why you are exploring melanocortin peptides instead of other types of neuropeptides?"**

**Dr. Hernan:** "Neuropeptides are a bit of a hot topic right now in epilepsy. Many researchers are excited about cannabidiol for seizures, which can act at neuropeptide cannabinoid receptors. My interest in melanocortins is sort of serendipitous. In graduate school, I developed a model of local abnormal brain activity during development that was meant to mirror certain pediatric epilepsy where children are having a lot of what's called "focal inter-ictal spikes" without a lot of seizures. These are small abnormalities in

brain activity in localized regions in the brain that you probably wouldn't notice unless you were monitoring brain activity with an EEG. We were interested in testing a drug called adrenocorticotrophic hormone (ACTH for short) in this model, with the idea that it would stop the abnormal brain activity in the short-term and lead to long-term improvements in cognition. Turns out that it didn't improve the abnormal brain activity but did improve attention! We repeated our experiment in a different model of early life seizures and found the same thing: improved cognition without changes in seizures. This was really interesting to me, and I really wanted to understand why. ACTH binds to melanocortin receptors, certain subtypes of which are located in the brain. Activating these receptors in the brain protects the brain in models of Alzheimer's Disease, multiple sclerosis and stroke, but no one was looking at them in epilepsy. In fact, most researchers think that ACTH works through a completely different mechanism in epilepsy; my data suggest that these brain receptors are playing a much larger role than previously thought."

**Chinmayi: "What would you say has been your most important scientific finding?"**

**Dr. Hernan:** "The idea that activation of melanocortin receptors can prevent cognitive impairment in epilepsy, if true, could be my most important finding. ACTH itself has many side effects, but there are other drugs that bind to these receptors that have relatively few side effects and could be used in children with epilepsy as an add-on therapy to prevent cognitive impairment. I'm still in the early stages of testing my hypothesis, but it could be huge for the way we treat patients with epilepsy."

**Chinmayi: "What is the most interesting thing that you've come across in your research?"**

**Dr. Hernan:** "That's a hard question; there are so many things I think are interesting! In my research specifically, we just published a paper showing that neurons from a brain that developed abnormally during gestation can function like healthy neurons with a simple intervention of environmental enrichment. This was important it showed that structurally abnormal brains can be functionally restored, even into young adulthood, with something as non-specific and translational as just providing more sensory and social stimulation to the environment."

**Chinmayi: "What is a typical day for you like (what is your schedule like every day)?"**

**Dr. Hernan:** “I think one of the best parts of my job is that I don’t have a “typical day”. I come in to lab and depending on the day, I could be sitting at a computer analyzing data, in lab working on an experiment or mentoring a student, or I could be talking to colleagues about a grant or listening to a seminar. I do some formal teaching of undergraduates and medical residents as well. For the most part, I spend my day doing a little bit of all of those things. No two days are the same!”

**Chinmayi:** “**What is your favorite part about your job?**”

**Dr. Hernan:** “It’s never boring and always intellectually stimulating. I have a lot of flexibility in terms of how I spend my time and what projects I get to work on at any given time. I get a lot of personal satisfaction out of the fact that something that I discover could have the potential to help people in the future. That’s such an amazing feeling.”

**Chinmayi:** “**What type of research do you see yourself doing in the future?**”

**Dr. Hernan:** “I think I’d like to focus much more on cognition and systems neuroscience in the future. I’m particularly interested in attention, social behaviors and executive function, and disorders of these types of cognition (such as ADHD and autism). There’s a lot of overlap between epilepsy and these disorders. Understanding these aspects of cognition from a systems neuroscience perspective is really interesting to me.”

**Chinmayi:** “**What are the challenges/obstacles you face in your career?**”

**Dr. Hernan:** “Funding is always a challenge. Before I was awarded my K22, I had written about 8 grants to different funding bodies. That’s pretty consistent with the success rate in general, but it takes a lot of time to put together grants and it can be a bit demoralizing to constantly be denied funding. Juggling writing grants, papers and doing experiments is difficult, and work-life balance in science is notoriously difficult to achieve because science never stops! When you’re right in the middle of an experiment, it’s sometimes impossible to drop what you’re doing to be home at a set time.”

**Chinmayi:** “**What are some common misconceptions about your research, if any?**”

**Dr. Hernan:** “I think there are a lot of misconceptions about science in general. I see a lot of distrust of science happening right now. I think that’s partially the fault of scientists because we don’t always do a good job communicating with the public about our research, but there also seems to be this idea when we do speak out against

pseudoscience that we have ulterior motives. Science is a slow process and conclusions are constantly being revised and reevaluated when new data arise, so I think this, combined with how science is conveyed to the public through the media, can often be very confusing.”

**Chinmayi: “Why do you think people should know and care about what your research?”**

**Dr. Hernan:** “Epilepsy is a really common disorder. There are about 50 million people living with epilepsy in the world; approximately 1 in 26 people will develop epilepsy in their lifetime. When most people think about epilepsy, they think of seizures. But epilepsy is fundamentally a brain disorder, and the brain’s job is not just to seize or not seize, but rather to produce complex behavior, to allow us to learn and interact with our environment and each other. Many patients with epilepsy are diagnosed with psychiatric disorders and have problems with learning and memory. Patients and their caregivers often say that these problems that co-occur with epilepsy are *more* detrimental to their overall quality of life than the seizures themselves. Understanding epilepsy as a whole brain disease that produces both seizures and cognitive impairments helps us find new treatments for these patients, and potentially even help us understand some pretty fundamental things about how the brain works in general.”

**Chinmayi: “Do you have any advice for students that are interested in neuroscience?”**

**Dr. Hernan:** “Never stop learning. Be curious about the world around you, curiosity is probably one of the biggest prerequisites for success in science. Read a lot, and not just in your particular field because you never know what information or skill you’ll pick up from a different field that will help you in the future. Studying science is obviously important in order to be a scientist, but so are math and aspects of engineering (particularly statistics and programming). I would say that neuroscience is an up and coming field and there are still so many unanswered questions about the brain that there will be plenty of room for neuroscientists for decades!”