Amy Ramchandani's Path to Personal Discovery

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Amy Ramchandani always knew that science was her calling, but discovering exactly what intrigued her in such a broad field was a journey of self discovery. Ramchandani started as USC as a biochemistry major, but quickly discovered that she did not enjoy chemistry as much as she thought she did. Even after switching to a major in biology, she still felt that something was missing. One day while talking to a friend, she heard about neuroscience. "I really liked biology, but I wanted something more specific," Ramchandani reminisced. She recalled the moment after listening to a guest lecturer speak at Nu Roh Psi – the neuroscience honor society that first caused her to look into changing her major. Soon after, Ramchandani sat in on one of Dr. Ann Rankin's lectures to get a taste of the topic and quickly became absorbed in the world of neuroscience. The lecture on split brain syndrome left her with more questions than answers and an increased thirst for knowledge. This combined with the fact that so little of the brain was covered in her introductory biology course, BISC 220, lead Ramchandani to consider pursuing neuroscience research to appease her thirst for knowledge.

Ramchandani first met Dr. Arshad Khan at a Beyond Books Banquet hosted by Program Board's Academic Culture Assembly her sophomore year. Ramchandani was inspired by Dr. Khan's desire for his students to learn from their work in the lab, and began working as a part of his group soon after the banquet. At the beginning, she worked diligently at mastering the basics – mounting brains on slides, keeping notebooks, and attending lab meetings, but by the fall of 2010, Ramchandani had her own project.

Research Background

Ramchandani's project consisted of examining a pathway that responds to insulin in the brain. A previous experiment had been performed in humans in which healthy subjects (control groups) and subjects with type II diabetes (experimental group) had been allowed to sleep and then injected with insulin. Causing a drop in blood glucose in both groups, the healthy subjects woke up on their own feeling sick in response to low blood glucose. The subjects with type II diabetes however, had to be woken up by the researchers when their blood glucose dropped to a critical level because they were not able to wake up on their own. This study presented an issue that needed to be addressed – if patients with type II diabetes experience a sudden drop in blood glucose while they are sleeping, they may not be able to wake up on their own and may instead fall into a diabetic coma. Ramchandani explained that this was because there was a disconnect somewhere in the patient's neural pathway that was preventing the brain from detecting the drop in blood glucose and waking the patient up. Ramchandani's project was to figure out where this disconnect was occurring.

Experimental Methods and Findings

Ramchandani's research was conducted on a rat model. Since researchers are not yet sure of how the pathway works, Ramchandani decided to start at the locus coeruleus since it is the part of the brain that is responsible for arousal pathways and helps control circadian rhythm cycles. "'Locus' means 'location,' ' coeruleus' means 'blue.' When anatomists were first dissecting the brain, they decided to call this region the locus coeruleus because it is literally blue, even in an undyed brain!" Ramchandani explained. Using phosphorylated Erk (Extracellular Receptor Kinase, a molecule involved in gene expression pathways[1]) that attaches to cells that activate in

the pathway, along with 2D oxyglucose, she was able to pinpoint that there were glucose sensing neurons present in the locus coeruleus. To verify her discovery, Ramchandani injected the same region with saline, but in this cause the neurons did not activate. This meant that there were glucose sensing neurons in the locus coeruleus.

Ramchandani was ecstatic that her hard work has finally paid off – "when I first saw the slide under the microscope, it was an amazing feeling… something that will always be with me." Ramchandani is now preparing to submit her paper and is currently performing the final calculations on her research.

This finding has the potential to change lives. With more information on the neural pathway that alerts humans that their blood glucose levels are low while they are sleeping, researchers can look for a way to remedy the broken pathway in individuals with type II diabetes. If left untreated, individuals that experience hypoglycemia while sleeping may become unresponsive unless their blood glucose levels can be raised. Hypoglycemic episodes may also leave long term results such as impaired test performance and impaired auditory and sense responses[2] especially in young children.

Outside Interests

Outside of research and her studies, Ramchandani is passionate about helping those around her and volunteering. Around the time she became involved with neuroscience research, she also became involved with Interaxon – a program that teaches school age students about the brain. Ramchandani travels to schools around USC and Compton to teach kids from elementary to high school about concepts such as the fight or flight mechanism or how drugs impact the brain. In her third year of involvement with the organization, Ramchandani now helps write the

lesson plans for the program as part of the e-board. She feels that the fact that she is able to help teach kids concepts that she did not learn about until college, and then have them go home and tell their parents about what they have learned is particularly rewarding.

Ramchandani's desire to help others and support them through difficult times also lead her to become a residential advisor in Parkside Apartments. She enjoys the fact that the job allows her to explore other cultures through the diverse residents that live in the Parkside area and that she is able to offer advice to incoming students about making the most out of their time at USC.

Final Thoughts

When asked for advice for other undergraduates interested in science, but not sure where to start, she encourages USC students to get involved in research as early as possible. "Take advantage of the fact that USC is a research university," she says "there are so many professors here that are very interested in teaching their students about their research." In addition, she reminds students to keep an open mind; "no matter what you think you want to do, always keep an open mind, because you never know what you will like until you try it… there is nothing to lose, you can only gain either the knowledge that you like something, or an understanding of what you like, and what you don't."

Sources:

[1]Mapk/erk in growth and differentiation. (2003, January). Retrieved from http://www.cellsignal.com/reference/pathway/MAPK_ERK_Growth.html

[2]Hoffman, R. P. (2011, August 25).*Pediatric hypoglycemia* . Retrieved from http://emedicine.medscape.com/article/921936-overview