Cornell University
Graduate School

Cornell University Three Minute Thesis (3MT) Competition

Maria Sapar, Biochemistry, Molecular & Cell Biology: "How do Phagocytes Recognize Degenerating Neurons?"

[Clock Ticking]

>> Narrator: Cornell University 2019 Three Minute Thesis finalist. Maria Sapar, Biochemistry, Molecular & Cell Biology.

>> Sapar: Hi, everyone, this is what I'm working on figuring out, is how do phagocytes recognize degenerating neurons. So, what's a phagocyte? It's a cell that can eat other cells. And phagocytes come in many different types. And their job is to keep your tissues and organs healthy by devouring foreign pathogens, and other sick, or dying, cells. Now neurons are very special cells. We need them to feel, to learn, to remember a past, and imagine our future. When neurons degenerate and die, that's what we lose, and that's why diseases like Alzheimer's are so devastating for the patients, and their loved ones. Today, five million Americans are living with Alzheimer's, and that number will only continue to grow as the population ages. There is no cure. So, in the last 15 years or so, researchers have found that overactive phagocytes in the brain are contributing to these diseases, like Alzheimer's. For some reason, sick neurons are being eaten alive by phagocytes, which causes them to degenerate and die. So, we want to understand why that's happening. So, here's how I investigate this problem. So, I worked with fruit fly larva sensory neurons. They kind of look like trees. The trunk is the axon, and the branches are called dendrites. Dendrites collect information such as heat and pressure, because these are sensory neurons. So used, when I cut off a branch using a microscope and a powerful laser, the phagocytes will only eat the detached part, but they will spare the rest of the neuron. So, how do they know that that part is damaged? So, phagocytes are known to recognize signals called eat me signals. Only dying cells expose these signals. And one certain signal is called phosphatidylserine, or PS for short. So, I asked, do injured neurons expose PS? And, indeed, they do. In this context, over there, PS is helping phagocytes find the dead parts of the neuron and clear it away. In this case, this is important for healing, and it promotes neuronal regrowth. But, what if PS is exposed inappropriately? So, I tested that idea. I forced healthy neurons to expose PS. And what happened is that phagocytes attacked these neurons and chewed up their branches. So, neurons need their branches to collect and relay information, so losing them could seriously affect their function. So, my thesis work is on understanding how phosphatidylserine is regulated in neurons, and during neuronal degeneration, and how phagocytes detect PS signals, and also what other eat me signals there may be. So, in short, I want to know how do phagocytes recognize degenerating neurons? Thank you.

[Applause]