In people with neurodevelopmental disorders, genetic alterations occur well before a pregnancy is known, changing a child’s life forever. The severe social and cognitive impairments associated with many of these disorders are often due to changes in the way your neurons communicate with each other, like a circuit that is not connected properly. Symptoms usually manifest within months of birth, and in many cases, treatments are ineffective.

At the cellular level, altered connections between neurons can cause them to excite each other until they are firing out of control. In some cases, this abnormal firing behavior can lead to sudden, uncontrolled bursts of electrical activity, otherwise known as seizures.
Such changes in brain activity are common among individuals who have SYNGAP1 mutations. SYNGAP1-related intellectual disability is classified as an autosomal dominant condition, which means that just one copy of the altered gene in each cell is sufficient to cause the disorder.

This condition is caused by spontaneous mutations in this gene, resulting in intellectual disability and epilepsy. So how do things go wrong so quickly? To better understand this, researchers at the Scripps Research Institute in Florida performed a study on human neurons grown in a dish. By removing SYNGAP1 from the cells, and looking at how they communicated with one another, they found that in the absence of this gene neurons were wiring together earlier than under normal circumstances.

They were also sending stronger signals to each other and firing much more frequently than they were supposed to. These findings suggest that the early occurrence of seizures in patient affected by this disease may be caused by the premature wiring and excess activity in these neurons. Although more research is needed to disentangle the mechanisms of this complex disease, this study sheds light on a new potential mechanism for SYNGAP1-related symptoms. It also provides new crucial evidence on how single genes can make or break the brain. This study was published on September 4th, in the Journal of Neuroscience.

The AMI procedure: gateway to a cyborg future

by Arielle Hogan

In the year 2020, we find ourselves moving increasingly closer to the futures of our favorite Sci-Fi films and novels. Self-driving cars, flying drones, and virtual reality are already a part of our day to day lives, and now a recent medical innovation called the AMI procedure has let us add cyborgs to that list.
What exactly is a cyborg, and how does the AMI procedure hold the key to a cyborg future? Put simply, a cyborg is a human that has bidirectional communication with its machine part. This allows a mechanical hand to feel and function like a human hand. For this to occur, the machine must be seamlessly integrated with the human nervous system. This technology could help so many people, so why haven’t we seen more cyborgs? The answer lies in the outdated amputation process. This process destroys underlying neural circuitry, making it impossible for bionic limbs to integrate into the human nervous system. In 2018, scientists at MIT developed a new amputation procedure that maintains the integrity of the nerves underlying the cut site.

With intact nerves and muscles, a bionic limb can be connected to our nervous system, thereby restoring feeling and function, and allowing human and machine to become one. So far, the AMI procedure has only been tested on nine patients, all with promising results. This new procedure brings us one step closer to eradicating physical disability, and with it, we usher in the age of the cyborg.

More on the authors..

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