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## Brain - the Most Important Organ

If I asked you what the most important organ was then maybe you would say it was the heart or the lungs, but the vast majority of you would probably have said the brain and for good reason too. The brain controls everything about you.

### How the Brain Works

The brain works by transmitting signals through something called neurons, the neurons transmit these signals through what are called axons. And then those axons are covered in a substance called myelin which acts as a sort of insulator that makes signals faster. Now with all of this it may surprise you that the brain is made of mostly fat! In fact it has the most fat out of any organ. But the brain still manages to work like a well oiled machine. After the neurons clump up they form something called grey matter and white matter. And those form to make up the entire brain. The vagus nerve is the main nerve that connects the brain to the rest of the body. It is sometimes called the "Highway of the brain" because of how much information passes through it. The arguably most important part of the brain is called the brainstem, it controls breathing, heartbeat, and other vital systems. Then after that the brain is split into hemispheres. There are also cortexes and lobes, but I won't go into detail with those. The left hemisphere controls logical thinking. It also controls speech. The right hemisphere controls the creative part of you. It is tied to artistic ability and also helps you recognize people. But both hemispheres control the opposite side of the body, the right controls left and left controls the right side.

### The Immune System

With all these delicate parts that need to be protected the brain has evolved a way to combat any viruses or bacteria that are trying to attack it or any other part of the body. This system is called the immune system. The first cells that come are called phagocytes. The specific phagocyte I will talk about is called a Macrophage. It is the first defense against bacteria and viruses, but they can be infected by viruses, so the body has made cells called natural killer cells to kill any infected cells. While the Macrophages are very powerful in the case of a bacterial infection, the Macrophages will also cause inflammation and call Neutrophils. The Neutrophils are so powerful that they accidentally harm the body too. Now if this isn't enough then the macrophages will call an immune cell called the Dendritic cell. The Dendritic cell will start collecting antigens of the virus/bacteria. Then they will travel to a lymphocyte through the lymphatic system. There they will activate T and B cells. The T cells then go to activate the B-cells and the B-cells produce antibodies that will kill the virus/bacteria. After this there will

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be leftover T and B cells that will remember the bacteria/virus, and they are called memory T and B cells. This is how vaccines work!

## Multiple Sclerosis

Now with that out of the way we can start to talk about some diseases. The first one I will talk about is called M.S. (Multiple Sclerosis.) This disease is formed because of what is called an autoimmune attack. An autoimmune attack is what happens when the immune system accidentally attacks itself. The most prominent of the cells that attack the own body are the natural killer cells. Now usually in a normally functioning immune system there are cells to stop this, they are called suppressor cells. In patients with M.S. however there is both a lack of suppressor cells and too many natural killer cells. This overall leads to the destruction of the myelin and the symptoms associated with M.S. which there are too many to count, but a few examples are Depression, Headache, Sleep Deprivation, and other symptoms like those. Prions Another of these neurodegenerative diseases are called prions. Prions are malformed proteins that infect other proteins and turn them into other prions. Prions are mostly found in cerebrospinal fluid. There is currently no way to catch Prions from other people other than... Cannibalism and surgical equipment that was not sanitized. But, you can catch it from eating the meat off of animals that have it. One example of these diseases is Mad Cow disease. In humans it's called vCJD, but the similarity between these two prions is that they both have a 100% death rate within one to two years.

## The Blood Brain Barrier (BBB)

Now you may be asking yourself "Doesn't the brain have ways to stop diseases like those from harming it?" Well if you were asking those questions then you would be right. It is called the Blood Brain Barrier and as the name implies, it is a barrier between the blood and the brain. Usually this barrier can keep most bacteria and viruses out using a sort of mesh...at a cost. The BBB also keeps immune cells from entering the brain in the event of an infection. This is why brain infections are so severe if they occur.

## Split Brain

Now back in the 19th century they didn't understand the delicate machinery of the brain. So they started tampering with it. They created a procedure where they split the cord connecting the two hemispheres in order to cure seizures. It worked for a time, but then the patients started reporting that one part of their body was acting sort of on its own. For example they would choose to eat something and then they would have the left part of their body do something else. This is of course because the two parts of their brain couldn't communicate with each other that well. And that's why it worked so well to cure seizures which happen because of the brain

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sending random signals everywhere.

All of the diseases I listed are all incurable... For now. So think about the future and what will happen and how medicine will evolve to help cure these diseases. Take this advice and help the world become a better place with no disease!

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