Analysis Of How Pathogenesis And Transmission Of Organisms Are Responded To By The Immune System In Animal Species

The immune system is what keeps animals healthy and is essential for survival. The immune system fights against bacteria, viruses, parasites, and without it the body would just be open for attack. The immune system involves many types of cells, organs, proteins and tissues which are spread throughout the body. These can detect if a foreign tissue has entered the body- self from non-self. If a pathogen is detected, then the body sends out an immune response. To do this the body sends out an army of white blood cells, billions of these white blood cells are created in the bone marrow every day. The immune system has different ways of fighting off the different types of pathogens. `

Virus

A certain type of white blood cells called macrophages destroy germs as soon as they are detected in our body. When a viral infection begins to take hold, we use white blood cells that are a more powerful defence called T and B lymphocytes. A special type of protein made by B cells called antibodies bind to virus to stop it from replicating, these antibodies will also tag viruses to make aware to other blood cells that they need to be destroyed. T-cells play a different role, some act as guards to raise alarm when invading viruses are detected, whereas others kill the virus-infected cells, or will help B cells to create more antibodies. As soon as the virus has been cleared, a small section of these specialised cells (T&B) will persist and keep a memory of the destroyed virus. This is called ‘Acquired immunity’, which means the is primed to prevent another infection and helps to stop it from accidently attacking its own cells.

Bacteria

At first most bacteria are left undetected, however once a certain bacterial population level has been reached they start damaging the body by changing the environment around them. The immune system reacts to this and starts to activate the guard cells, the first being macrophages. These cells are scattered all over the body to make sure they are ready to attack when there is an invasion. These macrophages are designed to and can devour around 100 intruder cells each and often will be able to stop this attack on their own. These same cells control inflammation (swelling), this is done by the order of blood vessels to release water (containing white blood cells) in the areas that are infected which makes the process of fighting a lot easier. However, if these macrophages are fighting for too long they will need to call for back up. They do this by releasing message proteins that will communicate and tell other blood cells there is urgency in that location. Once the message is received, neutrophils, will leave their patrol routes in the blood and relocate to the site of infection. These neutrophils fight extremely hard and not only kill bacteria but also healthy cells, this means they have evolved to ‘commit suicide’ after 5 days to stop too much damage on the host. They can also create barriers that trap and kill bacteria.

If this is unsuccessful and the invasion has not been stopped then the immune system will send

out another type of cell, the dendritic cell. The dendritic cell is designed to collect dead bacteria, rip it into pieces and place the parts on its outer layer. These dendritic cells will then make a decision on if it's a bacteria or virus. If a bacteria is indicated then cells that are experts in fighting bacteria will be recruited. The dendritic cells travel close to the lymph node and take around a day, where waiting to be activated are billions of helper T-cells and killer T-cells. These T-cells are trained at birth, which is a complicated process which results in only a small majority surviving. The quarter that survive are given a specific setup, this then means the dendritic cell needs to find a T-cell with the same set up, able to combine with the parts of the intruder that is shown on the outside of the dendritic cell. Once this perfect match is found a chain reaction takes place. The T-cell will then duplicate itself thousands of times, some will become memory cells which stay in the lymph nodes which allows the body to become immune to that particular infection and others travel to where the infection is and fight with the other cells. The remaining, activate the B cells at the centre of the lymph node.

The B cells can duplicate extremely fast, not only that but they produce antibodies to fight the infection. The helper T-cell is a stimulus for the B-cell to stop it from dying of exhaustion. The B cells create antibodies, which are small proteins that are designed to bind to the outside of the intruder. Antibodies pour into the blood in their millions and travel to the site of infection, where they disable lots of the bacteria and therefore make them harmless or in fact kill them off. The antibodies may also stun the bacteria this makes it easier for killer cells like macrophages to attach to the bacteria and eliminate them.

All the actions of the white blood cells add up to eliminate the infection in their own way. The cells of the body that were during infection process are replaced quickly by the body itself. The immune cells are now redundant and so 'commit suicide' so that the body's resources are not used up needlessly.