9: THE BODY FIGHTS BACK

This lesson is not a complete overview of the immune system. We'll focus on the fight against viruses, although much of this information would apply to other pathogens as well. The body has several layers of defense. Most viruses are kept out because of physical barriers, but if some get past those, we have two more levels of defense: the **innate** (non-specific) immune system, and the **adaptive** (specific) system.

1) PHYSICAL BARRIERS

These work so well that under normal circumstances we go about our lives oblivious to the vast number of viruses in our environment.

2) ROAMING "EATERS" (phagocytes)

If viruses get past our physical barriers, they are met by roaming immune cells that eat all foreign substances they find.

3) SENSORS that detect viruses

TLR-3 Found on the outside of phagocytes, and inside their endosomes.

EXAMPLES:

RIG-1 **MDA-5**

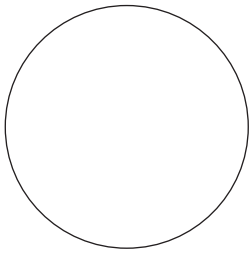
Found in the cytoplamsm of all cells. They detect viral RNA (usually dsRNA).

4) INTERFERON

The sensors trigger the production of interferon, a chemical message that causes the production of many anti-viral proteins, and also alerts other cells to the presence of the virus.

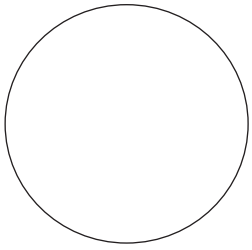
5) NATURAL KILLER CELLS

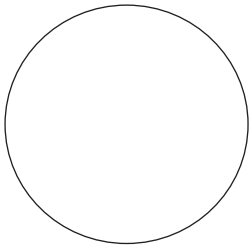
NK cells are a type of white blood cell called a lymphocyte.



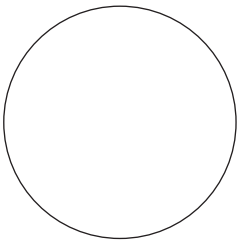
6) KILLER T CELLS

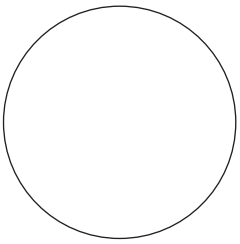
Killer T cells must get permission from helper T cells.





7) B CELLS and their ANTIBODIES





Macrophages present viral proteins to T helper cells.

T helper finds B cell with matching antibody.

The B cell starts making many antibodies, which stick to the virus.