

## Complexity of the Immune System

“Dear Lynda

I would be grateful if you could explain about the body’s immune system how much protection do we have from disease?”

Without becoming too scientific I will do my best to explain. The body’s immune system is a highly complex and ingenious multi-layered system of biological defences. Its primary purpose is to defend the body from bacteria, viruses, fungi, parasites, toxins, cancerous cells and other disease-causing agents. The immune cells of this amazing defence system are located all over the body; the majority can be seen in the thymus, the spleen, the lymph nodes, the bone marrow, the tonsils and the gut. Immune cells are also found in the blood and these are the white blood cells. There are many types of white blood cells but the immune response is associated with the Lymphocytes, which are divided into three main categories; B-lymphocytes, T-lymphocytes and natural killer cells which are carried in the bloodstream to locations in the body where they are needed, for example sites of injury or infection. The natural killer cells are capable of spontaneously killing certain virus-infections or cancerous cells.

A simplified explanation of the many layers of the immune defence system is that it can be described as being divided into two categories; non-specific immune responses and specific immune responses.

The non-specific immune responses are at the fundamental level of the body’s immune defence system and include the physical barriers of the skin; the tiny hairs called cilia in the respiratory tract and other areas of the body which expel foreign particles from the body; and chemical defences such as stomach acid and bacteria-destroying enzymes in saliva and tears. Another layer of non-specific immune defence which is more complex is provided by a number of different types of white blood cells namely the monocytes and neutrophils. These blood cells are capable of ingesting and destroying bacteria and foreign particles, this process is called phagocytosis which means ‘cell eating’. They also help other white blood cells to kill micro-organisms and are responsible for producing important chemical messenger molecules called cytokines which co-ordinate different aspects of the immune response.

The specific immune responses are incredibly sophisticated and are able to recognize and respond specifically to every type of foreign material they meet. The specific immune response is able to make minute distinctions between material that forms part of a person’s body and material that is of foreign origin. It is capable of performing this distinction because the immune system contains within it a detailed image of your unique body. A foreign substance that invades the body and generates a specific immune reaction as it encounters the immune system is called an antigen.

The specific immune response can be divided into two main categories humoral and cell-mediated immunity. Humoral immunity is responsible for attacking antigens that are floating around in the body fluids surrounding the cells of the body. Humoral immunity produces antibodies using B-lymphocytes. These antibodies are a type of protein molecule and are the body's primary defence against bacterial infection. Each antibody is specifically designed to attack each antigen.

The other main category of the specific immune response is the cell-mediated immunity this is mainly responsible for attacking antigens inside the cells, for example viruses. The T-lymphocytes are responsible for this process, they can recognize and kill target cells, for example those that are infected with viruses and also foreign cells, i.e. tumours.

The immune responses are indeed one of life's miracles. This incredibly ingenious biological system intricately connected to both the brain, body and mind protects us from the onslaughts of many millions of invaders which attack us daily. Live with joy and health.

Lynda Beetham

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