

Podcast: Immune system (Part 1)

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My name is Ute Papkalla, I am a member of the health team of the German Institute for Medical Mission, also called Difäm. With me is my colleague, Carina Dinkel. Today we want to give you a short overview on how our immune system works and how it reacts to an infection with the coronavirus.

Most patients infected with the novel coronavirus SARS-CoV-2 show mild or even no symptoms. However, 10 to 20 percent of the patients develop stronger disease symptoms in the course of the COVID-19 disease. An even smaller percentage of patients develop the life threatening cytokine storm, which we will talk about in our next podcast.

However, let us first look at how our immune system in general tries to defend us and how it answers to an infection. Carina will explain how our immune system reacts when it is confronted with the corona virus.

Our immune system provides several means to fight an infection. It comprises an army of different cell types in the blood and other body tissues. As a first step, our body must differentiate between a particle that belongs to our body and a particle that is foreign and may cause harm. White blood cells constantly patrol in our blood to identify foreign particles like viruses, bacteria or parasites.

What happens when these patrol cells meet a SARS-CoV-2 virus, which causes Covid-19?

The human immune system comprises a broad arsenal of cells and other defence mechanisms that closely interact with each other. The first immune response of the infected body will be the unspecific so-called innate response. This is the general response to any infection. It involves white blood cells like macrophages and killer cells attacking the virus directly. The macrophages present particles of the virus to other immune cells of the body. The virus particles are also called antibody generators, in short “antigens”. Once a foreign antigen is detected, the body reacts with the creation of specific antibodies.

This is very interesting; what happens next?

The creation of specific antibodies happens in the second branch of the immune system, and is called adaptive immune response. For the stimulation of the adaptive immune response, the communication between the different immune cells is done by cytokines. Those cytokines indicate, for example, if more antibodies must be produced.

So, “adaptive” means that we are now tailoring our immune response to the specific coronavirus.

Exactly. We generate antibodies that bind specifically to the spike protein of the coronavirus. This is the way the antibodies prevent the coronavirus from docking to a certain receptor of our body cells, so it cannot enter these cells to replicate itself.

That sounds very clever. But do the antibodies last forever to protect us?

Yes and no. The antibodies become less and less with time, but the body keeps the construction plans for them. There are two types of white blood cells involved in this process – the T-cells and the B-cells:

The T-cell response is called the cell-mediated response. The T-cells consist of different subtypes of cells. The helper T-cells call other white blood cells to an infection site. The memory T-cells keep a record of the virus so that they can recognise it when it enters the body again. The cytotoxic T-cells destroy our own body cells when they are so badly infected by the virus that they have become useless.

The helper T-cells activate the B-cells, which are our second adaptive weapon against an infection also called the humoral immune response. They produce the antibodies that neutralize the virus, which means that they render it ineffective. B-cells also produce memory B-cells, which can also recognise the specific antigen of the coronavirus in the future.

OK. Can I imagine that like a database? The body stores this information, recognizes the specific kind of virus, and can thus activate the fitting antibodies for fighting the intruder.

Yes. Our body has a database of T-cells and B-cell antibodies that can attack the coronavirus after the first infection. Scientists are still learning how long this memory lasts after a Covid-19 infection.

Let me wrap up how the immune system works:

In the first days of an infection with a pathogen like the coronavirus, the innate immune system tries to kill all intruders. If it is overwhelmed, the adaptive immune system steps in. The reaction of T- and B-cells takes several days. However, once the adaptive immune system has fought the virus with antibodies, it has recorded its specifics in a database. When we get again into contact with the same virus, our antibodies are reproduced faster to fight off an infection.

We have heard that the coronavirus is a nasty fellow. We had better make sure not to get it.

I totally agree. So, wear masks in crowded places, keep your distance and wash your hands.

Be blessed and stay safe.

Sources:

Immune system and Coronavirus

https://www.charite.de/en/service/press_reports/artikel/detail/covid_19_immune_system_gone_astray/

https://www.who.int/docs/default-source/coronaviruse/risk-comms-updates/update-34-immunity-2nd.pdf?sfvrsn=8a488cb6_2

<https://www.newscientist.com/definition/cytokine-storm/>

[https://www.thelancet.com/journals/lanrhe/article/PIIS2665-9913\(21\)00011-4/fulltext](https://www.thelancet.com/journals/lanrhe/article/PIIS2665-9913(21)00011-4/fulltext)

<https://www.aerzteblatt.de/archiv/216372/Infektion-mit-SARS-CoV-2-Abwehr-im-Ausnahmestand>