

Podcast: Viral vector vaccines

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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, Carin Dinkel. Today we will talk about a specific kind of vaccination against Covid-19: the viral vector vaccines. Which of the currently many vaccines are viral vector vaccines?

The one, which has already been approved, is the vaccine from the Astra Zeneca Company known as Covishild or Vaxzevria. In addition, the vaccine from Johnson & Johnson and the Russian Sputnik V use viral vector technology.

Yes, I have heard of them. But I do not really know what that viral vector technology means.

Normally if a virus enters the body, it infects a cell and hijacks the protein making machinery to replicate itself. This is what the coronavirus does and what all other viruses do. With the viral vector technology, the fact that a virus can enter the body cells can easily be used.

Various viruses have been developed as vectors, including adenovirus - a cause of the common cold and vaccinia virus. These vector viruses are stripped completely of any disease-causing genes and genes that enable them to replicate. This means, the viruses are harmless. Instead of their own genes, the viruses are made to carry the genetic information of the spike protein of the Coronavirus, which acts as an antigen. Human cells manufacture the antigen as if it were one of their own proteins and it is presented on their surface alongside many other proteins. When the immune cells detect the foreign antigen, they start an immune response against it.

The spike protein which acts as antigen is just a protein. It is harmless if it is not attached to a coronavirus and does not cause any disease.

That still sounds pretty complicated. Can I just repeat it, to see if I got it right?

There is a harmless virus, which carries the genetic information of an antigen. It infects the body cells and hijacks the protein machinery. There spike protein is built, the immune system detects the spike protein as foreign material and starts building antibodies against it.

Yes, that is pretty much it. I can also explain with a practical example, so it might be even easier to understand:

I have the information that my friend urgently needs to fight an enemy. I cannot go to my friend myself to inform him, this would be too dangerous. Therefore, I send a mail carrier, who delivers the information right into the hands of my friend. With this information, my friend can successfully fight his enemy. The viral vector is equivalent to the mail carrier in this little story. It can get easily into my friend's house – meaning the body cells. The information is the genetic code for the spike protein, which is then used to initiate the process that finally enables my friend to fight the enemy – the process that leads to the building of antibodies.

We are using a virus to fight a virus. Isn't it dangerous?

No, as I already said, the all-round dangerous genetic information is taken away from the vector virus. The vector viruses used for Corona vaccines are non-replicating viral vectors. Meaning, they have no possibility of multiplying in body cells, they just die after delivering the important genetic information.

Good, I am relieved. But are you really, really sure about this?

Yes, I am absolutely sure about this. The viral vector is harmless. Viral vector vaccines are not completely new. Scientists began creating viral vectors more than 50 years ago. Besides being used in vaccines, viral vectors have also been studied for gene therapy, to treat cancer, and for molecular biology research. For decades, hundreds of scientific studies of viral vector vaccines have been conducted and published around the world. Some vaccines recently used for Ebola outbreaks have used viral vector technology as well, and a number of studies have focused on viral vector vaccines against infectious diseases such as Zika and flu. However, the one you have probably all heard of is the vaccine against Ebola. It also uses viral vector technology.

I heard rumours about side effects of the vaccine – some kind of thrombosis.

That is true. Very, very rarely a sinus vein thrombosis - that is a certain kind of thrombosis in the brain - can occur after vaccination. It seems to occur mainly in young women of childbearing age. But so far only very few cases have been reported worldwide with millions of doses already used. However, this side effect is closely monitored and observed. Now the risk of getting Covid and dying from it is much higher than the risk of getting this kind of thrombosis from vaccination. The WHO therefore recommends the vaccination.

And apart from this, are there any other side effects?

Nothing serious. Just the usual harmless possible side effects after vaccinations. This might include muscle pain, fever and any reaction at the site of injection. Any temporary discomfort experienced after getting the vaccine is a natural part of the process and an indication that the vaccine is working.

Can you tell me a bit about the efficacy of the viralVectorVaccines?

As we are talking about a whole group of vaccines from different companies and slightly different techniques, it is not so easy to give exact numbers. To prevent a symptomatic Covid infection the efficacy is overall at around 70%. To prevent a serious Covid condition the efficacy is even above 90%. It also seems to be working against the British and the Brazilian variant. For the South African variant, one study shows significantly lower efficacy for the vaccine from Astra Zeneca. However, we do not have much data here and still need more research done to see whether this is really true.

Thank you Carina and to all of you: be blessed and stay safe.