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Translated from Slovenian

Following the trail of new conspiracy theories

Since the beginning of the Covid-19 pandemic, doubts have been raised about the safety of vaccines based on mRNA technology. Every now and then, a frightening post goes viral and alarming posts bombard us from all sides, especially from social networks. The latest such wave focuses on foreign DNA, which is said to be in vaccines and can be integrated into our genes. There, it triggers the development of autoimmune and cardiovascular diseases, skin diseases, neurological problems and even cancer.

This time, outrage, fear, letters to the authorities and the establishment of new initiatives to protect public health have been caused by research by David J. Speicher, a virologist at the University of Guelph in Canada. He measured the amount of residual DNA in three vials of Australian vaccines and found that they all exceeded the legally permitted limit of 10 ng/dose, by a factor of 145. The research has given new impetus to concerns about vaccine safety, calls for a ban on mRNA technology and accurate data on the health consequences of vaccination. One of the documents circulating online is an open letter from the North Group, a coalition of citizens from northern Europe, calling for the immediate discontinuation of modified mRNA vaccines against Covid-19 and for an investigation into the excessive levels of residual DNA.

What is residual DNA and why does it cause concern?

“The DNA identified in the vials is artificial and foreign genetic material, copied and amplified in E. Coli bacteria and used as a template for the production of mRNA,” the North Group writes. They warn that this DNA should have to be removed from the mRNA before being wrapped in lipid nanoparticles and packaged into the vaccine. This DNA is said to have the ability to replicate both in bacteria and, as in the case of the Pfizer vaccine, in human cells. “Lipid nanoparticles are known to be taken up by all organs of the body, including the brain, heart, liver, ovaries and testicles, and can therefore transfer their contents to cells and organs,” they add. Residual DNA in vaccines is said to have the potential to integrate into our genes and thereby trigger the development of autoimmune and cardiovascular diseases, skin diseases, neurological problems and even cancer.

Wrong method

Health institutions and ministries around the world have responded to such concerns with clarifications countless times. The Australian Therapeutic Goods Administration, which oversees the safety of therapeutic products, including medicines, medical aids and vaccines, has conducted a comprehensive assessment of the levels of residual DNA and endotoxins in mRNA vaccines used in Australia. They have once again confirmed that they meet internationally agreed limits. From their statement on the shortcomings of the research by Dr. Speicher, however, is to be concluded that he

indulged in a bunch of mistakes that should not occur to a serious scientist. The samples themselves are said to be contestable. The expiration date of the vials has already expired in 2022, and one is even said to have been opened. Above all, Dr. Speicher chose the wrong testing method, called fluorometry. This uses a fluorescent dye to stain not only the remaining DNA in the vaccines, but also the main component, mRNA. This, of course, means incorrect results, as it measures falsely high levels of DNA.

Biology does not work like that

In addition to the fact that the results of the study cited by concerned individuals are wrong, the understanding of how vaccines work is also wrong, experts say. To understand the situation, it is important to first understand how mRNA vaccines against Covid-19 are produced. They are designed to introduce a small, short-lived piece of information – messenger – RNA (mRNA) into our cells and instruct them to produce a harmless protein of the SARS-CoV-2 virus. This prepares the immune system to recognize the virus and fight it if we become infected. During vaccine production, mRNA is synthesized using plasmids – small, round pieces of DNA in E. coli bacteria that carry genetic instructions. Once the desired mRNA is produced, the plasmid DNA is removed through purification processes, after which small amounts of DNA may indeed remain. But these pieces are heavily damaged and non-functional. The central fear that fuels concerns about the safety of mRNA vaccines is that residual DNA from vaccines could somehow integrate into our genes and cause long-term damage. But biology simply does not work that way, experts say. In order for foreign DNA to integrate into our genome, it would have to enter the nucleus of our cells, where our DNA is located. But mRNA vaccines do not enter the nucleus; they work in the cytoplasm, the outer region of the cell. Even if a few DNA fragments were to enter a cell, our cells have numerous defense mechanisms to recognize and destroy foreign DNA, including enzymes that break it down before it can cause any harm. Vaccines have been used for decades, and many – including the chickenpox vaccine – contain DNA. There is no evidence that chickenpox vaccination causes cancer or autoimmune diseases. “mRNA vaccines are a major achievement in vaccine development,” emphasizes renowned immunologist Dr. Alojz Ihan. “Molecular mRNAs can be produced industrially using biochemical synthesis processes, which ultimately leads to a chemically very pure product without biological impurities, such as those in classic vaccines, which contain residues of cultivation in cell cultures. mRNA molecules in the machinery of our cells serve as instructions for the creation of various proteins, including viral ones, if desired. The lifespan of mRNA in the cell cytoplasm is short, as it is quickly degraded and never enters the cell nucleus, so the formation of any harmful genetic changes in the cell is excluded." The Society of Oncology Patients also maintains that vaccination against Covid-19 does not cause cancer. At the same time, they add that when infected with viruses, the viral genetic code is introduced into our cells. The transcript of some viruses, unlike mRNA vaccines, can actually be integrated into our genome (e.g. retroviruses such as HIV-1).

When asked how an mRNA vaccine could be developed in such a short time, while classic vaccines require at least a decade, Dr. Ihan answers in an explanation for doctors that he prepared for the National Institute of Public Health: "Usually, the development of pharmaceutical active ingredients, including vaccines, takes at least a decade - from the idea, which usually arises in academic laboratories (universities, institutes), to clinical studies, with which the pharmaceutical industry, in accordance with the rules of regulators, registers the active ingredient as a medicine and obtains permission to use the medicine. The length of development is primarily associated with the high

costs of research, which at each stage, from academic projects to financing clinical studies, requires numerous project applications, procedures for obtaining funds and assessments of the possibilities for transferring active ingredients to the next phases of research. Due to the Covid-19 pandemic and its devastating consequences for the entire world, countries (EU, USA, Russia, China) have decided to finance the development of vaccines themselves and assume the financial risks of possible failure. This has resulted in the largest mobilization of researchers and the pharmaceutical industry in history. Vaccine development has accelerated significantly, and due to unlimited funding, clinical phases have been carried out with the full number of subjects (several tens of thousands) needed to assess the safety and efficacy of the vaccine. At the same time, all the rules for vaccine registration have remained the same. Data on the efficacy of vaccines are therefore just as credible as they would be for vaccines registered over a significantly longer period. On the other hand, in the case of temporary permits for the use of vaccines, vaccine safety data will only be valid for the period until the interim evaluation of clinical studies. This mostly concerns safety data between three and six months after vaccination. The fact is that the vast majority of complications after vaccination occur during this period, but clinical studies will take place, as is usual, for two years and only after this period will the vaccines be able to receive final approval, when they can be considered completely safe also in terms of long-term effects.

It is healthy to question the interests of politics, capital and pharmaceutical giants. What is much less healthy is that people are increasingly distrusting the scientific method. It is the one that has led us to progress in all areas, including medicine. It has provided us with the technically advanced and comfortable life that modern civilization enjoys.

But precisely because the majority still trusts science, it is so important that it refutes doubts and fears with research. If they are baseless, this will not be too difficult. Without evidence, however, in a world where paranoia has crept into every aspect of life, it will be difficult to convince people to trust their word.

Why do we need *E. coli* bacteria to produce mRNA?

A plasmid is a small piece of genetic code that contains the “recipe” for how to make a piece of virus that is used in vaccines. Bacteria such as *E. coli* are “chefs” who can copy this recipe very quickly. They can quickly make millions of copies of one fragment. We insert the plasmid recipe into a bacterium, give it a nutrient medium to grow, and this results in millions of copies of the plasmid. These are then cleaned of any remaining bacterial material and used to make mRNA.

What is mRNA?

mRNA is the blueprint that cells use to make proteins. They are the building blocks of life – everything in our bodies, from muscles to hormones, is made from them. Our cells have DNA, which is like a cookbook with thousands of recipes for making proteins. But the DNA always stays safe in the cookbook (the nucleus). When a cell needs a particular type of protein, it makes a copy of that recipe from the DNA. This copy is mRNA. This then travels from the cell nucleus to special “factories” in the cell called ribosomes. Ribosomes read the mRNA message and assemble a protein from amino acids. For use in vaccines, scientists create mRNA with instructions on how to make a small, harmless virus particle (such as the S protein of the coronavirus). When the vaccine is injected into the body, the cells read the mRNA and create this virus particle. Our body recognizes it as foreign and starts

producing antibodies. This prepares it to fight the real virus. After a few hours or days, the mRNA breaks down in the body and disappears.