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Editorial

Comparative Characteristics of the Main Coronavirus Vaccines

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Since the beginning of the epidemic, vaccine development has been a priority for all developed countries. According to WHO (26 January 2021), more than 60 vaccines worldwide are already in clinical trials. More than 170 are being tested on animals. There are 22 vaccines that have made it through the final phase of testing.

The vaccine, developed by US company "Pfizer" and its German partner "BioNTech", has been registered first in the EU. Phase III clinical trials ended on 9 November 2020. In addition to EU countries, the vaccine is used in Australia, Saudi Arabia, Switzerland, Norway, Iceland, Serbia and some other countries. The efficacy of Pfizer's development has been confirmed by a recent study, based on mass vaccination in Israel (data of 25.02.2021) with 94%. It is based on a matrix RNA encoding the gene for the surface, so-called spike S-protein of the coronavirus.

"Moderna" is a US-made vaccine. Its composition is very similar to that of Pfizer. The principle of action is the same as that of "BioNTech/Pfizer": the drug is based on matrix RNA (mRNA). This is the genetic material of the pathogen, which is reproduced artificially in laboratory conditions. The effectiveness of the vaccine is also estimated at 94%, according to preliminary data from the phase III clinical trial. The company has decided that the research will continue until the end of 2022. "Moderna" is the first company in the world to test its own coronavirus vaccine in humans. "Moderna" vaccine is already in use in the EU, Norway, Iceland, Greenland and the Faroe Islands.

"AstraZeneca" is a British-Swedish vector vaccine. It is based on a chimpanzee adenovirus carrying the S-protein gene of coronavirus. The fact that the vaccine was developed using chimpanzee adenovirus rather than human adenovirus should reduce the risk of allergic reactions and severe side-effects. However, the disadvantage of this product, as with all vector vaccines, is that the technology itself is new and has not previously been used in health care. One of the pluses for vector drug manufacturers is their speed of creation. The vaccine is registered for use in the European Union. It is licensed for emergency use in another 20 countries.

"CoronaVac" is an inactivated vaccine from Chinese biopharmaceutical company Sinovac Biotech, which has shown controversial efficacy results. According to various studies, its effectiveness ranges from 50 to 91%, which on average is significantly lower than that of European and Russian counterparts. It is used only in China. Nine more countries (Azerbaijan, Bolivia, Brazil, Colombia, Indonesia, Laos, Turkey, Chile, Uruguay) have approved "CoronaVac" for emergency application.

"Janssen Pharmaceutica/Johnson and Johnson" is an American adenovirus vector vaccine. Based on the results of phase III clinical trials, efficacy in different regions ranged from 66% to 72%. The effectiveness of protection against a severe form of coronavirus was 85% in all test groups.

Three vaccines are currently registered in Russia. To achieve reliable protection, an additional dose, the so-called booster dose, must be administered. Russian vaccines against coronavirus do not contain live virus. The duration of vaccines is expected to be between one and several years.

"Sputnik V" (Gam-CovID-Vac, Gamaleya Centre) is the first vaccine in the world. This vaccine (vector vaccine) has already passed the third phase of trials. It is based on two non-human adenoviruses, in which a small section of the Sars-Cov-2 virus genome has been incorporated. The development was registered in August 2020. It is 91.4% effective, preventing the development of severe disease in 100% of cases. "Sputnik V has been registered in 30 countries.

"EpiVacCorona" (developed at Rospotrebnadzor's Novosibirsk scientific centre Vector). "EpiVacCorona" received registration in October 2020. It is based on synthetic analogues of viral protein sites, peptides. This means that it is completely free of biological carriers of the virus, which, in theory, should make it even less allergenic. The immune system recognises epitopes - "pieces of antigen", microscopic particles that are targeted by the immune system. Trials have not yet been completed on a group of elderly people.

"CoviVac" (from the Chumakov Centre) is the latest Russian development. Its registration date is 20.02.2021. It is based on the "killed" coronavirus SARS-CoV-2. "CoviVac" has the potential to provide the greatest protection and full immune response because the body will be exposed to the whole virus and not just a fragment of it. "CoviVac" gives the human immune system a complete set of coronavirus antigens, which in turn will produce a complete set of antibodies. The preliminary immunological activity of the vaccine has been estimated at 85%. Nearly all vaccines have the same side effects: fever, general malaise, headache and pain at the injection site. All these symptoms are infrequent and are a normal reaction of the body to the action of the drug.

Dozens of other vaccines are under development. Among them is the Russian drug - "Sputnik Light". Unlike "Sputnik V", "Sputnik Light" is a single-component vaccine based on the successful and already used Gamaleya Centre product.

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