

3. ENTEROMIX mRNA – Science & Technology

Russia has announced a significant development in oncology with the unveiling of EnteroMix, a new cancer vaccine. Early clinical trials have reportedly shown 100% efficacy, positioning it as a potential game-changer in the fight against cancer. The vaccine is now ready for clinical use, according to the Russian Federal Medical and Biological Agency (FMBA).

About the EnteroMix Vaccine

Development and Collaboration – The vaccine is classified as an oncolytic vaccine, meaning it uses viruses to infect and destroy cancer cells. It was developed by the Ministry of Health's National Medical Research Radiology Centre (NMRRC) in partnership with the Engelhardt Institute of Molecular Biology under the Russian Academy of Sciences.

Technology and Efficacy – EnteroMix is an mRNA-based vaccine that has successfully passed all preclinical trials, demonstrating both high safety and effectiveness. Its primary functions are to shrink aggressive tumours and slow their growth. A major advantage is its ability to achieve this without the harsh side effects commonly associated with chemotherapy or radiation therapy.

Mechanism of Action – The vaccine employs a unique strategy, using a combination of four harmless viruses. These viruses are engineered to specifically target and destroy cancer cells while simultaneously activating the body's own immune defences to fight the cancer.

Personalized Therapy – A key feature of EnteroMix is its customization. The vaccine will be fully tailored to each patient's unique tumor RNA. This makes it a fully personalised immunotherapy, designed to be highly specific to an individual's cancer.

Understanding Vaccination Principles

Core Function – Vaccination works by stimulating the body's immune system to create a defensive response against a specific pathogen (like a virus or bacterium). This "primes" the immune system, giving the body a crucial head start to fight off the disease if it encounters the pathogen later.

Traditional Vaccines – For many years, vaccines were based on using killed or weakened (attenuated) versions of viruses. Classic examples include the highly successful vaccines against polio, measles, and yellow fever. In 1951, Max Theiler was awarded the Nobel Prize in Physiology or Medicine for developing the yellow fever vaccine.

Evolution of Vaccine Technology – As technology advanced, scientists began creating vaccines that introduced only a part of the viral genetic code instead of the whole virus. However, the large-scale production of such vaccines often requires cell culture (growing cells under controlled lab conditions), which can be a time-consuming process.

mRNA Vaccines

The Concept – While the technology behind mRNA vaccines has been known since the 1980s, it wasn't perfected for large-scale, viable vaccine production until recently. Instead of introducing an inactivated virus to trigger an immune response, mRNA vaccines use messenger Ribonucleic Acid (mRNA). This mRNA delivers a specific "message" or set of instructions to the body's cells.

The Mechanism – The genetically engineered mRNA in the vaccine instructs cells to produce a specific protein (an antigen) that is typically found on the surface of the target virus or cancer cell. The immune system recognizes this protein as foreign and mounts a defence, creating antibodies and memory cells. This prepares the body to fight the actual pathogen if it ever appears.

COVID-19 – A Turning Point – The COVID-19 pandemic was the catalyst that brought mRNA technology to the forefront. It allowed scientists to design and deploy highly effective vaccines at unprecedented speed, preventing severe illness and death and changing the course of modern medicine.

Safety and Future Potential – A key safety feature is that mRNA does not alter human DNA. It never enters the nucleus of the cell (where DNA is stored) and is naturally broken down by the body within a few days. With their proven safety and effectiveness, researchers are now expanding the use of mRNA technology to combat other diseases, including influenza and, as seen with EnteroMix, creating

personalised cancer treatments.

Significance of the EnteroMix Vaccine

Fully Personalized Design – Each EnteroMix vaccine is uniquely crafted based on the genetic makeup of an individual's tumour. This high degree of personalization enhances target specificity and ensures a more robust immune response.

Power of the mRNA Platform – The mRNA platform allows for rapid development and scalability, overcoming a major hurdle that has slowed cancer vaccine research for decades. This method can be quickly adapted for different types of cancer, making it a versatile tool in oncology.

Benefits for Global Patients – The success of vaccines like EnteroMix could signal a global shift away from harsh, one-size-fits-all treatments towards safer, tailored immunotherapies. This promises better outcomes and improved quality of life for patients by reducing debilitating side effects.

Relevance for India – In India, cancers like colorectal and cervical cancer are among the leading causes of cancer mortality. Access to an effective, personalized vaccine like EnteroMix could transform cancer care in the country. However, successful implementation will depend on overcoming challenges related to cost, building the necessary infrastructure, and establishing supportive regulatory frameworks.

Source – https://www.business-standard.com/health/cancer-breakthrough-russia-s-mrna-vaccine-shows-100-early-success-125090800142_1.html

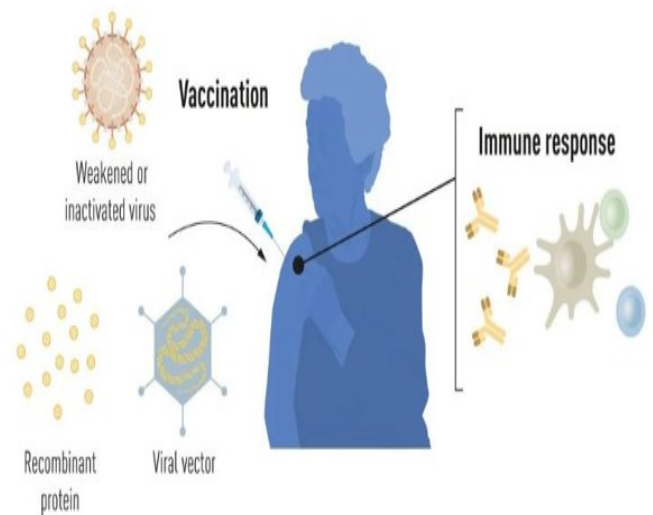


Figure 1. Methods for vaccine production before the COVID-19 pandemic.

