Study shows mRNA vaccine technology can be used for HIV vaccines

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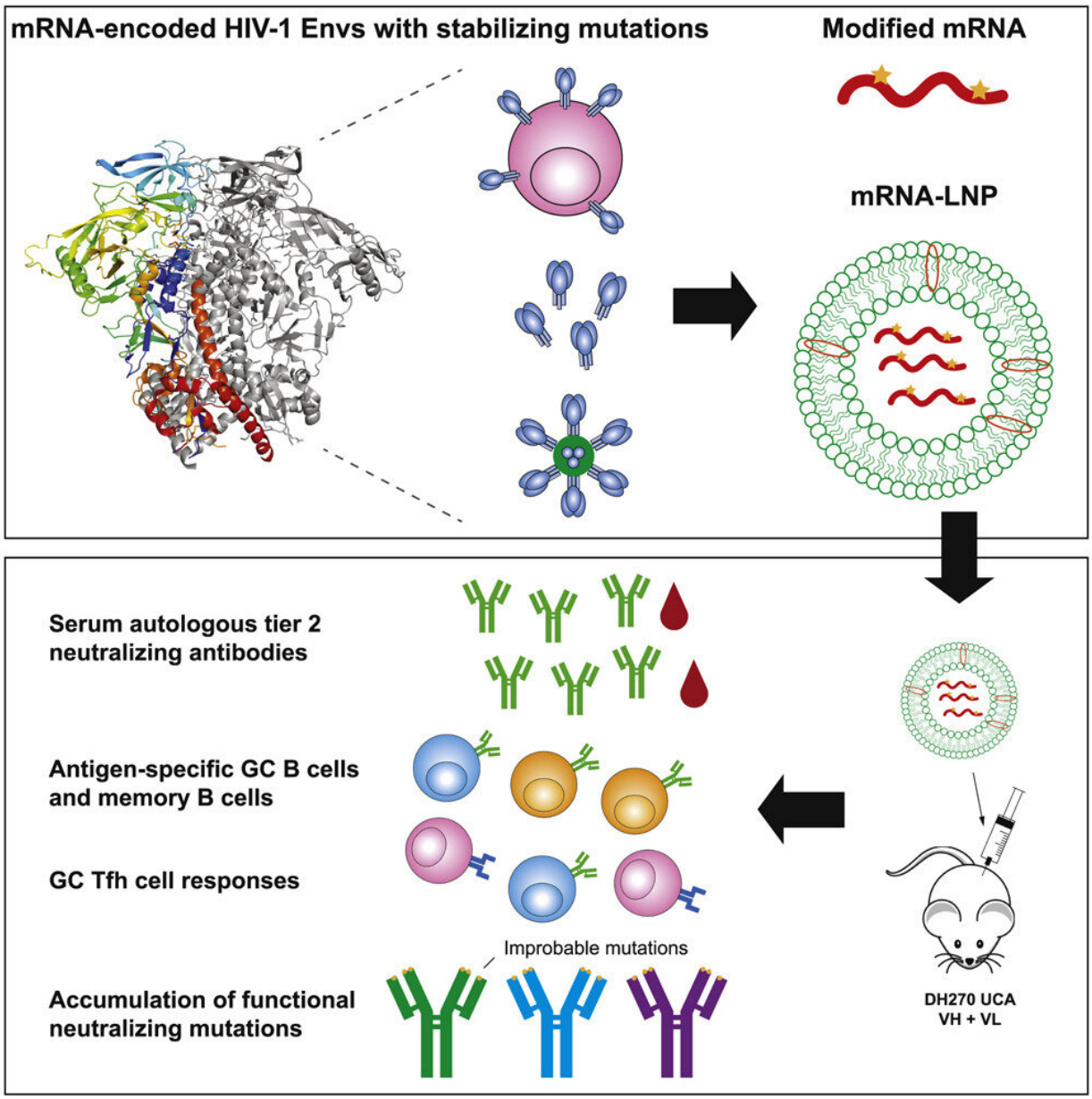

Graphical abstract. Credit: *Cell Reports* (2022). DOI: 10.1016/j.celrep.2022.110514

Using mRNA technology like that in the COVID-19 vaccines, researchers have demonstrated a successful way to deliver a potential HIV vaccine, researchers at Duke Human Vaccine Institute report.

Publishing online March 15 in the journal *Cell Reports*, the research team describes an important advancement in what is a complex vaccine development process. The approach uses mRNAs within lipid nanoparticles that are capable of stimulating HIV antibodies.

"This work demonstrates that we now have a practical platform for producing a complex HIV vaccine," said co-senior author Barton Haynes, M.D., director of the Duke Human Vaccine Institute. "The mRNA technology has been highly successful for COVID-19, and we previously found that it was also effective for a Zika vaccine. But HIV is so much more complicated. This is a major step forward."

Haynes and colleagues—including co-senior author Drew Weissman, M.D., Ph.D., the Roberts Family Professor in Vaccine Research at the Perelman School of Medicine at the University of Pennsylvania—found that mRNAs, which use genetic material to teach immune cells to recognize the targeted pathogen, are able to encode complex antigens that are key to HIV vaccine development.

Because the virus that causes AIDS mutates rapidly, only certain sites on its outer envelope remain intact through the ongoing changes. A successful vaccine requires perfectly structured proteins aimed at these sites to trigger the immune response—a technical hurdle that proved challenging with older vaccine technologies.

The research team was able to build an mRNA vaccine that could encode for the acquisition of the critical mutations, and monoclonal antibodies that neutralize diverse HIV.

"I began studying HIV and AIDS at the National Institutes of Health, and those that face the diseases have continued to be a group of people I really care about," said Weissman, whose decades-long mRNA research led to the effective SARS-CoV-2 mRNA vaccines. "I am excited that the mRNA-vaccine platform, which has helped to slow the spread of COVID-19 and decrease death from it, may be able to be put to work to protect people from HIV. These remarkable results may mark the next era of mRNA research and healthier futures for more people."

"Manufacturing complex nanoparticle protein immunogens on a large scale presents significant challenges, so we are encouraged that the use of mRNA raises the possibility of making such a complex immunization regimen both logistically achievable and potentially cost-effective," Haynes said.

More information: Zekun Mu et al, mRNA-encoded HIV-1 Env trimer ferritin nanoparticles induce monoclonal antibodies that neutralize heterologous HIV-1 isolates in mice, *Cell Reports* (2022). DOI: 10.1016/j.celrep.2022.110514. www.cell.com/cell-reports/full … 2211-1247(22)00250-9

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