Transcript Details

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Looking Back to Look Forward: The History of mRNA Vaccines

Announcer:
Welcome to *VacciNation* on ReachMD, sponsored by Moderna. Here is Dr. John Russell.

Dr. Russell:
RNA has always had a bad reputation as being something that's really hard to work with because of its instability. As far back as 1978, scientists used fatty membrane structures called liposomes to transport mRNA into MAL cells. In the early 1980s, Harvard, a team led by Dr. Craig, and others used RNA synthesis enzyme to produce biologically active mRNA in the lab.

So, there was a graduate student at the Salk institute in the late 80s and '87, Robert Malone. So, Malone picked up on some of this Harvard work, but added a liposome with a positive charge, which helped it engage with the negatively charged mRNA backbone. Malone left Salk to work in industry on mRNA over the years. So, over the years, mRNA technology was studied at many different startups, vaccine manufacturers, and universities and really didn't go a whole lot of places. Then some researchers at the University of Pennsylvania, Katalin Kariko and Drew Weissman figured out a way to alter a part of the mRNA code to invade the cell's innate defenses. So, they were working on vaccines for HIV/AIDS without a whole lot of success.

In 2010, a team led by Derrick Rossi at Boston Children's showed how modified mRNA could transform skin cells into embryonic stem cells and then into muscle tissue. This discovery received great acclaim, and he started Moderna in Cambridge. Moderna has mRNA in its name. Penn then sold the patent rights to a lab reagent company called CELLSCRIPT™ on their work. But another linchpin for success was the development of lipid nanoparticles, or LNPs.

So, there was a Dr. Pieter Coulis at the University of British Columbia in Vancouver, his team developed LNPs that delivered strands of nucleic acid that silenced gene activity. They expanded this work to mRNA delivery and overall, this has been part, either directly, or indirectly for the two mRNA COVID vaccines from Biotech or Moderna. By 2020, Moderna had nine different vaccines in development and then the pandemic hit. A prototype vaccine was produced within days of the sequencing of the viral genome of COVID-19. Biotech went on to partner with U.S. pharma company, Pfizer, in development of their vaccine.

Interestingly enough, much of the intellectual property of all of these years of development has expired, as the intellectual property for Dr. Malone is beyond its seventeen years. And even the work by Dr. Kariko and Weissman will expire over the next five years. There was a great opportunity for this technology that was waiting to find an answer for its use when you had a huge need and a huge influx of capital. So, suddenly when the United States government and other governments invested money in the development of the mRNA technology to fight COVID, and it led to this moon landing-type outcome; two vaccines, which are 95%+ effective in preventing hospitalization and death is more than anyone could've wished for.

I think now we are sitting at this point to say, 'Should someone get a Nobel prize for the development of this?', so, who will it be? Will it be Malone? Will it be Kariko or Weissman? Will it be Rossi? Will it be Coulis? It will be very interesting. Will someone be recognized, or will be a group of people recognized for this? If you pardon the parlance, this very, kind of, overnight success that happened over thirty years.

Announcer:
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