SAINTS PERSPECTIVES

Things Exceptional (Nobel Prizes)

The Nobel Prize in Medicine or Physiology 2023

2 October 2023.

The Nobel Prize Committee

Announced that the

2023 Nobel Prize in Physiology or Medicine

Is awarded jointly to

Professors Katalin Kariko and Drew Weissman

for developing the technology that led to the mRNA Covid vaccines

Description

The simple explanation of molecular genetics involves four genetic “letters”. In DNA, the molecule in which genes are usually stored, these are **a, c, g** and **t** — the initials of the chemicals involved. When a gene is activated, its sequence of letters is copied into a similar molecule, RNA, in which **t** is replaced by a related chemical, **u**. The resulting message (the“m” in mRNA stands for “**messenger**”) is read by cellular machines called ribosomes, which assemble the desired protein.

The idea behind mRNA vaccines was to make mRNA that encodes part of a protein found in a pathogen. The recipient’s cells will start churning out the protein fragment in question, which will be recorded by the immune system as foreign, and thus probably hostile. If the pathogen in question turns up for real, the immune system has a head start. And the ability to persuade cells to produce proteins for which they lack the genes themselves could have all sorts of uses beyond just vaccines.

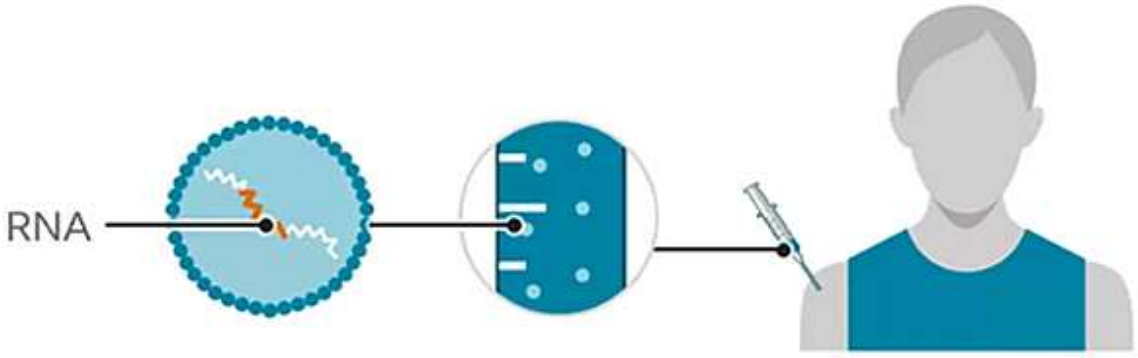
In biology, however, nothing is simple. Early attempts to produce mRNA vaccines created a hostile response to the injected RNA. Cells that took it up recognised the molecule as foreign, and invited the immune system to kill them on the assumption that they had become infected.

Dr. Karikó and Dr. Weissman realised that there must be some significant chemical difference between the artificially created RNA and the natural human sort.

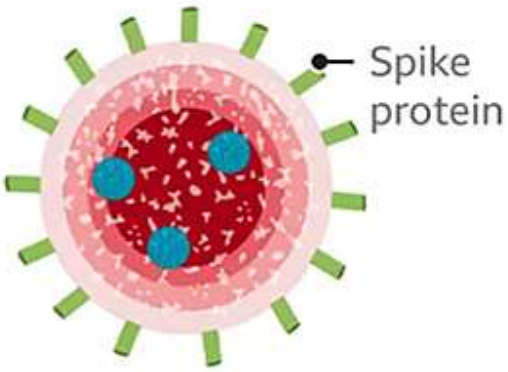
Experiments revealed it to be in the exact chemistry of the letter known as u. Tweak that to look like the human version of u and the problem goes away.

Technical Details – How an mRNA vaccine works

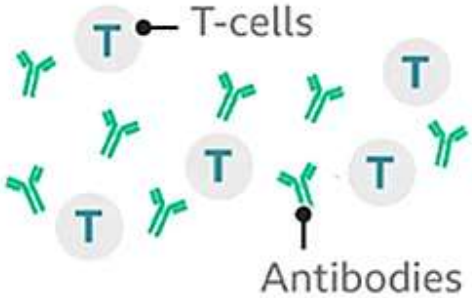
1 Scientists take part of the virus's genetic code and turn it into a vaccine that is injected into the patient

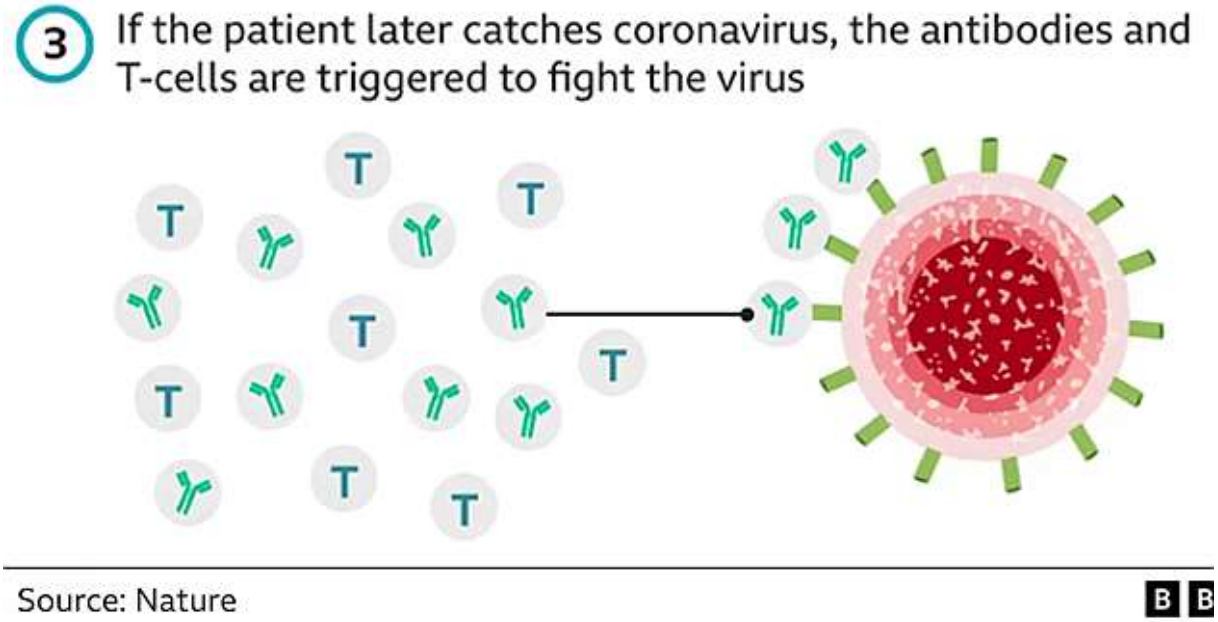


2 The vaccine enters the cells and tells them to produce the coronavirus spike protein

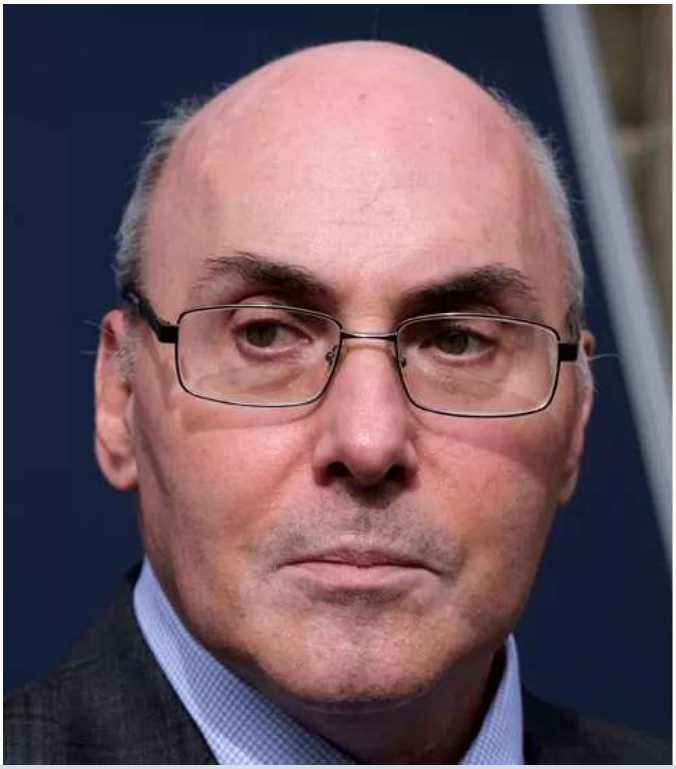


The body's immune system reacts, produces antibodies and activates T-cells to destroy cells with the spike protein





About the Winners



Professors Drew Weissman (left) and Katalin Kariko

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The groundbreaking work was done in **2005 by Dr Karikó and Dr Weissman** at the University of Pennsylvania, and it almost didn't happen at all. The magazine – Nature - rejected the paper in which the pair wrote up their discovery, and they had to fight hard to persuade the journal (Immunity) in which it eventually appeared,

Before this, Dr. Karikó had been demoted by the University of Pennsylvania for insisting on carrying on with her mRNA work when her superiors thought it was leading nowhere.

Even after publication, interest was slow to develop. But develop it did, so that by early 2020, when Covid struck, two firms—BioNTech, at which Dr Karikó was once a senior vice-president, and Moderna—were already working on mRNA vaccines.

They were able to switch their attention and develop versions effective against the newly discovered coronavirus. They did this by causing the mRNA involved to encode part of one of the virus's proteins, called "spike". Billions of jabs and millions of lives later, Dr Karikó and Dr Weissman have become heroes.

Katalin Kariko is now a professor at Szeged University in Hungary and
Drew Weissman is still working as a professor at the University of Pennsylvania.

Prize amount:

10 million Swedish kronor, to be shared equally between the Laureates.

The Nobel Assembly, consisting of 50 professors at Karolinska Institutet, awards the Nobel Prize in Physiology or Medicine. Its Nobel Committee evaluates the nominations. Since 1901 the Nobel Prize has been awarded to scientists who have made the most important discoveries for the benefit of humankind.

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Previous Nobel winners

- 2022 - **Svante Paabo** for his work on human evolution.
- 2021 - **David Julius and Ardem Patapoutian** for their work on how the body senses touch and temperature.
- 2020 - **Michael Houghton, Harvey Alter and Charles Rice** for the discovery of the virus Hepatitis C.
- 2019 - **Sir Peter Ratcliffe, William Kaelin and Gregg Semenza** for discovering how cells sense and adapt to oxygen levels
- 2018 - **James P Allison and Tasuku Honjo** for discovering how to fight cancer using the body's immune system
- 2017- **Jeffrey Hall, Michael Rosbash and Michael Young** for unravelling how bodies keep a circadian rhythm or body clock
- 2016 - **Yoshinori Ohsumi** for discovering how cells remain healthy by recycling waste

References

Nobel Prize goes to scientists behind mRNA Covid vaccines
BBC NEWS https://www.bbc.com/news/health-66983060

The 2023 Nobel prizes honour work that touched millions of lives
The Economist https://www.economist.com/science-and-technology/2023/10/05/the-2023-nobel-prizes-honour-work-that-touched-millions-of-lives