

IMMUNIZATION & PUBLIC HEALTH

Ahmet SALTIK, MD

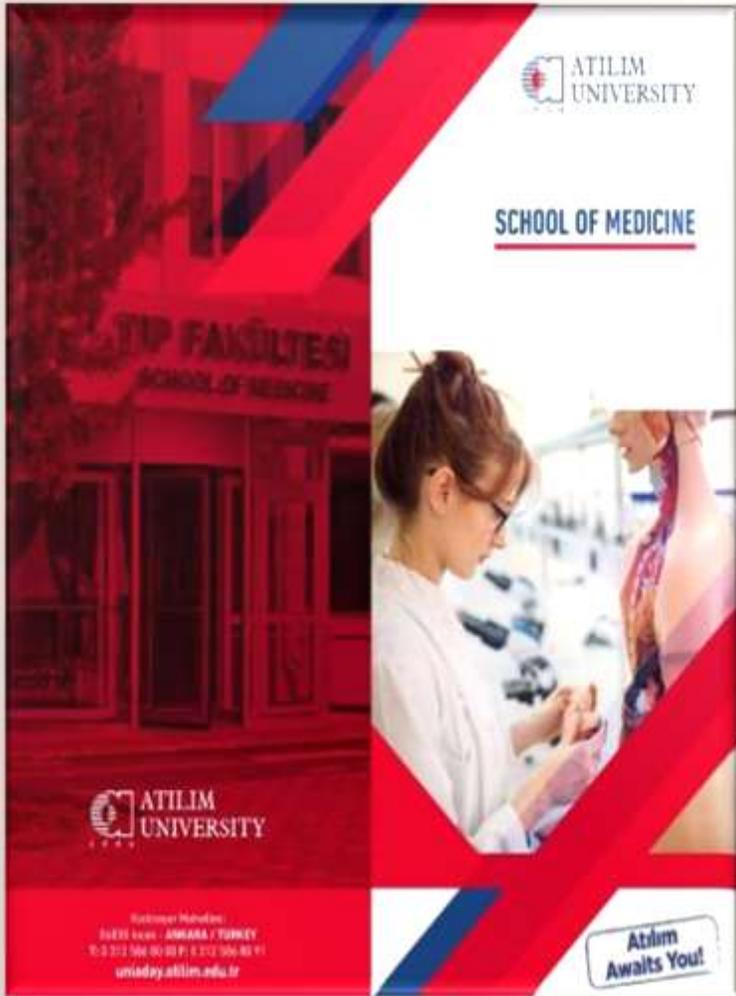
Professor of Public Health

MSc, in Health Law

BSc, in Public Administration & Political Sciences



"...public health promotes and protects the health of people and the communities where they live, learn, work, and play."



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- ✓ **Vaccination** is one of the best ways to prevent diseases.
- ✓ *In total, vaccines are estimated to save between 2 and 3 million lives every year.*
- ✓ Together with governments, vaccine manufacturers, scientists and medical experts, WHO's vaccine safety programme is constantly helping monitor the safety of vaccines.
- ✓ *This helps ensure that vaccines are safe for you and your family.*



What is vaccination?

- Vaccination is a simple, safe, and effective way of protecting people against harmful diseases, before they come into contact with them. It uses your body's natural defenses to build resistance to specific infections and makes your immune system stronger.
- *Vaccines train your immune system to create antibodies, just as it does when it's exposed to a disease.*
- However, because vaccines contain only killed or weakened forms of germs like viruses or bacteria, they do not cause the disease or put you at risk of its complications.
- *Most vaccines are given by an injection, but some are given orally (by mouth) or sprayed into the nose.*

Why is vaccination important?

- ❖ **Vaccination** is a safe and effective way to prevent disease and save lives – now more than ever.
- ❖ *Today there are vaccines available to protect against at least 20 diseases, such as diphtheria, tetanus, pertussis (whooping cough), influenza and measles.*
- ❖ Together, these vaccines save the lives of up to 3 million people every year.
- ❖ *When we get vaccinated, we aren't just protecting ourselves, but also those around us.*
- ❖ Some people, like those who are seriously ill, are advised not to get certain vaccines – so they depend on the rest of us to **get vaccinated and help reduce the spread of disease.**

Why is vaccination important?

- During the **COVID-19 pandemic**, vaccination continues to be critically important.
- *The pandemic has caused a decline in the number of children receiving routine immunizations, which could lead to an increase in illness and death from preventable diseases.*
- WHO has urged countries to ensure that essential immunization and health services continue, despite the challenges posed by COVID-19.
- *More information about the importance of vaccines is available [here](#).*

How does a vaccine work?

- ✓ Vaccines reduce risks of getting a disease by working with your body's natural defenses to build protection.
- ✓ *When you get a vaccine, your immune system responds.*
- ✓ It: Recognizes the invading germ, such as the virus or bacteria.
- ✓ *Produces antibodies. Antibodies are proteins produced naturally by the immune system to fight disease.*
- ✓ Remembers the disease and how to fight it.
- ✓ *If you are then exposed to the germ in the future, your immune system can quickly destroy it before you become unwell.*

How does a vaccine work?

- ❖ The vaccine is therefore a safe and clever way to produce an immune response in the body, without causing illness.
- ❖ *Our immune systems are designed to remember.*
- ❖ Once exposed to one or more doses of a vaccine, we typically remain protected against a disease for years, decades or even a lifetime.
- ❖ *This is what makes vaccines so effective.*
- ❖ Rather than treating a disease after it occurs, vaccines prevent us in the first instance from getting sick.

How do vaccines protect individuals and communities?

- ❑ Vaccines work by training and preparing the body's natural defences – the immune system – to recognize and fight off viruses and bacteria.
- ❑ *If the body is exposed to those disease-causing pathogens later, it will be ready to destroy them quickly – which prevents illness.*
- ❑ When a person gets vaccinated against a disease, their risk of infection is also reduced – so they're also far less likely to transmit the disease to others.
- ❑ *As more people in a community get vaccinated, fewer people remain vulnerable, and there is less possibility for passing the pathogen on from person to person.*
- ❑ Lowering the possibility for a pathogen to circulate in the community protects those who cannot be vaccinated due to other serious health conditions from the disease targeted by the vaccine.
- ❑ This is called “**herd immunity**.”

How do vaccines protect individuals and communities?

- “**Herd immunity**” exists when a high percentage of the population is vaccinated, making it difficult for infectious diseases to spread, because there are not many people who can be infected.
- *But herd immunity only works if most people are vaccinated.*
- At the same time, herd immunity does not protect against all vaccine-preventable diseases.
- *For example, tetanus is caught from bacteria in the environment, not from other people, so those who are unimmunized are not protected from the disease even if most of the rest of the community is vaccinated.*

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- ❖ Immunization is a global health and development success story, saving millions of lives every year.
- ❖ *Vaccines reduce risks of getting a disease by working with your body's natural defences to build protection. When you get a vaccine, your immune system responds.*
- ❖ We now have vaccines to prevent more than 20 **life-threatening diseases**, helping people of all ages live longer, healthier lives.
- ❖ *Immunization currently prevents 2-3 million deaths every year from diseases like diphtheria, tetanus, pertussis (whooping cough), influenza and measles.*

Immunization is a key component of primary health care and an indisputable human right.

- ❖ *It's also one of the best health investments money can buy.*

https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1 6.11.10

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- **Vaccines** are also critical to the prevention and control of infectious-disease outbreaks.
- *They underpin global health security and will be a vital tool in the battle against antimicrobial resistance.*
- Yet despite tremendous progress, far too many people around the world – including nearly 20 million infants each year – have insufficient access to vaccines.
- *In some countries, progress has stalled or even reversed, and there is a real risk that complacency will undermine past achievements.*
- **Global vaccination coverage** – the proportion of the world's children who receive recommended vaccines – has remained the same over the past few years.

https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1 6.11.10

Preventing epidemics and pandemics

- ❑ The number of high-threat infectious hazards continues to rise; some of these are re-emerging and others are new.
- ❑ *While outbreaks of vaccine-preventable infectious diseases, such as meningococcal disease, yellow fever and cholera, can have disastrous effects in areas with limited health infrastructure and resources, and where timely detection and response is difficult.*
- ❑ WHO develops global strategies for the prevention and control of epidemic-prone diseases, such as yellow fever, cholera and influenza.

With partners from a wide range of technical, scientific and social fields, WHO brings together all globally available resources to counter these high-threat infectious hazards and scale these strategies to regional and country levels.

https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1 6.11.10

Preventing epidemics and pandemics

✓ Flagship global strategies include:

- *the Eliminate Yellow Fever Epidemics strategy 2017- 2026;*
- **Ending Cholera: a Global Roadmap to 2030;**
- *the Pandemic Influenza Preparedness (PIP) Framework; and*
- **the Global Strategy for Influenza 2018-2030.**

WHO is also the secretariat for the governance of global emergency stockpiles, including the International Coordinating Group on Vaccine Provision, which manages and coordinates the provision of emergency vaccine supplies and antibiotics to countries during major outbreaks.

https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1 6.11.10

COVAX

CEPI



unicef



Immunization currently prevents

2-3 million deaths every year from diseases like diphtheria, tetanus, pertussis, influenza and measles..

There are now vaccines to prevent more than 20 *life-threatening diseases*, and work is ongoing at unprecedented speed to also make COVID-19 a vaccine-preventable disease.

When a safe and effective vaccine is found, COVAX (led by WHO, GAVI and CEPI) will facilitate the equitable access and distribution of these vaccines to protect people in all countries. *People most at risk will be prioritized.*



- **Vaccines** save millions of lives each year. Vaccines work by training and preparing the body's natural defenses -***the immune system***- to recognize and fight off the viruses and bacteria they target.
- *If the body is exposed to those disease-causing germs later, the body is immediately ready to destroy them, preventing illness.*

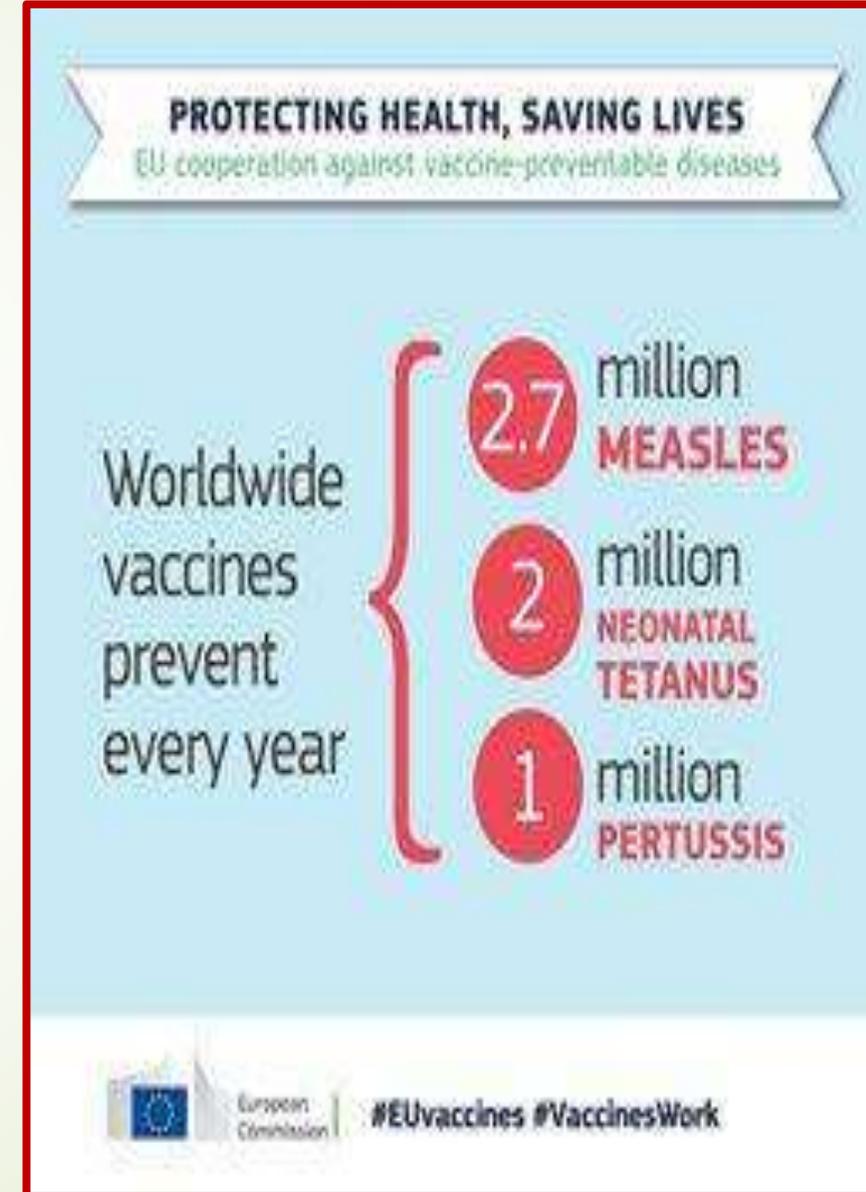
<https://youtu.be/ieZ1XnEgLbA> 21st May 2021



What is Vaccination Coverage and Why is it Important?

16

Vaccination coverage is the estimated percentage of people who have received specific vaccines. Health departments all over the US monitor vaccination coverage to understand how well communities are protected from *vaccine-preventable diseases*. Vaccination coverage information is used to identify areas and groups with lower vaccination coverage so public health departments, health care partners, and schools can take action to help improve vaccination coverage and **protect everyone from vaccine-preventable diseases**.



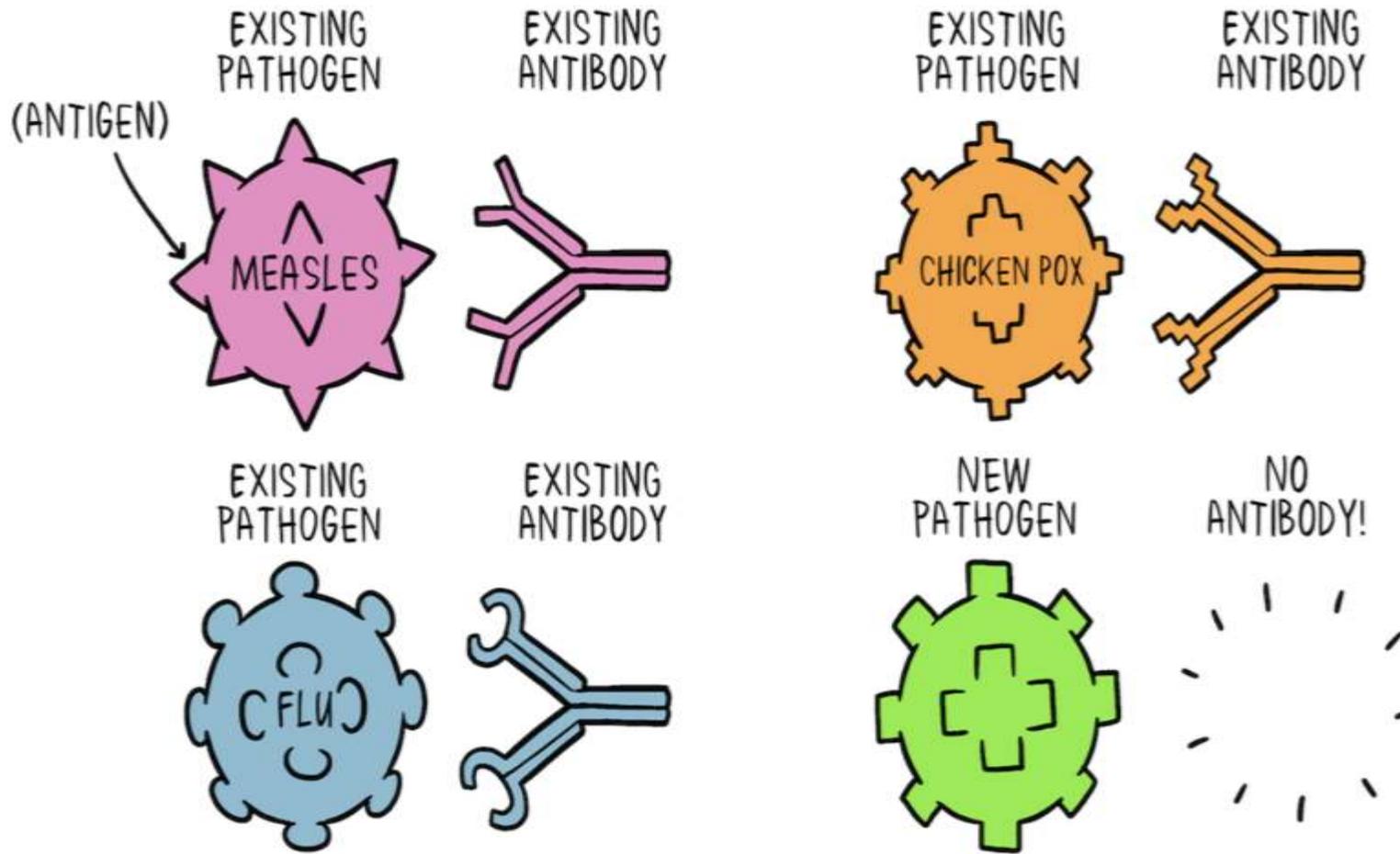
In the early 1900s, **polio** was a worldwide disease, paralysing hundreds of thousands of people every year.

By 1950, two effective vaccines against the disease had been developed. But vaccination in some parts of the world was still not common enough to stop the spread of polio, particularly in Africa.

In the 1980s, a united worldwide effort to eradicate polio from the planet began. Over many years and several decades, **polio vaccination**, using routine immunization visits and **mass vaccination** campaigns, has taken place in all continents.

Millions of people, mostly children, have been vaccinated and in August 2020, the African continent was certified polio free, joining all other parts of the world except Pakistan and Afghanistan, where polio has not yet been eradicated.



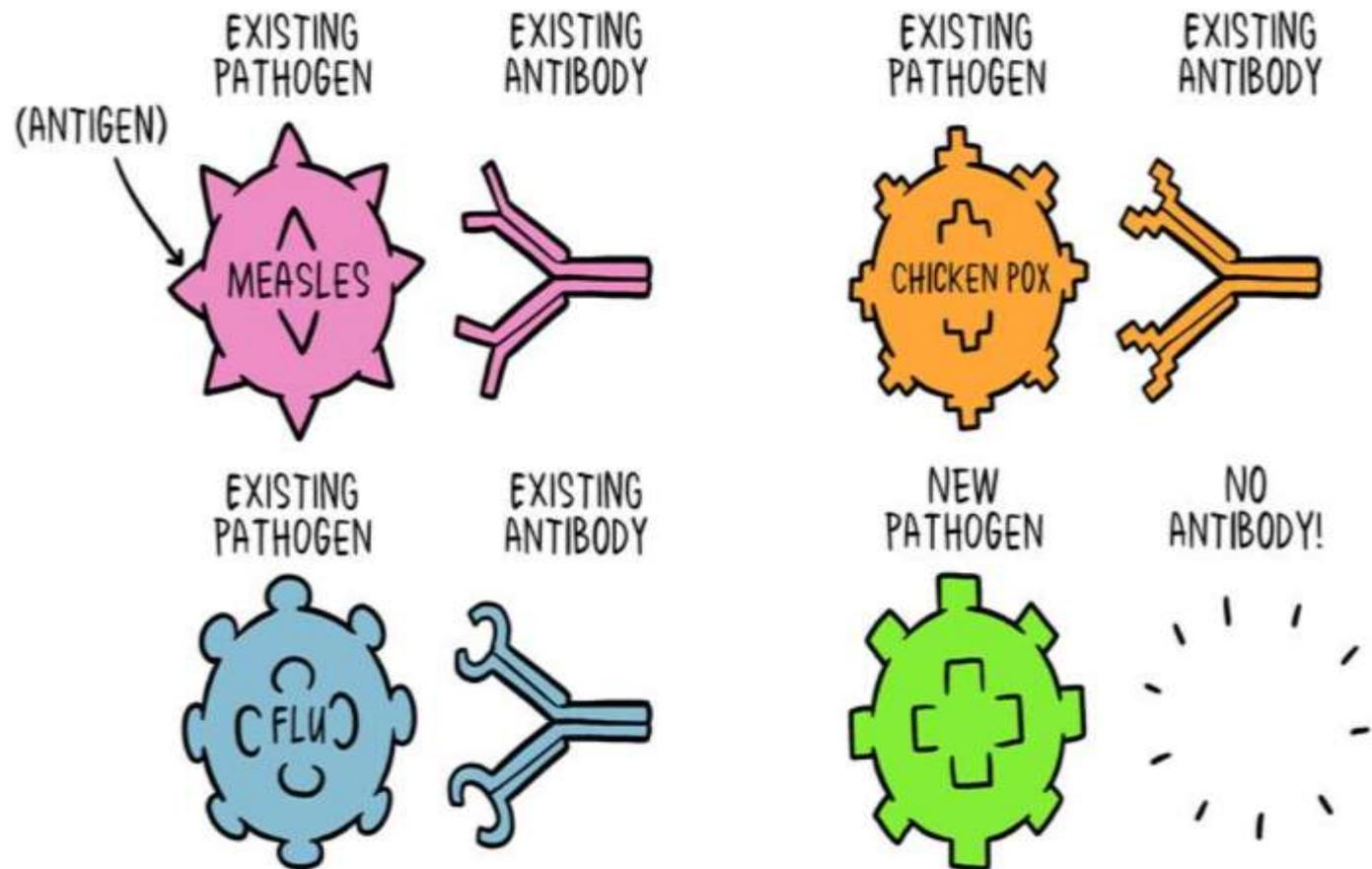


How do vaccines work?

Germs are all around us, both in our environment and in our bodies. When a person is susceptible and they encounter a harmful organism, it can lead to disease and death.

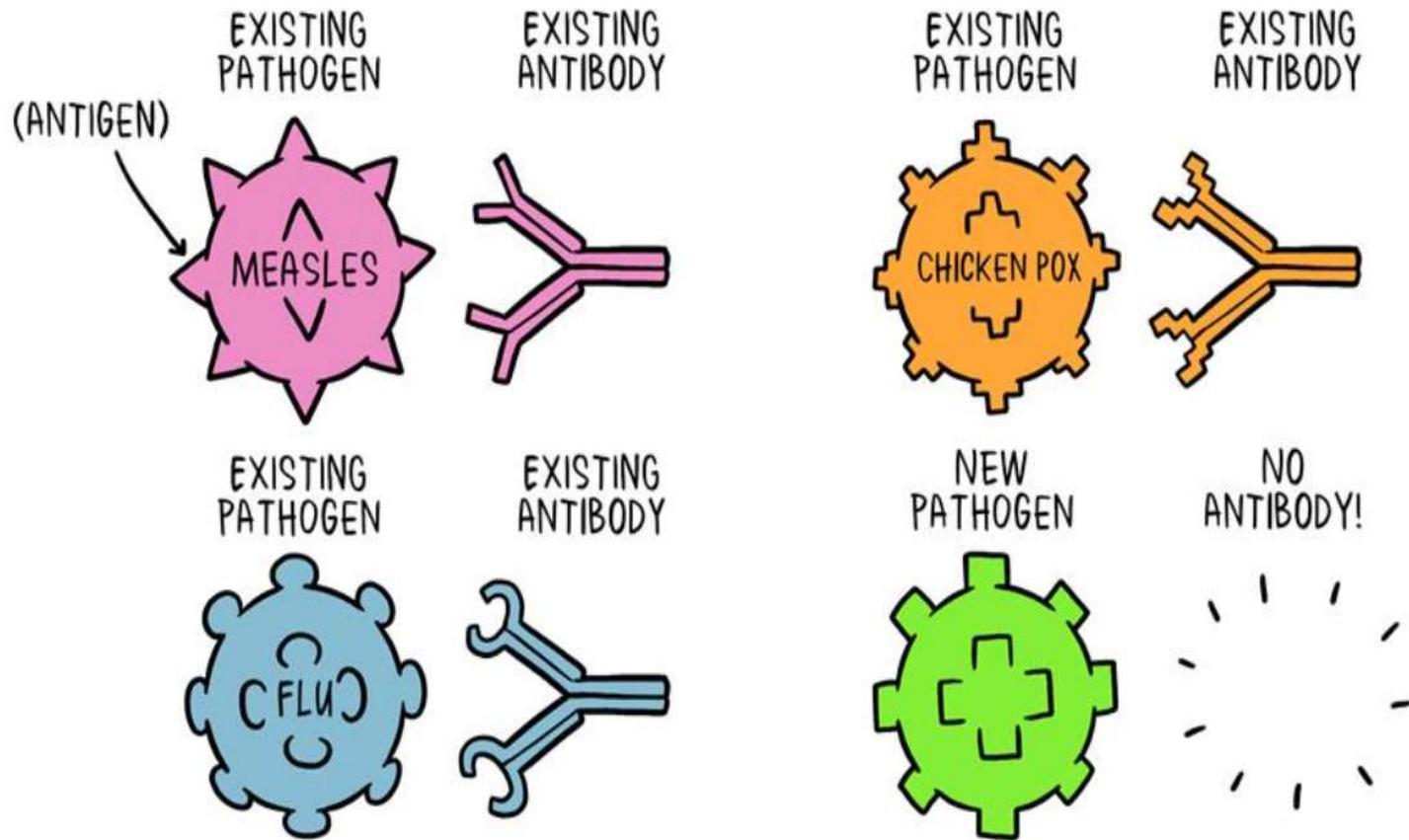
The body has many ways of defending itself against pathogens (disease-causing organisms). Skin, mucus, and cilia (microscopic hairs that move debris away from the lungs) all work as physical barriers to prevent pathogens from entering the body in the first place.

When a pathogen does infect the body, our body's defences, called the immune system, are triggered and the pathogen is attacked and destroyed or overcome.



When a new pathogen or disease enters our body, it introduces a new antigen. For every new antigen, our body needs to build a specific antibody that can grab onto the antigen and defeat the pathogen.

Once the antigen-specific antibodies are produced, they work with the rest of the immune system to destroy the pathogen and stop the disease. *Antibodies to one pathogen generally don't protect against another pathogen except when two pathogens are very similar to each other, like cousins.* Once the body produces antibodies in its primary response to an antigen, it also creates antibody-producing memory cells, which remain alive even after the pathogen is defeated by the antibodies.

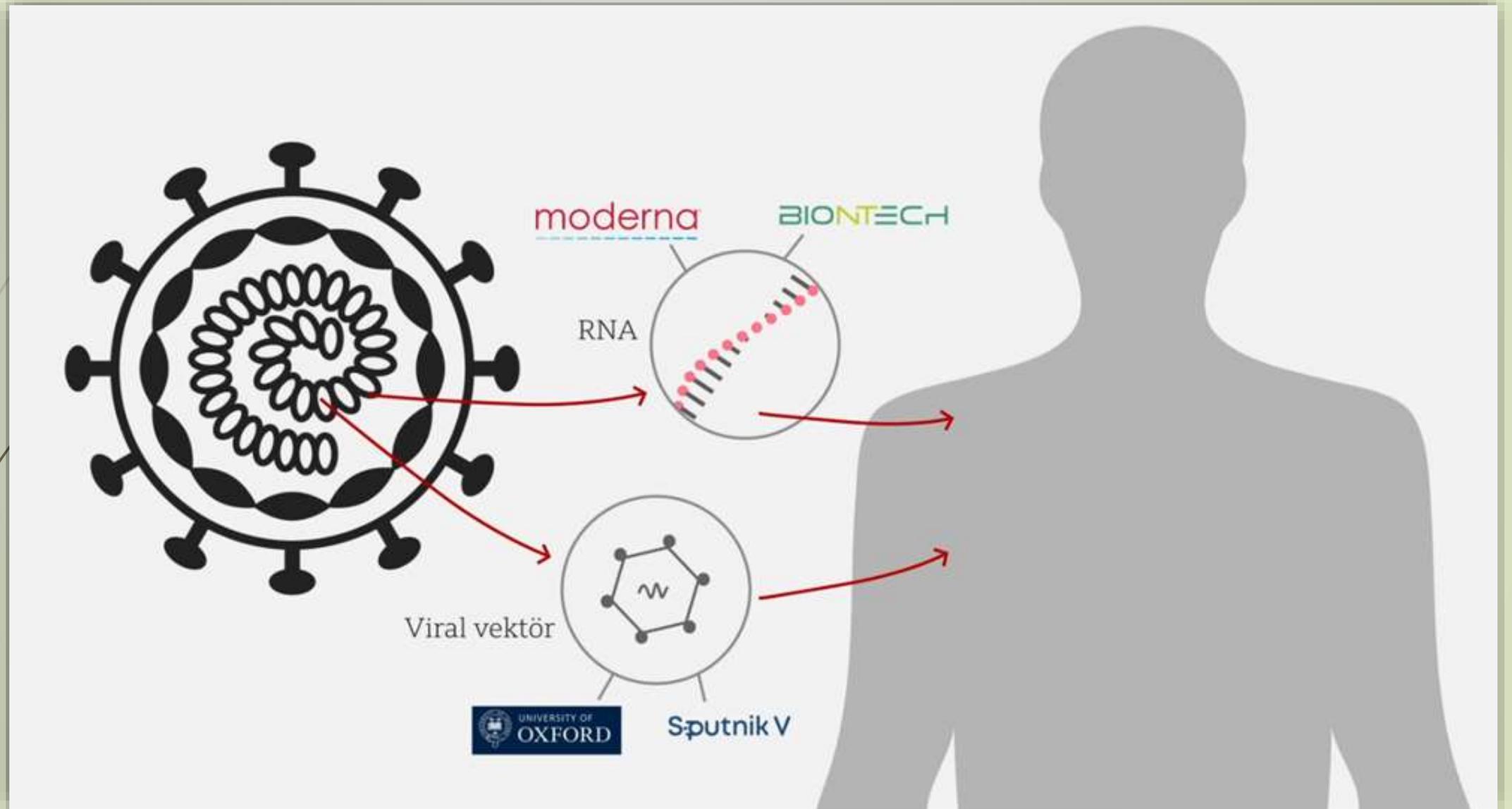


When a new pathogen or disease enters our body, it introduces a new antigen. For every new antigen, our body needs to build a specific antibody that can grab onto the antigen and defeat the pathogen.

If the body is exposed to the same pathogen more than once, the antibody response is much faster and more effective than the first time around because the *memory cells* are at the ready to pump out antibodies against that antigen. This means that if the person is exposed to the dangerous pathogen in the future, their *immune system* will be able to respond immediately, protecting against disease.

mRNA and Viral Vector vaccines

21

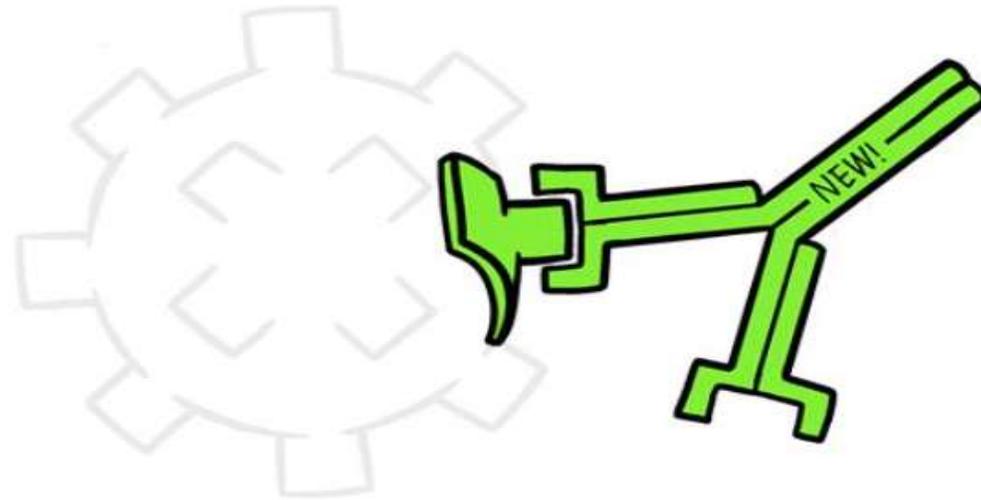


How vaccines help

Vaccines contain weakened or inactive parts of a particular organism (antigen) that triggers an immune response within the body. Newer vaccines contain the blueprint for producing antigens rather than the antigen itself. Regardless of whether the vaccine is made up of the antigen itself or the blueprint so that the body will produce the antigen, this weakened version will not cause the disease in the person receiving the vaccine, but it will prompt their immune system to respond much as it would have on its first reaction to the actual pathogen.

VACCINE

NEW ANTIBODY



A VACCINE is a tiny weakened non-dangerous fragment of the organism and includes parts of the antigen. It's enough that our body can learn to build the specific antibody. Then if the body encounters the real antigen later, as part of the real organism, it already knows how to defeat it.

Some vaccines require multiple doses, given weeks or months apart. This is sometimes needed to allow for the production of long-lived antibodies and development of memory cells. In this way, the body is trained to fight the specific disease-causing organism, building up memory of the pathogen so as to rapidly fight it if and when exposed in the future.

Communal (Herd) immunity

23

When someone is vaccinated, they are very likely to be protected against the targeted disease. But not everyone can be vaccinated.

People with underlying health conditions that weaken their immune systems (such as cancer or HIV) or who have severe allergies to some vaccine components may not be able to get vaccinated with certain vaccines.

These people can still be protected if they live in and amongst others who are vaccinated. When a lot of people in a community are vaccinated the pathogen has a hard time circulating because most of the people it encounters are immune. *So the more that others are vaccinated, the less likely people who are unable to be protected by vaccines are at risk of even being exposed to the harmful pathogens.*

Communal (Herd) immunity

24

This is called *communal (herd) immunity*.

This is especially important for those people who not only can't be vaccinated but may be more susceptible to the diseases we vaccinate against.

No single vaccine provides 100% protection, and communal (*herd*) immunity does not provide full protection to those who cannot safely be vaccinated.

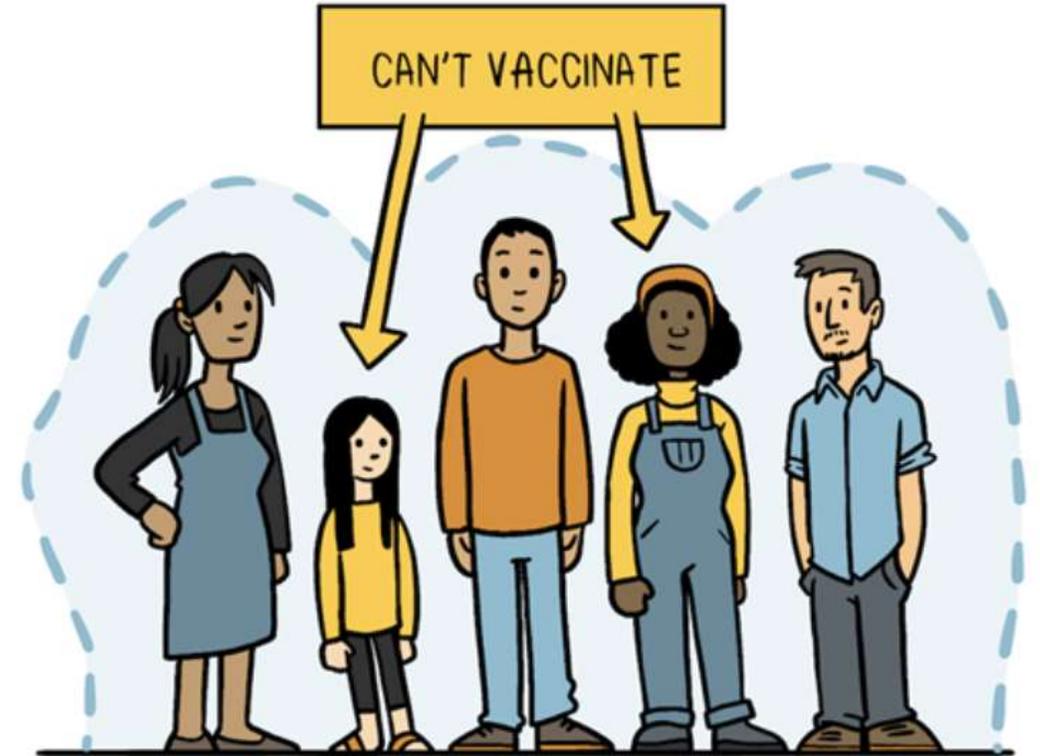
But with communal (*herd*) immunity, these people will have substantial protection, thanks to those around them being vaccinated.

❖ ***Vaccinating not only protects yourself, but also protects those in the community who are unable to be vaccinated. If you are able to, get vaccinated.***



A vaccine protects an individual...

Throughout history, humans have successfully developed vaccines for a number of **life-threatening diseases**, including meningitis, tetanus, measles and polio.

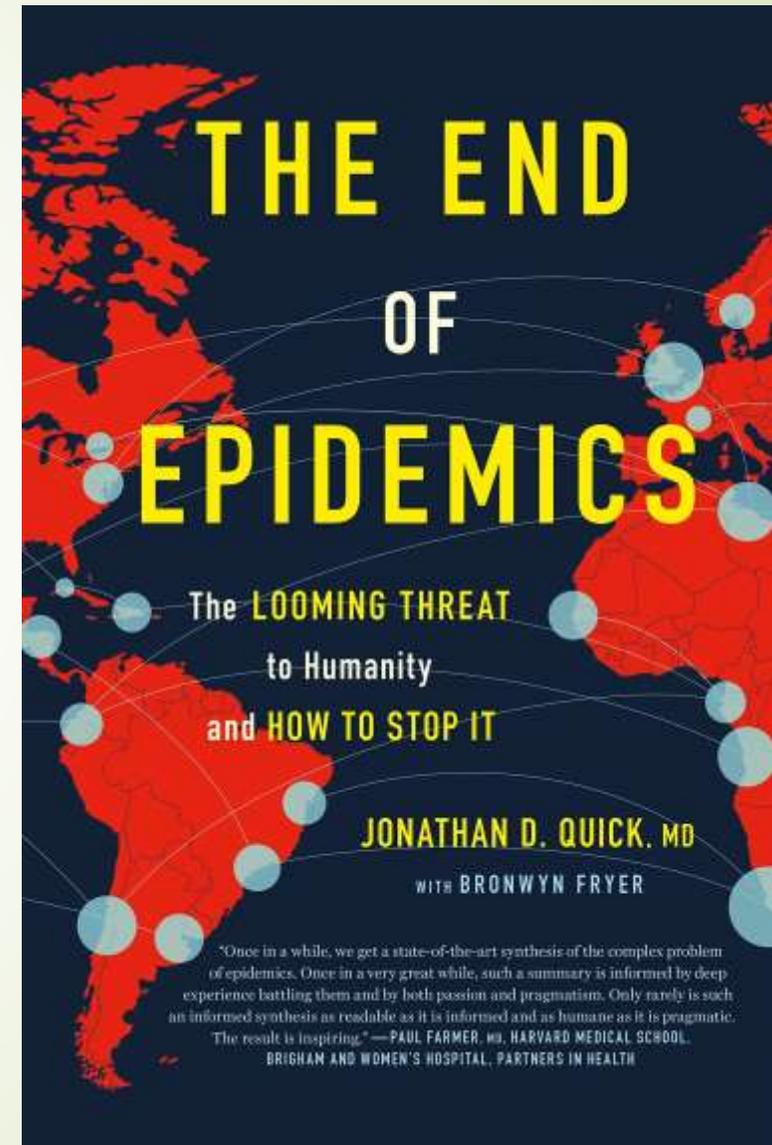


When a community is vaccinated, everyone is protected, even those who can't be vaccinated due to underlying health conditions.

<https://youtu.be/SkSdFzjNPs?t=4>



- ❖ *The fastest way to end the pandemic is to ensure that people in all countries have access to safe and effective vaccines as soon they are available.*
- ❖ *Ensuring global access to a vaccine is the only way to tame the pandemic, says Seth Berkley, chief executive, **GAVI, the Vaccine Alliance***



How are vaccines tested?

27

Once a promising vaccine is identified, it will firstly undergo scrupulous laboratory testing. This includes careful examination and testing of the vaccine and its ingredients. These tests evaluate the safety of the vaccine, and how well it prevents a disease.

If positive results are achieved in the lab, a manufacturer can then apply to do clinical trials. These trials typically involve several thousand healthy volunteers participants on a voluntary basis, whose safety is ensured by national regulatory authorities, and last for many years. The trials are bound by strict regulations and take place across three main phases:

- During **Phase I**, small groups (approximately 20-50 people) receive the vaccine. This phase will assess the safety, side effects, appropriate dosage, method of administration and composition of the vaccine.

How are vaccines tested?

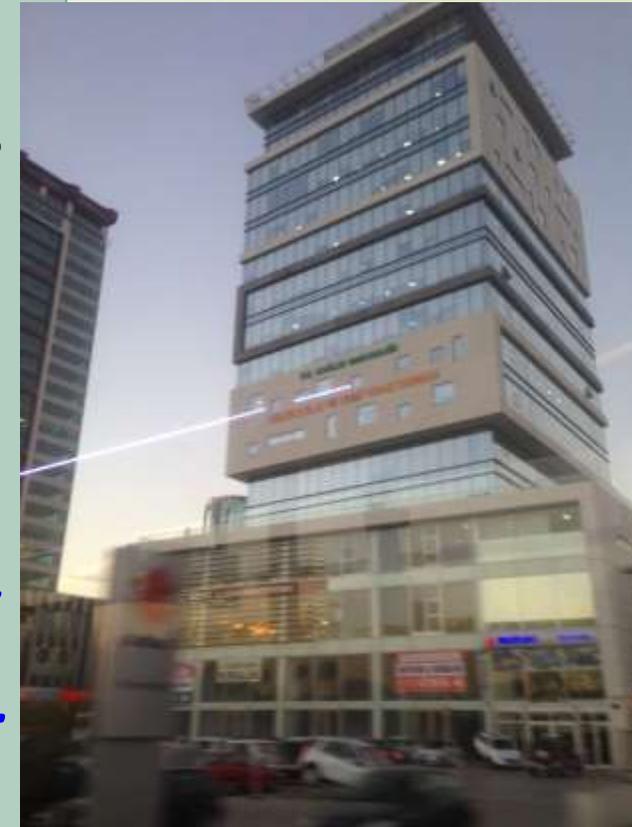
- If it is successful, it will proceed to Phase II. At this stage, the vaccine is usually given to several hundred people. This group will have the same characteristics (e.g. age, sex) as the people for whom the vaccine is intended to be given.
- *In Phase III, the vaccine is usually given to thousands of people to help ensure it is safe and effective for broader use.*
- The results of all these studies will be assessed when regulators decide whether to approve a vaccine.
- *Studies may also take place after a vaccine is introduced. They enable scientists to monitor efficacy and safety among an even larger number of people, over a longer timeframe.*

Who approves a vaccine?

29

In countries where vaccines are manufactured, national or regional regulators oversee a vaccine's development. This includes approving clinical trials, evaluating their results, and taking decisions on licensing. In deciding, regulators must refer to very strict international standards on acceptable **ethical** clinical practice.

Once a vaccine has been developed, national regulators decide whether to introduce a vaccine in their countries. WHO provides information to support this process, through comprehensive evaluation of the available evidence, and its regularly updated position papers on vaccines.



TURKISH MEDICINES
AND MEDICAL DEVICE
AGENCY

How is vaccine safety monitored?

30

As with all medicines, the safety of a vaccine must be continuously monitored, even after trials and vaccine introduction.

This monitoring considers reports from several sources.

Nationally, these include the people who get vaccines, parents or caregivers, and health workers.

These reports are then submitted to national health authorities.

At a regional and global level, WHO and UNICEF support countries in collecting and monitoring this information, and ensuring countries have the most up to date evidence on available vaccines.

How does WHO help ensure vaccine safety?

31

- WHO works to make sure that everyone, everywhere is protected by safe and effective vaccines.
- *To do this, we help countries set up rigorous safety systems for vaccines -alongside other medicines- and work to develop the strictest standards for their regulation.*
- Together with external scientists, WHO experts are continuously monitoring and updating the safety profile of more than 20 vaccines.
- *With external partners, it also helps countries investigate and communicate if potential issues of concern arise.*
- Events that are reported to WHO are evaluated by an independent group of experts (the Global Advisory Committee on Vaccine Safety, or GACVS). On behalf of this committee, WHO issues regular statements on vaccine safety. *For more information on how vaccines work, see our [Q&A on vaccines](#).*

How do we know that a vaccine is safe?

32

The most commonly used vaccines we have today have been in use for decades, with millions of people receiving them safely every year.

In addition, there are several new vaccines under development. If approved, these will help prevent more life-threatening diseases – such as COVID-19, Zika or Nipah viruses - or improve the effectiveness of existing vaccines.

As with all medicines, every vaccine needs to go through extensive and rigorous testing before it can be introduced in a country. Once they are in use, they must be continuously monitored to make sure they are safe for the people who receive them.

<https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-vaccine-safety> 06.12.20

What happens if a problem is suspected with a vaccine?

33

- If a potential problem is reported following vaccination, a thorough investigation will take place.
- Investigations involve a thorough examination of the case in question, including medical assessment.*
- If necessary, detailed studies are conducted.
- During these investigations, it is extremely rare that health problems are found to be caused by the vaccine itself.*
- Health events are most often found to be co-incidental, i.e. entirely unrelated to vaccination.

<https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-vaccine-safety> 06.12.20

What happens if a problem is suspected with a vaccine?

34

- ❖ Sometimes, they are related to how the vaccine has been stored, transported or administered (*for instance, where errors are made in preparing the vaccine; cold chain injection technique; IM, IC/ID, intra-fat..*).
- ❖ *Such errors can be prevented by training health workers and, strengthening vaccination programmes.*
- ❖ In the rare cases where a genuine adverse reaction is suspected, the vaccine may be suspended from use.
- ❖ *Further investigations will take place to determine what exactly caused the event, and corrective measures put in place.*

<https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-vaccine-safety> 06.12.20

Are there side effects from vaccines?

35

- Vaccines are very safe.*
- As with all medicines, side effects can occur after getting a vaccine. However, these are usually very minor and of short duration, such as a sore arm or a mild fever. More serious side effects are possible, but extremely rare.
- A person is far more likely to be seriously harmed by a disease than by a vaccine.*
- Vaccine-preventable diseases like measles, meningitis or polio can be deadly, or cause severe illness and disability.*
- Possible complications of these diseases can include:
 - Blindness**
 - Deafness**
 - Paralysis**
 - Brain damage**
 - Infertility**
 - Cancer**
 - Birth defects**
 - Death...**

<https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-vaccine-safety> 06.12.20

To bring *COVID-19 pandemic* to an end...

36

- ✓ To bring **COVID-19 pandemic** to an end, a large share of the world needs to be immune to the virus. The safest way to achieve this is with a vaccine.
- ✓ *Vaccines are a technology that humanity has often relied on in the past to bring down the death toll of infectious diseases.*
- ✓ Within less than 12 months after the beginning of the COVID-19 pandemic, several research teams rose to the challenge and developed vaccines that protect from SARS-CoV-2, the virus that causes COVID-19.
- ✓ *Now the challenge is to make these vaccines available to people around the world.*
- ✓ It will be key that people in all countries -*not just in rich countries*- receive the required protection.
- ✓ *To track this effort we at Our World in Data are building the international COVID-19 vaccination dataset that we make available on this page.*
- ✓ It is updated each morning, with the most recent official numbers up to the previous day.
<https://ourworldindata.org/covid-vaccinations> 16.5.21

Who will be offered a 3rd vaccine?

37

- ❖ People whose earlier vaccine protection may have worn off are likely to be prioritised. Currently, ***it's not certain how long COVID-19 vaccine protection lasts***, though studies suggest at least six months.
- ❖ However, **vaccine protection varies** by individual and naturally wanes over time. For some people, this waning happens more rapidly, for reasons such as old age, the effect of some chronic illness, or taking treatments that may suppress the immune system.
- ❖ Consequently, a **booster dose** is likely to be needed for people in these high-risk groups to make sure good immune protection is maintained. Indeed, the UK's Department of Health and Social Care has said that boosters will be distributed based on clinical need.

UK vaccine booster Q&A: what will be given and when, explained by public health expert 19.05.2021

Will the booster be an updated formula?

38

- ❑ However, a major concern is that a new ***variant emerges*** that can evade the immunity provided by existing vaccines – what’s known as “***vaccine escape***”.
- ❑ Should an escape variant emerge, one strategy may be to boost people with the existing vaccine that has the best efficacy against it.
- ❑ For example, the B1351 variant identified in South Africa appears to have some escape potential, as the Oxford / AstraZeneca vaccine is less effective at preventing mild to moderate **COVID-19** when facing it.

UK vaccine booster Q&A: what will be given and when, explained by public health expert 19.05.2021

Will the booster be an updated formula?

39

- ❑ However, early research -some of which still needs to be reviewed by other scientists- suggests the **Pfizer/BioNTech vaccine** isn't so severely affected.
- ❑ If none of the existing vaccines are sufficiently effective, then **updated vaccines** may be needed. However, they will take time to alter and mass produce.
- ❑ In the meantime, we **need to closely monitor** and study both the **emergence of new variants as well as the effectiveness of existing vaccines** against them.



[UK vaccine booster Q&A: what will be given and when, explained by public health expert](#) 19.05.2021

Immunity or Protection From COVID-19, Including After Vaccination

“**The FDA** is reminding the public of the limitations of COVID-19 antibody, or serology, testing and providing additional recommendations about the use of antibody tests in people who received a COVID-19 vaccination.

*Antibody tests can play an important role in identifying individuals who may have been exposed to the SARS-CoV-2 virus and may have developed an adaptive immune response. However, antibody tests should not be used at this time to determine immunity or protection against COVID-19 at any time, and especially after a person has received a **COVID-19 vaccination**.*

The FDA will continue to monitor the use of authorized SARS-CoV-2 antibody tests for purposes other than identifying people with an adaptive immune response to SARS-CoV-2 from a recent or prior infection.”

[FDA In Brief: FDA Advises Against Use of SARS-CoV-2 Antibody Test Results to Evaluate Immunity or Protection From COVID-19, Including After Vaccination | FDA](#) 23.05.2021

Dr. Jonas Salk, who owned the patent to the polio vaccine?
Salk replied :

❖ *“Well, the people. There is no patent.
Could you patent the sun?”*



Pfizer, Moderna and AstraZeneca have all started work on updated boosters to better handle the new variants. Marc

Immunization

- Influenza and pneumonia are among the top 10 causes of death for older adults.
- *Emphasis on Influenza vaccination for seniors has helped.*
- Pneumonia remains one of the most serious infections, especially among women and the very old.