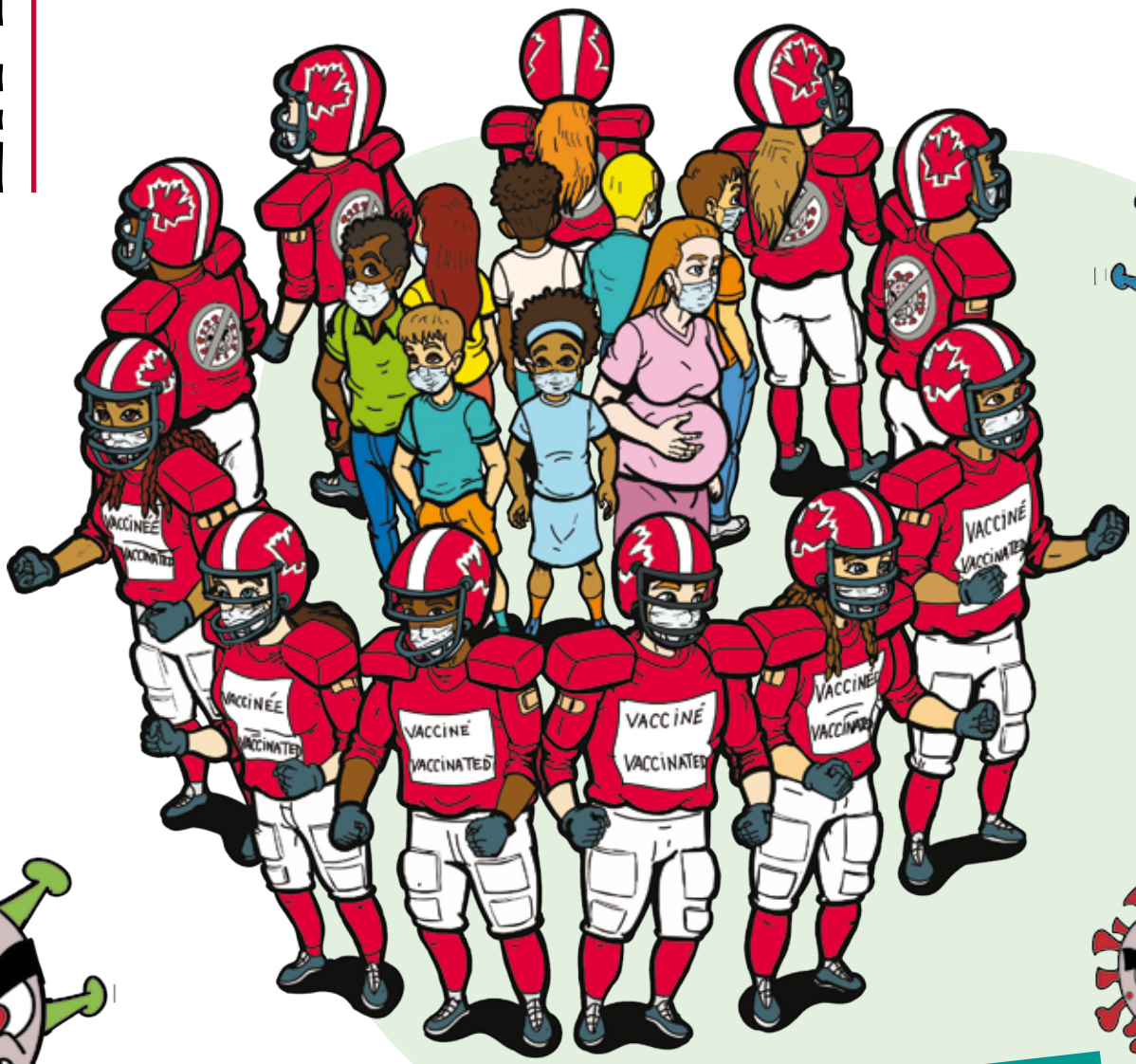
LA LIBERTÉ

SCIENCES Mag JUNIOR

JUNE 2021
VOL. 1 | N° 3



TEAMWORK

AGAINST THE CORONAS!

LA LIBERTÉ | SCIENCES Mag JUNIOR

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Special thanks to Patricia Harper, Daniel Bahuaud, Laure and Danielle Ghia, and Prof. Kevin Coombs for their input.

**The title Professor (Prof.) used in the magazine includes all the different levels of professorship (assistant, associate and full).*

La Liberté Sciences Mag Junior was made possible with the support of :

Agence de la santé publique du Canada | Public Health Agency of Canada

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LA LIBERTÉ
Depuis 1913

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Magazine unit cost:
$4.50 + Taxes
Annual subscription to ***La Liberté***:
$65.90 (GST and provincial tax included)
la-liberte.ca

ISSN 0845-0455

POSTAL CONVENTION -PUBLICATIONS N° 40012102 | REGISTRATION 7996

La Liberté and its *Sciences Mag Junior* are products of the publishing company Presse-Ouest ltée.

MESSAGE FROM
THE EDITORIAL TEAM

SOPHIE GAULIN
EXECUTIVE DIRECTOR
AND EDITOR-IN-CHIEF

FANNY DEMEUSY
COORDINATOR OF
THIS ISSUE

Many parents, children, grandparents, and education professionals have expressed interest in having ***La Liberté Sciences Mag Junior*** continue its work of popularizing information about public health issues, especially as they relate to the ongoing health crisis since late 2019. Here is the third issue of the series, titled ***Teamwork Against the Coronas!***

The first two issues, ***No Mercy for the Coronas*** (May 2020) and ***Together Against the Coronas!*** (November 2020), have been downloaded over 200,000 times. They have even been adapted for the Pasteur Institute of Guyana and the Regional Health Agency of Guyana.

Since April 2020, the team at ***La Liberté*** and its collaborators have been working to provide young (and not so young) people with publications that give them the keys to understanding how SARS-CoV-2 lives, evolves and, above all, fights. It is obvious that the more we understand how vaccines and variants work and the importance of herd immunity, the more confident we are in overcoming this health crisis.

With this in mind, ***La Liberté Sciences Mag Junior*** takes you back in time and looks at the history of vaccines. Once again, we have relied on the transmission of scientific knowledge, on the expertise of Canadian researchers and, of course, on the talent of our entire team of artists and writers to address all these concepts in a playful yet rational tone.

In a context where misinformation circulates faster than information and even faster than the virus, our media assumes its important role of quality informant.

As you can see, in the face of this pandemic, we need to be a team! We would like to thank all those who contributed to the third issue of this series: the artists, the writers, the scientists, the graphic designers, the colorists, the editors, and of course the financial partners without whom this publication would simply not be possible!

Let's remain united, patient, attentive and conciliatory. Solidarity and team spirit remain more than ever the indispensable elements in this relentless fight against the virus.

PROF. JEAN-ERIC GHIA
SCIENTIFIC DIRECTOR
OF THIS ISSUE

I would like to thank the health professionals and my scientific colleagues in their fight against the virus in general but also for their collaboration in this magazine. They have helped to bring the scientific essence of this third issue and to provide you with the keys to continue the fight, to understand the evolution of the virus, its repercussions and the functioning of vaccination.

I am honored and proud to be chosen once again as Scientific Director of this third issue of ***Sciences Mag Junior***.

Throughout my career as a professor and researcher, I have always been convinced that knowledge must be shared with as many people as possible, and this transmission is even more important today in the context of a pandemic. It is never easy to understand and popularize scientific information, but ***La Liberté***'s ***Sciences Mag Junior*** series aims to enrich and help young people understand, and it is a logical extension of my daily work to participate in it and ensure the accuracy of the scientific information.

ABDELHAMID SOUISSI
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MARTINE BOUCHARD
PRESIDENT AND CHIEF EXECUTIVE OFFICER
HÔPITAL ST. BONIFACE HOSPITAL

Once again, St. Boniface Hospital has responded to support this science magazine project for young people titled ***Teamwork Against the Coronas!***

Convinced from the outset of the importance of educating the general public on the scientific concepts that motivate the decisions of health authorities and institutions such as ours, we consider our support for such an initiative to be essential.

I am proud that our institution continues to promote such projects, and also delighted to continue this adventure alongside ***La Liberté*** with whom we share common values such as the transmission of knowledge, the quality of information and the accessibility of scientific expertise.

I would like to take this opportunity to salute the work done by all the care staff who are on the front line. Despite their fatigue, they do not give up; they continue to fight and to face up to the challenge. For more than a year, we have all been fighting together in the face of the pandemic and it is also our cohesion on a global scale that has advanced science and access to vaccines.

It will also be our solidarity that will allow a potential exit from the crisis. Getting vaccinated has become an act of citizenship and solidarity. Thanks to this issue, children, parents, grandparents and teachers will be able to understand the history of vaccines, the complexity of variants and especially the importance of collective immunity.

While we wait for a safer stage in this pandemic period, I would like to thank those who will be vaccinated. Our health professionals who work in our institutions deserve this gesture of solidarity and caring.

STÉPHANIE ROY
EXECUTIVE DIRECTOR
CENTRE DE SANTÉ SAINT-BONIFACE

Centre de santé Saint-Boniface is delighted to, once again, contribute to the youth magazine on coronas.

It is an indispensable tool for youth and their families to engage in discussion about the pandemic, an event that will mark an entire generation.

No one could have imagined that we would still be dealing with this pandemic a year later. However, we are starting to see the light at the end of the tunnel or should I say, the vaccine at the end of the line. This year's theme has really been one of flexibility, gratitude and patience.

We are pleased to be one of the primary care clinics in Manitoba offering COVID-19 vaccines to our clients and the community. We continue our efforts to emphasize the importance of vaccination and to encourage people to get vaccinated.

This publication contains concrete facts for young people who are bombarded with false information on the Internet, especially about vaccines and their efficacy.

Our future depends on a well-informed younger generation that is open to science-based discussions. It is our responsibility as health care professionals to make this information available to all.

We hope you enjoy reading the magazine and that it provides a starting point for productive discussions.

ALAIN LABERGE
SUPERINTENDANT
DIVISION SCOLAIRE FRANCO-MANITOBAINE

The Division scolaire franco-manitobaine (DSFM) is very pleased to support this third issue of the magazine ***La Liberté Sciences Mag Junior - Teamwork Against the Coronas!***

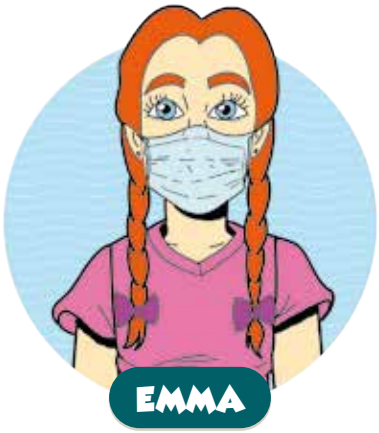
The first two issues have proven to be informative and much appreciated not only by the community, but also by the students and teachers of the DSFM schools, so it was an obvious choice for us to continue our support of the project by supporting the creation and promotion of this publication.

Presented in a creative, engaging and fun way, ***La Liberté Sciences Mag Junior*** magazine easily reaches a wide audience, including those in our 24 school communities. It has become an indispensable resource for education professionals as well as for parents who are looking for the tools to best answer their children's questions.

Moreover, in this context of global health crisis where misinformation can be a source of anxiety for students and their families, this magazine provides relevant and verified information that allows readers to feel better informed on many issues related to vaccination. A balm that soothes the aches and uncertainties that are often the cause of stress; an asset for the students because we know that a child who is well, learns well.

Thank you and congratulations to the entire team at ***La Liberté*** for their professionalism, and especially for supporting the learning process and ensuring the well-being of our students, parents, staff and community.

We wish another great success to the third edition of the *La Liberté Sciences Mag Junior* magazine ***Teamwork Against the Coronas!***



Asha, Emma, Idriss, Juan, Li-Na and Sam have just finished the school year and they still can't go on vacation because of COVID-19.

Only gatherings of less than 10 people are allowed so they decide to organize their summer mini-camp.

On the first day of vacation, they meet at Li-Na's for this camp that promises to be unlike any other!

LI-NA'S BROTHER

LI-NA'S MOTHER

Illustration : Tadens Mpwene

"What if we found a theme for our summer camp? ", proposes Li-Na.

"Hey, look at the cow! Is it yours Li-Na? ", asks Idriss.

"No, it's not mine. It belongs to the farm next door. My mother and I call it Blossom! Come on, let's go see it! ", says Li-Na.

"Blossom? Strange name for a cow!", exclaims Juan.

Illustration : Tadens Mpwene

"Why do you call it Blossom?", asks Asha.

"Actually, my mom came up with that name. She's a virology professor at the university and she tells a story about a famous cow named Blossom to all her students", explains Li-Na.

"What is virology?", questions Sam.

"In short, it's the science of studying viruses", answers Li-Na.

Illustration : Tadens Mpwene

Okay, let me tell you more about Blossom. That way, you'll learn the story of the very first vaccine.

At the end of the 18th century, there was a disease that was taking a very heavy toll. It was called smallpox. It was kind of like chicken pox, except that it was much more serious. Many people died from it. It too caused itchy pimples, but it also caused very high fevers.

In 1796, a British doctor, Edward Jenner, noticed that people who milked cows rarely got smallpox. Instead, they got another disease with pus-filled pimples: it was called vaccinia, also known as "cowpox".

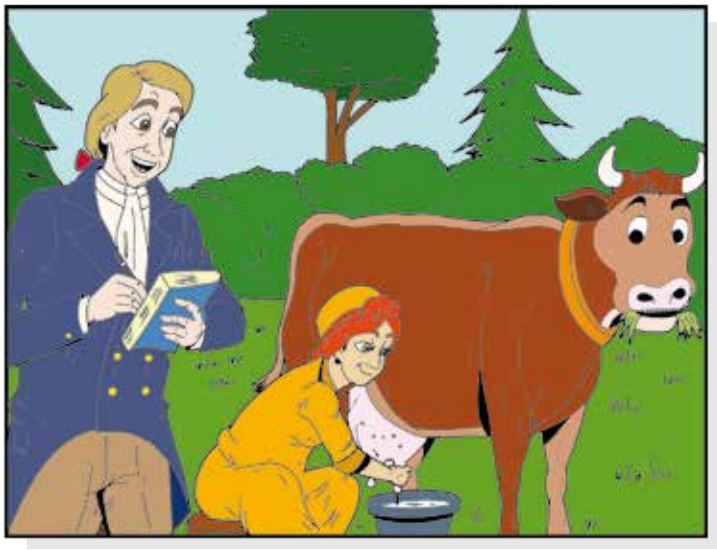


Illustration : Tadens Mpwene and Theresa McAvoy

But fortunately for the milkmaids, vaccinia was less serious than smallpox! So Edward Jenner thought that maybe vaccinia was what protected milkmaids from smallpox!

It sounds obvious, but it's pretty smart, eh?

So, Jenner decided to use the pus from one of the pimples of a milkmaid, Sarah Nelmes, who had caught vaccinia while milking Blossom, her cow. He injected it into a healthy eight-year-old boy, James Phipps. Afterwards, James felt a little "strange", but nothing too serious.

A few weeks later, Edward Jenner injected him with the smallpox that everyone feared... And guess what? The boy didn't even get sick! He was protected against the disease.

Edward Jenner then called his process "vaccine". And so vaccine, the treatment, comes from the word "vaccinia", the cowpox.

So that's how vaccination was invented and now you know why my mom likes to call this cow Blossom!

Vaccinia is a word derived from the Latin "vacca" which means cow.

It is estimated that over the past 38 years the smallpox vaccine has saved more than 180 million lives.

Illustration : Tadens Mpwene

Illustration : Tadens Mpwene

"You were telling your friends the story of Blossom, weren't you?", Chung asks.

"There is also the fascinating story of Louis Pasteur and little Joseph Meister. That's another true story that has saved millions and millions of lives! ", Li-Na's brother reminds them.

Louis Pasteur

(1822 – 1895)

Louis Pasteur was a French scientist. He studied physics and chemistry. His discoveries in microbiology led to great advances in the world of medicine. He spent years identifying the microorganisms that cause diseases and finding ways to counter them.

Pasteur also contributed to other discoveries such as pasteurization. It's a technique that allows food to be preserved for longer periods of time by heating it to a high temperature and then cooling it sharply. This is done in order to kill as many microorganisms as possible and prevent them from multiplying.

He became world famous for his research on the rabies virus and using his pasteurization method to kill the virus, which he tested on animals. He was also the first to test the killed virus on humans.

Microorganisms are tiny living things that can only be observed under a microscope. There are several varieties. For example, bacteria are microorganisms.

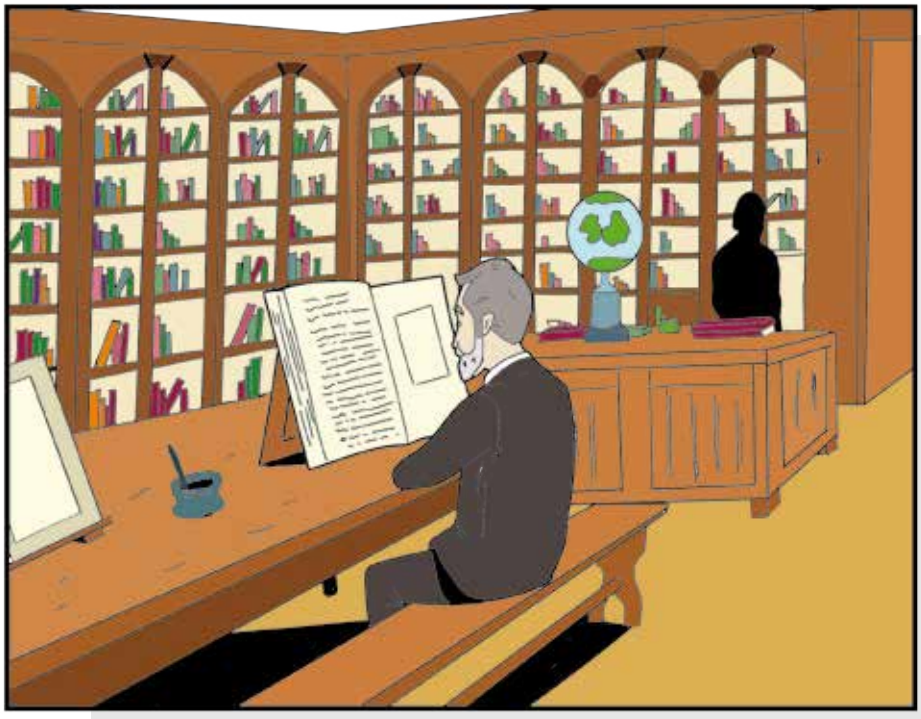
Illustration : Tadens Mpwene

On July 4, 1885, in Alsace, a region of France, little Joseph Meister was headed to a nearby town when he was attacked and bitten several times by a dog that the police said had rabies.

At that time, rabies was fatal and there was no cure.

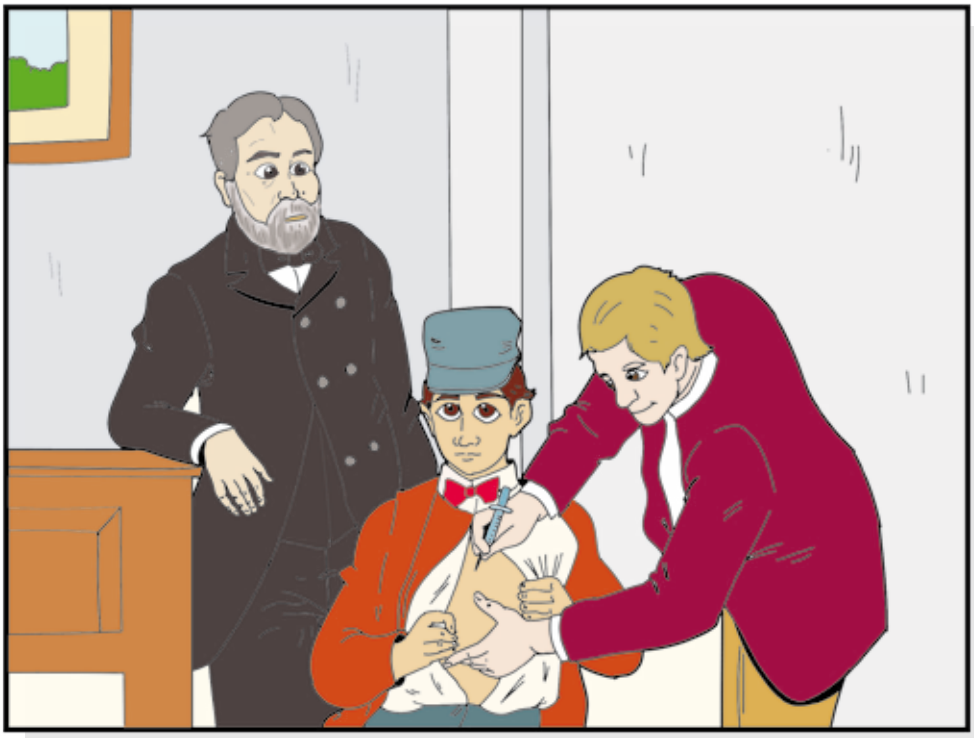
Joseph's mother was worried for her son. She had heard of a chemist in Paris named Louis Pasteur who was vaccinating rabid dogs. So, knowing that her son was doomed to die of rabies, she decided to find this chemist and ask him to cure her little Joseph.

Illustration : Tadens Mpwene



After visiting several hospitals, she finally found Louis Pasteur at the École normale supérieure.

At that time, Louis Pasteur had only tested his vaccine on animals. Inspired by the story of Edward Jenner and little James Phipps, he used this same kind of method on little Joseph!



Over ten days, Joseph received a total of 13 shots of a rabies virus. Each injection was a bit stronger than the last one. That's quite a few shots, but at least Joseph was able to go home because the vaccine had worked.

He was saved!

Illustration : Tadens Mpwene

Thanks to the rabies vaccine this disease has been almost eradicated in North America.

Jenner and Pasteur are really inspiring, but it was still risky for the kids !

"You're right Juan", says Li-Na's big brother. In fact, today, it would no longer be possible. We respect life so much that there is an ethics committee not only for humans but also for animals! Let me contact one of the ethic medical advisor at the university's ethics committee. She will explain it to you."

"Pasteur's and Jenner's experiments were critical to the progress of vaccine science. But today, such experiments would not adhere to the ethical and safety standards of modern studies. At the time, such rules did not yet exist. So it's hard to judge them by today's standards.

Today's vaccine trials, including the new ones for children with Pfizer and Moderna COVID-19 vaccines, use much more modern rules for getting permission from parents or guardians for their children to participate in clinical trials, and ensure that the children themselves also agree to participate.

The current trials are ethical and safe and can provide us with much needed data to support the vaccine rollout for children."

Illustration : Tadens Mpwene and Theresa McAvoy

PROF. AVIVA GOLDBERG
Ethics Medical Advisor
Dept. of Pediatrics
and Child Health

Rady Faculty of Health Sciences
University of Manitoba

"Well, I think we've found the theme for our mini-camp. Why not talk about science? It's so exciting!

Illustration : Tadens Mpwene

We could even start a club!", exclaims Emma.

"We could call it "The Science Fans Club!" Our mission: to understand everything about vaccines!

Besides, we've already learned a lot about the immune system from Ms. Laura in class, so we should have a solid foundation on which to build our mini-camp for science detectives! "

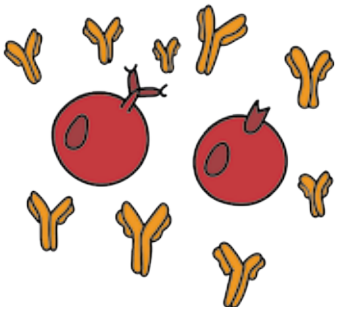
Good idea, Emma ! Tell me, did you learn about how a vaccine works at school?

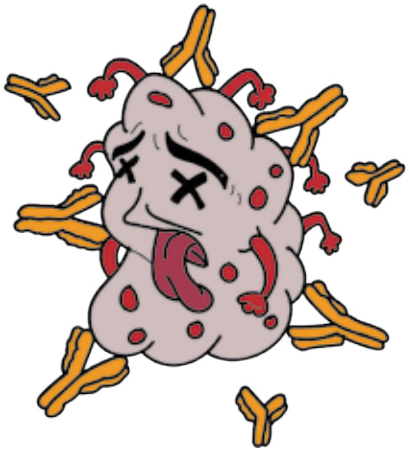
1

When we receive a vaccine, the product injected into our body makes our defense, or immune system, believe that it is the real virus or bacteria. But it is not! The product looks like it, but it is not dangerous!

Our immune system then starts to attack the product as if it were the real intruder. To do this, it forms special cells that make weapons called antibodies. These antibodies are able to eliminate the fake virus or bacteria.

2





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That way, whenever the real virus or bacteria later enters our body, our defense system will recognize it faster and make weapons more quickly. We will then be able to eliminate the intruder very quickly before it multiplies everywhere in our body and makes us sick. And there you have it: we're protected!

Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

"I always hear about vaccines that have weird names. Like mDNA, I think", says Asha.

"No it's mRNA... for messenger RNA", responds Idriss.

"You are all just as curious as professional scientists!!! Since you're so interested, I've asked my fellow researchers to meet with your fine Science Fans Club!"

"Help me set up the video projector and put a big white canvas between the two big poles that are here", says Jade, Li-Na's mom.

Illustration : Tadens Mpwene and Theresa McAvoy

Illustration : Tadens Mpwene

These days I hear a lot about messenger RNA vaccines. What is the difference between RNA and DNA?

PROF. JEAN-ERIC GHIA
Dept. of Immunology & Internal Medicine
Rady Faculty of Health Sciences
University of Manitoba

“We were all born from a single cell containing all the information about our body. This initial cell multiplied billions of times to make you the human being you are.

Inside each of these cells, there is a nucleus. In each nucleus, there are 46 chromosomes carrying all the information to make us.”

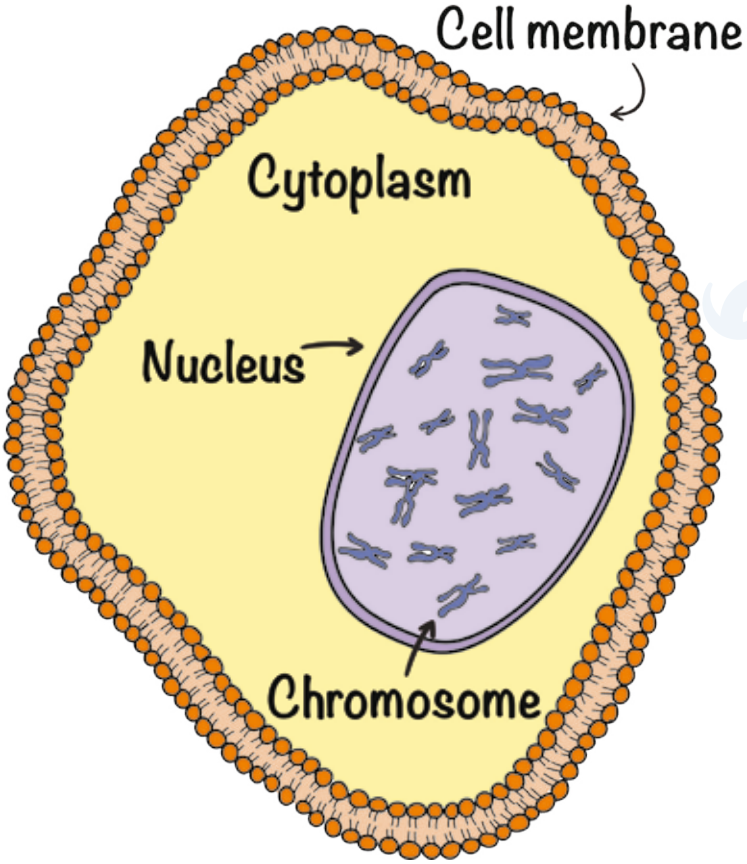
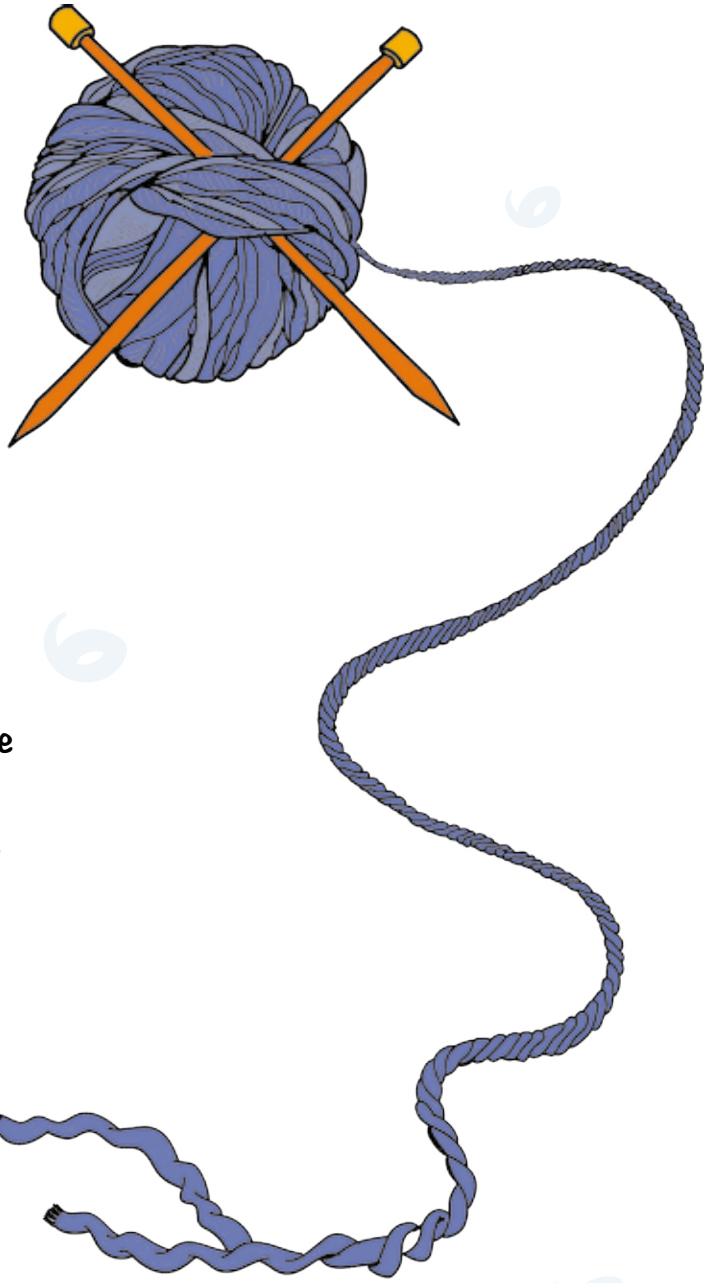


Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

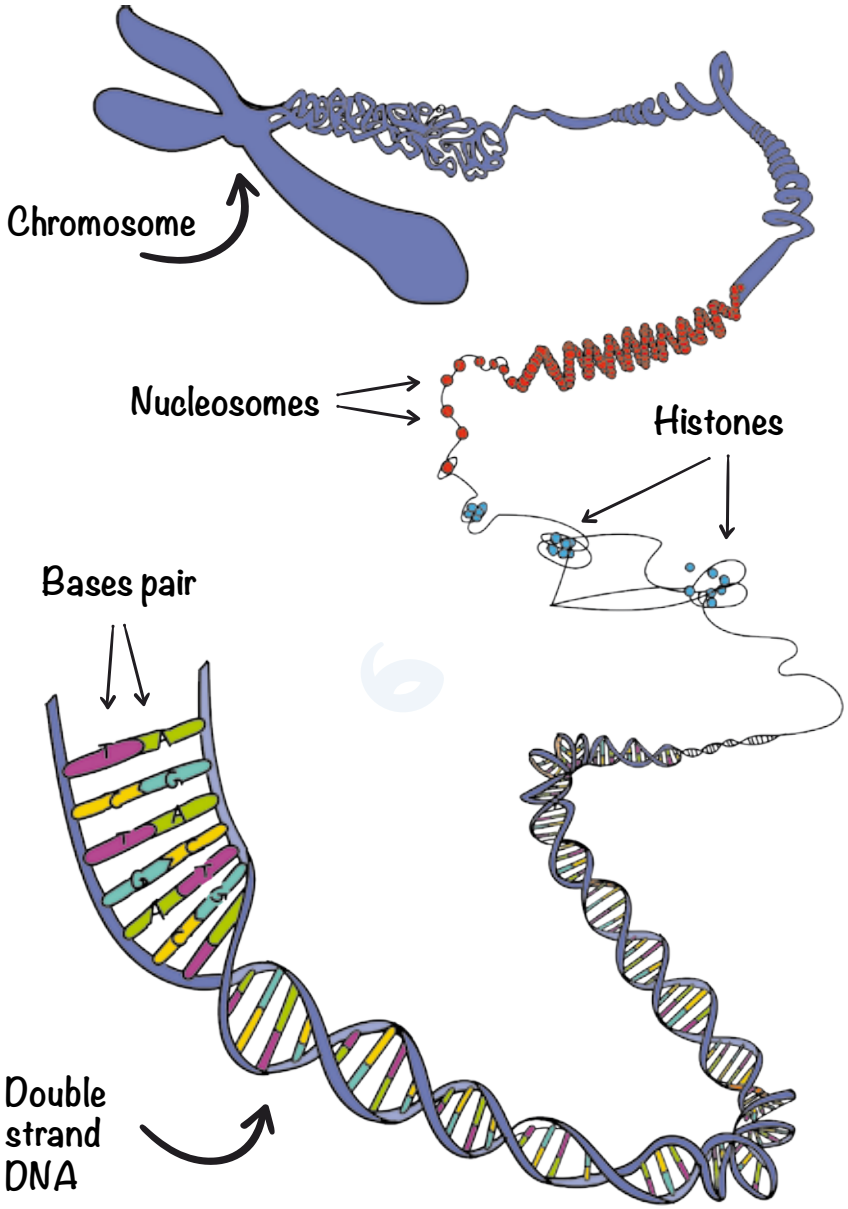


“A chromosome is like your ball of yarn, Emma: a big ball made of a long, coiled thread called DNA, for deoxyribonucleic acid.

If you look at a thread of yarn inside the ball, you will see that it is made up of even smaller threads that wind together. DNA is the same; there are two threads, or strands, that wrap around each other in an helix. This DNA contains “the recipe” for our body, in other words our genes.”

“Does that mean our chromosomes are like a big cookbook?”, Emma wants to know.

Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy



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Yes, a book that uses an alphabet of only 4 letters:

A for Adenine,
T for Thymine,
C for Cytosine
and G for Guanine,
which are bases.

Each chromosome contains an incredible number of recipes (genes) to make all the components of the cells in your body, such as proteins.”

Proteins are not just what we can find on our plate, like our eggs for breakfast. There are of course proteins in our muscles, but that's not all ! Proteins are found in all our cells !

They have various roles that are essential to the proper functioning of our body. For example, they can have a role in the structure of cells, or in the transport of other molecules in our body.

Illustration : Laëtitia Kermarrec

Illustration : Tadens Mpwene and Theresa McAvoy

“Oh boy... All these A’s, C’s, G’s and T’s... And all these difficult words...

It’s all getting mixed up in my head...”, says Sam, holding his head with both hands.

“Blossom’s story was for sure much easier to understand”, adds Li-Na.

“DNA, which forms the chromosomes, can’t leave the nucleus of the cell because the precious recipes for making your body’s components, such as proteins, have to remain well protected.

However, the little factories that make the proteins from the recipe, called the “ribosomes”, are located outside the nucleus, in the cytoplasm.

So, when a cell in your body needs to make a protein, a copy of the recipe comes out of the nucleus. The two strands of DNA separate for a moment and a copy of one of the strands is made. This copy is called mRNA.

“

It is almost the same 4-letter language as DNA, except the letter T has been replaced by the letter U (for Uracil). This one-letter change from T to U allows our body to differentiate between DNA and mRNA.

Once made, the mRNA leaves the nucleus (through gates that can only open one way). The ribosomes read the copy of the recipe and use the right ingredients, called amino acids, to make the protein. This newly created protein can then be used by the cell and by our body.

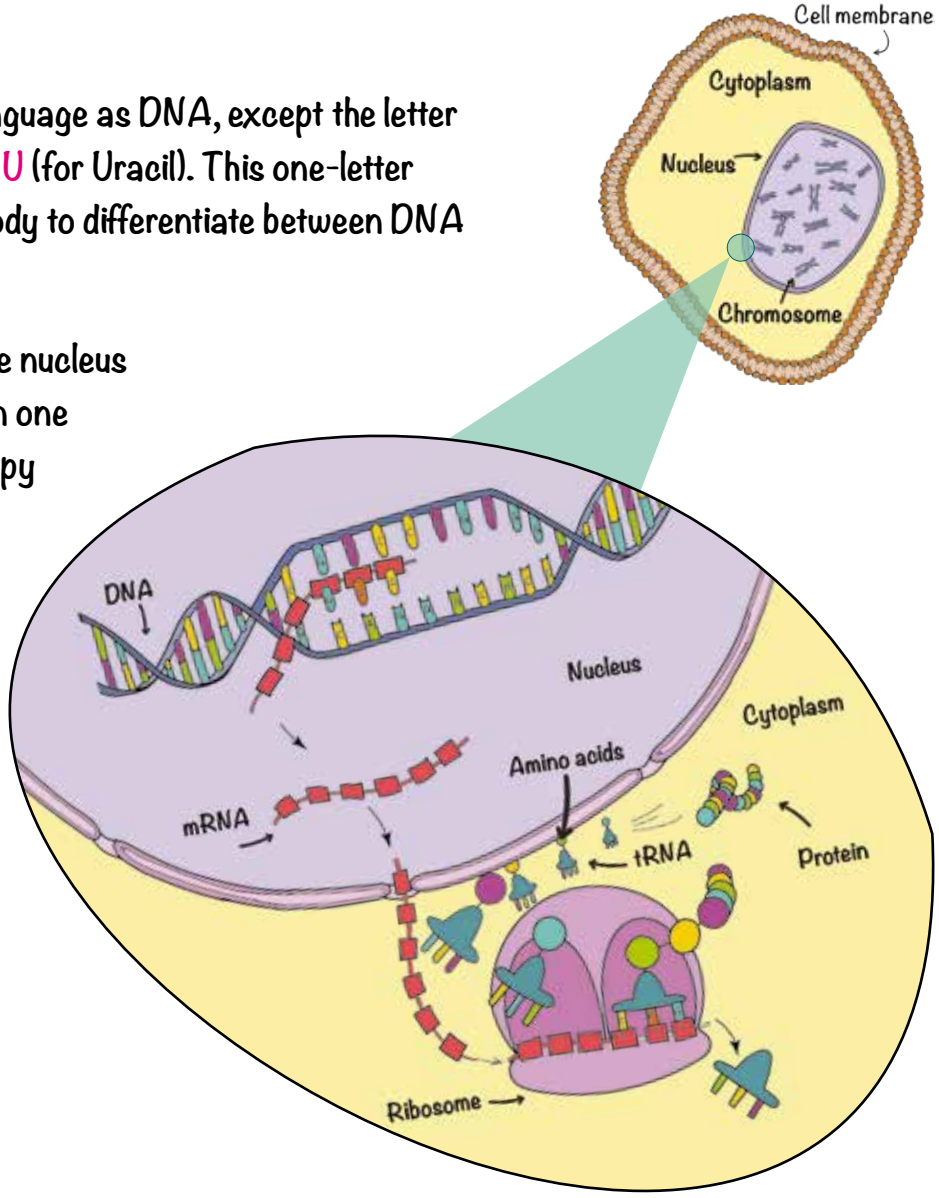


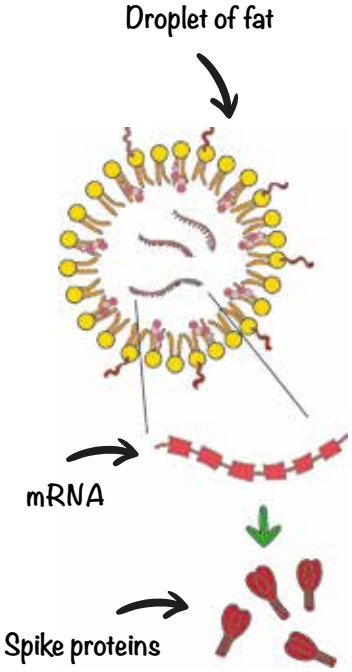
Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

So mRNA is a bit like copying a recipe (DNA) onto a sheet of paper !

But why are we talking about mRNA vaccines?

PROF. MICHAEL CHARETTE
Dept. of Chemistry
Faculty of Sciences
Brandon University

Good question Idriss. But before we talk about how a vaccine works, we need to remember how the virus gets into our bodies. Remember, the virus carries keys called "spike proteins" that allows it to enter human cells.
To develop a vaccine for COVID-19, scientists at Moderna and Pfizer-BioNTech used a method that involves injecting a laboratory-made mRNA into your body. Remember, mRNA is a copy of the original DNA recipe for a protein.



Scientists took an mRNA copy of the virus' spike protein recipe, and put it in a droplet of fat.

I will let my colleague Prof. Cullis explain because this is his field of research. It is to him that we owe thanks for many great discoveries.

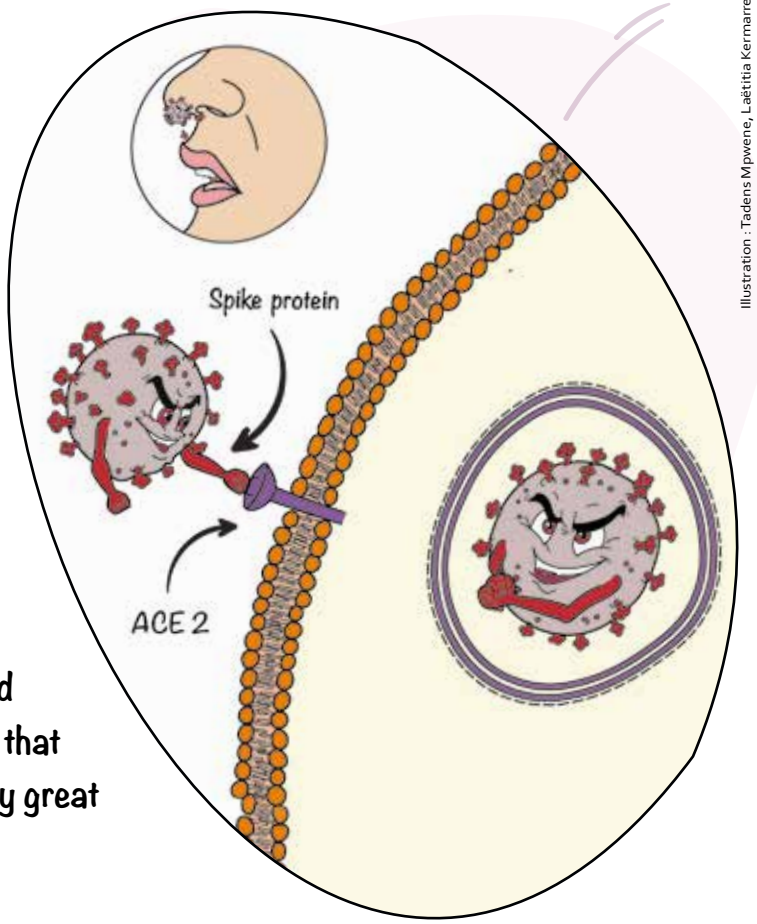


Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

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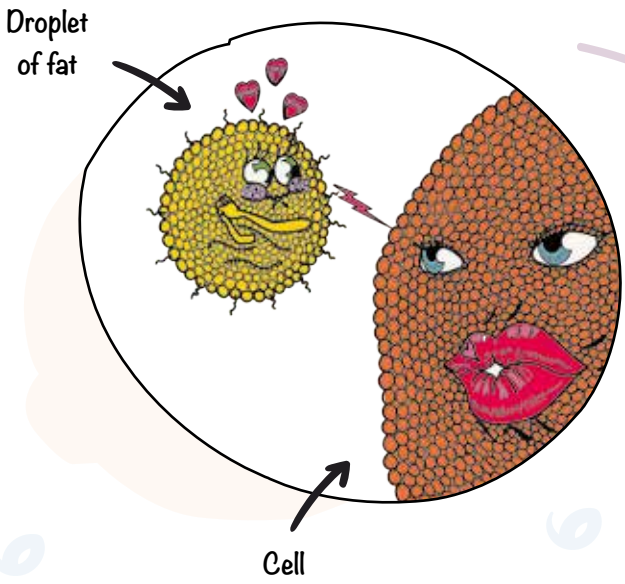
We used a fat droplet for two reasons:

- mRNAs are very fragile so we need to protect them from degradation.

- mRNAs only work once they are inside cells, but cannot enter the cell without the help of fat droplets. When droplets see a cell membrane, which is also made of fat, they fuse together.

PROF. PIETER CULLIS
Dept. of Biochemistry and
Molecular Biology
Faculty of Medicine
University of British Columbia



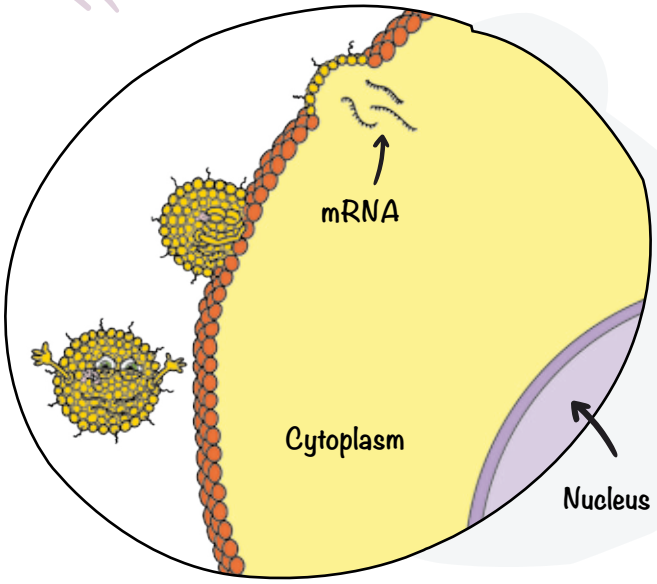


Illustration : Tadens Mpwene, Laëtitia Kermarrec

PROF. KEVIN COOMBS
Dept. of Medical Microbiology
and Infectious Diseases
Rady Faculty of Health Sciences
University of Manitoba

“

The little factories in your cells, the ribosomes, are super efficient. As soon as they see the mRNA copy of the spike protein recipe, they will read it and start producing it.

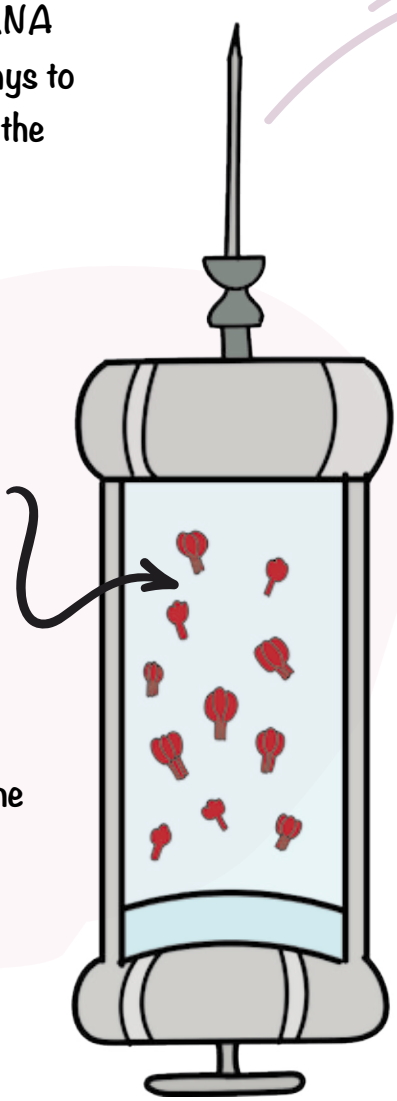
The spike protein is then shown to our immune system as the “wanted” poster. And our immune system prepares its weapons against it to protect you from an infection.

The advantage of a mRNA vaccine compared to other types of vaccines is that it is easy to change quickly.

They say mRNA vaccines are new. So the ones I received when I was a child were not the same?

PROF. DEANNA SANTER
Dept. of Immunology
Rady Faculty of Health Sciences
University of Manitoba

No, they were not the same... Until the appearance of these new mRNA vaccines, there were three ways to make vaccines Emma. Inside the syringe, researchers could:



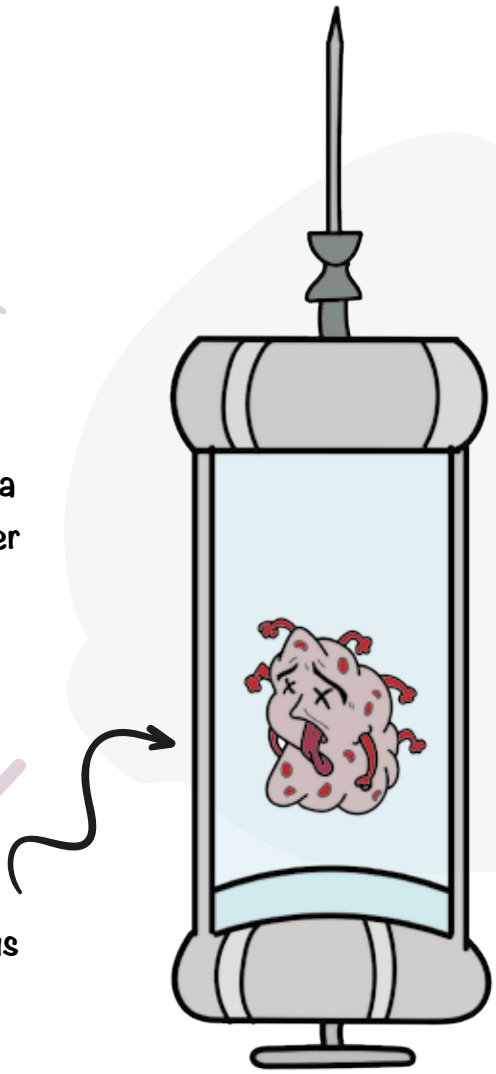
1 Use a small, harmless piece of the virus

It is a good idea to pick a very important piece the virus uses to enter our cells, its key protein. This way, our immune system can make antibodies to attach to that piece and block the virus from getting in. In the case of SARS-CoV-2, we would choose the spike protein, that represents the key protein.

Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

2 Use a killed virus

However, with these first two methods, sometimes a special product, a "booster", must be added to better motivate our immune cell army to make weapons, even if the enemy seems weak.



Killed virus

Illustration : Laëtitia Kermarrec

3 Use a lab-weakened virus

Because weakened viruses are not completely dead, they can still activate our immune cells, but they are not strong enough to cause the disease.

Weakened virus

But there is another kind of vaccine. I worked on adenoviruses during my research at the university. My supervisor is here to tell you more. Good morning, Prof. Kung.

PROF. SAM KUNG
Dept. of Immunology
Rady Faculty of Health Sciences
University of Manitoba

Hello Chung and hello everyone! Our immune system is very good at recognizing and responding to a family of viruses called adenoviruses. These DNA viruses usually cause us symptoms of the common cold. Because they can enter our bodies so easily, scientists came up with the idea of using them to create vaccines.

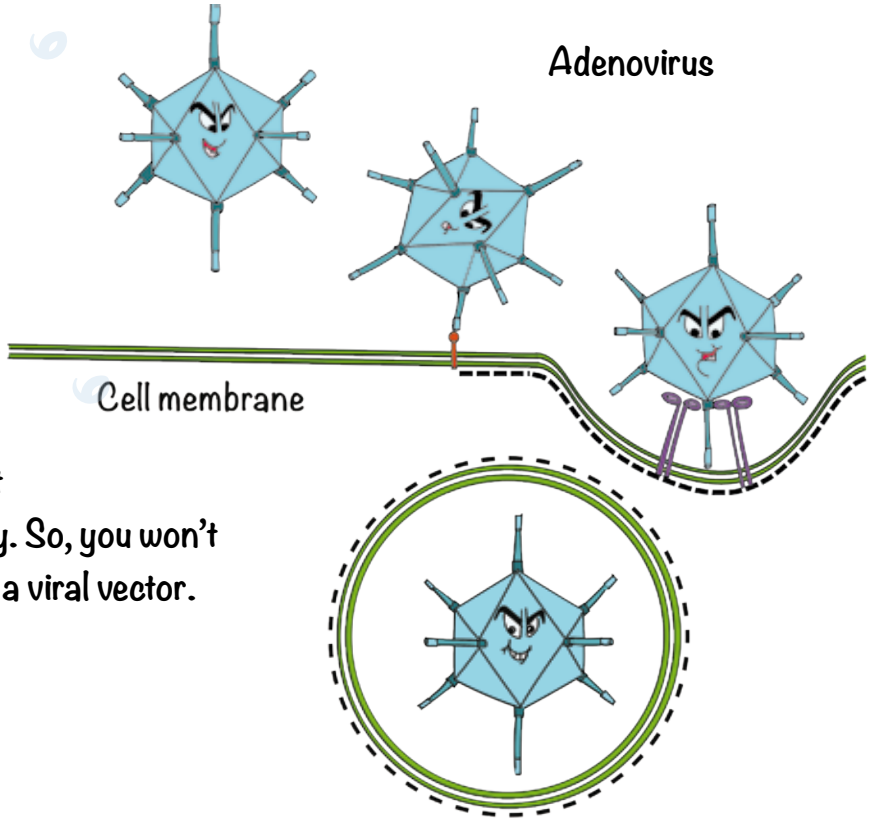
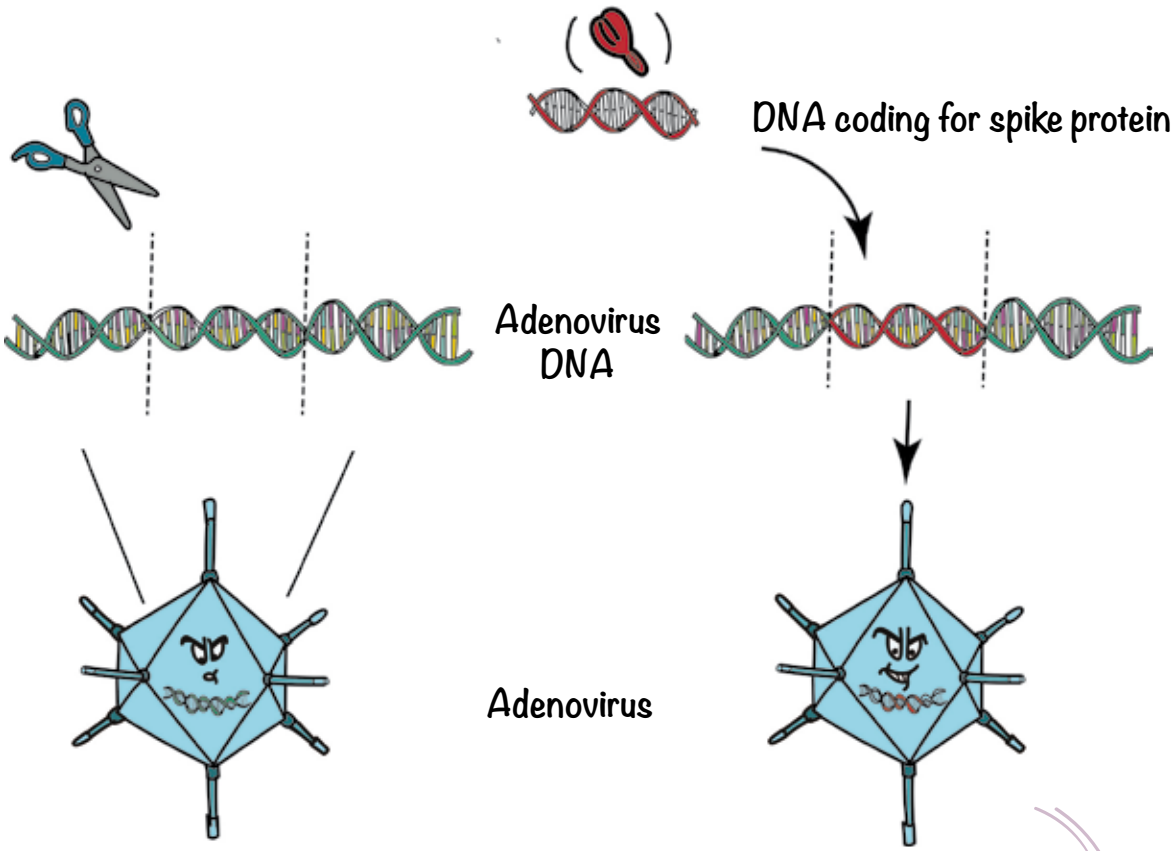


Illustration : Tadens Mpwene and Laëtitia Kermarrec

Of course, to use it as a vaccine, researchers first remove the mechanism that allows the adenovirus to multiply. So, you won't develop a disease. This is called a viral vector.

In the adenovirus vaccine against COVID-19, the researchers inserted into the adenovirus DNA the gene (DNA) of the spike protein. This way, the spike protein can be made in our body after vaccination.

As with other vaccines, our immune system learns to recognize the protein and forms an army to fight it like a regular common cold. You are then protected against future infections with SARS-CoV-2.



The adenovirus is used as a vehicle to easily carry what we want to inject into the body.

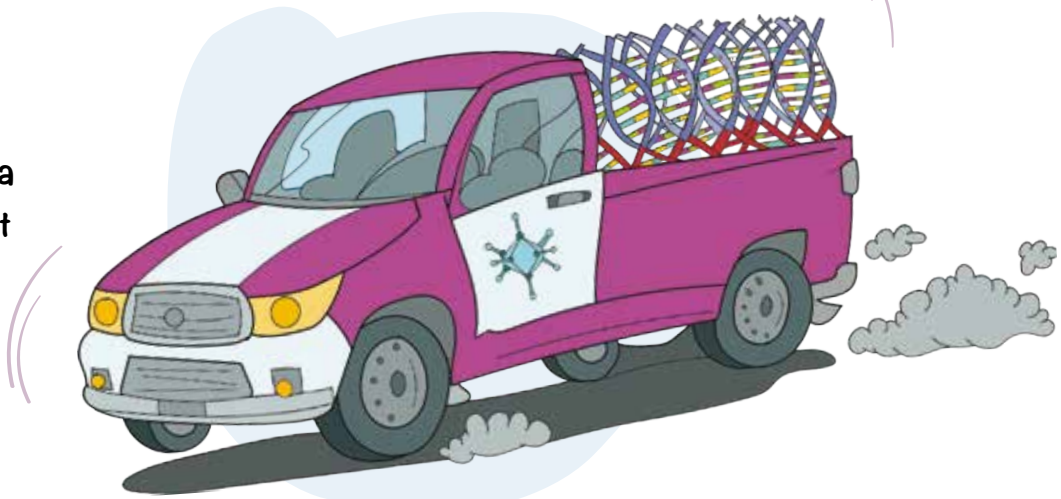


Illustration : Tadens Mpwene and Laëtitia Kermarrec

That's a lot of possible vaccines. In Canada, which ones are used, and, are they really effective?

As per today* only four vaccines have been authorized by Health Canada. The first two are based on the mRNA technology. They are effective.

*June 2021

Labo Pfizer-BioNTech

- Mode of action: mRNA
- Approved December 09, 2020 by Health Canada
- Two doses required
- Average efficacy 95%, 7 days after second dose

Moderna vaccine
Labo Moderna

- Mode of action: mRNA
- Approved December 23, 2020 by Health Canada
- Two doses required
- Average efficacy 94%, 14 days after second dose

Illustration : Tadens Mpwene and Theresa McAvoy

AstraZeneca

- Mode of action: viral vector
- Approved February 26, 2021 by Health Canada
- Two doses required
- Average efficacy 66%, 15 days after second dose

“And the two others are based on the technology described by Prof. Kung using viral vector like an adenovirus. They are also effective.

Janssen vaccine
Johnson & Johnson

- Mode of action: viral vector
- Approved March 05, 2021 by Health Canada
- One dose required
- Average efficacy 66%, 14 days after vaccination

Illustration : Tadens Mpwene

My grandmother was vaccinated and later she was very tired and her muscles were sore. I was worried ! So did the vaccine protect her or make her sick?

PROF. DEANNA GIBSON
Dept. of Biology
Irving K. Barber Faculty of Sciences
University of British Columbia

Even if your grandmother experienced some side effects after the injection, vaccines are safe. Our immune system reacts to the vaccine by making cells that will spit out defending antibodies that will block the real virus from infecting us later.
Sometimes we can feel sick because the immune system gets activated fighting the injected vaccine.

Illustration : Tadens Mpwene and Theresa McAvoy

This can cause a fever, or redness and pain where the vaccine was injected, and we can feel sore and tired. These symptoms are telling us that our immune system is active and working hard and we should rest for a day or two. These effects will go away very quickly. It is very, very rare that there are serious side effects after a vaccine, so when you have any doubt regarding your symptoms after a vaccine, it is important to talk to a health professional.

If vaccines protect so well, why aren't children the first ones to be vaccinated?

PROF. ERIC BENCHIMOL
Dept. of Paediatrics
SickKids Hospital
University of Toronto

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Because researchers saw early in the pandemic that children very rarely had severe forms of the disease, they tested vaccines on adults first. It was more urgent to protect front-line health care workers first, as well as the most vulnerable people, such as the elderly. For now*, some COVID-19 vaccines can be used in teenagers aged 12 to 17.

Illustration : Tadens Mpwene and Theresa McAvoy

“

We can use them in this age group because research studies have told us that they are safe and effective. And as soon as testing is completed on younger children, in accordance with all ethical and safety rules, children under 12 years of age will also be able to benefit from the vaccine.

*June 2021

But why was the community where my grandparents live a priority area for the vaccine? There are not only Elders where they live.

PROF. MARCIA ANDERSON
Dept. of Community Health Sciences
Rady Faculty of Health Sciences
University of Manitoba

“As a matter of fact, First Nations communities are among the prioritized populations. For instance, in Manitoba, a First Nations-led team has been watching how COVID-19 affects First Nations communities. We have seen and shared information about how First Nations people are at higher risk of catching COVID-19, being sick enough to get admitted to hospital and that this happens at younger ages.

“We used this information in our planning with the Provincial Government to prioritize vaccine supply to First Nations communities AND to make sure that First Nations people living in urban areas can get the vaccine at younger ages.

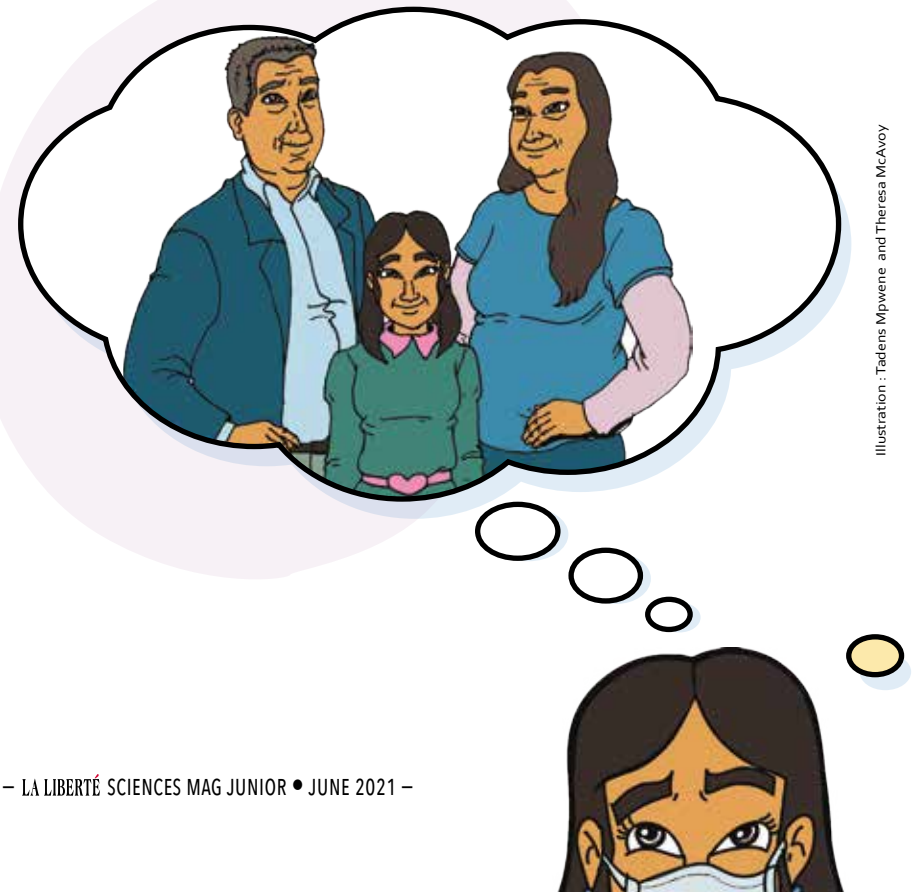

Illustration : Tadens Mpwene and Theresa McAvoy

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We all benefit when the people who are most at risk of contracting COVID-19 get vaccinated first.

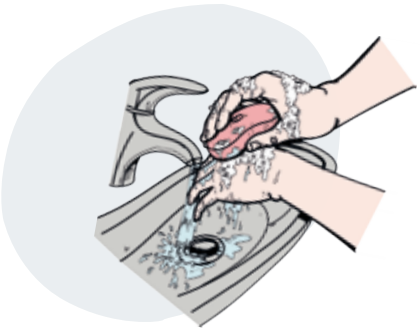
Illustration : Tadens Mpwene

Anyway, I can't wait to be vaccinated so I can stop wearing this mask. The minute I get vaccinated, I take it off !

PROF. GIL KAPLAN
Dept. of Medicine & Community Health Sciences
Faculty of Medicine
University of Calgary

Actually, Juan, although vaccines are very effective, you won't be able to take off your mask right away after receiving an anti-SARS-CoV-2 vaccine. You will still have to protect yourself and others, by wearing masks, handwashing and distancing from your friends.

Illustration : Tadens Mpwene



The vaccine stimulates your immune system to fight future infections, but it's not immediate. You have to wait for immune cells and antibodies to build up in your body in order to defend yourself properly.

Even after being vaccinated, it's not that simple. Doctors have shown that the vaccine keeps most people from getting sick, but scientists don't know if we can still transmit the SARS-CoV-2.

That's why we need to keep using protective equipment.

Illustration : Tadens Mpwene

Why can´t we take medications heal?

PROF. JOANNE EMBREE
Dept. of Medical Microbiology and Infectious Diseases
Rady Faculty of Health Sciences
University of Manitoba

Anti-viral medications don't really kill viruses, but they do stop them from being able to multiply and infect other cells in your body when you are already sick.

That's why you usually feel better with a drug and don't get sicker. In general, anti-viral medications work best when you get them either before you get sick or really soon afterwards because it slows down the first multiplications of the virus in your body.

There is one medication called Remdesivir that can do this for SARS-CoV-2. It has helped people who were very sick, but it is given with a needle and in a hospital. The good thing about vaccines is that in the vast majority of cases, they prevent you from being very sick and having to be admitted to the hospital. Scientists are still working to find other medications that you can take as a pill or syrup, so that you could take it at home when you start to get sick and avoid a trip to the hospital.

Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

We have seen that vaccines have not existed forever, and I imagine that it is the same for drugs. But before all that, when we were sick, how could we get treatment?

PROF. GUILLAUME POLIQUIN
National Microbiology Laboratory
Public Health Agency of Canada

Illustration : Tadens Mpwene and Theresa McAvoy

Before vaccines, doctors at that time did not have many remedies for diseases. Although the concept of medicine already existed, the science was limited – they used remedies from nature: plants (valerian, verbana...), powders made from precious stones (gold, pearls, silver...) that were crushed and mixed with water or juice. Sometimes, they would turn to strange products made of maggots and toads that were applied onto the skin or eaten. Fortunately, today, we can make drugs taste like strawberries or bananas. Phew!

But if they didn't have drugs or vaccines like we do today, how did they keep from getting sick?

They did what we have been doing since the beginning of the pandemic: they isolated themselves. For example, in ancient times and in the Middle Ages, people with diseases were sometimes sent to special places, such as leper colonies for people with leprosy.

Later, during the 14th century, Italian cities implemented the "quarantine". All people arriving from an infected city had to spend 40 days on an island or on their ship before being allowed to enter the city.

Illustration : Tadens Mpwene and Theresa McAvoy

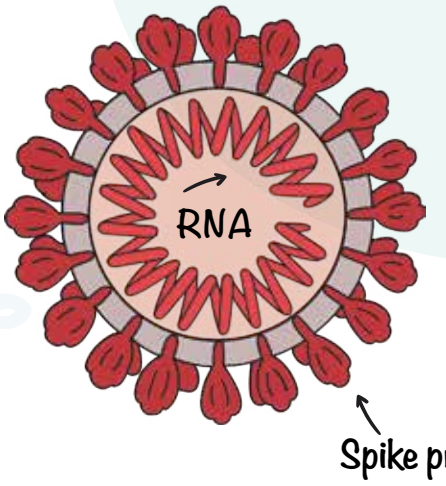
Illustration : Tadens Mpwene

I'm pretty upset because I thought that with the vaccines, it would be the end of Covid, and now my parents seem even more worried than before. They keep talking about variants. But I don't even know what variants are.

PROF. DENIS LECLERC
Dept. of Microbiology-Infectiology and Immunology
Faculty of Medicine
Laval University

When the virus infects your cells, it makes millions of copies of itself. But sometimes it makes mistakes in copying itself, leading to the emergence of viruses that are a little bit different, called variants. Let me explain...

Do you remember that our cells contain DNA with all the original recipes to make us? Now remember that the coronavirus is an RNA virus and all the recipes to make the virus are on it.



To multiply, the virus uses the machinery of the cell it infects, and a copyist called replicase. It is these replicases of RNA viruses that sometimes make mistakes by copying the recipes to make new viruses. And that's when variants appear! These variants are simply viruses with some differences in their RNA.

Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

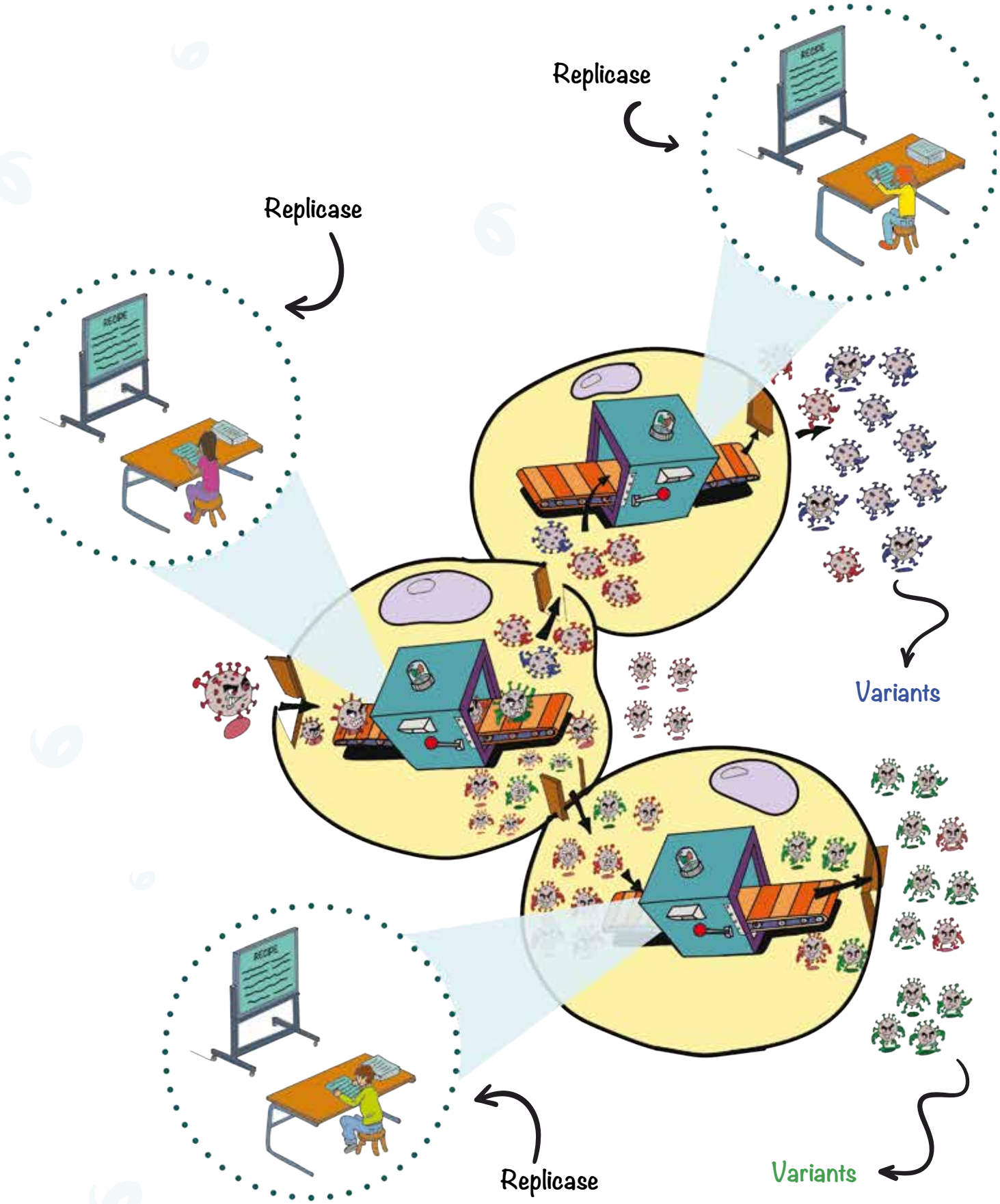


Illustration : Tadens Mpwene and Laëtitia Kermarrec

Can the variants be more dangerous?

PROF. JIM STRONG
National Microbiology Laboratory

Public Health Agency of Canada

Sometimes yes, sometimes no! Remember, when the virus multiplies, mistakes can be inserted into its RNA genes because the copyist makes mistakes. In a way, this is like when you follow a recipe and you substitute one ingredient for another. For example, with the ingredients in front of you, if you are making cookies like your mom made, you could substitute brown sugar for white sugar and the cookies will still look very similar and taste really good. But if you were to mistakenly use salt instead of white sugar, the cookies would be pretty awful tasting and most people would not like them. Now if you put bigger chocolate chips in your cookies, people will like them more.

Illustration : Tadens Mpwene and Theresa McAvoy

“

For viruses it is the same, if the error of the copyist and the difference in the recipe is not in its favor (such as with the salted cookie) then the variant will disappear. If the difference does not change the virus (such as using brown sugar instead of white sugar), the variant will continue to circulate but it will not be a concern. If, on the other hand, the new ingredient strengthens the virus (such as using bigger chocolate chips), then the variant may circulate more and more and become stronger.

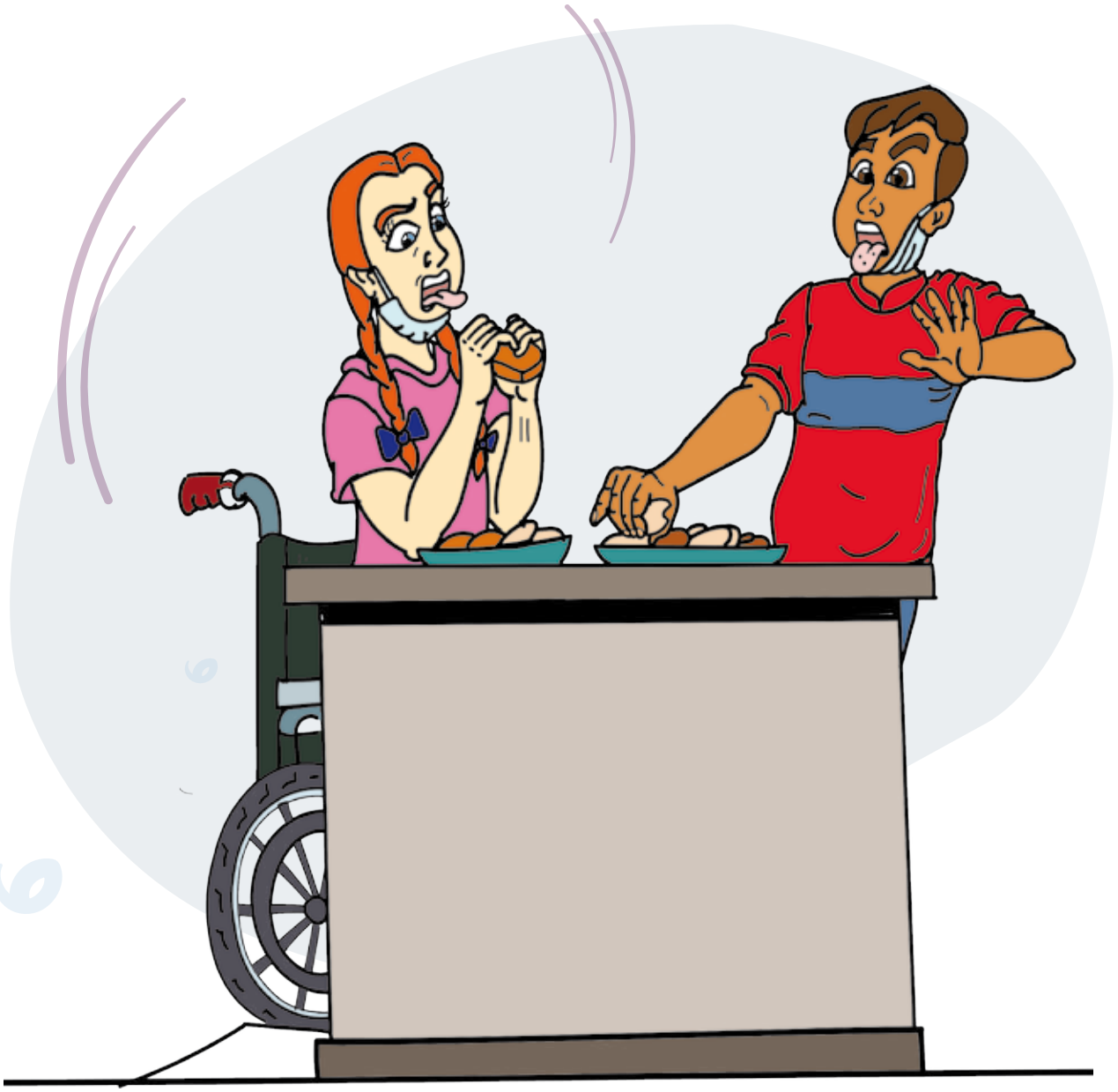


Illustration : Tadens Mpwene

But how can we detect these errors?

PROF. FRANÇOIS BOUDREAU
Department of Immunology
and Cell Biology

Faculty of Medicine
and Health Sciences
University of Sherbrooke

“The RNA of the coronavirus contains only 30,000 letters A, U, G, C. To read them, a technique called sequencing must be used. This technique uses a laboratory machine called a sequencer that reads the letters of the RNA one by one in order to discover misspellings compared to the first virus. If the sequencing of the virus genome is done in a very fast way and everywhere in the world, it can then help public health authorities to understand which variant is spreading. It is through this technique, the collaboration of scientists and the sharing of their data that it has been possible to determine whether new variants are associated with more serious diseases. In addition, sequencing is very important because it will allow us to track the emergence of new variants and anticipate the creation of new vaccines.

Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

What about SARS-CoV-2?

PROF. THOMAS MUROOKA
Dept. of Immunology
Rady Faculty of Health Sciences
University of Manitoba

Compared to other viruses, SARS-CoV-2 is slower to mutate. But in times of a pandemic, it circulates much more, so it multiplies more, and therefore it varies a lot more! Among all the variants, there are only a few that are concerning to the scientific community. They all have strange names: B.1.1617(Delta), B.1.351 (Beta), P.1 (Gamma) and B.1.1.7 (Alpha). These variants of concern contain mutations on the spike protein and are all more infectious than the original virus. It is as if they were each wearing a different shaped spike protein. The immune system, especially those protective antibodies, might not recognize these new variants and start to ignore them. In this case, we will need to re-train our immune system to recognize these new variants and destroy them.

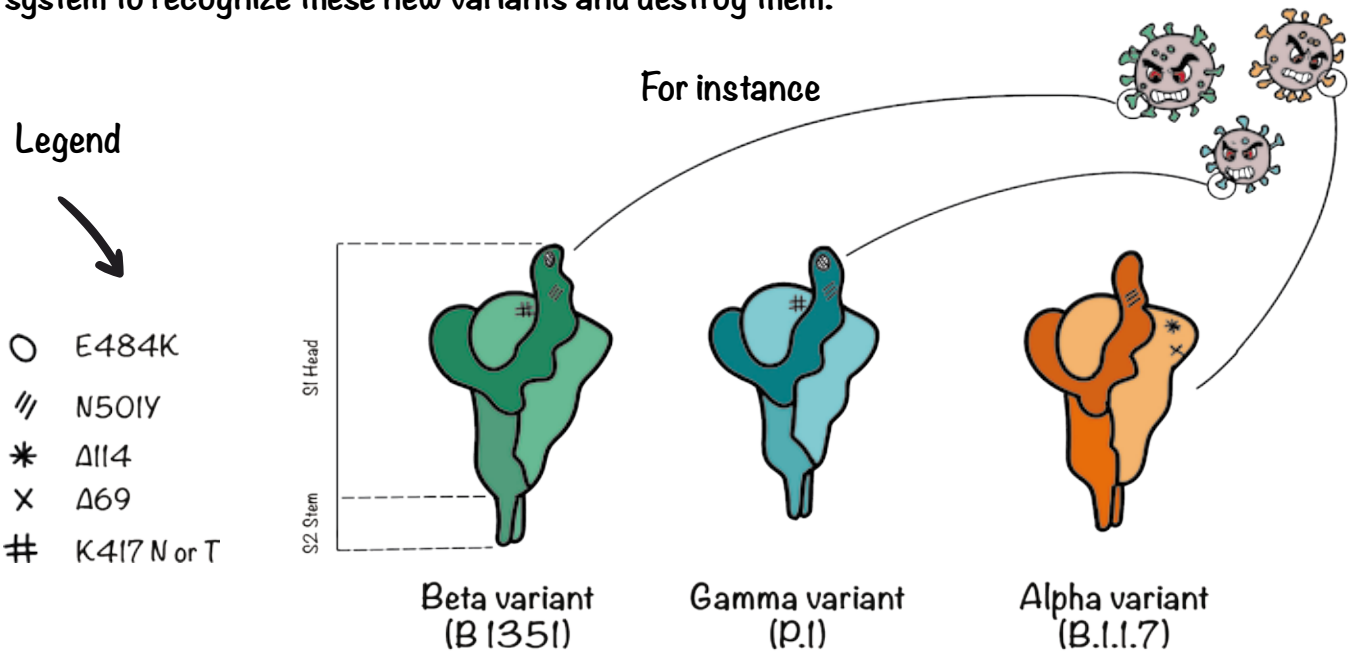


Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

But if the virus changes, will the vaccine still protect us?

PROF. ANNE GRIFFITHS
Department of Paediatrics
SickKids Hospital
University of Toronto

“

The first vaccines were designed to protect us against the first strains of the SARS-CoV-2 virus from 2019, before the variants appeared. But as we have talked about, viruses make mistakes when they multiply, and sometimes a mistake makes the virus stronger and it will take the place of all others. As a result, vaccines are expected to become less effective, but there is still some protection.

“

It looks like the mRNA vaccine is a bit stronger against some variants. Why? Maybe because the protein made by the small factory in the cell has a stronger similarity with the real spike protein, but scientists are still researching like real detectives.

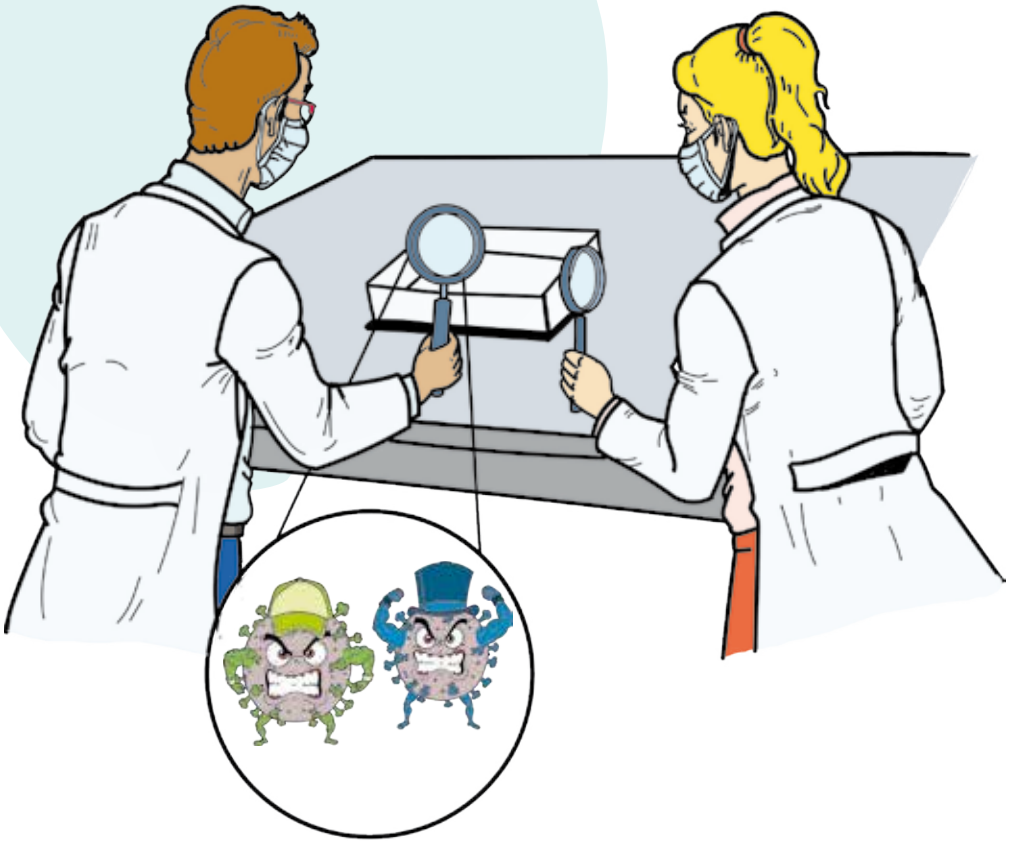


Illustration : Tadens Mpwene and Theresa McAvoy

Are we going to have to be vaccinated for every variant? Because even though everyone says vaccines were created in record time, I still think it took forever !

PROF. BLAKE BALL
National Microbiology Laboratory
Public Health Agency of Canada

“

Don’t worry, now that we know more about the virus and what it is made of, scientists will be faster to adapt the vaccines. They will quickly exchange the parts of the old vaccine that are recognized by the immune system with a new part that looks like the new variants. It’s kind of like replacing one recipe with another!

It’s easy and could be done in just a few days. Then the vaccine would have to be made and tested to make sure it is as safe as the old vaccine, which could take only a few months from start to finish!

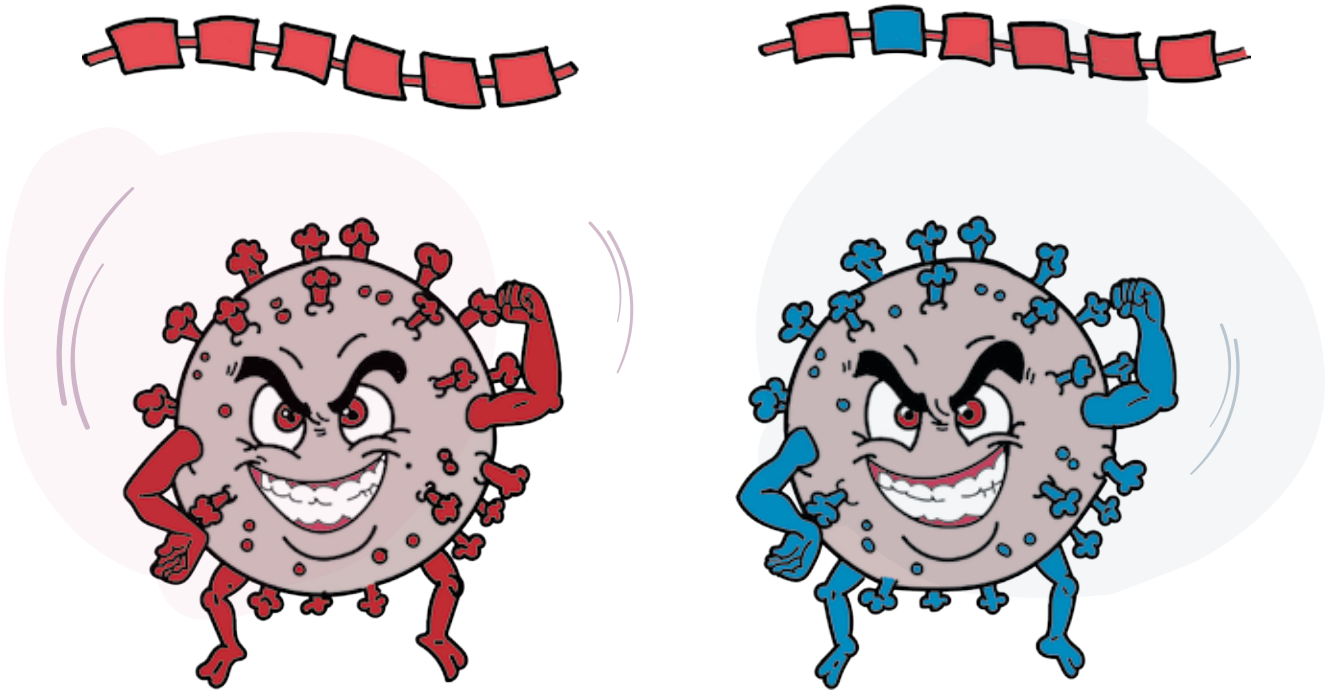
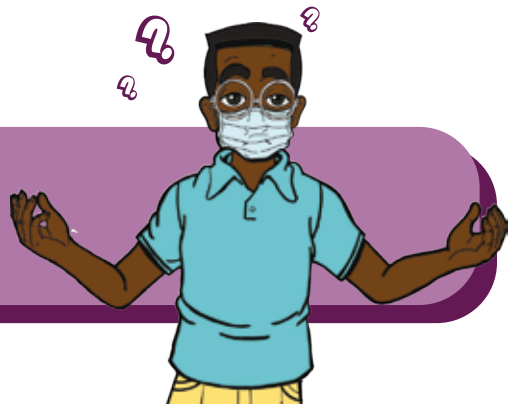


Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

Will we ever be able to get rid of SARS-CoV-2 for good?



PROF. XI YANG
Dept. of Immunology
Rady Faculty of Health Sciences
University of Manitoba

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It depends. We may not be able to get rid of the virus completely, at least not in the near future, but we should be able to get it under control. The currently available vaccines still work pretty well for the major variants. If we can get most people vaccinated quickly, we will be able to prevent the onset of more serious variants. We could achieve herd immunity.

“

Scientists are now trying to improve the vaccination strategy. They are also looking at developing modified, or new, vaccines based on the new mutations to increase their efficiency. We, therefore, may eventually get rid of it.

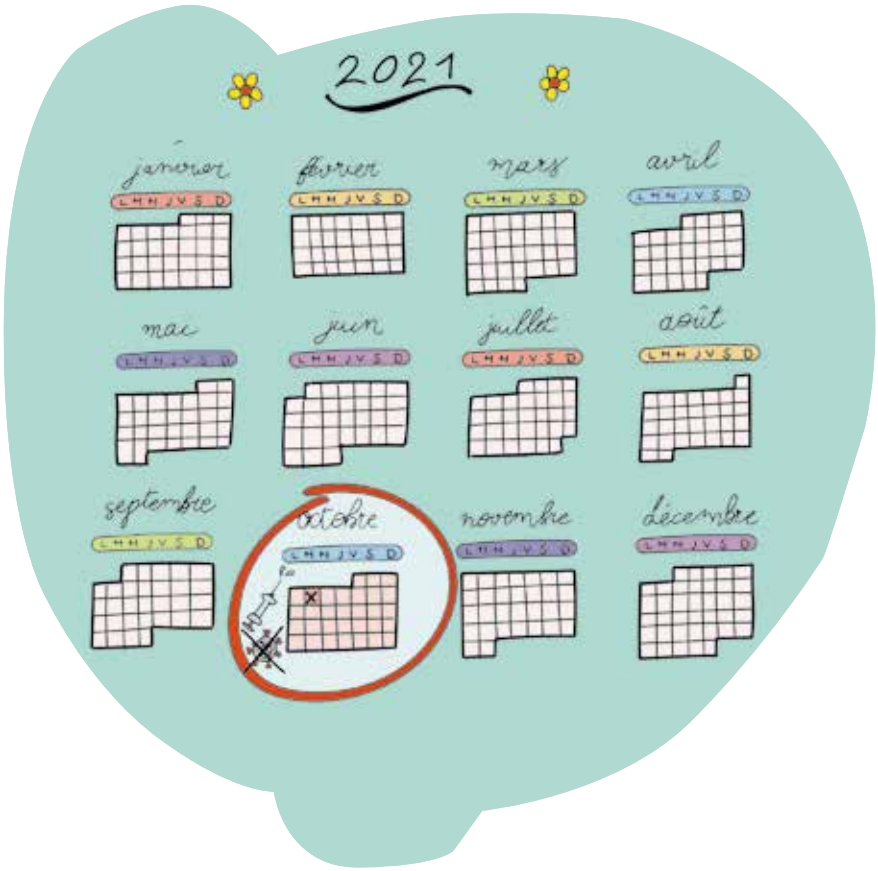

Illustration : Tadens Mpwene, Laëtitia Kermarrec and Theresa McAvoy

What exactly is herd immunity?

PROF. HEATHER WILSON
Vaccine and Infectious Disease Organization
University of Saskatchewan

“The immune system of people who have been vaccinated against SARS-CoV-2 and people infected with the virus who have recovered know what the enemy looks like. Their B and T immune cells are then ready to fight!
Unfortunately, not everyone can get the vaccine. For example, people undergoing treatment for cancer or other sick people who have weaker immune systems. It is up to us to protect them through “herd immunity”.

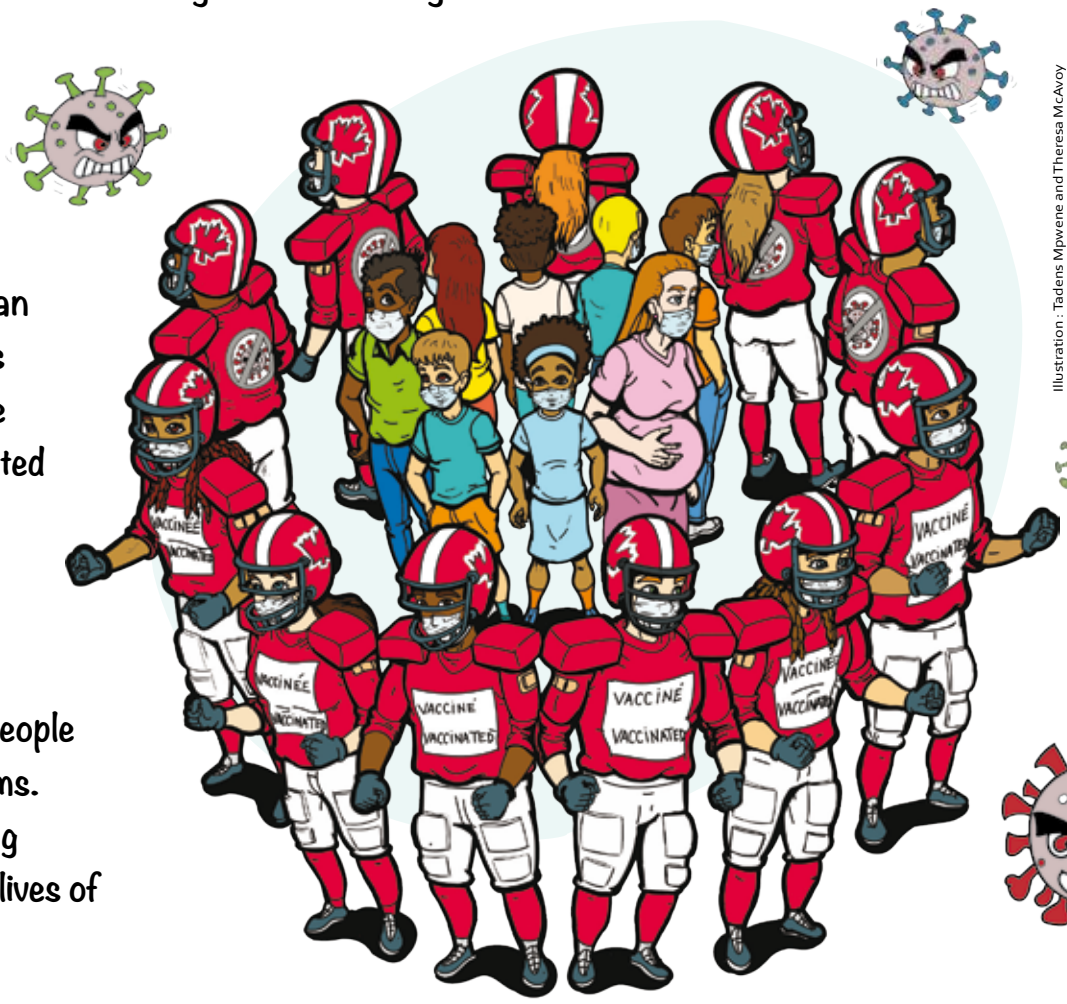

Illustration : Tadens Mpwene and Theresa McAvoy

“This is because the virus can only spread if it has access to a large number of people who have not been vaccinated or who have not already been infected. If most of us get vaccinated, then the virus can’t easily spread and it can’t reach people with weaker immune systems. You can be a hero by getting vaccinated and saving the lives of others!

“

It’s like a race against time.

The virus is still changing rapidly, but if we can vaccinate a large number of people very quickly, then we will win!

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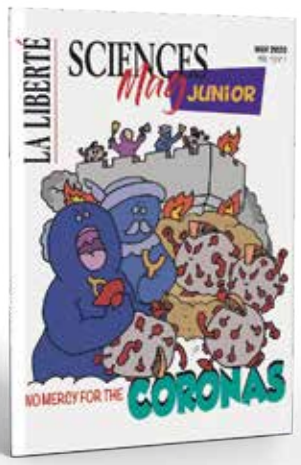

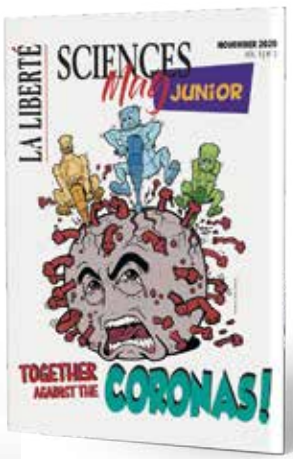

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