Tiny Germs, Big Questions
A Youth BIOlab Activity Book
Hôpital St-Boniface Hospital
RECHERCHE • RESEARCH
Youth BIOlab Jeunesse
Welcome!

All of us here at St. Boniface Hospital and St. Boniface Hospital Research are very curious people who study how the body works and figure out what happens when people get sick. During the COVID-19 pandemic, people have been very curious about infectious diseases caused by germs that might be around us! We can protect ourselves and others from infectious diseases by masking, physical distancing, isolating when sick, and getting vaccinated, if you can, to prevent germs from spreading. As you work through the activities in this book, you can learn about germs, vaccines, health, and disease!

The Youth BIOlab’s job is to share all of the things we learn with people like you!

Scientists always start with a question when they want to learn new things. We know that curious kids like you have questions too!

If you have any questions about germs or vaccines, write them down below! Maybe you’ll find answers to some of them throughout the book! Follow us in the book to find out how to do the activities!
Fact or Fake?

Below are four YouTube comments and their replies. Try your best to figure out which is the vaccine information and which is the misinformation. Colour in the thumbs down 🗯️ if the comment is misinformation, and the thumbs up 👍 for reliable facts!

MISINFORMATION IS: false info being shared as if it's 100% true. It can be hard to know what to believe. Misinformation sometimes...

- sounds outrageous - Things are more believable if you feel more afraid, happy, sad, or mad when hearing or reading it!
- makes claims that can't be backed up with proof. Ask, how do they know this?
- tells half-truths that don't explain a whole situation but if part is true, you might believe the whole thing. “If you believe this...you must believe that”
- doesn't give reliable sources - Ask, where is this info from?

Youth BIOlab

My uncle's cousin's friend's sister's kid got a vaccine and now the poor guy has autism. I won't get the jab, I don't want autism.

👍 👎️ REPLY

Ok but that was only a concern about the MMR vaccine and it was found to be false! The doctor that wrote that study lost their medical license because of it...

👍 👎️ REPLY

I just got my booster shot to better protect myself from the new covid variants that are emerging. Thanks for the info, Steve!

👍 👎️ REPLY

Geez, how have you people not noticed that covid is over and we don't need boosters anymore? Everyone has had covid already and our lives are 100% back to normal.

👍 👎️ REPLY

People are so naive. Don't you people know the government puts microchips into all vaccines so they can steal our information? OPEN YOUR EYES SHEEPLE!! 🐐 🐐

👍 👎️ REPLY

No microchips, but lots of antigens that our immune cells can recognize and make antibodies for! If we get exposed to the real germ, hopefully we won't get so sick! P.S. if you're worried about microchips, you should probably ditch your cell phone.

👍 👎️ REPLY

That new covid mRNA vaccine was made too fast, other vaccines took decades to make and this one less than 2 years. Seems sus to me.

👍 👎️ REPLY

It wasn't really just 2 years of research, they've been studying RNA for meds since the 80's and the first SARS since 2003 so it's really been decades PLUS extra funding, PLUS so many scientists shared info globally so it makes sense.

👍 👎️ REPLY
Most Wanted Germs

The most wanted germs are the ones who throughout history have infected a lot of people, caused a lot of damage, or a lot of deaths! Vaccines can help us stop these most wanted germs from spreading in our communities and around the world.

Help catch these bad guys by looking for them throughout the rest of the activity book and find out why they’re so terrible! Who’s been eradicated and who’s still at large?

**COVID-19 (SARS-CoV-2)**
Fever, inflammation in the brain, blood vessels, and lungs, causing severe breathing problems. Killed close to 5.5 million people in 2020-2021.

Eradicated or still at large?

How to protect yourself:

**Flu (Influenza virus)**
Difficulty breathing, sore throat, fever, and fatigue. Bad cases kill 10’s of thousands of people every year.

Eradicated or still at large?

How to protect yourself:

**Smallpox (Variola major virus)**
Causes a fever and sores all over the body and killed between 300-500 million people in the 20th century alone.

Eradicated or still at large?

How to protect yourself:

**Measles (Measles morbillivirus)**
From irritated eyes, fever and rash, to brain swelling and pneumonia, this super contagious virus killed 140,000 people in 2018 alone.

Eradicated or still at large?

How to protect yourself:

**Tetanus (Clostridium tetani)**
Makes muscle-stiffening toxins that can stop people from breathing! With a 50% survival rate, it can kill 35,000 people a year.

Eradicated or still at large?

How to protect yourself:

**Ebola (Zaire ebolavirus)**
Causes fever, aches and pains, vomiting, diarrhea, and internal bleeding. Killed over 11,000 people in 2014-2016.

Eradicated or still at large?

How to protect yourself:
Recognize These Plague Causing Germs?

Follow their winding paths to see the damage they cause and how we can stop them!

Poliovirus
- This virus attacks white blood cells that normally fight infections. Since 1980, 47 million have died.

Cholera
- 3 out of 10 people who got this infection have died.

HIV/AIDS
- ⅓ of the world got this feverish disease from 1918-1919, and about 50-100 million died.

Spanish Flu
- This virus infects our nerves, paralyzing 1 in every 200 people infected.

Smallpox
- These germs spread between rodents, fleas, and people, killing ⅗ of the world from 1347-1350.

The Black Death
- Up to 4 million catch this infection every year and over 14,000 will die from severe diarrhea and dehydration!

This disease can be treated with antibiotics. Without treatment, it kills 6 of 10 people infected.

Clean drinking water, hand washing, and oral vaccines can help stop this disease.

This virus naturally mutated into a much less deadly form. Now seasonal vaccines can protect us.

Medicines can slow viral growth and its spread to others. New mRNA vaccines are being tested!

Since the 1950’s 80% of countries have used oral vaccines to get rid of this disease.
Our Protection - the Immune System

Your immune system is what protects you from infections by germy invaders! There are different parts working all over the body. Mucous membranes help stop germs from getting inside. Lymph nodes and vessels filter and clean fluids, and if tough germs sneak by, white blood cells are made and trained to destroy any invaders!

Colour by pattern our protective systems to see what they look like and where to find them!

- Bone marrow and thymus gland make and train white blood cells
- Spleen and lymph nodes filter and clean blood
- Let’s get those germs!
- Got ya!
- Now let’s get a closer look.

I am still at large! You can protect yourself from me by wearing a mask, social distancing, washing your hands, and getting vaccinated!

COVID-19 (SARS-CoV-2)
Our Protection - the Immune System

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**COVID-19 (SARS-CoV-2)**

- Bone marrow and thymus gland make and train white blood cells
- Spleen and lymph nodes filter and clean blood
- Mucous membranes and Peyer's patches are a barrier to stop germs!
- Purple, Yellow, Green, Pink, Red

Colour by pattern our protective systems to see what they look like and where to find them!

### Word Scramble

Unscramble the words below to learn what our white blood cells do and how they help you fight germs! Look to the pictures on this page and the page before for hints to unscramble the words!

Some _______ _______ _______ _______ patrol around tissues like our _______ _______ membranes where _______ _______ might get in! They can gobble up invaders, make chemicals the germs don’t like, and start a _______ _______ which makes it hard for germs to grow. They can also call for more helper cells.

If _______ _______ are too powerful, and grow a lot, they can start an _______ _______ _______. Dendritic cells and macrophages, who engulf or eat germs, carry them to the _______ _______ nodes where their weak spots can be studied!

This team of white blood cells works in our _______ _______ _______ _______ and lymph _______ _______ to learn about tough germs and build Y-shaped weapons called _______ _______ _______ that help target and kill germs or the host _______ _______ they're infecting. B cells can remember germs for decades after an _______ _______ _______ or if you get a _______ _______ _______.

I am still at large! You can protect yourself from me by reducing your contact with other people’s bodily fluids and avoid outbreak areas!

**Ebola (Zaire ebolavirus)**
Word Search

As you find words in the word search, try to sort them into the groups below! Are they a germ or infectious disease? Can they help your body fight germs that cause infections? Or are they ways that we try to reduce the spread of germs in the community?

**Word bank**

ANTIBIOTICS
BACTERIA
CHICKEN POX
EAR INFECTION
FLU
FUNGI
GOOD SLEEP
HAND SANITIZER
HAND WASHING
HYDRATE
MASKS
MUMPS
PHYSICAL DISTANCE
PNEUMONIA
QUARANTINE
SELF ISOLATE
STAY HOME
STREP THROAT
VACCINES
VIRUS
VITAMIN C
VITAMIN D
ZINC

**Germs & illnesses**

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I am still at large! You can protect yourself from me by washing your hands often and getting vaccinated before flu season!

**Things that boost your immune system & help your body fight infectious disease**

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**Ways to prevent the spread of germs in the community**

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**Flu**

(Influenza virus)
Our bodies are always fighting off germy invaders, but sometimes it can take a long time for our immune cells to get rid of those pesky germs, and in that time we can get sick!

Have you been sick before? Draw in the sick symptoms that have happened to you!

- Yellow snot if you’ve had a cold
- Red cuts if you’ve had an infected cut
- Red splotches on the skin if you’ve ever had a rash
- Brown diarrhea if you’ve ever had a stomach flu
- Pink eye if you’ve ever had pink eye
- Yellow toenail if you’ve ever had a toe fungus
- Green throw up if you’ve ever had the flu
- Red dots on the skin if you’ve ever had chicken pox
- Pink throat if you’ve ever had a sore throat
- Red forehead if you’ve ever had a fever
- Pink ear if you’ve ever had an ear infection
- Can you think of other sick symptoms you’ve had that you can add?

I am still at large! You can protect yourself from me by avoiding rusty metal and staying up-to-date on your vaccine!
How Do Vaccines Work?

Vaccines use our body’s natural immunity to learn to fight germs before we get an actual infection. The trick is to show our bodies what strong or dangerous germy invaders look like, without exposing us to the real germ! Vaccines get our immune defences ready for when the real germ shows up and tries to make us sick.

**Live attenuated vaccines** contain germs that are made weak in the lab. These weak germs are bad at infecting our cells, but are good at teaching our immune system how to recognize and fight them.

**Subunit vaccines** introduce only pieces of a germ. These pieces can't infect our cells, but your body studies the pieces and helps your immune cells know how to fight off the real germ if it ever comes around.

**Viral vector vaccines** get a harmless virus to carry a piece of DNA from an infectious germ into our cells. This DNA tells our cells to make a protein from the harmful germ to teach our white blood cells to detect the harmful germ and build immunity for it.

**mRNA vaccines** don't contain any germs or parts of germ. Instead, they have instructions that tell our cells how to make one tiny piece of the germ. The piece can't make you sick, but it can still train your white blood cells to recognize the real germ if it comes along.

**Inactivated vaccines** introduce a dead bacteria or virus into our bodies. They can't infect our cells, but they help build up our immunity to protect us if the alive germs try to infect us.
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**COVID-19**

- Influenza
- Meningitis
- Measles
- Chickenpox
- Ebola
- Polio
- Hepatitis A

**Vaccines**

- Live attenuated
- Subunit
- Viral vector
- mRNA
- Inactivated

**Trace the Disease!**

Marilyn, a student at a local high school, started feeling sick on Monday, and by the following Tuesday, she tested positive for a very infectious type of COVID-19. Contact tracers talked to Marilyn to figure out how it might have spread through their group of friends...your job is to figure out how many people caught it!

On Monday, Marilyn had a bit of a sore throat, but went to Dollarama at lunch with Rayna and Hamza anyway.

On Wednesday, Marilyn didn’t show up at school. By the end of the day, Hamza was feeling tired, but decided to go to volleyball practice anyway with Jasmine and Cynthia. Later that night, Rayna, Phil, and Xander went to the movies, but they kept their masks on the whole time since the theatre was pretty packed.

On Friday after school, Sofia and Phil went to the indoor gym at the Y and played 2 on 2 basketball with Cynthia and Brayden. After the game, Cynthia and Brayden went over to Urijah’s to hang out for a while. Urijah was the first of his friends to be fully vaccinated.

By Sunday morning, Brayden had a slight cough, but that didn’t stop him from hanging out at church with Quinton and Kareem. Their parents made them wear masks since there were so many older folks there. Sofia felt achy, but wanted to go shopping for a party dress, and invited Rebekah and Ella to go with her, so they headed out to the mall together. In the evening, Urijah and Will went over to Demaris’ house to work on a project. Quinton needed help studying for a math test, so he invited Lucas over for help.

On Tuesday, Ella wanted to play hockey after school, so they invited Tevin and David to play on the outdoor rink at their local park. Marilyn, who had been sick all weekend but was starting to feel better, got her test results back and tested positive for the disease.
Immunity Maze

Vaccines help us build immunity for infectious diseases that can be dangerous, or even deadly. Vaccination greatly reduces your risk of getting sick and passing a disease on to others in your community.

Can you achieve full immunity? Find a path through the maze and pass through the hepatitis, flu, DTap, polio, chickenpox, MMR, COVID-19, and rotavirus vaccines on the way!

What are they?

**DTap** protects you against, tetanus, diptheria, and pertussis.

**MMR** protects you from measles, mumps, and rubella.

I am still at large!

You can protect yourself from me by washing your hands often and getting vaccinated!

**Measles**

(Measles morbillivirus)
Navigating information about germs, diseases, and pandemics can be hard. It can be difficult figuring out what information we can trust, and some information can be hard to understand!

Let’s look at some misinformation statements circulating the internet and social media and decode the reality!

Vaccines don’t make you sick, but you might feel [ ] while your [ ] trains your body how to [ ].

mRNA vaccines don’t cause you to “shed” the virus to other people, there are no [ ] in these vaccines, just [ ] for your body to make a [ ] of the [ ] and [ ] how to [ ] it!

We get booster shots not because vaccines don’t work, but to [ ] us as the [ ] over [ ] and [ ] help our [ ] how to [ ] them!
I'm hungry! Let's get something to eat!

ACHTUNG!

Keep following public health orders regardless of your vaccination status!

WARNING!
They are eating in close contact!

Tiny Germs, Big Concerns

Timmie, Angelo, and Amari are best friends! They always hang out together!

These ads are so stupid...

We don’t need to get vaccinated! We’re young and healthy!

What do you mean?

They’re not stupid! We can still get COVID-19!

It might not affect us as much, but what about the people around us?

I live with my grandparents. I got vaccinated to keep them safe.

Timmie’s vaccinated, right?
I only have the first dose. The needle hurts! I’m scared to get the second one!

Timmie! You should get the second dose!

Getting it keeps everyone safe! If you’re scared, you can try a stress ball. Or I could come with you and talk you through it.

Guys, I have Covid :/ Srsly bro, we’re going to the water park next week >;

I’m going to get tested. You should too, Angelo.

whatever. I feel fine.

Timmie can’t taste his favourite ice cream! Or anything else he eats or drinks!

He decides he had better take a COVID-19 test.
Amari, Timmie, and Angelo’s bodies each respond very differently to the viral invasion. Amari’s ready with lots of antibodies and trained white blood cells (WBCs) to stop the virus but Timmie’s body is still slowly learning how to fight the germs, and Angelo’s WBCs have no clue how to deal with the virus yet.

Amari’s B cells

Great work! Those neutralizing antibodies are stopping most of the virus before it can even penetrate our cells!

Timmie’s B cells

The virus is still really active, we’ve got to get more antibodies out there!

Angelo’s B cells

AHHHH! What are these things? They’re getting into cells all over the place!

We’re figuring out the antibody shape! We’ll start production tomorrow!

Meanwhile in the lungs...

Only a few viruses left! Killer and T have this covered! Let’s head home everybody!

Some of them are escaping! We need reinforcements!

What are these things? Sound the alarm! Fever stat! We need all the help we can get!

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AHHHH! What are these things? They’re getting into cells all over the place!

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Apparently there was a party last weekend and a student went to the party with COVID, infecting multiple students. They're all sick or home now in quarantine.

Angelo and Timmie choose to go to the party even though Amari said they shouldn’t.

This party be lit bruh!

Five days later...

Ms. Ringer, where is the rest of the class?

So does that mean they’re not coming to the water park tomorrow?

Unfortunately yes, they will be missing the field trip.

Thanks to the students from Met Centre for Arts and Technology for writing and storyboarding this comic!

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CLASS CHAT

Timmie and Angelo, I just talked to Amari and they said that you guys tested positive??

OMG did you guys go to the party knowing you had covid??

Well...I wasn’t feeling sick yet and Timmie was feeling a bit better, so we thought it was okay.

Not cool bro. I heard a bunch of ppl are sick now

Been testing negative for 2 days now, probs cuz I’m vaxxed. Hope you all feel better soon! 😊

The next day...

Amari’s better already?! I guess I should have gotten the jab.

Wish you were here 😊

Five days later...

17
# Germs and Ladders

**Materials:** you will need a die (if you don’t have one, scan the QR code to the right) and a piece to act as your player (a rock, a piece from a different game, a coin, anything).

**How to play:** Each player will take a turn rolling the die. This number is how many spaces you move with your playing piece. If you land on a ladder, climb the ladder to advance further in the game. If you land on a germ, slide down the ebola tail.

Add some germy facts as you try to make it to the finish line. First person to make it to the finish line wins!

<table>
<thead>
<tr>
<th>Finish</th>
<th>1,000,000,000,000 germs can live in one gram of poop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td>34</td>
<td>Washed your hands after going to the toilet.</td>
</tr>
<tr>
<td>33</td>
<td>Some vaccines come as oral medication.</td>
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<tr>
<td>32</td>
<td>You let your dog lick your face.</td>
</tr>
<tr>
<td>31</td>
<td>Viruses need to get inside of living cells to survive and reproduce.</td>
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<tr>
<td>30</td>
<td>You clean and disinfect frequently touched surfaces.</td>
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<tr>
<td>29</td>
<td>Vector-borne diseases, like malaria and lyme disease, are transferred to us by bites from infected animals.</td>
</tr>
<tr>
<td>28</td>
<td>Sneezed and didn’t cover your mouth. Saliva from a sneeze can travel as far as 8 metres.</td>
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<tr>
<td>27</td>
<td>Thanks to vaccines, smallpox is eradicated.</td>
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<tr>
<td>26</td>
<td>Only washed your hands with water after going to the toilet.</td>
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<tr>
<td>25</td>
<td>1,000,000,000,000 germs can live in one gram of poop.</td>
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<tr>
<td>24</td>
<td>Washed your hands after blowing your nose.</td>
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<tr>
<td>23</td>
<td>Didn’t wash your hands before making a sandwich.</td>
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<tr>
<td>22</td>
<td>E. coli, a poop bacterium, can double every 20 minutes.</td>
</tr>
<tr>
<td>21</td>
<td>Zoonotic diseases can transfer between humans and animals like the Black Death.</td>
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<tr>
<td>20</td>
<td>Thought it was better to get natural immunity instead of the vaccine.</td>
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<tr>
<td>19</td>
<td>Wore a mask to the store.</td>
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<tr>
<td>18</td>
<td>Vaccines help prepare your body to fight off certain germ invaders.</td>
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<tr>
<td>17</td>
<td>Bacteria have been around for about 3.5 billion years.</td>
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<td>16</td>
<td>Had a sore throat and stayed home from school.</td>
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<td>15</td>
<td>Keep your immune system strong by eating well, exercising, and getting enough sleep.</td>
</tr>
<tr>
<td>14</td>
<td>Washed your hands after blowing your nose.</td>
</tr>
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<tr>
<td>9</td>
<td>E. coli, a poop bacterium, can double every 20 minutes.</td>
</tr>
<tr>
<td>8</td>
<td>Zoonotic diseases can transfer between humans and animals like the Black Death.</td>
</tr>
<tr>
<td>7</td>
<td>We have trillions of bacteria on and in us at all times.</td>
</tr>
<tr>
<td>6</td>
<td>Vaccines have been around since 1798.</td>
</tr>
<tr>
<td>5</td>
<td>You let your dog lick your face.</td>
</tr>
<tr>
<td>4</td>
<td>Some vaccines come as oral medication.</td>
</tr>
<tr>
<td>3</td>
<td>Washed your hands after going to the toilet.</td>
</tr>
<tr>
<td>2</td>
<td>Only washed your hands with water after going to the toilet.</td>
</tr>
<tr>
<td>1</td>
<td>Learn some germy facts as you try to make it to the finish line. First person to make it to the finish line wins!</td>
</tr>
</tbody>
</table>
Memory Game

Germs have unique shapes on their surface called **antigens**. Some of our immune cells can make Y-shaped weapons, called **antibodies**, that are able to stick perfectly to these antigens, and mark them for destruction! After an infection or vaccination, some antibodies stick around in our body and remember how to attack that same germ if it tries to sneak in again!

Test your memory by recognizing germs and their matching antibody!

1. Colour the memory squares below and colour the puzzle on the back side of this page.
2. Cut the squares out, flip them face down and mix them up so you don’t know which is where!
3. Turn over any two pieces, if the names match and the antibodies fit, you get to keep them.
   If they don’t match, turn them back over and try again!

Eg: See how the strep throat antigen fits perfectly into the strep throat antibody spot?

<table>
<thead>
<tr>
<th>Germs</th>
<th>Antibodies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hepatitis B</strong></td>
<td><strong>Antibody</strong></td>
</tr>
<tr>
<td>Orthohepadnavirus</td>
<td>Strep throat</td>
</tr>
<tr>
<td>Hepatitis B virus</td>
<td>Strep throat</td>
</tr>
<tr>
<td></td>
<td>Whooping cough</td>
</tr>
<tr>
<td></td>
<td>Dengue fever</td>
</tr>
<tr>
<td></td>
<td>Rotavirus</td>
</tr>
<tr>
<td><strong>Syphilis</strong></td>
<td><strong>Antibody</strong></td>
</tr>
<tr>
<td>Treponema pallidum</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Zika virus</strong></td>
<td><strong>Antibody</strong></td>
</tr>
<tr>
<td>Flavivirus zika virus</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dengue fever</strong></td>
<td><strong>Antibody</strong></td>
</tr>
<tr>
<td>Flavivirus dengue virus</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gonorrhea</strong></td>
<td><strong>Antibody</strong></td>
</tr>
<tr>
<td>Neisseria gonorrhoeae</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Syphilis</strong></td>
<td><strong>Antibody</strong></td>
</tr>
<tr>
<td>Treponema pallidum</td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>Hepatitis B</strong></td>
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</tr>
<tr>
<td>Orthohepadnavirus</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B virus</td>
<td></td>
</tr>
</tbody>
</table>
There is always a battle going on inside of our bodies between germs trying to make us sick and our immune cells trying hard to protect us!

Colour in the dramatic battle between germs and immune cells, cut them out, and try to put the puzzle together!

Don’t forget to colour the front side of this page for the memory game!
Germs BINGO

We're all working together to reduce the spread of germs and keep our immunity up! How many things do you do to stay healthy and keep others safe?

Spell out the word GERMS diagonally, vertically, or horizontally to win! How many germs BINGOs can you get?

<table>
<thead>
<tr>
<th>G</th>
<th>E</th>
<th>R</th>
<th>M</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stayed at home when feeling sick</td>
<td>Always wash your hands before you eat</td>
<td>Eat foods high in vitamin C like citrus, red bell peppers, or kale</td>
<td>Exercise at least 3 days a week</td>
<td>Wash hands for 30 seconds with warm soapy water</td>
</tr>
<tr>
<td>Eat fermented foods like yogurt, sauerkraut, kimchi, or kefir</td>
<td>Use hand sanitizer when you can’t wash your hands</td>
<td>Avoid touching your eyes, nose, and mouth in public</td>
<td>Got your first COVID-19 shot</td>
<td>Keep open cuts clean</td>
</tr>
<tr>
<td>Close the toilet lid before flushing the toilet</td>
<td>Wash fruits and vegetables before eating them</td>
<td>FREE SPACE</td>
<td>Get vitamin D by getting out in the sun everyday</td>
<td>Avoid hanging out with people that are sick</td>
</tr>
<tr>
<td>Wear a mask to protect yourself and others</td>
<td>Eat foods high in antioxidants like berries and leafy greens</td>
<td>Sleep 8 hours a night</td>
<td>Use sanitizing wipes or soapy water to clean tables</td>
<td>Stay hydrated by drinking lots of water</td>
</tr>
<tr>
<td>Brush your teeth twice a day</td>
<td>Got your second COVID-19 shot</td>
<td>Always wash your hands after using the washroom</td>
<td>You cover your coughs and sneezes</td>
<td>Avoid sharing foods or drinks with other people</td>
</tr>
</tbody>
</table>

You don't have to worry about protecting yourself from me, I was eradicated through vaccination in 1980!

Smallpox (Variola major virus)
Answer Key

Page 5
Recognize These Plague Causing Germs?

Poliovirus
- This virus infects our nerves, paralyzing 1 in every 200 people infected.
- Since the 1950's 80% of countries have used oral vaccines to get rid of this disease.
- This virus attacks white blood cells that normally fight infections. Since 1980, 47 million have died.
- ½ of the world got this feverish disease from 1918-1919, and about 50-100 million died.
- This virus naturally mutated into a much less deadly form. Now seasonal vaccines can protect us.
- This virus can help stop the germs don't like, and start a fever which makes it hard for germs to grow. They can also call for more helper cells.

Cholera
- This virus infects our intestinal cells and lymph nodes, causing severe diarrhea and dehydration!
- Clean drinking water, hand washing, and oral vaccines can help stop this disease.
- Up to 4 million catch this infection every year and over 14,000 will die from severe diarrhea and dehydration!
- 3 out of 10 people who got this infection have died.
- Thanks to vaccines, this disease was wiped out in the 1980's, and never seen again!

HIV/AIDS
- Medicines can slow viral growth and its spread to others. New mRNA vaccines are being tested!

Spanish Flu
- This virus spread between rodents, fleas, and people, killing ½ of the world from 1347-1350

Smallpox
- These germs spread between rodents, fleas, and people, killing ½ of the world from 1347-1350

The Black Death
- This disease can be treated with antibiotics. Without treatment, it kills 6 of 10 people infected.

Page 3
Fact or Fake?

Page 7
Word Scramble

Page 8
Word Search

If germs are too powerful, and grow a lot, they can start an infection. Dendritic cells and macrophages, who engulf or eat germs, carry them to the lymph nodes where their weak spots can be studied!

This team of white blood cells works in our spleen and lymph nodes to learn about tough germs and build Y-shaped weapons called antibodies that help target and kill germs or the host cells they’re infecting. B cells can remember germs for decades after an infection or if you get a vaccine.
**How Do Vaccines Work?**

- Live attenuated vaccines
- Subunit vaccines
- Viral vector vaccines
- mRNA vaccines
- Inactivated vaccines

**Trace the Disease!**
- Arrows show each contact and chance of catching the infection.
- Being outdoors or vaccinated halved the spread of infection.
- Masks protected each person wearing them.

**Immunity Maze**

**Decode the Message**

Vaccines don’t make you sick, but you might feel TIRED while your IMMUNE SYSTEM trains your body how to FIGHT OFF the GERMY INVADERS for the FUTURE.

mRNA vaccines don’t cause you to “shed” the virus to other people, there are no REAL VIRUSES in these vaccines, just INSTRUCTIONS for your body to make a PIECE of the GERM and LEARN how to FIGHT it!

We get booster shots not because vaccines don’t work, but to PROTECT us as the GERM CHANGES over TIME and help our IMMUNE CELLS REMEMBER how to FIGHT them!
The Youth BIOlab at the St. Boniface Hospital Albrechtsen Research Centre is a space for students and teachers to explore and experience real biomedical science in a world-class research centre. We partner with the education community to promote health and science literacy in Manitoba youth.

The Tiny Germs, Big Questions activity book was developed during the COVID-19 pandemic to help teach people about vaccines, diseases, and health!

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Stay Curious!

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