

# Through Martin's microscopic world

Marta Maroto Díaz

Illustrations: Adolfo Ruiz Mendes



© Copyright 2022. Pfizer, S.L.U.



www.pfizer.es

Text: Marta Maroto Díaz  
Illustrations: Adolfo Ruiz Mendes  
Design: Cósmica® comunicación | arte | web

© Copyright 2022. Pfizer, S.L.U.  
All rights reserved.

Madrid, January 2024



Scan this code with your mobile camera and discover the microscopic world of Martin.

## WHEN YOU USE THE **AUGMENTED REALITY APPLICATION**

- Make sure you have your mobile speaker activated.
- Keep your phone horizontal when you interact with the images in the story to enjoy a better experience.
- Use the scroll bar that appears in each Augmented Reality scene to adjust its position.

**Scenes with Augmented Reality are indicated with this bacteria.**



Have you ever wondered about those microorganisms you can't see with the naked eye but you've heard mentioned so many times? Would you like a fun way of learning about them? Then be sure to read this story in which "Through Martin's microscopic world" you'll learn all about bacteria, those tiny organisms 1000 times smaller than a pencil tip, but which are nevertheless essential to our life. Although your eyes can't see them, they are one of the oldest life forms in the Universe, due to their ability to adapt to both scorching heat and the coldest, most remote corners of the planet Earth.

This project aims to show you the work carried out by our company. Some years ago, we started publishing stories, written by our Pfizer colleagues, focusing on science and innovations that change patients' lives, so as to reinforce our commitment to health information as an educational tool for children, parents and professionals in healthcare and education.

We hope you find it helpful, educational and fun as you learn about and understand all the interesting facts about bacteria, what they are like and how they behave, their different shapes and types and also how they all help keep us healthy, although sometimes they can produce infections that make us feel ill.

With this story, we also aim to reinforce the key message on the importance of using antibiotics correctly, from the "One Health" perspective, to save millions of lives and avoid the development of what is considered likely to be the next pandemic, multidrug-resistant bacteria.

**Maite Hernández**

Director External Communications Spain

**Francisco Mesa**

Medical Director Hospitals Spain

Dedicated to my nephews and children  
everywhere, so they may grow up in a healthy  
world free of bacterial resistance.





# Through Martin's microscopic world

Marta Maroto Díaz

Illustrations: Adolfo Ruiz Mendes

# Presentation

Martin loves discovering new things. What he likes most of all is finding worms in the mud and putting a stick in a hole in the ground to see what bugs come out.

'Martin! Quick, wash your hands, they're covered in dirt!' his mother says when he gets back from his adventures.

'Just a moment, mum,' he always answers.



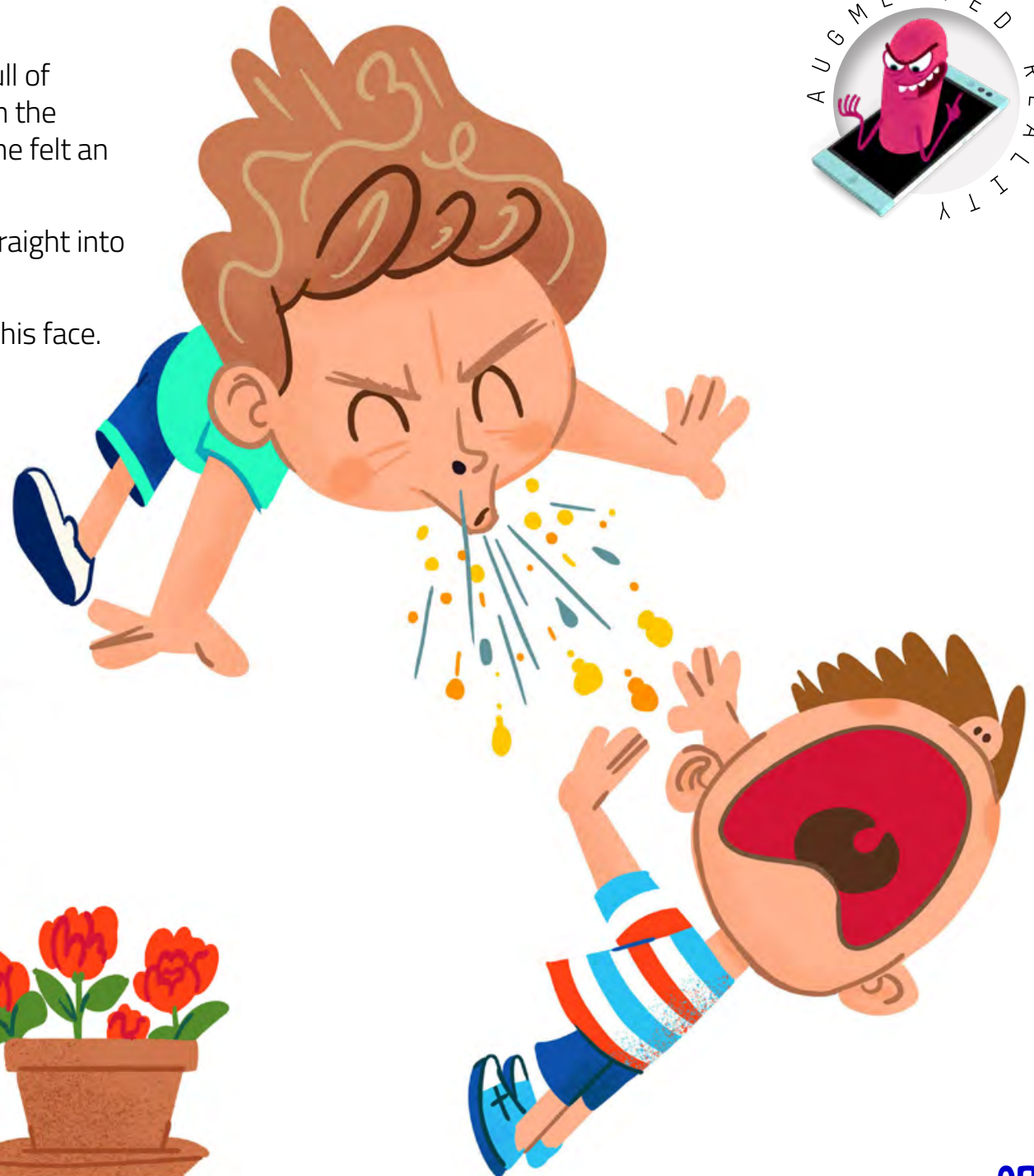


One spring day, Martín came home with his nose full of pollen after smelling all the flowers in the garden. In the middle of a staring contest with his brother Oliver, he felt an overwhelming need to sneeze.

As the contest was in full swing, Martín sneezed straight into Oliver's face.

'Eww, disgusting!' said Oliver, rubbing his hands on his face.

'Ha, ha, ha. No need for you to have a shower now,' Martín replied.



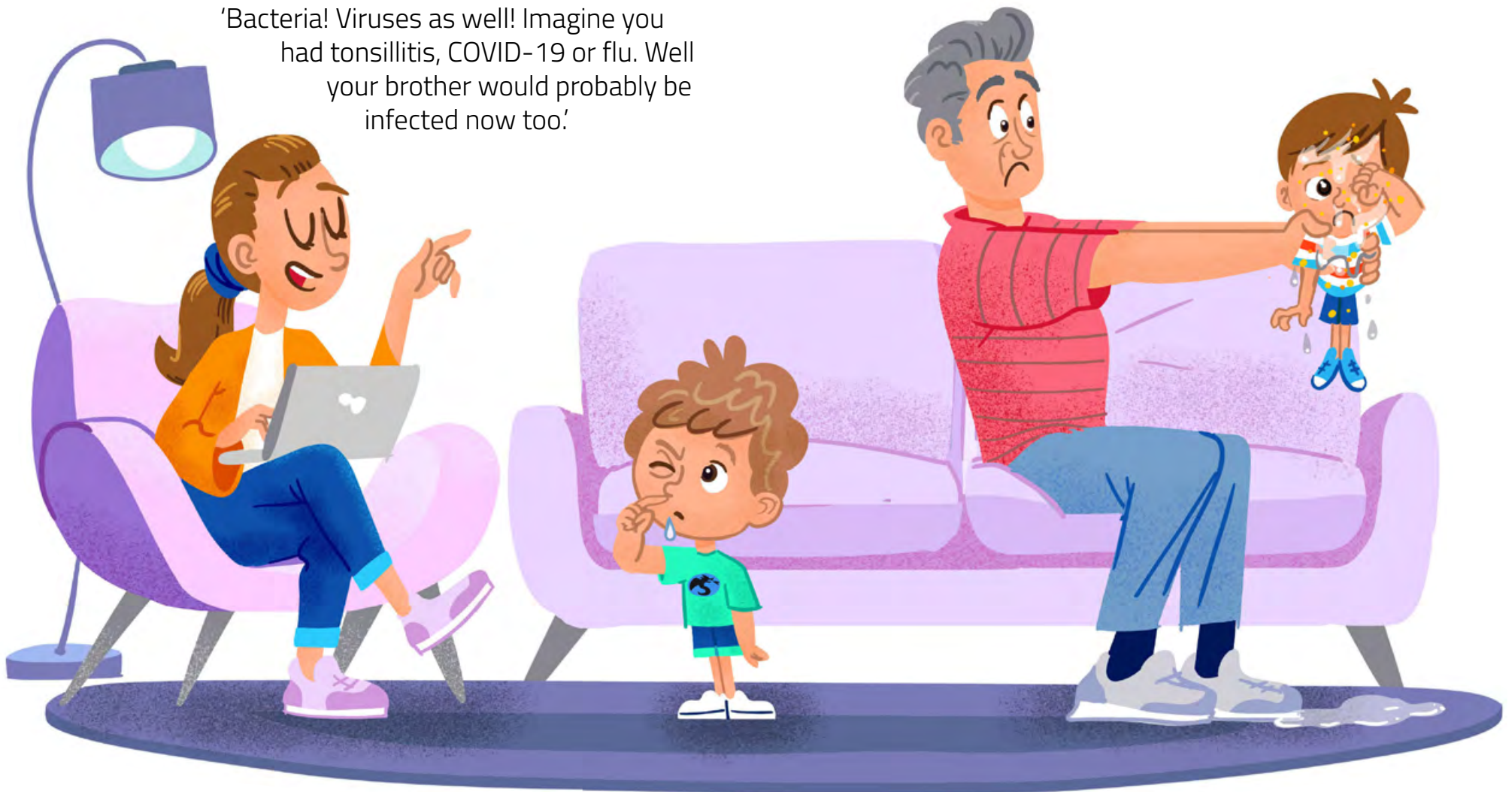
Martin and Oliver's mother, who was working on the computer nearby, got up and said, 'Martin, when you sneeze, use your arm to cover your mouth to stop bacteria travelling onto your brother's face.'

'All right, I'm sorry,' answered Martin, 'But what did you say could travel?'

'Bacteria! Viruses as well! Imagine you had tonsillitis, COVID-19 or flu. Well your brother would probably be infected now too.'

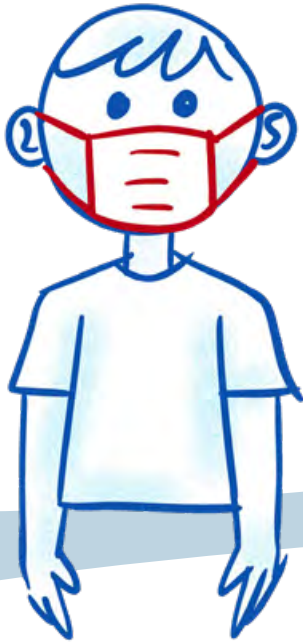
'Cool. So bacteria don't need a passport to travel round the world?' said Martin with a thoughtful tone.

'It's not at all cool! You mean I've now got bacteria on my cheeks? On my forehead? Get them off me, mum, please!' complained Oliver, unable to stop rubbing his face.





OK



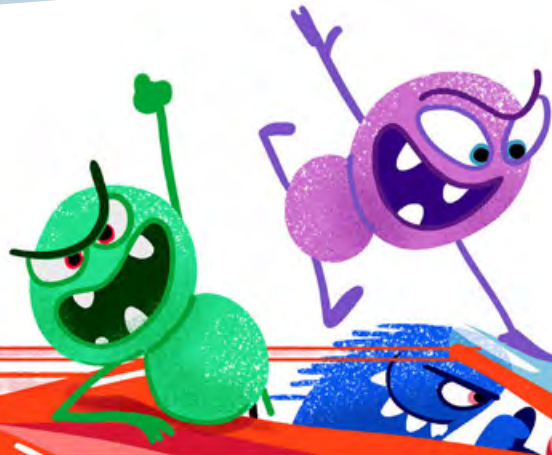
## TOP TIP

If you're about to sneeze, near other people and don't have a tissue at hand or you're not wearing a face mask, follow these three steps:

1. Put your face to your arm or arm to your face, whatever you prefer.
2. Sneeze freely.
3. Reply with a 'Thanks' if anyone says 'Bless you!'



100 MPH



## Fascinating Fact

Did you know that the air from a sneeze can reach speeds of up to 100 mph? And what's more, the mixture of saliva, snot and other strange things this air contains can reach a distance of eight metres. This means that droplets you sneeze out containing viruses or bacteria can infect all the children in a room.

# The encounter

It was time to sleep, but Martin couldn't stop thinking about those strange bugs he had been talking about with his mum, 'If they're bugs, what can't I see them? Why are they bad and make you sick? Do they have a mum and dad? And brothers?' And with these thoughts going round his head, he fell asleep.

'Hey, lad, wake up!' a voice said in the middle of the night.

Martin slowly opened his sleepy eyes and saw a very strange creature, shaped like a cylinder with hairs and a tail, and dressed in uniform.

Martin was a little scared because he also realised he didn't know where he was. 'Where am I? Who are you? Are you an alien? Why am I not in my bed?'

'That is not quite accurate, you're still in your bed,' said the strange thing calmly.





'But this isn't my bed, it looks like another planet!' answered Martin.

'That's because we've made you smaller; now you're my size, the size of bacteria.'

'What?' Martin was getting a more nervous, 'You're a bacteria? Are you going to hurt me?'

'Me? Why? Let me introduce myself: I'm Captain Bacillo and my mission is to show you my world, the microscopic world of bacteria.... And all for free! I'd say you are a lucky lad.'

Then, using its tail as if it were an antenna, the strange creature said, 'Klebsi, are you receiving me? Contact made! You can pick us up.'

'Who are you talking to?' asked Martin.

'To Klebsi, the bacterial pilot of the ship Microscope. He'll pick us up in a jiffy,' answered Captain Bacillo with a wink.

At that moment, the sound of a spaceship was heard (one of the cool ones, the fun ones) and Martin exclaimed with surprise, 'That's it! What a strange shape.'



Martin and Captain Bacillo boarded the ship.

'That's Lieutenant Klebsi,' said Captain Bacillo, pointing to another creature that looked like him, but in a different colour.

'Hello,' said Martin, 'Are you good or bad?'

'That depends,' answered Klebsi mysteriously, 'Time to take off!'

The Microscope lifted off, showing Martin a world that was completely new to him. His room looked different now, full of creatures every bit as strange as Bacillo and Klebsi.

These creatures were happily living their lives; some of them at a concert on his bed, others eating in a restaurant on one of the leaves of his plant...

## Fascinating Fact

A microscope is like a magnifying glass, but much more powerful. The instrument lets you see organisms a thousand times smaller than the tip of a pencil. The first person to see these creatures through a primitive microscope was Anton Van Leewenhoek, and he even gave them a name: animalcules.



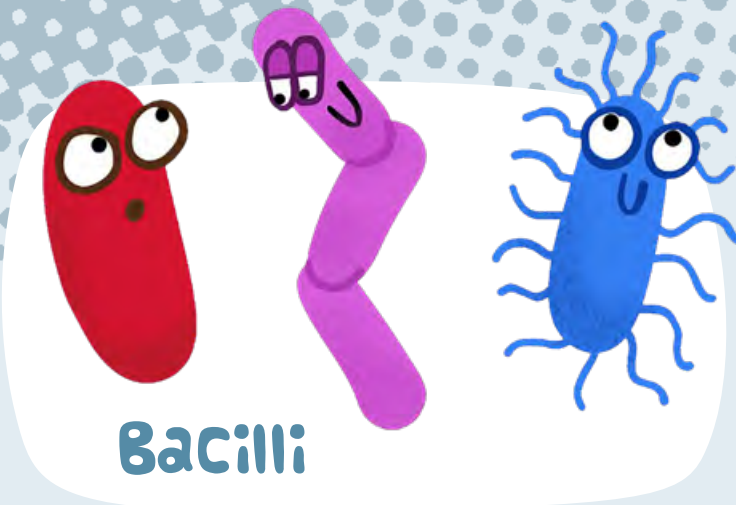
# Bacteria in the outdoor world



'Although you can't see us, bacteria live in every tiny corner of the planet,' Captain Bacillo told Martin, 'We might be sunbathing in a chair or freezing in the Arctic. We can live in the mouth of a lion or in Batman's nose... that's how cool we are.'

'But they are not all the same: these ones are round and those ones look like a spring,' Martin remarked, pointing to a group of bacteria on bikes and skateboards riding over his homework.

'Of course not! Did you think we were all the same?' answered the Captain, 'Us bacteria are living creatures, like humans, and we also have different names and looks. It would be so boring otherwise!'



© Copyright 2022. Pfizer, S.L.U.

**Info** 'Bacteria are small living creatures, older than the dinosaurs, who are found everywhere, and they are essential to life on our planet. For instance, they make the soil fertile for plants to grow. It's also true that some bacteria are dangerous and can cause diseases in other living creatures.'

There are loads of bacteria, and all have names that sound like aliens. However, so you can tell them apart, we've classified them into four groups by their shape:

**COCCUS.** These are round, like a tennis ball, or a ping-pong ball, or a football, volleyball... whatever ball you want.

**BACILLI.** You can spot the bacteria in this group by their cylinder shape, like a marker pen.

**VIBRIOS.** This might be the hardest to guess. What shape might they be? Do they remind you of a crescent moon?

**SPIRILLA.** No problem with these ones, right? Exactly! They are shaped like a spiral or spring.



'Well I must say your world is great fun,' declared Martin, 'But my mum said you could make my brother ill. So, are you good or bad?' he asked, glancing at Klebsi.

At this the captain cried, 'You're right! It's time for explanations. Klebsi, set course for the inside of Oliver!'

'Inside my brother? Why?' asked Martin anxiously.

'You remember that sneeze in your brother's face? We now we are going to be that sneeze!'

'Hang on tight,' warned Klebsi, 'Super-speed in five, four, three... NOW!'

The Microscope shot off towards the open mouth of Oliver, who happened to be snoring at that moment.

'Ohhhh!' cried Martin, grabbing his seat as if he were on a roller coaster, 'You didn't finish the countdown!'

Klebsi smiled cheekily.

'Ha, ha, ha. Klebsi loves pranks,' said the Captain while raising his arms to infinity and beyond.



# Bacteria in the human body

Once inside Oliver's mouth, the ship slowed down and turned on its powerful spotlights to light up the area.

'A perfect entry, Klebsi,' exclaimed the Captain, 'We're in!'

'Are those things over there also bacteria?' asked Martin, pointing to some creatures who were covering their eyes with their hands, gesturing angrily at the light disturbing them.

'Of course, there are millions of bacteria all around the body,' answered the Captain, 'They are in the mouth, nose, skin, intestines...'

'So, it's my fault my brother's sick?' said Martin, concerned.

'Of course not, lad! These bacteria live in your body without hurting you, helping you grow strong and healthy. All together, they are known as microbiota.'



© Copyright 2022. Pfizer, S.L.U.



'Ah, so these are good,' noted Martin.

'Bacteria are neither good nor bad,' answered the Captain, 'Most of them are harmless and help carry out beneficial functions that give you the vitamins you need to grow healthy and strong. The problem is when unauthorised bacteria get into your body.'

'What happens then?' asked Martin, intrigued.

'Well they are in a place where they don't belong and could hurt you,' answered the Captain, 'They are known as...' at which point the Captain paused for dramatic effect, '...pathogens!'

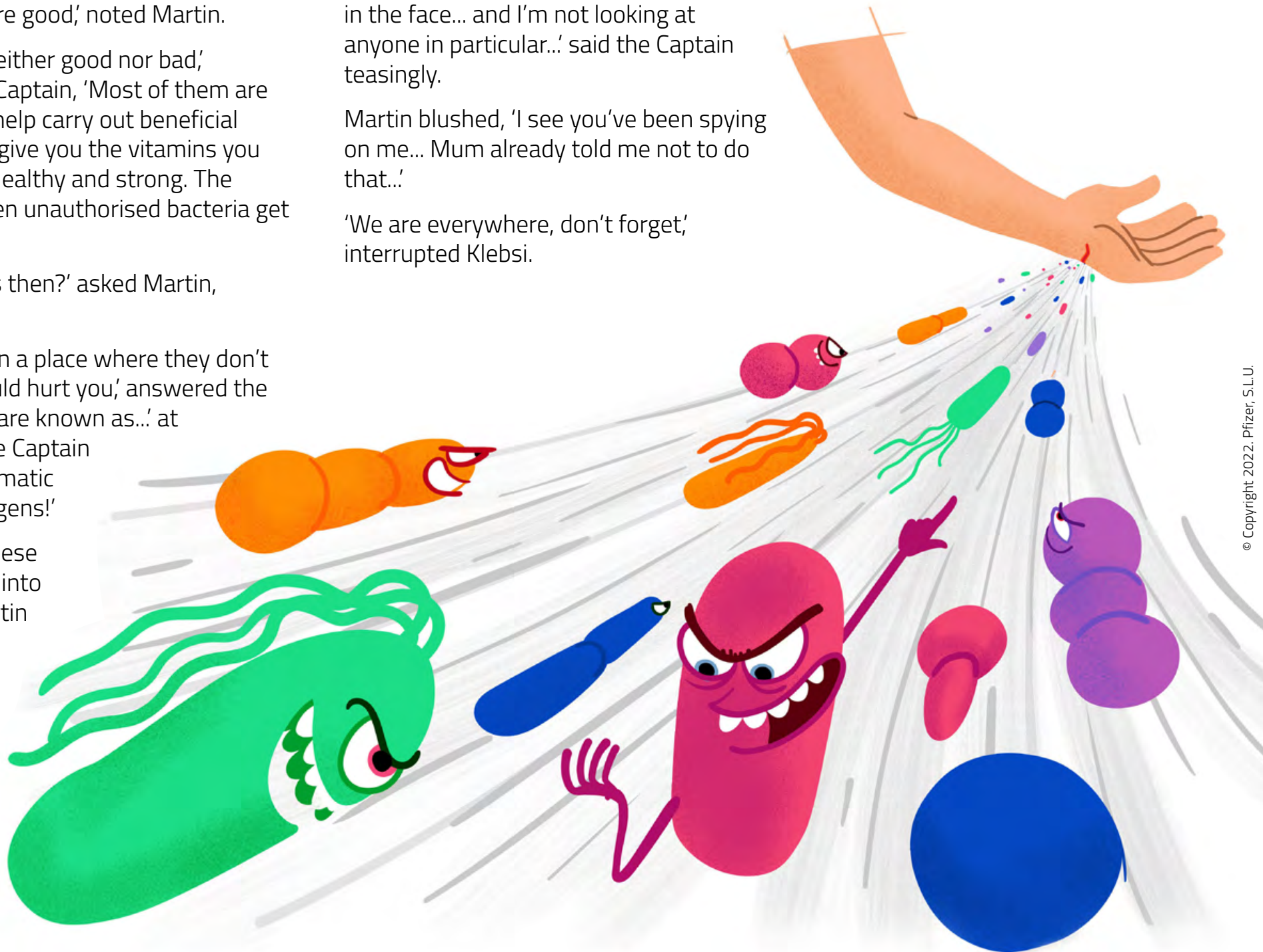
'And how do these pathogens get into our body?' Martin finally asked.

'Well, through the air, water, a prick, a cut, a sneeze

in the face... and I'm not looking at anyone in particular...' said the Captain teasingly.

Martin blushed, 'I see you've been spying on me... Mum already told me not to do that..'

'We are everywhere, don't forget,' interrupted Klebsi.



**Info** The good bacteria are in our body from birth.

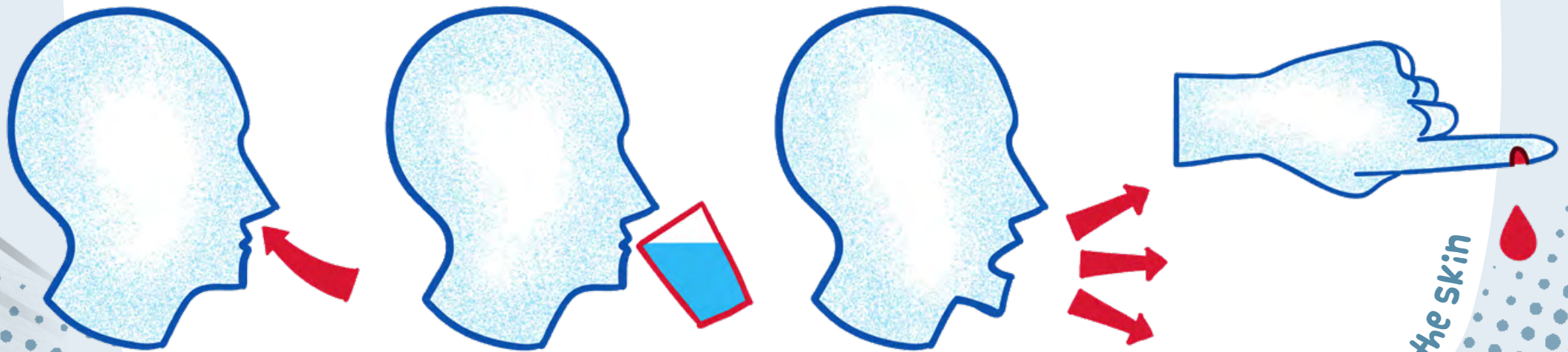
We acquire them from our mother and they are with us throughout our lives, defending us from harmful bacteria. That's why it's important to look after them through a healthy diet and good personal hygiene.

Harmful bacteria can enter our body in lots of different ways...

- Through the air we breathe.
- From the water we drink.
- When someone coughs or sneezes.
- From objects we touch or put in our mouths.
- Through a wound (when you bite your nails for instance).
- When you get pricked (such as with a nail or infected needle).

## BACTERIAL INFECTION

When dangerous bacteria enter our body, they start to multiply and try to hassle us. This is what's called a bacterial infection. Your body will react by sending an army with super powers to destroy them. You might feel a little weak while this is going on.



through the nose / through the mouth / when someone sneezes / through the skin



'And talking of entering, we're now inside your brother's intestines!' said the Captain while they drifted over some bacteria at work collecting food with cranes and diggers.

'Wow! The steak he had for dinner must be in here somewhere!' said Martin excitedly.

A thought came to Martin as the ship voyaged through the intestine, 'Hey, and is there no way of defending yourself against these "thugs"?'

'Pathogens,' the Captain corrected him, 'Well of course there is, and the best way is by protecting your body.'

'How?' asked Martin.

'Klebsi, load the defence program on the monitor.'



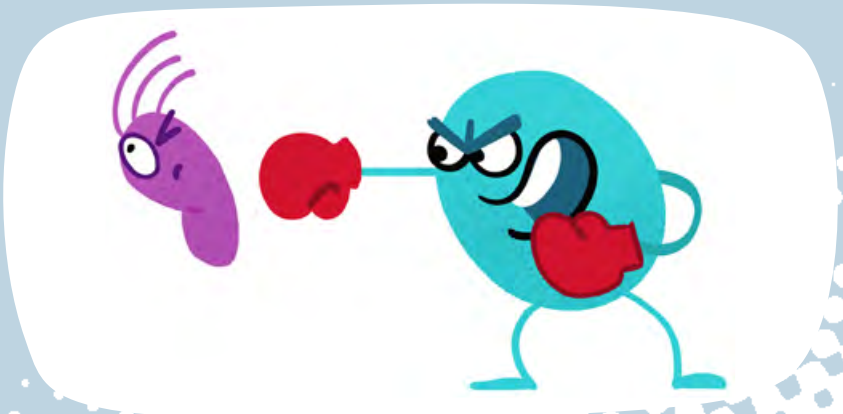
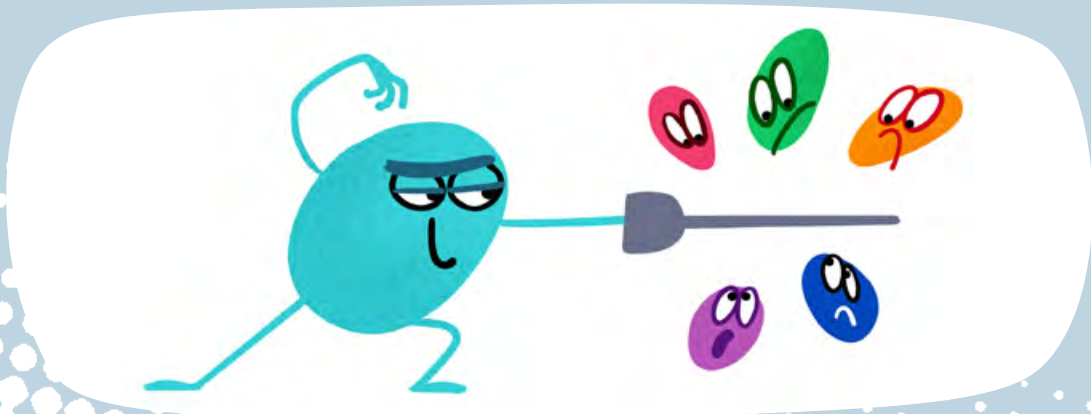
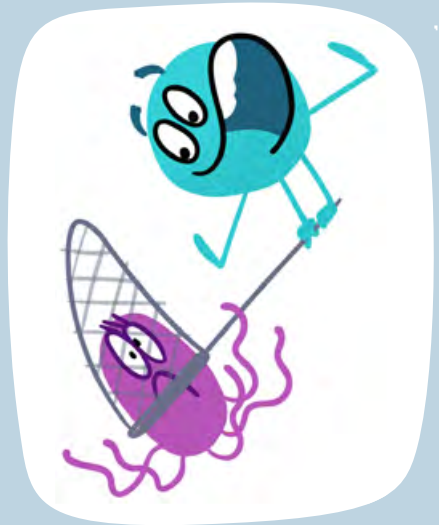
'Wow! How time flies,' said the Captain, 'It's time to end the mission.'  
'Nooo, not yet,' protested Martin, 'I wanted to go to the brain!'  
'Another time, but I'll let you choose how to leave: the ear or the nose?'  
'The nose, through the nose, like snot!' said Martin excitedly.  
'Set course for the nose, Klebsi! By the way, are you hungry?' the Captain asked Martin.  
'A little,' Martin smiled.  
'In that case...' the Captain offered him a cheese board, '...try this cheese, I was involved in making it.'  
'Really?' Martin took a big bite, 'Well it's delicious!'



# TOP TIPS

## BACTERIAL DEFENCE PROGRAM

By following these top tips, your body will keep those bacteria that make you sick under control.



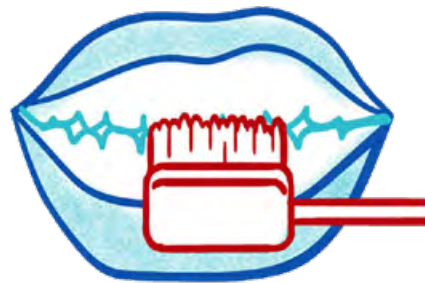
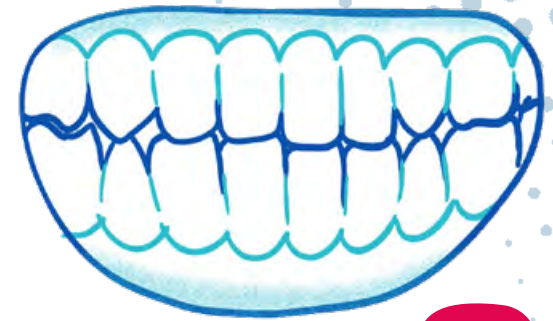
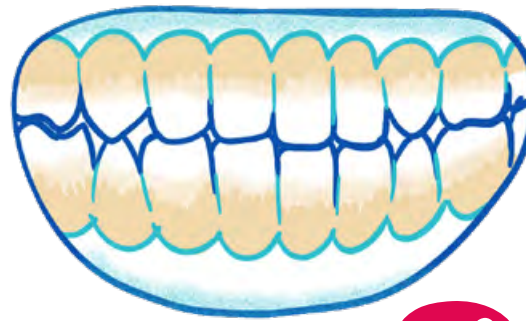
# TOP TIP

## SUPER CLEAN MOUTH

Brush your teeth for two minutes at least twice a day. This stops a load of nasty stuff full of bacteria building up and sticking to your teeth, which can damage them and your gums.

By the way, bacteria go crazy over sweets and sugary drinks, so be careful.

If you're not sure how to brush, ask your parents to teach you.



# TOP TIP

## SHINY CLEAN HANDS

If your hands are dirty (for instance, after going to the toilet or touching the floor) and then you touch food which you put in your mouth, BANG! You could get invaded, especially if your bacterial defences are not up to scratch. Put your hands under the tap and when they are wet, rub them together with soap until they are foamy and carry on for 40-60 seconds. No longer than it takes to sing Happy Birthday a couple of times.



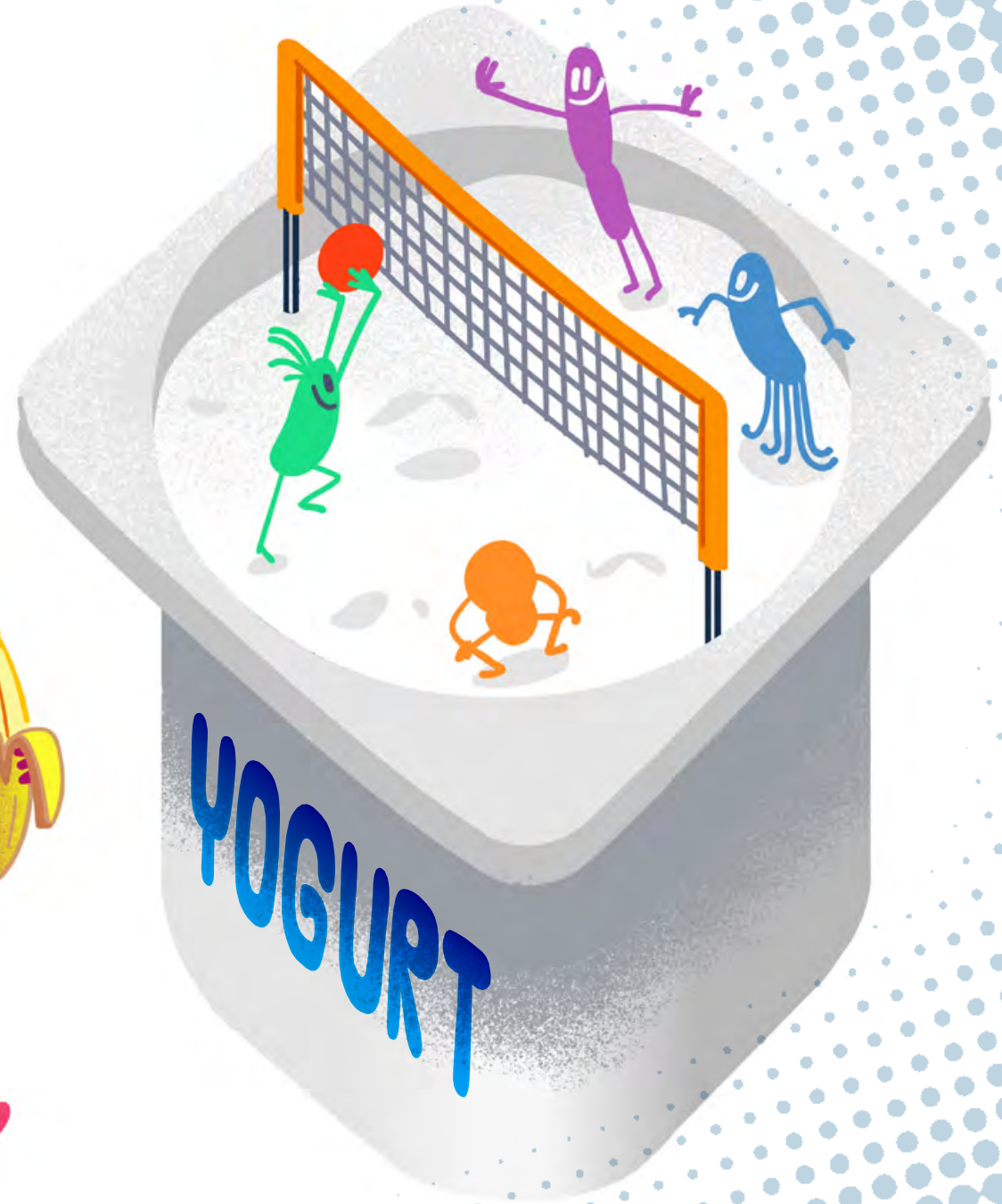
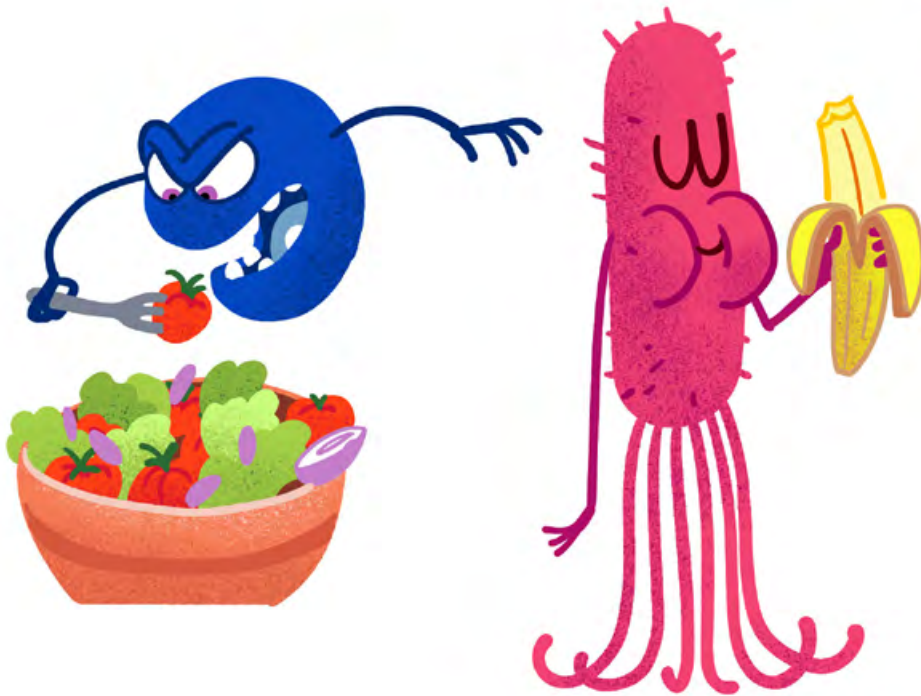


# TOP TIP

## TOP LEVEL FOOD

In your intestine there is a team of bacteria helping your digestion and manufacturing the energy that moves your body. Can you remember the name of this team?

Microbiota, that's right! Well they need food like this. Give them a treat; they deserve it!



## Fascinating Fact

Do you like cheese? And yoghurt? Well bacteria play a very important part in how they look, smell and taste. This process of bacteria transforming milk is called fermentation and it's been used for thousands of years.



# Antibiotics and goodbye

The Microscope flew majestically out of Oliver's nose as he carried on snoring, to land gently on Martin's bed.

'It was a pleasure to meet you,' said Captain Bacillus, 'You'll be back to normal when you wake up.'

'And don't sneeze in your brother's face,' advised Klebsi.

Martin agreed and then added, 'It's been great! When can we meet up again?'

'Well, you know, although you can't see us, we'll be close by,' answered the Captain from the door of the ship.

Then a doubt came to Martin, 'And what happens if those "plantigrades" get into my body and I can't get rid of them?'

'Pathogens, lad,' the Captain corrected him one last time. 'Well in such cases, your doctor would prescribe medicines called antibiotics. So don't worry! Until next time!' at which the ship rose and disappeared out of his sight.

'Ahh-hhaaa!' Martin yawned one of those huge yawns that come over you when you've just had an adventure and fall instantly asleep.



## Info

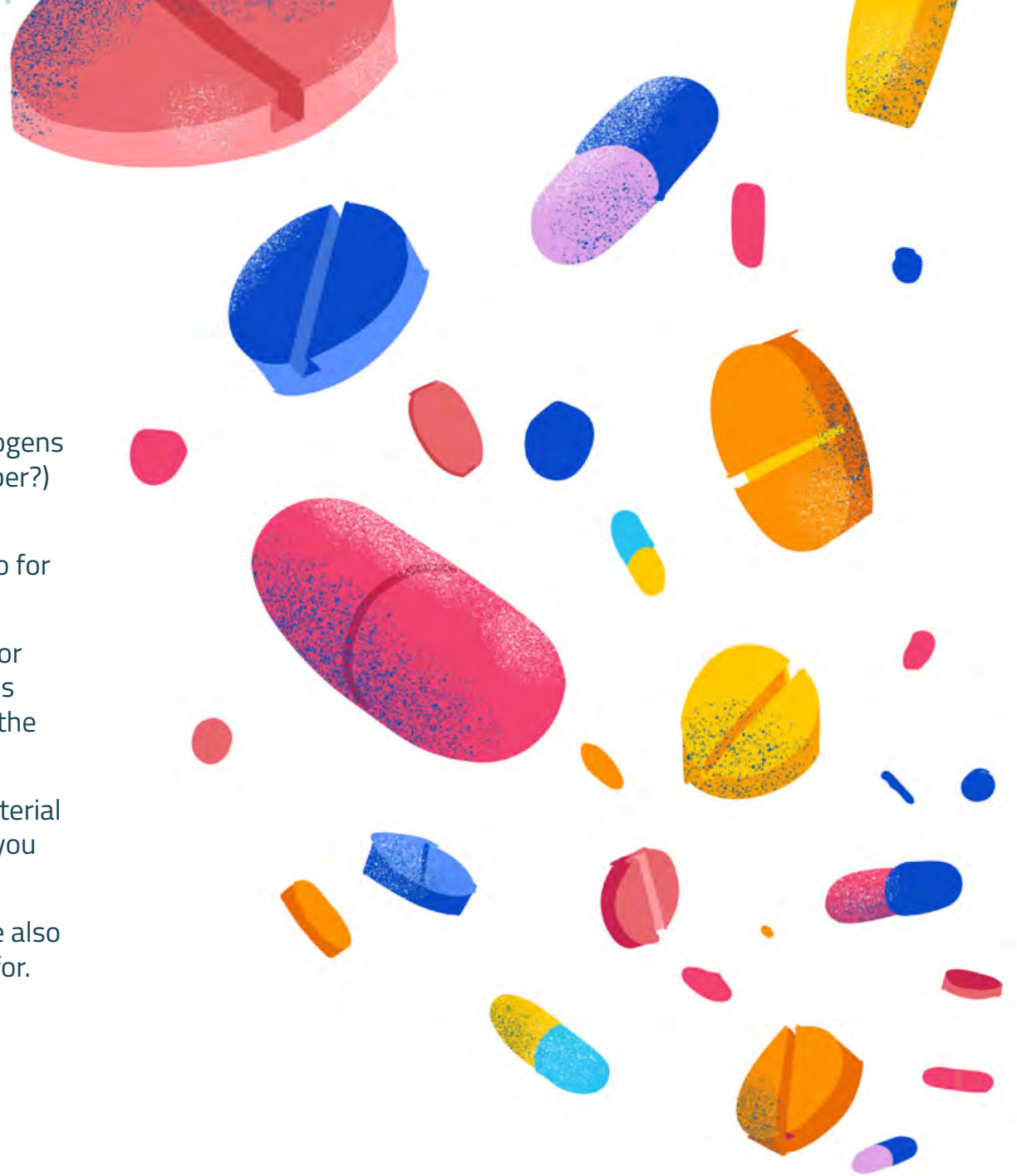
An antibiotic is a medicine you use when pathogens (those bacteria that invade your body, remember?) insist on hassling you.

Antibiotics are not just for people, they are also for cats, dogs, horses and other animals.

An antibiotic has to be prescribed by a doctor (or vet, if you're an animal), because it not only kills the pathogens that attack your body, but also the bacteria that look after it, like the microbiota.

You only need antibiotics when you have a bacterial infection, but it is your doctor who should tell you this.

Not all infections are due to bacteria. There are also viruses, like flu, which antibiotics are no good for.





# Info

## SUPERBUGS

This is the name given to bacteria that have become highly resistant to antibiotics.

It is VERY important to use antibiotics correctly; millions of lives depend on it, because when you don't take your medication when you should or stop taking it too soon, the invasive bacteria have time to learn and become stronger.

Unfortunately, this isn't always achieved. In recent years, antibiotics have been losing their ability to combat bacteria, which are becoming more and more resistant to the effect of the medicine. In other words, the superbugs are winning the battle.

## Activity

### FIGHT LIKE AN ANTIBIOTIC

Its time to put an end to bacterial infection. Draw a superbacteria on a page, giving it an angry face, and fight it like an antibiotic.



## Fascinating Fact

Did you know that climate change is causing superbugs to appear? Imagine you are in the swimming pool and the water is a bit cold; obviously you're not going to have a great time. But if the water is warmer, you'll be more comfortable, right? Well, it's the same for some bacteria and global warming; they are more comfortable.

Cholera, for instance, is a very dangerous disease transmitted by bacteria that live in contaminated water. And higher water temperatures now favour its growth.



## Fascinating Fact

This man, Alexander Fleming, has saved more lives than all The Avengers put together. How? Because in 1928 he discovered the powers of a fungus known as *Penicillium*, which gave humanity its first ever antibiotic.



# Epilogue

When Martin opened his eyes, he saw he was back to his normal size. The sun was already streaming through the window, although his brother Oliver was still snoring in the bed next to his.

'Oliver, Oliver!' he shouted excitedly, 'I went into your mouth, travelled down to your stomach and came out through your nose!'

While Oliver looked at him strangely, still half asleep, his mother came into the bedroom, 'Hey, what's all this fuss about?'

'Mum, you have super powers! And I know why I mustn't sneeze in someone's face and why I have to wash my hands when I touch worms or go to the toilet, I was told by some bacteria,' Martin said proudly.

That day, Martin told his friends about his adventure in the microscopic world and everything he'd learned.





# The End

'Until next time! And remember that not only bacteria like us can cause infections and diseases.

'There are also respiratory viruses that cause flu and COVID-19, and fungi such as Aspergillus. But we'll leave those for another adventure!'



# Appendix / exercises

And what about you? Have you learned a lot about the microscopic world of bacteria? Maybe you can help Martin's friends, because some of them still have a few doubts.

**EXERCISE #1 MARTIN'S FRIENDS HAVE A FEW DOUBTS. CAN YOU ANSWER THEM?**

1. Andrew thinks bacteria can live under water without drowning. Is he right or is that daft?
2. Paul seems to have understood that microbiota are bacteria that can enter our body and make us sick.
3. However, unlike Paul, Sarah thinks the bacteria that make us sick are called pathogens.
4. Zoe thinks that the first antibiotic was discovered at the beginning of the 21st century.



5. Agnes can't get the idea out of her head that climate change makes dangerous bacteria more resistant.
6. Agatha understands that pathogens love sweets and sugary drinks.
7. James believes that washing your hands prevents disease.
8. Tobias has come to the conclusion that it would be better if bacteria did not exist which is why we should take antibiotics.
9. India thinks that wearing a face mask reduces the risk of transmitting disease, even if you sneeze in front of people.



Agatha



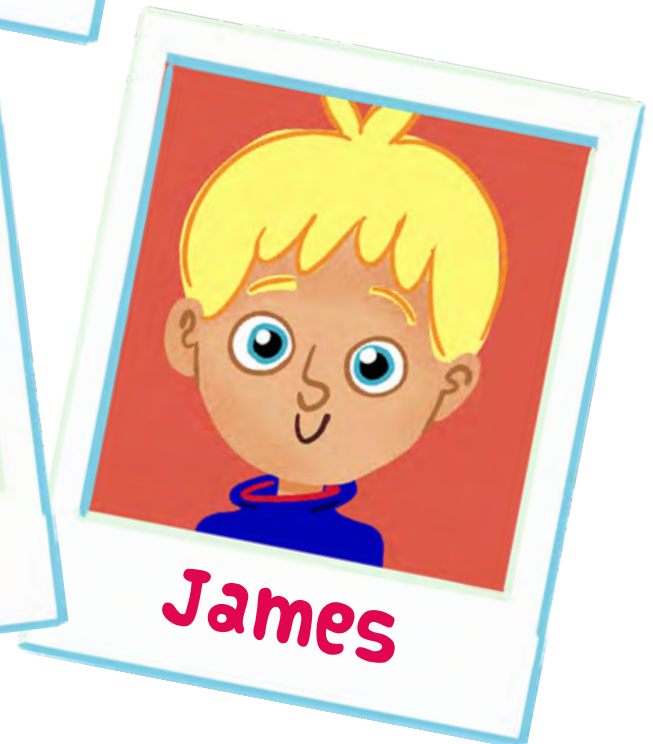
Agnes



India



Tobias



James

EXERCISE #2 CAN YOU SAY THE NAME OF THE DIFFERENT TYPES OF BACTERIA? COCCUS / BACILLI / SPIRILLA



figure 1



figure 2



figure 3

EXERCISE #3 WHAT ARE ANTIBIOTICS USED FOR? YOU CAN ONLY MARK ONE ANSWER.



EXERCISE #4 DO YOU KNOW HOW TO SAY BACTERIA IN OTHER LANGUAGES? LET'S SEE! CHOOSE THE CORRECT WORD.

bactérie

Bakterium

bacterie

bactéria

bacterium

English

Dutch

Portuguese

German

French



# Answers to the exercises

## EXERCISE #1

1. TRUE. Bacteria not only can live in the ocean, but also in extreme conditions, such as in the snow or in a volcano.

2. FALSE. It's the exact opposite:

Microbiota are bacteria that live in our body, mainly in the intestine, and keep our body healthy.

3. TRUE. Sarah is right. These bacteria, called pathogens, can cause infections and make us ill.

4. FALSE. Zoe is out by 100 years.

Alexander Fleming investigated the super powers of the fungus *Penicillium*

in 1928, in the first half of the 20th century.

5. TRUE. This is correct. With global warming, bacteria are more comfortable and can multiply like crazy.

6. TRUE. Correct. If you don't brush your teeth and you eat too many sweets and soft drinks, bacteria can settle down in your mouth and cause caries, among other things.

7. TRUE. As simple as that, because if you don't wash your hands after

## EXERCISE #2

going to the toilet or touching an animal, the dangerous bacteria will stay on your hands (and on food if you touch it later).

8. FALSE. Most bacteria live in harmony with us. Antibiotics should only be used when pathogens cause a disease in your body.

9. TRUE. Of course. A face mask acts as a barrier so that bacteria can't travel to other people.

## EXERCISE #3

Figure 1 BACILLI

Figure 2 SPIRILLA

Figure 3 COCCI

## EXERCISE #4

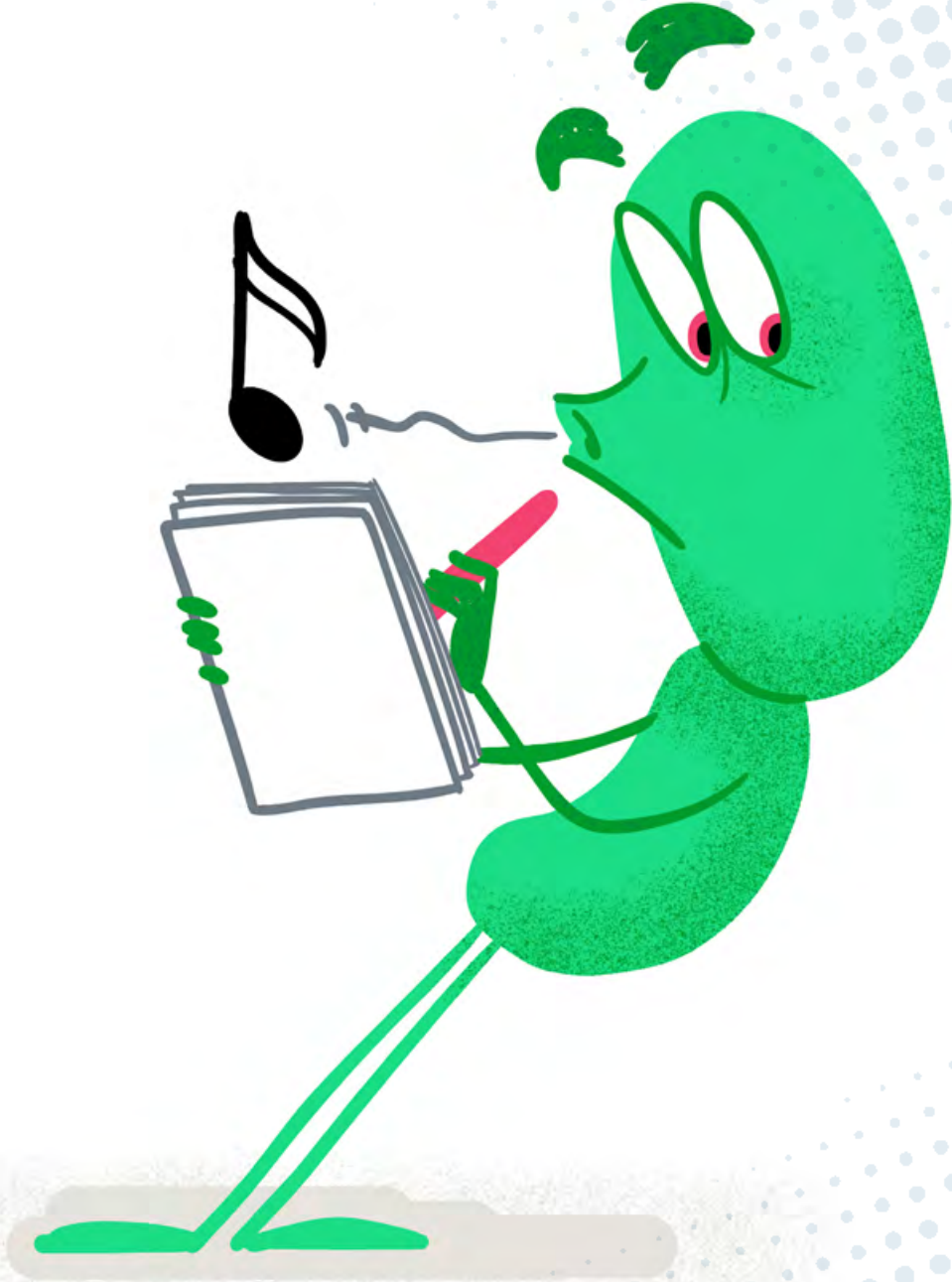
German BACTERIUM

French BACTERIE

Dutch BACTERIE

English BACTERIUM

Portuguese BACTERIA



# How to wash your hands with soap and water

Length of time for the procedure: 40-60 seconds.



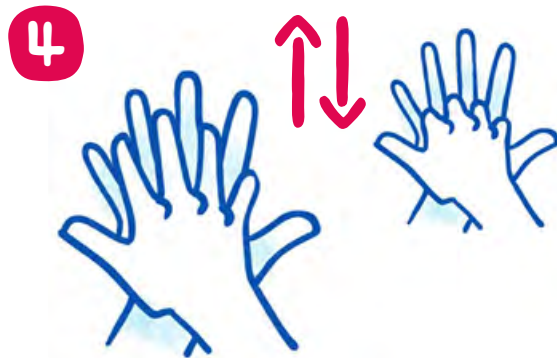
Wet your hands with water.



Use enough soap to completely cover your hands.



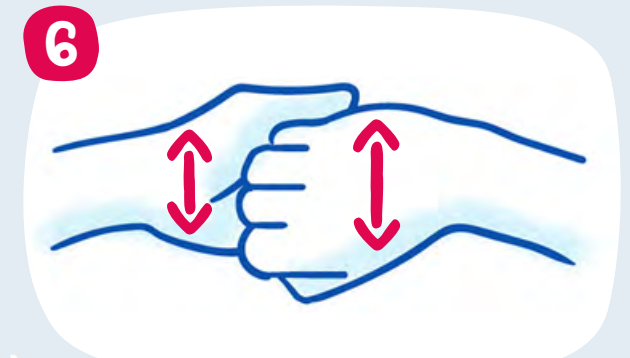
Rub the palms together.



Rub the palm of the right hand on the back of the left, interlacing your fingers, and vice versa.



Rub palm against palm, interlacing your fingers.



Rub the backs of your fingers against opposite palm, interlacing your fingers.



Rotate your left thumb in your right palm and vice versa.



Rub the tips of the fingers on your right hand in little circles backward and forward on the palm of your left hand and vice versa.



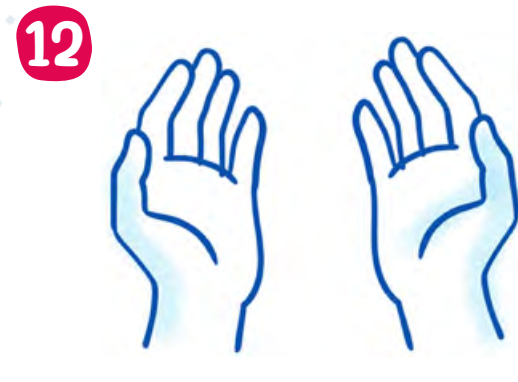
Rinse your hands with water.



Dry your hands thoroughly with a disposable towel.



Use the towel to turn the tap off.



Your hands are now safe.



OTHER  
STORIES  
FROM THE  
COLLECTION!





My thanks to Aracnofobia, all my colleagues at the Pfizer Spain Hospital Unit and Western Cluster, and the Corporate Affairs Unit for their unconditional support in carrying out this project.





[www.pfizer.es](http://www.pfizer.es)