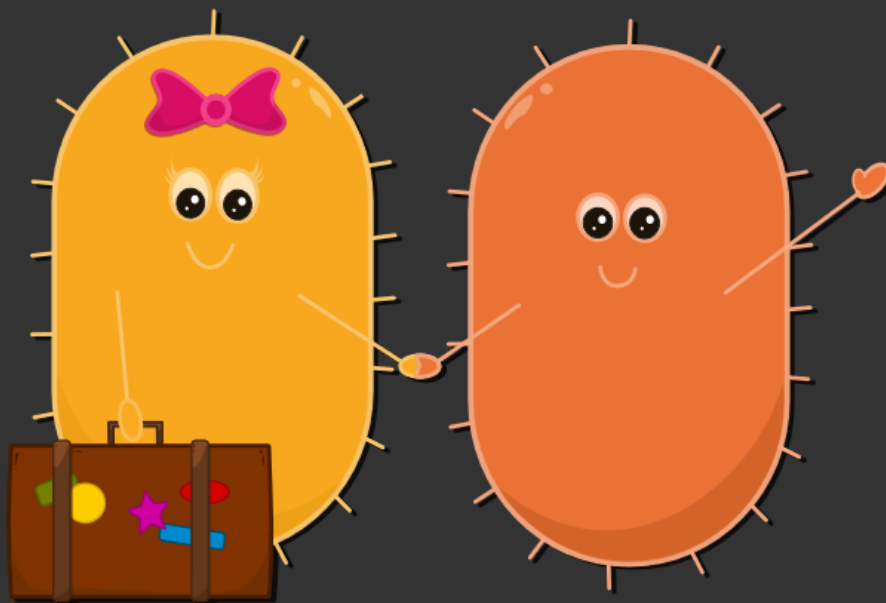




Bacillus Becky on search for friends

iGEM Team TU Darmstadt 2021



Bacillus Becky on search for friends

Today's story is about a little bacterium named Becky. You've probably heard of bacteria before, right? Bacteria are tiny little living things. They are sooo tiny that you can't even see them most of the time - and yet the little ones are almost everywhere in the world, for example on your skin or even inside you. But don't worry! Bacteria are not always evil. They can also be very sweet and help you digest your sweets.

But because bacteria are so small, they can't do so much on their own. That's why most bacteria look for groups in which they can live and work together. Not so different from us humans or other living creatures. After all, it's nicer for all of us to share tasks with friends and spend time with family.

But back to Becky. We already know that Becky is a bacterium. But there is not only one kind of bacteria, but many different ones. As I can tell from Becky's long rod-shaped body and some other characteristics, Becky is a Bacillus. This is one of many different kinds of bacteria. As the story progresses, we will learn about other types of bacteria together.

Becky would also like to live in a community. She has heard a lot about so-called biofilms, where bacteria of her kind like to live to support and protect each other.

So far, however, Becky has not been able to find a suitable biofilm for herself. She swims around alone and a little sad and feels very lonely.

She decides to actively search for a new home. And this will be a long and exciting journey for her. You are very welcome to join Becky on this adventure. I am definitely very excited and can't wait! So... are you ready? Then let's go!

After a short while, Becky hears music and laughter in the distance. *soundeffect* She decides to follow the sound, as it sounds like a lot of fun. As she gets closer, she sees a large group of bacteria dancing together. She directly notices that the other bacteria all look a little different from Becky herself. They are rather round, like little balls. Upon closer inspection, I'm pretty sure that Becky has come across a community of streptococci there. And they're having a party. That makes Becky want to join the party. One of the streptococci notices Becky and comes up to her.

(Sebastian:) "Hey, you're new here, aren't you?"

(Becky:) "Yeah, I'm Becky. It looks like you guys are having a lot of fun here!"

(Sebastian:) "Hi Becky, I'm Sebastian. I'm glad you're here! You're welcome to join us. We have a special dance. Here take my hand and we'll line up together with the others."

Becky gladly accepts the offer. Sebastian holds onto a row of streptococci and holds out his hand to Becky as well. Happy to have found a nice group so quickly, she grabs Sebastian's hand and wants to join in too. But somehow... it doesn't work. She just can't hold onto Sebastian.

Oh no, poor Becky. That's probably because she herself is a Bacillus and not a Streptococcus...

The Streptococcus species of bacteria likes to form chains, which is of course great for dancing. But this is not possible for every bacterium. Sad and disappointed that she probably hasn't found her home yet, Becky says goodbye to Sebastian and the other streptococci and sets off again.

Tired from the excitement of the party, Becky drifts off to relax a bit.

(Theo:) "Hey, you need to watch where you're going a little!"

Becky looks up. She almost bumped into another bacterium.

(Becky:) "Oh, sorry! I'm just a little tired. I'm Becky, and you are?"

(Theo:) "No problem, I'm Theo. I'm just on my way to my favourite spring. It's great for relaxing when you're tired. Do you want to come with me? It's the perfect temperature and my friends are already waiting for me. I can introduce you to them."

(Becky:) "Oh, that sounds great!"

That does sound great. Maybe Becky has already found a suitable community with Theo and his friends? Theo looks like a thermococcus. They're different in appearance from Becky, too, but maybe she'll fit in well with the group anyway?

Becky and Theo set off. The closer they get to the spring, the warmer Becky gets. Theo seems to enjoy the warmth a lot. Arrived at the steaming spring he jumps directly to the other bacteria. *soundeffect water splashing* Becky also wants to join the others and jumps after Theo *sound effect water splashin* ... and very quickly out again.

B: "ow ow ow, hot hot hot".

Becky doesn't understand... How can the others sit in the water so calmly? It is way too hot!

Oh no, I didn't even think of that. Theo and his friends are thermococci. They are thermophilic bacteria, which means they love heat. They can withstand temperatures of up to 100°C. Becky feels most comfortable at a temperature of 40°C.

Well, at least we learned something about bacteria again: They are very different and like different locations and temperatures. I have even heard of bacteria that live at 0 degrees! I don't even want to imagine that. And neither does Becky... She quickly says goodbye to Theo and the others and moves away from the hot spring until the temperature finally becomes more comfortable again.

So Becky journey continues...

Soundeffect *bang*

Becky startles! What was that? A loud bang snaps Becky out of her daydreams. A second bang sounds. Soundeffect *bang* I wonder if someone got hurt. Quickly Becky makes her way in the direction of the bangs. As she gets closer, Becky notices a horde of bacteria clearly having fun. Every now and then, a bang sounds from their midst. Soundeffect *bang* Puzzled, Becky approaches a bacterium standing a bit off to the side.

(Becky:) "Hello you! What are you doing here? Why is it so loud? Is everything alright? Do you need help?"

(Annabelle:) "Oh, hello. I'm Annabelle. Don't worry, everything is fine. We're achrobacter, this is kind of our hobby. We like to let it bang!"

Ahh, that explains it, of course. Achrobacter are also called pop-gas-bacteria. What is popping are two gases, hydrogen and oxygen. The Achrobacter bacteria can make water out of it. This produces the loud bang.

Becky looks at the other bacteria in amazement. They seem to be having a lot of fun.

(Annabelle:) "Try it out, it's fun!"

Annabelle shows Becky oxygen and hydrogen. Becky is very happy about the offer! How cool is that! She could imagine staying here and letting it bang all day long! She summons up all her courage, takes the two substances, and...

...nothing happens

Poor Becky... Unfortunately, she is not a pop-gas-bacterium like Annabelle and the others. It is not difficult at all for them to start the reaction. For quite a while they try to explain to Becky how they manage to create the bang, but Becky is just not able to do it.

What a disappointment! Once again, Becky doesn't feel at home and sets out on her own.

This time, a group of bacteria doesn't take long to arrive. As far as I can tell from here, the bacteria even look a bit like Becky. At least, they are also rod-shaped. Becky seems to notice this too and gets a bit more hopeful again. Maybe she has finally found her biofilm to join. Let's take a look right now.

The bacteria stand all very close together. As she gets closer, Becky hears a lot of whispering. Everyone seems very excited and full of anticipation.

(Becky:) "Hey you, I'm Becky. Are you guys planning a field trip? You all seem so excited. "

(Petra:) "Hello Becky. I'm Petra Pseudomonas. "

(Narrator: Ah a pseudomonate, so a different species of bacteria than Becky after all, but maybe she'll like it here anyway) "

(Petra:) "We are planning a very special trip.... To the humans... "

(Becky:) "Oooh, that sounds exciting, can I come with you?"

Petra:) "Yeah sure, the more the merrier! We have a great plan, are you ready?"

(Becky:) "Of course!"

That sounds promising. I wonder what that great plan is?

Petra:) "Sooooo, we've been working on this toxin here for a very very long time. (As Petra says this, she points to a bulging box next to her) We'll take these to the humans and pour them out there hehe.

Wait a minute? Did I hear that right? What kind of bacteria did Becky come across here? That doesn't sound good at all...

Becky seems to think so too.

(Becky:) "Ehmm but won't people get sick from it?"

Petra:) "Yes exactly, that is the goal hehe.

Now it is clear: Petra and the other Pseudomonas are pathogens. They are evil bacteria that cause illness in humans by secreting substances that are toxic to humans.

Becky wants nothing to do with that! Unnoticed she sneaks away.

Why is it so difficult to find a suitable biofilm for Becky? Slowly Becky becomes hungry. She has been on the road for what feels like an eternity and hasn't eaten in a long time.

What Becky would like most is some grape sugar (, also called glucose). She loves sweets. Just like you guys, right? While Becky is strolling around looking for glucose, she meets another bacterium that appeals to her. She introduces herself as Cindy. After a short conversation, Becky mentions how hungry she is.

C: I have a really great place to eat, come I can show you.

Somehow, I don't have a good feeling about it. Becky is so hungry, though, that she gratefully accepts Cindy's offer and follows her. After a short time, they arrive at an open, sunny spot. Far and wide, Becky can't spot any grape sugar. Cindy lies down in the sun and sighs happily.

Ah now I remember why Cindy looked so familiar to me! I once read something about so-called cyanobacteria! And Cindy looks exactly the same! They don't get energy from food like Becky does from glucose and you and I do from our favourite foods, but from the sun.

Becky is all confused. She herself just gets warm in the sun, she doesn't get any energy. Without proper food, she feels limp and tired. She says goodbye to Cindy, who obviously benefits from the sun's energy, and sets off on her own again.

Tired and powerless, she sits down by the side of the road. She has met so many different bacteria on her long journey, most of whom were also super sweet and helpful. Still, there wasn't a group that Becky really fit in with. She decides to take a nap to recharge a little bit.

After some time, Becky opens her eyes and.... Sees herself. She blinks a few times. No really, she is looking at her own reflection. No wait, there's not just one reflection of her, but two, no three, no four, no.... Quite a few. Becky can't count that far at all! I wonder if this is a dream. Suddenly one of the bacteria from her dream starts talking to her:

(Boris:) "Hello you, what are you doing here all alone? You look so tired and hungry. Can we help you? We have some food left. "

(Boris:) "Hello, I'm Becky. Yes, I am very hungry. But what do you have to eat?"

You can see how sceptical Becky is. Well, it is understandable after the long journey and the many disappointments. But the bacterium, which introduces itself as Bacillus Boris, hands Becky a large piece of grape sugar. Becky is very happy and devours her favourite food immediately. She immediately notices how she becomes more powerful and energetic again.

(Boris:) "Wouldn't you like to stay with us? You'll fit in well with us. We've lived together for a long time and have formed this biofilm here by being there for each other."

That sounds great to me! But Becky is still a little sceptical....

(Becky:) "You don't want to harm anyone, do you? And attack people or something?"

(Boris:) "What? No! No way! "

Phew, lucky you... But Becky is still not convinced."

(Becky:) "And do you like to bathe in hot springs?"

(Boris:) "You ask funny questions. No, well we stick to 40 degrees, anything else is way too hot for us."

(Becky:) "Perfect!"

Becky is overjoyed. Boris introduces her to the other Bacillus bacteria, who are all happy to meet her. She quickly becomes perfectly integrated into the biofilm, as if she had always belonged there.

Finally, she feels happy and content.... and at home.

And so, she lived happily and contentedly in the Bacillus biofilm, in which she will experience many more things. But those are completely different stories. No matter how hard it can be sometimes, if you stick together and are always there for each other, you can do anything!