

# But Why: A Podcast for Curious Kids

## Why do we have blood and what does it do?

March 24, 2023

**Jane** 00:21

This is But Why: A Podcast for Curious Kids, from Vermont Public. I'm Jane Lindholm. On this show, we take questions from curious kids all over the world and it's our job to find answers. You can send your own question on whatever topic has you excited to learn more. Have an adult record you asking it and send the file to [questions@butwhykids.org](mailto:questions@butwhykids.org). Or send us a video version on social media.

**Jane** 00:48

There is an amazing journey happening right now, inside your body. It happens all the time, whether you're awake or asleep, though it goes harder and faster when you're awake, and fastest when you're running around and taking big deep breaths. This journey is essential to keeping you alive. It's how food, oxygen and germ-busting defenders get to where you need them. And when you get injured or have a cut, this is the route special cells in your body take to help stop you from continuing to bleed. Do you know what I'm talking about now? I'm talking about your bloodstream, the path your blood takes all over your body. Your blood is pretty amazing. And today we're going to answer some of the questions you've sent us about how our bodies make blood, what it is, why we need it and all the different things scientists and doctors can learn about you just from studying one tiny drop of your blood. In order to learn a little bit more about what blood is, I drove over to the biggest hospital in Vermont, UVM Medical Center, to visit the blood lab. A blood lab is where your blood goes after a doctor takes it to be tested.

**Jane** 02:02

Inside a great big room on the bottom floor of the hospital, there were lots of people looking into microscopes and staring at images of blood on computer screens. And this was something I had never seen before: dozens of small vials of blood were traveling along a conveyor belt headed towards several big machines.

**Dr. Harm** 02:20

These are blood vials that have blood from patients who have come to have tests done. And the computer can scan the little barcode on the label. And the computer talks to this conveyor belt and the conveyor belt takes the tube of blood to the machine where it's going to be tested.

**Jane** 02:37

So it can tell which machine the blood needs to go to?

**Dr. Harm** 02:41

Yeah. It's all computerized and really smart. And all that information is embedded right in that barcode.

**Jane** 02:47

How much blood is in each one of these tubes?

**Dr. Harm** 02:50

Each one of these tubes has anywhere between three milliliters to five milliliters, which is only a few ounces. So it's a really, really small amount.

**Jane** 02:58

Not much. You wouldn't even fill a cup with this.

**Dr. Harm** 03:01

No, no. And we can get so much information from such a little little amount of blood. So it's really great.

**Jane** 03:07

The person who was showing me around the blood lab is Dr. Sarah Harm. Yes, Dr. Harm is really her name!

03:14

I am a doctor that helps doctors figure out why people are sick or healthy. So when you go to your doctor, and they listen to your heart and your lungs, and they might give you a shot, if you go and you feel sick, they might say, "Hey, why don't you go to the hospital and have some blood taken." And when you have that blood taken, it comes to a laboratory like mine. And in the laboratory, we will study that blood sample so that we can decide if there's something that's not normal, right, or that we might want to fix. And then we send that information to the doctor that listened to your heart and your lungs or gave you that shot. And it helps that doctor know how to make you better.

**Jane** 04:05

Dr. harm is a pathologist. Pathology is the study of disease in people. And her specialty is blood.

**Benny** 04:13

I'm Benny, and I'm four years old. And I live in Indiana. What's in the blood and what crazy things does the blood do?

**Camille** 04:24

My name is Camille and I'm thee and a half. I want to know why the people have blood.

**Mark** 04:29

My name is Mark. I am six years old, and I am from Columbus, Ohio. My question is: what is blood and why is it in our bodies?

04:44

Blood is super cool and what keeps you alive. So your blood carries some main ingredients that all of the tissues in your body need to survive. Blood carries food. It carries use oxygen. It carries things that will protect you from viruses and bacteria. And it also carries things that can help mend cuts and heal you. So blood takes all of those things and just distributes it to everywhere that your body needs.

**Thompson 05:20**

My name is Thompson. I live in Alexandria. What is blood made out of?

**Freya 05:25**

Hi. My name's Freya. I live in Perth, Australia. I'm four. How do people have blood cells?

**Rowley 05:38**

Hi, my name is Rowley. I live in West Hartford, Connecticut. I'm four years old. My question is what are blood cells?

**Lachlan 05:46**

My name is Lachlan, I am six years old. I live in Queensland, Australia. And my question is, is blood made of chemicals?

**Zeke 05:55**

Hi, my name is Zeke. And I'm five years old. And I'm from Lakewood, Washington. What is blood made out of?

**Baylen 06:03**

My name is Baylen and I live in San Francisco. I am six years old, what is blood made out of?

06:10

blood is made up of two main parts. So there's a liquid part. And we call that either plasma or serum. And then there's cells. And there's three different types of cells that we'll talk about: red blood cells, white blood cells and platelets. The liquid part of your blood is that part that carries the food to everywhere that needs it--your brain, your eyes, your muscles, your skin. It carries the food by, when you eat, your body takes out the important parts, the good parts, the vitamins, the minerals. And then that those things get carried in your plasma all around your body so that all of your organs and cells have food. Then there are the cells. So there, there are red blood cells. Red blood cells, they deliver oxygen. So they gather oxygen from your lungs. And then they take that to all of the different places in your body that need it. So I like to think of them like the delivery trucks that you see outside, or the mail truck. They collect the mail, they collect the boxes, and then they go deliver that to the places that need it. And then they go back again and pick up more boxes. Same thing with your red cell and delivering oxygen.

**Dr. Harm 07:22**

And then there are white blood cells. And the white blood cells, they protect us. So they protect us from viruses or bacteria, things that might want to hurt us. They're kind of like firefighters. So the firefighter goes to see the fire, they put it out, they protect us. That's what your white blood cells are doing, and

they are carried in your blood. And then there are platelets. And the platelets are, they're like little tiny band aids from the inside. So if you get a cut, your skin is cut and underneath your skin are the blood vessels and the blood vessels or what the blood is flowing around in your body with, like big garden hoses. And so those blood vessels get cut, and the blood will come out and platelets come to that spot. And they put a little patch on the inside. So they're like our band aids.

**Jane** 08:12

So that's why you don't just keep bleeding and bleeding and bleeding when you get cut. Those platelets kind of come together and fuse together to make a scab, right? And so we see the scab on our body and then over time that heals and new skin is formed. But it's the platelets that are making it so that we don't just keep bleeding when we get a cut?

08:30

Yeah, exactly. Those platelets come and they have some help from all of the other parts of the blood, too. The plasma helps out a little bit. And there are lots of different things that cause you to stop bleeding. But it's really those platelets that are coming in and they form a little plug from the inside.

**Charlie** 08:44

And from Monroe, New Hampshire and I'm five years old. My name is Charlie. How much blood do people have in them?

08:55

The amount of blood you have in your body depends on how big you are. And so we usually determine how much blood is in your body based on how much you weigh. So if you weigh about 50 pounds, which is about 23 kilograms, you have about one and a half liters of blood, which, if you know how big a can of soda is, that's about five cans of soda.

**Jane** 09:17

Wait, so a kid who's listening right now might have five cans of soda worth of blood in their body right now?

**Dr. Harm** 09:24

Yes, circulating all over the place.

**Jane** 09:27

And how much blood might their adult have in their body?

09:31

So their adult friends or parents, if they weigh about 150 pounds, let's say that, they have about 14 cans of soda circulating through their body.

**Jane** 09:44

That still doesn't seem like that much. I mean, you shouldn't drink five cans of soda in one day, but you might drink five cans of fizzy water, sparkling water in one day. That's the amount of blood in your whole body to do all the things you just told us about?

09:58

Yeah, those little tiny sells are quite magical and they get all of this done.

**Charlie** 10:02

Hi, my name is Charlie, I live in Fairfield, Connecticut. How do you make blood?

**Atlas** 10:08

My name is Atlas. And I'm six years old and I live in San Antonio, Texas, where is blood made from inside your body?

**Cecelia** 10:19

Hi, my name is Cecilia, and I'm three years old. I'm from Vancouver, Canada. Why does bone marrow make blood cells?

**Desmond** 10:29

My name is Desmond from Kansas City. And I'm four years old. How is blood made?

**Mira** 10:36

My name is Mira. I'm six years old. I'm from Vancouver, Canada. And my question is, how do we make blood?

10:44

Your body makes blood from the bones. And your bones are there for for two reasons. They keep us together, they keep us from you know, falling over. And your long bones especially, so the bones in your legs and your arms, that's where most of the blood comes from. And so while the outside of the bone is really hard, that's the hard part that we we can feel, there's a soft inside. So if you imagine like a paper towel roll holder, the cardboard inside the paper towel or inside the toilet paper roll, imagine that's what your long bones look like. And so the outside is really super hard right to keep us standing up straight. And then the inside is kind of like this soft, mushy material. And it's full of cells that are there to make new blood cells, red blood cells, white blood cells, platelets. That all comes from inside your bones in your bone marrow.

**Jane** 11:42

If you don't want to have to Google and go see this online, you could, next time you're in the grocery store, go over to the meat area, and look at the different cuts of meat and you might see one of these. Sometimes they cut through a bone so it looks like just a little circular piece of bone. And you can see that hard outside and it's kind of softer on the inside. So it's not just humans; you can see it in other animals, too. And that's what Dr. Hermas talking about, that you can see where that blood is being made inside the bones. But how does it get from the inside of the bone to the outside through all that hard bone?

12:16

We have these tiny, tiny, tiny little blood vessels. So remember those garden hoses that are carrying blood everywhere. Those little tiny garden hoses, those little blood vessels go inside of your bone into the bone marrow. And then that's where all the little cells that are being made by your bone marrow are coming into the circulation, into your blood vessel.

**Jane** 12:37

Is your body constantly making new blood?

**Dr. Harm** 12:39

Constantly?

**Jane** 12:41

Well, where's the old blood going?

12:43

The old blood is cleared through a couple of organs that are kind of like our filters. So the old blood will get filtered out of our bloodstream through organs like the spleen, and organs like the liver. They are specially designed to help filter out the old blood cells.

**Jane** 13:04

You also mentioned that the red blood cells are kind of like the delivery trucks taking the oxygen to all the different parts of our body that need it. When they're empty, and they've delivered that oxygen, they're traveling through kind of a different network, right? They're not traveling back and bumping into all the delivery trucks that are full of oxygen and still have to deliver their oxygen. So how does the bloodstream work in your body to get the blood where it needs to go and then deliver it back to the parts of the body like the lungs where it can pick up more oxygen?

13:38

Yeah, so your heart is constantly beating because it's pumping the blood all throughout your body, and it pumps it in this big circle. Think about a big circle going through your body. And the blood in your lungs will pick up the oxygen and as it's then being delivered to all the tissues, it's going through vessels that we call arteries. And so arteries carry oxygenated blood. And then once the blood gets to the muscles or the skin, it's in something we call capillaries and those capillaries get really, really really tiny tubes. They're really tiny. And then it delivers the oxygen and it picks up any kind of, I don't know, your your cells are always working and so they produce a waste. And so your blood also picks up that waste and takes it with it so that it can take it back to the spleen and the liver and get filtered out, or to the kidneys. And then as far as the oxygen goes, the blood, once it releases its oxygen in the tissues, it goes into the blood vessels we call veins. And veins are the parts of your body that carry the oxygenated blood back to your lungs so that the red blood cells can pick up more oxygen and do the whole circuit all over again.

**Jane** 14:54

And here's something cool: your body can deliver more blood to certain places at certain times. So if you're running really fast, your body will pump more blood to your legs. And if you're working on a really, really hard math problem or puzzle, and your brain is doing a lot of work, your body will pump more blood to your brain.

15:13

There are signals that are produced by the parts of your body that are working harder than other parts. And when parts of your body are working harder, they will receive more blood flow than the parts that aren't working very hard.

**Jane** 15:28

That's pretty cool. And that's also why, when we're exercising, we breathe really hard, because we need to get more oxygen into our body faster, so that that oxygen can get to the muscles that are working so hard

15:38

Exactly. And that's why your heart pumps faster, because it needs to pump the blood faster, that's delivering all that oxygen, that those muscles that are working really hard really need.

**Jane** 15:50

Coming up: is blood red, or blue? It's a big debate among you in the questions you've sent. So we'll get to the bottom of it.

**BREAK** 15:58

BREAK

**Jane** 15:59

This is But Why: A Podcast for Curious Kids. I'm Jane Lindholm and today we're learning all about blood with a doctor who studies blood. Dr. Sarah Harm works at the University of Vermont Medical Center and the Larner College of Medicine, where she studies blood and teaches future doctors how to do it, too. Dr. Harm is answering all the many questions you've sent us about one of the most amazing things in our body: our blood! Your bloodstream is the path your blood goes all throughout your body, dropping off oxygen and nutrients for your muscles and organs, sending your germ fighting white blood cells to where there might be viruses or bacteria, and delivering platelets to the scene of a cut to help clot up and stop bleeding. Speaking of bleeding...

**Kieran** 16:46

My name is Kieran. And I'm three years old. And why do we bleed in we get cuts?

16:52

Hi, But Why. My name is Faith. I'm seven years old. I live in London. And my question is why: is blood red and drippy?

17:03

Blood is drippy because it does need to fit into really, really tight spaces, really, really tiny, tiny tubes. So thinking about a garden hose, right, which is what our blood vessels are, basically, if you would try to fit a brick through a garden hose, it's not going to work. And we need to deliver all of those, the food and the oxygen and the protection and those little band aids to platelets to all parts of our body. So they need, the blood needs to go through really, really small little spaces. And if you think about water (and blood is thicker than water but), water, it can go through cracks in the pavement, right? It seeps through tiny, tiny little spaces. So liquids can go into those smaller spaces moreso than a brick can or a tennis ball or something like that. Blood is a little bit thicker than water, because there's the liquid part, the plasma part and then there's those cells. And the cells are being carried in that that river of liquid, river of plasma or serum. And so having those cells in in the liquid part makes your blood a little bit thicker than than water.

**Jane 18:18**

How does your blood know to start congealing or getting solid to make a scab? Like how does it know to do that when you cut yourself but not do that inside your blood vessels?

18:29

We have all kinds of signals when you get a cut, if your blood vessel is is cut open for some reason. There are all kinds of cells that come to the rescue. There are the cells inside your blood vessel that send signals that "hey, something's wrong." And the first thing there, the platelets, those little band aids. The platelets come in, and then they send signals to other parts of your blood, mostly the parts that are carried in the plasma or the liquid portion. So the plasma carries things called coagulation factors. And these are different molecules that help bring in all of the different parts of your blood. They actually make things. They make a bigger band aid. So you have little tiny band aids with your platelets and then your coagulation factors come in and they make this huge band aid from inside so it grows. And then once your cut is healed, that band aid actually just slowly goes away and dissolves. So your body just knows what to do.

**Lucy 19:34**

Hello, my name is Lucy and I live in Hoover, Alabama. I'm seven years old and my question is why is blood red?

**Owen 19:44**

My name is Owen. I'm six years old and I live in Wynwood Pennsylvania. Why is blood red?

**Frankie 19:52**

My name is Frankie. I live in Sydney, Australia and I'm seven and a half years old and I would like to know, why is blood red?

**Theo 20:04**

My name is Theo. I live in San Mateo, California. I'm three years old. Why is blood red?

**Mira 20:13**

Hi, my name is Mira. I'm a six year old girl and I live in Saratoga Springs. Why is blood blue in your body and red when it comes out? Bye, But Why.

**Remi 20:13**

My name is Remi. I live in Montreal. And I'm six years old. Why is blood blue, not red?

**Alexandra 20:36**

Hi, my name is Alexandra. I am seven years old. And I live in North Carolina. Is your blood blue or red?

20:53

Your blood is red. And your blood is always red, whether or not it's carrying a lot of oxygen, or whether it's already delivered the oxygen and is on its way back to your lungs. All blood is red. If the blood is carrying oxygen, it's a really, really bright cherry red. And if it's already delivered its oxygen, it's still red, but it's a little bit darker.

**Jane 21:18**

If I look at the inside of my wrist, I can see some blood vessels. And it looks like they're blue or purple. So you might see it in in your inner elbow too, or if you sort of lift up your lip and flip it around so you can see the inside of your lip, you might be able to see a blood vessel and a lot of kids are wondering if your blood is blue. And you just said our blood is always red. So why does it look blue sometimes? And why do some people think that blood is blue?

21:46

I can see why you think your blood is blue, because you see it, right, you see the vein. And the reason that we see our veins as either blue or purple or even green in some people, has to do with the color of our skin. And so the lighter that our skin is, the red looks to our eyes like it's purple or blue. And the darker that our skin is, then that red blood actually can look more green, even. So that's why veins all have a different color. And everybody because it depends on the tone of your skin.

**Oscar 22:25**

Hi, my name's Oscar. I'm seven years old. I live in Winnipeg, Canada. Why does blood turn black after it dries?

22:38

So that's from the red blood cells kind of, if they're not in your body anymore, they're not going to stay in the nice little circle that they are. And so the things that are inside the red cell will you know kind of come out. And sometimes that makes it change color. Kind of like even when you get a bruise under your skin and you see that your your skin changes to a little bit of a yellow or a green or something like that. And that's from the breakdown of the red cells. And there's things like bilirubin that can make a little greenish tint or a yellowish tint. There's also, we have metal inside of our red cells and the metal is iron. And it's not in a really heavy metal form of iron, like when you pick up I don't know, something what in your fireplace, right? It's in its element form and, but that iron, right, when it reacts with other things, if your red blood cell bursts, it will cause some discoloration and those color changes that we see.

**Thea** 23:34

Hi, my name is Thea, and I live in Wellington, New Zealand. And my question is why does blood taste like metal?

**Fiona's adult** 23:44

Fiona, a six-year-old from Moretown, is wondering, why does blood taste like salt?

**Jane** 23:51

We have some kids who are wondering about what they taste when they taste blood. And is it okay to taste your blood, actually?

23:58

It's okay to taste your blood. Your blood might taste metallic-y like a metal because, again, there's that iron molecule, iron particles, inside your red blood cell. And that's the reason that your red blood cells can carry oxygen around to the different tissues. So you might be tasting a little bit of that. And as far as salty, you know, remember, the plasma part of our blood is carrying around lots of minerals and vitamins. And so you might be getting a little bit of that taste. And also, if you've ever tasted your sweat, your sweat is really salty. And oftentimes if you're tasting your blood, it means you have a cut on your skin. So you might just be picking up a little bit of the sweat that's coming off of your skin as well.

**Jane** 24:42

So it's okay to taste your blood but if you have a cut and you keep on sucking on it, are you going to prevent yourself from making the scabs that you need to actually heal that cut?

24:52

You could be delaying the scab from forming. But more importantly, we have a lot of bacteria in our mouth. And so by sucking on a cut, you know, continuously, you might actually be introducing some bacteria into that cut. And while the white blood cells are there to help prevent you from getting infected from bacteria, they can only do so much. And so if you keep introducing bacteria into the cut, you might get an infection.

**Jane** 25:23

So you are somebody who studies blood. And we're here in the blood lab at the UVM Medical Center where blood gets tested. What is it that you can find--or find out--in someone's blood, when somebody has to get a little bit of blood taken out of their body and tested?

25:42

We can see all different sorts of things. So we can look for...maybe we want to see how much iron you have in your blood. We can look for iron. We can look for calcium. We can look for sodium. So these are all elements, you know, in our blood, we can also count the number of red blood cells you have. Or we can count the number of white blood cells you have.

**Jane** 26:07

How many red blood cells and white blood cells do I have?

26:10

Oh, you have millions and millions and millions and millions and millions. Millions per little drop. So many cells that make your body work.

**Jane 26:18**

So millions of red and white blood cells just in one drop of blood? Millions?

26:22

Yes. We can also look for antibodies, things that we might want to check to make sure that, you know, you get a shot, and that's meant to to produce antibodies in your blood so that you can be protected from different viruses. We can look to see how many antibodies you have. We can really look for almost anything in your blood.

**Jane 26:44**

It's kind of amazing, you can be kind of like detectives too, right? If something is bothering me, and I'm not feeling well, you might be able to figure out by looking at my blood what is it that's bothering me, what's making me sick. Maybe partly through those antibodies, because the body is making these defenses against certain diseases. And so if you're looking for which defenses are there, then you're figuring out what the disease I have, or what disease I might have had in the past that we didn't know about, but I have the antibodies in my body to fight it off. So you know I probably either had that disease or got a shot or some kind of medicine to help make sure that I don't, that I can fight it off if I were exposed to it in the future. That's so cool.

**Dr. Harm 27:26**

It is cool. And we can see the antibodies, and sometimes we can actually see the virus or the antigens of whatever it is that might be infecting you right now.

**Jane 27:37**

Some kids have challenges and have to have to go to the doctor a lot and maybe have to get their blood taken a lot. And that can be hard; it can sometimes be painful; it can be scary. And it can be hard when you're any age, but especially when you're little to feel like things are happening to my body that I don't have control over. What would you say to kids who have to go through this a lot to help them understand what's happening after somebody puts a needle in their arm and take some of their blood?

28:10

The first thing is, is I know it hurts. I hate to have my blood drawn. And I am very sorry that we have to do that in order to get your blood. It's really, really important though, because we can see what's going on inside your body. And sometimes what you describe as a pain that you're having, or somewhere where you somehow you don't feel well, that's not quite enough for doctors to know what to do to make you feel better. And so seeing your blood or or seeing a part of a tissue on a glass slide and looking at the cells, really tells a story about what might be hurting you or what might be making you sick. And we

need to know what that is by studying your blood, by studying your tissues, so that we can help those doctors decide what medicines or what treatment might make you feel better.

**Jane 29:12**

Okay, one more question.

**Petra 29:14**

My name is Petra. I'm four and a half years old. I live in New York, Brooklyn. I want to know why we have different blood types?

**Jane 29:24**

This is pretty interesting, Petra. We don't really know why there are different blood types. Remember, we all have the same thing in our blood: the liquid called plasma, plus red blood cells, white blood cells and platelets. But then there's something called blood groups. We've known now for more than 100 years that there are differences in blood among people. At some point in human evolution, it's possible that having certain things in our blood gave us an advantage or a disadvantage depending on where we were living. But there isn't any firm proof or theory about why we still have all of these differences in our blood, and why your blood might be different from the blood group of your biological parents or your siblings or your cousin or your friends. It's really complicated to explain what a blood group actually is. But the important part to understand is why it matters what blood group you're in.

**Jane 30:20**

The blood groups you'll most often hear people talking about is what they call your blood type. There are eight main blood types: A positive and A negative, B positive and B negative, AB positive and negative and O positive and negative. The reason that it's important to know about these different groups is in case you ever need to get some extra blood, called a transfusion, because of an illness or injury. You would need to get blood from someone who has a compatible blood type. That means a blood type that will kind of match your own blood type so your body doesn't think the new blood is bad and try to fight it off. The most common blood type in the world is O positive, with A positive not too far behind. The rarest blood type is AB negative. Do you know what blood type you are?

**Jane 31:09**

In our next episode, we'll actually go to a blood donation center where people have blood taken out of their bodies to give to someone else who needs it. I did it and I brought along my recorder so you can come along for the experience. But we've already filled our heads with a lot of new information today. So let's end this episode here, take a breather and talk about blood donation next time.

**Jane 31:32**

Thanks to Dr. Sarah Harm for making the complicated science of blood so understandable. She has a pretty big official job title. Want to hear it? She's Associate Professor of Pathology and Laboratory Medicine at the Larner College of Medicine at the University of Vermont, and Medical Director of the Division of Laboratory Medicine in the Department of Pathology and Laboratory Medicine at UVM Medical Center.

**Jane** 31:36

But Why is produced by Melody Bodette and me, Jane Lindholm, at Vermont Public and distributed by PRX. Our team also includes Kaylee Mumford and Kianna Haskin. Our theme music was composed by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, stay curious!