

Erin Allmann Updyke

"In 2005, my life changed forever. My mom had just been diagnosed with hepatitis C and advised me to get tested. When my doctor told me I also had it, the room went dark. All my thoughts stopped and I didn't hear anything else being said. I worried that I'd given my kids a deadly disease. The next day I scheduled my family to be tested. Everyone's results were negative but this didn't end my personal nightmare with the disease. I was witnessing hepatitis C ravage through my mom's body. A liver transplant would only buy her time. She ultimately chose not to undergo a dual organ transplant and passed away on May 6, 2006.

My liver began to deteriorate quickly. I went from stage I to stage IV in less than 5 years which terrified me. I saw no hope. After years of unsuccessful treatments and being unqualified for clinical trials, I was finally accepted for a clinical trial in early 2013 and began the treatment later that year. My viral load started at 17 million. I went back for a blood draw in 3 days and it had dropped to 725. At day 5 I was at 124 and in 7 days my viral load was undetected. This trial drug had destroyed the very thing that killed my mother 7 years earlier. Today I've managed a sustained virologic response for 4.5 years but it's been a long road. One thing I always tell people who contact me is that nobody's hepatitis C journey is the same. We may have the same symptoms but how our bodies respond to treatments is unique. Don't hide in shame about having hepatitis C, it doesn't matter how you contracted it, what matters is that we get tested and treated."

TPWKY

(This Podcast Will Kill You intro theme)

Erin Allmann Updyke

That was from Kimberly Morgan Bossley and her story with hepatitis C that we found on Healthline.

Erin Welsh

Hi, I'm Erin Welsh.

Erin Allmann Updyke

And I'm Erin Allmann Updyke.

Erin Welsh

And this is This Podcast Will Kill You.

Erin Allmann Updyke

Today we're talking about-

Erin Welsh

Hepatitis C, as you may have guessed.

Erin Allmann Updyke

It's kind of in the firsthand a bunch of times.

Erin Welsh

Yep, yep. So what are we drinking this week?

Erin Allmann Updyke

We're drinking Live And Let Liver.

Erin Welsh

And what is in Live And Let Liver?

Erin Allmann Updyke

Of course there's alcohol which is, you know, take it easy on the alcohol on this one, guys.

Erin Welsh

Or just make yourself the placebo.

Erin Allmann Updyke

That too. But in the quarantini we have gin, grapefruit juice, lime juice, and grenadine.

Erin Welsh: Yeah. It's delicious and we will post the recipe to our alcoholic quarantini as well as our nonalcoholic placeborita on our website [thispodcastwillkillyou.com](http://thispodcastwillkillyou.com) and our social media pages, so Twitter @TPWKY, Instagram @thispodcastwillkillyou, and Facebook.

Erin Allmann Updyke: Yep. Cool.

Erin Welsh: Cool. I'm excited for this episode.

Erin Allmann Updyke: I know you are. I know you are but what am I? Also excited.

Erin Welsh: (laughs) You're such a nerd.

Erin Allmann Updyke: I know. I can't believe that's the first time I've ever said that joke actually, that was a good joke.

Erin Welsh: It was a good joke.

Erin Allmann Updyke: Thank you. Let's take a really short break and then dive into hepatitis.

TPWKY: (transition theme)

Erin Allmann Updyke: So hepatitis literally just means inflammation of your liver, okay.

Erin Welsh: Makes sense.

Erin Allmann Updyke: So we probably most often, at least many of us, think of viral hepatitis when we hear the word 'hepatitis' but do keep in mind that that's not by any means the only thing that can cause inflammation of your liver.

Erin Welsh: What else can cause inflammation of your liver?

Erin Allmann Updyke: Oh my gosh. Bacteria can cause it, parasites-

Erin Welsh: You know that was like asking me to ask that question.

Erin Allmann Updyke: I know. Parasites can cause hepatitis, you can have autoimmune hepatitis, you can get hepatic involvement if you have things like lupus, blah, blah, blah. So many things can cause inflammation of your liver. But often acute hepatitis is very commonly caused by viruses. I would argue that in fact we are just very uncreative in naming viruses because the viral hepatitises are named hepatitis A, B, C, D, and E.

Erin Welsh: I mean to be honest it's not a bad way to do it.

Erin Allmann Updyke: It's not bad, it's not bad. But one thing that makes it very confusing is that all of these different hepatitis viruses have nothing to do with each other.

Erin Welsh: Hepatiti?

Erin Allmann Updyke: Did you just say hepatiti?

Erin Welsh: Yeah. (laughs)

Erin Allmann Updyke: It's terrible. (laughs) All of these viral hepati-

Erin Welsh: Hepatiti I think is the word that you're looking for.

Erin Allmann Updyke: No. Not hepatiti, Erin.

Erin Welsh: Is that not the plural?

Erin Allmann Updyke: It's not the plural.

Erin Welsh: We'll see, we'll see.

Erin Allmann Updyke: Okay.

Erin Welsh: By the end of the episode it will be.

Erin Allmann Updyke: All of these viral hepatitis viruses, they have nothing to do with each other, Erin. Hepatitis B is not closely related to hepatitis C, etc. Okay? They just all are viruses that happen to affect the liver.

Erin Welsh: What? That's wild.

Erin Allmann Updyke: It is, it is wild.

Erin Welsh: So these are not even the same type of viruses?

Erin Allmann Updyke: Oh heck no, Erin.

Erin Welsh: Okay so that part is where I disagree with the naming then.

Erin Allmann Updyke: Thank you. Okay, I'm glad that you're finally on my page. So we're only discussing today one of these hepatitis viruses and that is hepatitis C, okay. And it turns out actually that TPWKY listeners are very familiar with this family of viruses that hepatitis C belongs to. Hepatitis C is a flavivirus.

Erin Welsh: I was bowled over when I saw that.

Erin Allmann Updyke: I know, it's very exciting.

Erin Welsh: It's so cool!

Erin Allmann Updyke: Yeah. So if these words like 'flavivirus' are confusing to you, don't worry you're not alone. Flaviviruses include dengue, the one we just talked about a few weeks ago. Also yellow fever, etc. Okay? If you remember yellow fever is called 'yellow fever' because it is a fever that turns you yellow because of its effect on your liver.

Erin Welsh: Right.

Erin Allmann Updyke

Okay. So like the other flaviviruses, hepatitis C is an RNA virus. Hepatitis C like many RNA viruses has a huge amount of what we call antigenic variation. So it has a lot of different antigens on its surface like the flu does, okay, influenza. So that means it's really hard to target from a vaccine perspective cause it has a lot of variation, there's a whole bunch of different targets, it's hard to get them all, they're constantly changing. RNA viruses also have really high mutation rates so they evolve very quickly. Hepatitis C is one of those. So spoilers, we don't have a vaccine. But unlike many of the other flaviviruses you don't get hepatitis C from mosquitoes.

Erin Welsh

Which I find very interesting also. But there are tick-borne and non vector-borne flaviviruses.

Erin Allmann Updyke

Yeah there are, absolutely. And you do get hepatitis C from blood which ultimately is where mosquitoes get flaviviruses from anyways.

Erin Welsh

Yeah.

Erin Allmann Updyke

You're just missing the vector. So hepatitis C, it invades your liver cells, your hepatocytes, that's where it tends to replicate and then it bursts out into your bloodstream and circulates in your blood. So it's transmitted person to person when you come into contact with that blood. So in the past when blood products weren't screened properly and I know Erin, you're gonna talk a lot more about that, right.

Erin Welsh

Oh yeah.

Erin Allmann Updyke

Yeah. Blood products were a very big source of infection prior to screening. In some areas of the world blood products are still a source of infection if it's very difficult to screen or if there's not access to good screening tools. But hugely important are actually medical tools used in things like surgeries, injections, that's actually one of the most common sources of infection today is medical injections using not properly sterilized needles or glass syringes. And then the other big source of infection today is injection drug use. It is possible to get infected via sexual transmission but it's honestly very rare, it's not like hepatitis B which is much more likely to be transmitted sexually.

Erin Welsh

Okay.

Erin Allmann Updyke

Okay so Erin I think I told you last week like, 'Oh yeah, hepatitis C is gonna be so easy for me to research, it's like really straightforward, we know a lot.'

Erin Welsh

Yeah, you were like, 'Oh it'll take me no time.'

Erin Allmann Updyke

Yeah. Took me forever.

Erin Welsh

Then you texted me today and you were like, 'Oh god.'

Erin Allmann Updyke

It took me forever and Erin, I'm not gonna have answers to any of your questions.

Erin Welsh

Ugh, Erin!

Erin Allmann Updyke

Okay. So let's talk about how you get sick from hepatitis C.

Erin Welsh	Okay.
Erin Allmann Updyke	While it can and often does cause an acute hepatitis which we'll talk about the symptoms of in just a second, the biggest issue and most dangerous part of hepatitis C is that between 50-85% of cases it results in a chronic infection that can eventually result in liver failure and/or liver cancer and death.
Erin Welsh	First question.
Erin Allmann Updyke	Oh god, okay.
Erin Welsh	(laughs) Sorry. 50-85 is quite a big range. What determines whether someone is going to become chronically infected or not?
Erin Allmann Updyke	Excellent question. There's a number of different things. Comorbidities, so things like having diabetes can increase your risk of chronic infection. Heavy alcohol use, especially more than 50 grams of alcohol a day which is like 4 alcoholic beverages a day can increase your risk of chronic infection. Being immunocompromised, for example coinfection with HIV definitely increases your risk for chronic infection. So yeah, things like that. The amount of virus that you're infected with is not actually associated with whether or not you develop a chronic infection which is different than a lot of other viral diseases that we see.
Erin Welsh	Okay. If you get infected with hepatitis C and then you do not develop chronic infection, can you get reinfected and then develop chronic infection?
Erin Allmann Updyke	Yes. Yes, you sure can.
Erin Welsh	Okay you're not like immune which I guess is then the struggle with creating a vaccine.
Erin Allmann Updyke	Yep.
Erin Welsh	Okay.
Erin Allmann Updyke	Good question. Okay so chronic infection means in this case that even though a person might not have any symptoms, the virus stays in their body, continues to replicate, and many, many years, we're talking 10, 20, 30 or more years down the line can result in serious disease. So then the question that I always like to try and answer on this podcast is how does this virus actually cause disease?
Erin Welsh	Yeah.
Erin Allmann Updyke	Erin we don't know.
Erin Welsh	What do you mean?
Erin Allmann Updyke	I mean we don't know! So here are the things we do know.
Erin Welsh	Okay.

Erin Allmann Updyke

When hepatitis C invades your liver it does stimulate an immune response, so your innate immune system which I think we talked about the innate vs adaptive immune system in the first vaccines episode if you want like a really nice intro to your immune system. But basically the very nonspecific first immune response is triggered when you get infected with hepatitis C. However for some reason that is unclear the downstream effects of that don't really happen in a lot of people infected with hepatitis C. So what that means is you have your first line defenders like macrophages and stuff that come in, release a bunch of chemical signals to trigger things like natural killer cells, which we talked about in the vaccines episode, that are supposed to come in and kill any viral infected cells so that that virus doesn't continue to replicate.

Something doesn't work right in that response when you get infected with hepatitis C. So we know that people who develop chronic infections with hepatitis C which again is the majority of people who get infected, they don't have a good T cell response. So their T cells aren't responding well to fight down this infection. But that's all we know. We don't know why, we don't know how to predict who is going to do a good job of fighting off the infection vs who isn't, and we don't know what the virus is doing specifically to cause these changes in people's immune response. It gets worse, it gets worse, Erin.

Erin Welsh

Okay, okay. I'm just shocked that we can treat this.

Erin Allmann Updyke

Dude. This is why I thought we knew the answers to these questions because the amount of advances that we have made in treatment for hepatitis C over the last 5 years is bananas.

Erin Welsh

Yeah.

Erin Allmann Updyke

So I was like of course we know, yeah, we got tons of treatment, we can cure it now, no big deal. I mean not no big deal but you know. I thought we knew. Erin, we don't know! And the other thing is like the whole cancer thing which we're gonna talk in more detail about - actually we're not because we don't know. We don't know how hepatitis C causes cancer. We don't know. That's the title of this episode. Hepatitis C: I Don't Know. We don't know.

Erin Welsh

Wow.

Erin Allmann Updyke

Okay. There are 6 different genotypes of hepatitis C. Overall they're not associated with different risks of ultimately liver failure but genotype 1b is one of the most common genotypes and that one is associated with an increased risk of liver cancer.

Erin Welsh

Okay.

Erin Allmann Updyke

But because we don't know why, it's not clear why.

Erin Welsh

Of course, yeah.

Erin Allmann Updyke

Oh my gosh, who knew? I didn't. Well let's talk about what we do know and that is the signs and symptoms. So in an acute infection the incubation period, so the time from when you first get infected to when you first show symptoms is actually quite long, it's usually like around 7 weeks.

Erin Welsh

Okay.

Erin Allmann Updyke

Which is pretty long. Only about 30% of people infected with hepatitis C will actually have acute symptomatic infection. And generally this presents with malaise, so feeling fatigued and feeling crappy. You often get nausea which isn't surprising since your liver is very involved with your GI tract, and right upper quadrant pain. Your liver is in the right upper quadrant of your abdomen, so your liver hurts.

Erin Welsh

Okay.

Erin Allmann Updyke

Okay. And then what you also get is dark-colored urine and that's because you get an increase in bilirubin which is basically a breakdown product of your red blood cells that your liver is supposed to get rid of but your liver's not working right so the bilirubin builds up and you have to pee it out.

Erin Welsh

Huh.

Erin Allmann Updyke

So instead of your poop being poop-colored, your urine is kind of poop-colored. And then as that bilirubin continues to build up, that's when you see things like jaundice, so that's literally your skin turning yellow from how much bilirubin is circulating in your system.

Erin Welsh

Right.

Erin Allmann Updyke

Another huge thing that you see in acute hepatitis infections are if you test your blood to look at specific enzymes that your liver produces, they will be off the charts high, like thousands of times or at least tens of times elevated on what they normally are. And that's a really big sign that you have an acute, that means first time, shortly after you get infected, hepatitis infection.

Erin Welsh

Okay.

Erin Allmann Updyke

But for the most part acute infection even when it's symptomatic is self-limited. So with hepatitis C you are very unlikely to die from what we call fulminant which is like very rapidly progressive acute liver failure.

Erin Welsh

Okay. The real risk comes in the chronic infection.

Erin Allmann Updyke

Exactly, exactly. And in general disease symptoms are pretty long lasting, you can be sick anywhere from 2-12 weeks but for the most part people do recover.

Erin Welsh

Okay.

Erin Allmann Updyke

In the case of hepatitis C however, up to 85% of infections become chronic and for the most part during this chronic infection, a person won't necessarily have that many signs or symptoms. If you were to test their blood, they might still have slightly elevated liver enzymes but you can see these elevations in liver enzymes from a number of different things so it's not like that specific to chronic hepatitis infection.

Erin Welsh

Okay.

Erin Allmann Updyke

But progressively as this infection kind of goes along its course, the biggest symptom that people tend to experience is fatigue, like really bad fatigue, just never really feeling fully energetic is kind of one of the biggest symptoms.

Erin Welsh

Okay.

Erin Allmann Updyke

But as we'll talk about there are some other symptoms that you start to see especially as the disease progresses because basically what's happening inside your liver is fibrosis. So fibrosis is the result of chronic inflammation in the liver that leads to scarring. Very mild fibrosis can be reversible but what happens with fibrosis, especially when it's a chronic infection, is that it progresses to what we call cirrhosis which is kind of the end stage of fibrosis.

Erin Welsh

Okay, I didn't realize that.

Erin Allmann Updyke

Yeah, I didn't either. I have to double google it to make sure I was saying it correctly. I should know these things Erin, I'm going to be a doctor.

Erin Welsh

(laughs) That's what Google exists for.

Erin Allmann Updyke

Yeah. I check Dr. Google too.

Erin Welsh

Oh good.

Erin Allmann Updyke

So cirrhosis which is kind of the end stage fibrosis, it's like your liver is so fibrotic... It's like your liver is supposed to be nice and red and beefy-looking but when it starts to progress from fibrosis to cirrhosis it gets hard, it doesn't move as much, the blood flow is really bad. And this happens in about 20-30% of people with chronic hepatitis C infection.

Erin Welsh

Wow, that's a lot.

Erin Allmann Updyke

It's a lot, yeah. And cirrhosis itself can lead to liver failure and eventual death but in the case of hepatitis C it's also associated with an increased risk of hepatocellular carcinoma, aka liver cancer.

Erin Welsh

Okay.

Erin Allmann Updyke

So what are some of the symptoms that we see when you progress all the way to cirrhosis?

Erin Welsh

I don't know, what are they?

Erin Allmann Updyke

Let me tell you. So the symptoms, they can be severe depending on how bad the fibrosis has gotten, if it's truly cirrhosis at this point. Fatigue is still a big one, muscle weakness is another because basically your liver is in charge of doing a lot of things to make products that the rest of your body uses and if your liver can't do that the your muscles and things can't work the way that they're supposed to.

Erin Welsh

Gotcha.

Erin Allmann Updyke

When you eat food and you absorb nutrients, all of those nutrients get absorbed into your bloodstream. All of the blood from your whole GI tract for the most part travels to your liver through one big vein called the portal vein, okay. So all of the blood from your GI tract for the most part is going to your liver and then your liver is gonna process all of that.

Erin Welsh

Okay.



Erin Allmann Updyke As your liver starts to become cirrhotic and hardens, that closes off that blood vessel and so it basically puts increased pressure on that portal vein and it backflows it, if that makes sense.

Erin Welsh Ooh that sounds terrible.

Erin Allmann Updyke It is terrible, it's like squeezing the end of a garden hose, right.

Erin Welsh Yeah.

Erin Allmann Updyke And that garden hose that goes to your liver, when it backflows it backflows into your GI tract. And so this can cause all of the veins associated with that to then start to dilate. So this can cause what we call varices or varicose veins. You've heard of those in like your legs?

Erin Welsh Yeah.

Erin Allmann Updyke Well you can get those associated with your GI tract, so around your belly button you can get huge amounts of varicose veins. You can get them in your esophagus because even your blood flow from your esophagus goes to that portal vein. And those, if they're under too much pressure, can burst.

Erin Welsh Oh my gosh.

Erin Allmann Updyke And then you can bleed out and die because of it.

Erin Welsh What?!

Erin Allmann Updyke Yep, that can happen. Another thing that can happen, if you think of closing off the end of a garden hose, how much pressure you can build up in that garden hose, eventually that hose is gonna start to leak from the sides, right. It's gonna spew liquid out, water out from the sides. The same thing can happen in what we call your portal tract, in that portal vein which can cause the fluid that's supposed to be in that vein to start leaking into your abdomen. So you can get a huge amount of fluid in your abdomen, that's what we call ascites.

Erin Welsh Oh my gosh.

Erin Allmann Updyke I have seen people in liver failure, not necessarily from hepatitis C but from cirrhosis, that we've drained 8 liters of fluid from their belly.

Erin Welsh Where is that liquid coming from?

Erin Allmann Updyke It's from your bloodstream. Like you retain it-

Erin Welsh I know but 8 liters?

Erin Allmann Updyke 8 liters. It's bad, it's not good.

Erin Welsh Oh my gosh.

Erin Allmann Updyke

That's like really bad. So yeah, you can imagine that that can cause a lot of complications right, a whole bunch of fluid just in your abdomen that can be a nidus for infection so you can get abdominal infections because of it. It also is just putting a lot of pressure on all of your organs, all this pressure in the veins can lead them to burst like I said already. So in general liver failure is not good news.

Erin Welsh

Well yeah.

Erin Allmann Updyke

And then some of the other signs and symptoms that we see are similar to what we see in acute liver disease, so things like jaundice, weakness, itching is a really big one because as bilirubin builds up it actually causes a really intense itching.

Erin Welsh

Why?

Erin Allmann Updyke

I don't really know. I'm not really sure but it does, it just makes you itchy.

Erin Welsh

Interesting.

Erin Allmann Updyke

And then hepatitis C can actually also have extrahepatic, so outside of the liver, manifestations especially by increasing abnormal proteins in your blood which can have issues like making your blood too thick, blah, blah, blah. Hepatitis COVID is not a good disease.

Erin Welsh

Well it's horrible.

Erin Allmann Updyke

It's horrible. And the big 'C' in hep C, cancer. I mentioned already it's generally only associated with cirrhosis. So cirrhosis becoming cancer in people with hepatitis C. That's not true for liver cancer that's not associated with hepatitis C, like you don't have to have cirrhosis to get liver cancer but in people with hepatitis C they generally have cirrhosis first and then liver cancer.

Erin Welsh

And so are there differences in the types of liver cancer that you get, like is the hepatitis C-associated liver cancer different than alcohol-associated liver cancer or just spontaneous?

Erin Allmann Updyke

Good question. There are different types of liver cancers. What's associated with hepatitis C is called hepatocellular carcinoma, that's the same type of liver cancer that you would get in association with very heavy drinking or with hepatitis B which is another major cause of HCC, hepatocellular carcinoma. But in general HCC is actually a pretty rare complication of hepatitis C infection, it's about 1-3% I've seen overall of people with chronic infection will go on to develop HCC. How exactly this chronic infection results in cancer, I really thought we knew Erin. I mean cancer is associated with high levels of inflammation and we know that this causes chronic inflammation.

Erin Welsh

Right.

Erin Allmann Updyke

So maybe it's as simple as that but the true mechanism, the way that we know it for HPV, we don't know in this case.

Erin Welsh

Okay.

Erin Allmann Updyke

So yeah. The good news is that there is treatment.

Erin Welsh

That's great news.

Erin Allmann Updyke

It is great news. And it's fascinating and amazing to me because we've made massive advances in treatment in the last few years. So it wasn't until I believe 2013 that the first what we call DAA, direct-acting antiviral, so that's an antiviral that directly attacks and blocks the replication of hepatitis C virus, was put on the market in the US at least in 2013. Prior to this there was still treatment but it was a combination of something called interferon which is actually one of those mediators of immune response that our body uses naturally and another antiviral called ribavirin. This was used before we had these DAAs and it did result in 40-60% of cases being cured but treatment took forever, like almost a year if not more and there was a ton of side effects and it was really difficult to tolerate. So the introduction of all these new, I think there's at least 8 now, direct-acting antivirals, DAAs, has been massive because now treatment usually only takes 8-12 weeks, it could be up to 24 depending on how severe disease is to begin with. But cure rates are above 90%.

Erin Welsh

That's really cool if you can afford the medication.

Erin Allmann Updyke

Yep, that's the asterisk. The cost of these medications, it varies hugely. It's dependent both on whether there's a generic formulation and since a lot of these drugs are super new, there might not be generics yet, and also what country you're looking at. So these can vary anywhere from \$15 to \$2500 for a one month supply of some of these drugs.

Erin Welsh

Can I guess which country is the \$2500 one?

Erin Allmann Updyke

Actually none of these were in the US actually.

Erin Welsh

What? Okay so the US is \$25,000 a month.

Erin Allmann Updyke

Maybe, I didn't see numbers for the US but yeah. That's one of the biggest challenges now that we have a way to cure it is both identifying disease because there are so many people living with hepatitis C that don't know that they're infected and actually getting this drug or these drugs to people who are infected. So there's a lot of people who are infected and know they're infected but haven't yet had access to these curative treatments.

Erin Welsh

Right.

Erin Allmann Updyke

So yeah. That's the biology of hepatitis C.

Erin Welsh

So much we don't know.

Erin Allmann Updyke

So much. Do we know anything? I don't know.

Erin Welsh

I don't know.

Erin Allmann Updyke

So tell me Erin, what's up with this? How did it get here? Why are we so bad at screening blood? Or are we?

Erin Welsh

Great questions. Let's take a quick break.

TPWKY

(transition theme)

Erin Welsh: As you mentioned, the hepatitis C virus is a pretty recent discovery and so the history of it is pretty short. So the virus itself was only discovered or named in 1989 but researchers knew of a non-A, non-B hepatitis virus for a little over a decade before that, so around 1975 is when it was kind of first recognized to exist.

Erin Allmann Updyke: Okay.

Erin Welsh: But before we get into too much of the medical history side of things I wanna talk about the evolutionary history of hepatitis C.

Erin Allmann Updyke: Please.

Erin Welsh: For a long time researchers assumed that hepatitis C virus had its roots in a nonhuman primate hepacivirus.

Erin Allmann Updyke: Okay.

Erin Welsh: But then they discovered a hepatitis C-like virus in horses and dogs which suggests that these viruses might be more widespread throughout mammals than previously thought.

Erin Allmann Updyke: Okay.

Erin Welsh: So where did they come from? Okay. Looking at the genetic diversity of hepatitis C virus there seems to be the most diversity in Sub-Saharan Africa and in Southeast Asia. And so that's probably where it had been circulating for a really long time in humans for who knows how long. But by the way how it circulated in these populations is not clear because as you mentioned it's bloodborne.

Erin Allmann Updyke: Right.

Erin Welsh: So there are a bunch of hypotheses ranging from mosquitoes, it actually being vector-borne.

Erin Allmann Updyke: Fascinating.

Erin Welsh: To sexual transmission, having it play more or a role. Or like circumcision practices or other things like that.

Erin Allmann Updyke: Interesting.

Erin Welsh: Yeah so it's kind of unclear. That's the theme of this episode. But how long did it circulate? And that is also a really hard question to answer.

Erin Allmann Updyke: (laughs) Oh gosh.

Erin Welsh: Shockingly.

Erin Allmann Updyke: Listeners, sorry.

Erin Welsh: We're sorry. There are models based on the genetic diversity of the virus that put the origin of hepatitis C no more than 1000 years ago.

Erin Allmann Updyke: Okay.

Erin Welsh: Which doesn't really seem possible given the hugely widespread nature of the virus which we know is a more recent thing but the fact that it exists in different genotypes in isolated populations, like geographically isolated populations.

Erin Allmann Updyke: Right, yeah.

Erin Welsh: And so maybe we're missing something about the replication of the virus itself, about how mutations accumulate, all this sort of thing. I mean the short answer is we don't know.

Erin Allmann Updyke: That's the title, Erin.

Erin Welsh: Let's get into the stuff that we do know and that is how it became global over the past 100 years. And by global I mean really global. I know this is maybe preempting you a little bit but how many people are estimated to be infected with hepatitis C worldwide?

Erin Allmann Updyke: Do you mean estimates from today or like 4 years ago? Cause I've seen very different estimates.

Erin Welsh: I've seen very different estimates too and I can't tell whether it's super optimistic.

Erin Allmann Updyke: At least 71 million, let's say that.

Erin Welsh: Right. And then the higher estimates are around 177 million?

Erin Allmann Updyke: 170 million, yeah.

Erin Welsh: Exactly. So up to 2.5% of the world's population.

Erin Allmann Updyke: Yep, epi section over. What the heck?

Erin Welsh: What the heck? I mean that's an enormous number of people.

Erin Allmann Updyke: Yeah, it really is.

Erin Welsh: And the reason that I wanted to mention those numbers now is because a big part of the story of hepatitis C is not just in the history of its discovery and medical advancements and treatments and so on, I mean those are really important but I think it's really important also that we understand how we got here. How on earth did 70-170 million people become infected with this virus?

Erin Allmann Updyke: Yeah, how?

Erin Welsh: I mean it's a complicated question to answer cause there are many different parts of it but a big part of that answer is, as you mentioned, through blood transfusions and other blood products. So even though the history of hepatitis C is a short one the history of blood and blood technology is not. And those histories are intertwined.

Erin Allmann Updyke Ooh.

Erin Welsh So I decided for this episode to focus on the blood transfusion side of the story.

Erin Allmann Updyke Awesome.

Erin Welsh And holy cow, it is so much more interesting than I thought it was gonna be. I had a really fun time researching this. Okay. Blood is a precious resource. The cost of a barrel of crude oil as of January 2020 is about \$58.

Erin Allmann Updyke Okay.

Erin Welsh The cost of a barrel of blood would be about \$63,000 and I estimated that based on the cost of a gallon of blood.

Erin Allmann Updyke I'm sorry.

Erin Welsh Yeah.

Erin Allmann Updyke What?

Erin Welsh Yeah.

Erin Allmann Updyke Wow.

Erin Welsh But even more than the monetary value of blood is of course its life saving qualities. From blood, whole blood, you can get white blood cells, plasma, clotting factors, antibodies, and the there's of course blood itself for transfusions. It is vital, it is a life giving liquid. And as you might expect this quality of blood has led to it being revered for millennia. It's impossible to give a history of blood itself and how it's been viewed throughout history because the scope would be enormous.

Erin Allmann Updyke Yeah.

Erin Welsh Like which cultural lens are you going to look through? Which myths are you going to write about? So let's pick this story up from where this life giving quality of blood first started to be tested. Blood had long been recognized as one of the four humors of the body, this was like the presiding medical theory. So it was along with phlegm, choler, and bile.

Erin Allmann Updyke I like that phlegm makes the cut.

Erin Welsh I know. Bring back phlegm. Then this whole humor theory of the body dates all the way back to Ancient Greece, cause I have to mention that in an episode contractually.

Erin Allmann Updyke Of course.

Erin Welsh But how blood traveled throughout the body, its circulation, wasn't discovered until 1628.

Erin Allmann Updyke Whoa.

Erin Welsh: Yeah. The first attempts at transfusions followed shortly after, mostly using animals, and they were unsuccessful as you might expect.

Erin Allmann Updyke: Like animals into humans?

Erin Welsh: Animals into animals.

Erin Allmann Updyke: Oh okay, okay.

Erin Welsh: Yeah. We'll get there, we'll get there. So in 1666 the first known successful blood transfusion was performed.

Erin Allmann Updyke: Whoa.

Erin Welsh: An English doctor named Richard Lower took two dogs and from one he drained as much blood as possible without killing it.

Erin Allmann Updyke: Oh yeah. I do remember this actually, I knew this story.

Erin Welsh: I'm gonna keep telling it anyway.

Erin Allmann Updyke: Do it, please.

Erin Welsh: With the other dog he sewed a reed to one of its neck arteries and attached the other end to the jugular of the barely alive dog. And he allowed the blood to flow from one dog to the other until the one that was giving the blood died and the other one that was receiving the blood revived. He stitched him back up and then the dog essentially came back to life. Within a few minutes he was back on his feet, he was running around, and seemed perfectly happy even with his dead comrade next to him.

Erin Allmann Updyke: I was gonna say the other one was dead. Cool.

Erin Welsh: Yeah. But this, even though it was a very gruesome experiment, it cracked open the world of possibilities to both physicians and philosophers. How could this be used to save lives? By transferring blood from one animal or one person to another, would the recipient take on the qualities of the donor? Can you make a tame dog vicious by the transfer of blood? Could you change your personality by getting someone else's blood? And so while the philosophers were busy debating the ramifications of blood transfusion, the scientists were busy refining the technique. Soon it was possible to conduct small transfusions enough to keep both the donor and the recipient dogs alive. But it wasn't all good news, not just because probably many, many dogs died along the way. Because people almost immediately started experimenting on humans, transferring blood from a cow to a human for example.

Erin Allmann Updyke: Oh no, bad idea.

Erin Welsh: Yeah. He survived.

Erin Allmann Updyke: Wow.

Erin Welsh: It was also done... Like he was forcefully volunteered.

Erin Allmann Updyke: Of course. Nobody volunteers for those quote "experiments".

Erin Welsh: No. They did this to him because they were like, 'Oh he's a drunk, he's mean to his wife, let's see if we can make him more docile with the blood of this gentle cow.'

Erin Allmann Updyke: (snorting)

Erin Welsh: And so he did seem to be a little bit calmer after that, probably because he was like exhausted and had been close to death.

Erin Allmann Updyke: Yeah.

Erin Welsh: And then like a year later or a few months later he shows back up, his wife is dragging him there and she's like, 'You gotta do it again, he's back to his normal state.' And so they did it and then he dies.

Erin Allmann Updyke: Yeah.

Erin Welsh: Turns out in the trial she had been poisoning him all along and so he actually died of arsenic poisoning.

Erin Allmann Updyke: No way!

Erin Welsh: Isn't that great? I love that.

Erin Allmann Updyke: Oh my god. That's really funny.

Erin Welsh: Okay but even though not all of these transfusions were successful by any means, people started to see the possibilities in this. People were still dying by the bucketload from infectious diseases like smallpox, plague, cholera, you know the ones. 'What if,' these physicians wondered, 'people could be cured of such illnesses by transfusing healthy blood like from lambs into sick people.' Lambs specifically.

Erin Allmann Updyke: Yeah, what if? Lambs specifically.

Erin Welsh: Yeah. So they tried it.

Erin Allmann Updyke: Did it work, Erin?

Erin Welsh: I mean to read the reports of some of these experiments you'd think that they'd discovered a miraculous cure-all.

Erin Allmann Updyke: Wow.

Erin Welsh: They started making claims that not only could fresh lamb's blood be used to cure leprosy and scurvy and so on but also unfavorable personalities. Or the other thing that they tried, and this was human to human, was to resolve marital conflicts by swapping the blood of wives and husbands.

Erin Allmann Updyke: Do a little tradesies with my hubs?



Erin Welsh: Trading spousal blood. Yeah.

Erin Allmann Updyke: Wow. I should ask him if he'd be into that.

Erin Welsh: You should try it. (laughs) Transfusing spouses, I love it.

Erin Allmann Updyke: Wow.

Erin Welsh: And by no means were these new transfusions widely accepted. Some people believed them to be the work of Satan or at the very least completely useless in curing any of the diseases that they were supposed to.

Erin Allmann Updyke: Okay.

Erin Welsh: And this bad press in addition to a couple of deaths following transfusions and a wrongful death trial led to the premature end of blood transfusions.

Erin Allmann Updyke: Oh.

Erin Welsh: In less than 5 or 6 years after the first successful transfusion, blood transfusions involving humans were banned in France and England and the pope banned the practice in the rest of Europe.

Erin Allmann Updyke: Wow, 5 years.

Erin Welsh: Yeah. It was like a real 180.

Erin Allmann Updyke: Flash in the pan.

Erin Welsh: And it would be more than 150 years before doctors experimented again with blood transfusions in humans. So in 1818 an obstetrician in London decided that he had to try something to reduce the enormously high mortality rate of people bleeding out after giving birth. So he tried a few transfusions with varying degrees of success, like 50%.

Erin Allmann Updyke: Okay.

Erin Welsh: But even with this low success rate, what this did was get scientists interested in transfusions again and they gave themselves license to experiment as they wished. And experiment they did. While there were some milk transfusions for instance, most doctors restricted their material to human blood-

Erin Allmann Updyke: Sorry, time out. What?

Erin Welsh: Yeah, something about the proteins and fattiness in milk would be good.

Erin Allmann Updyke: But where do they put the milk?

Erin Welsh: In the bloodstream.

Erin Allmann Updyke

No. No.

Erin Welsh

That one didn't last long, it wasn't super popular. I don't know if that experiment was repeated.

Erin Allmann Updyke

Okay, okay.

Erin Welsh

Most people fortunately just used human blood.

Erin Allmann Updyke

Okay.

Erin Welsh

But even then there were many ways a blood recipient could die. Physicians didn't know anything about blood groups, clotting factors, sterile technique, etc etc. So about 56 of 100 blood transfusions during the 1800s ended in death.

Erin Allmann Updyke

That is more than not.

Erin Welsh

It is more than not. And it's probably likely that at least some of these people were going to die anyway.

Erin Allmann Updyke

Okay.

Erin Welsh

But despite these not so great numbers, people didn't abandon the procedure altogether and that's probably fortunate because the discovery of blood groups was just around the corner. The guy who discovered blood groups like A, B, AB, O, etc, who's name was Karl Landsteiner, made some seriously impressive predictions about how different blood types could behave when introduced to one another and suggested that this knowledge would be really useful in increasing the success of transfusions. And that would win him the Nobel Prize. But even still nobody really paid much attention for a while to this.

Erin Allmann Updyke

Are you serious?

Erin Welsh

Yeah, it's kinda strange. Eventually they did. So throughout the early 1900s they refined the technique a little bit but doctors would just sit by their patient's side and kind of guess by intuition alone when their patient had received enough blood.

Erin Allmann Updyke

You're looking pinker! That'll do.

Erin Welsh

Yeah, seriously that was basically it.

Erin Allmann Updyke

Okay.

Erin Welsh

They didn't always guess correctly. And then there was the huge issue of blood doing what it does which is clotting. So it would gum up the works very rapidly until sodium citrate was discovered as a nontoxic anticoagulant. And then the world of transfusions was open to basically everyone, like as long as there was a willing donor, you could get the job done. Doctors weren't yet storing blood for later transfusions, they typically needed someone then and there, like a donor on the hoof I think is what they called it.

Erin Allmann Updyke

So you would just go into the surgery or go into the whatever and be the donor at that time?

Erin Welsh

Yep, exactly.

Erin Allmann Updyke

Okay.

Erin Welsh

And this could be a lot to ask of someone and so arose the practice of selling or buying blood and the field of professional donors. And remember this is the early 1900s when microbiology as a field was just a few decades old and the causative agents of many diseases were unknown. And the decades that followed saw the creation of the earliest blood banks and improvement of storage techniques, but arguably the biggest progress came, as you might expect, during WWII. It's no coincidence that this is also when hepatitis C began its global spread.

Erin Allmann Updyke

WWII.

Erin Welsh

WWII. So millions upon millions of people were dying or getting seriously injured, both military and civilian, and also traveling all around the world and then returning home hopefully at the end of the war. So with all of these injuries there was not only a huge need for blood but also a need for improvement in blood technology. And we've talked before about how much antibiotics revolutionized medicine during the war, people weren't as likely to die from infection from a minor wound or major wound after the discovery of penicillin. But before doing this episode I didn't realize just how much of an impact freeze-dried plasma made on survival as well.

Erin Allmann Updyke

Yeah, that makes sense. I wouldn't have thought of that either but yeah.

Erin Welsh

Oh it was remarkable.

Erin Allmann Updyke

Yeah.

Erin Welsh

So freeze-dried plasma, you just add water I guess, was a field-ready way to reduce shock and restore blood volume and this alone probably saved thousands of lives.

Erin Allmann Updyke

Wow.

Erin Welsh

Whole blood was less of a focus because it was much more difficult logistically to store and handle and so on.

Erin Allmann Updyke

Right, yeah.

Erin Welsh

And so military doctors looked on the plasma as a miracle. Soldiers would be going into shock with severe wounds and then they would bounce back from death with the injection of some plasma.

Erin Allmann Updyke

Wow.

Erin Welsh

But these doctors also recognized plasma's limitations. So the positive effects were often short-lived and the wounded appeared to be starved for oxygen, unable to get warm, and then would sometimes slip back into shock.

Erin Allmann Updyke

Since there was no red blood cells to carry oxygen.

Erin Welsh

Exactly. And so although plasma was pretty awesome it was no replacement for whole blood. And the problem was where to get it. During the war there was a shift from paid donors to volunteer donors because there just wasn't enough blood coming in and so they were like, 'Support the troops! Campaign for community!' That sort of thing. But at least in the US this blood wasn't being shipped overseas because the logistics of keeping blood cold during transport was difficult. As a result there was a constant shortage of blood and some doctors had to resort to being impromptu donors.

Erin Allmann Updyke

Oh gosh.

Erin Welsh

Yeah, or employing the whole 'donors on the hoof' method as had been used previously. After the war ended and the pressing need for blood decreased, the blood banks and blood donor organizations didn't fade, they actually grew enormously. The threat of nuclear war between the US and the USSR kept people running to blood banks to donate because if a nuclear attack happened the immediate need for blood would be greater than maybe the entire war combined. People recognized the problems with paid donors though and the American Red Cross along with smaller blood banks across the country focused on convincing the public to donate blood out of a sense of community.

But there was a darker side to this. Racism and blood donation had existed since the modern history of blood transfusions and it didn't stop after the war. Even though scientists repeated over and over again that blood was blood and you couldn't tell a person's race based on their blood, the Red Cross and other blood donation centers still practiced the racist regulations of only allowing white people to donate. Or when that rule was overturned they forced people to label the blood so that a recipient could then see or choose whether they wanted to receive that blood.

Erin Allmann Updyke

I should be surprised by this, Erin.

Erin Welsh

It was probably less of the patient and more of the hospital.

Erin Allmann Updyke

Yeah, of course.

Erin Welsh

Yeah. It could have been the patient too.

Erin Allmann Updyke

But just the fact that that was the Red Cross practice. Ugh.

Erin Welsh

Eventually these racist practices died out, not soon enough, and then they would later be replaced by still screening blood based not on the blood but on the person who's giving the blood.

Erin Allmann Updyke

Yep.

Erin Welsh

Which is really-

Erin Allmann Updyke

Problematic.

Erin Welsh

To say the least, yeah. But ethical and legal issues surrounding blood donation continued to pop up or reemerge, mostly focusing on whether blood could be considered a commodity. So around the world, different countries had debated whether or not to pay donors for their blood or to rely on volunteers and the US was one of these countries that was sort of caught between those two things. And the ethical issues with paying for blood were obvious to everyone. There was exploitation of poor people who were literally selling pieces of themselves as a way to make money which is an issue that continues to be a problem in paid medical studies but we're not gonna get into that.

Erin Allmann Updyke

It's a different episode.

Erin Welsh

It's a different episode, yeah. And then the fact that there was still no good testing for certain infections such as hepatitis even though hepatitis C was not yet known. And then came the legal and moral ramifications of whether blood was considered a commodity. Because if it was, it was then subject to federal trade and commerce laws in the US and if it were considered a product, it was subject to the Uniform Product Code which was a regulation that stated that anything sold as a product of commerce carried an implied warranty. But blood banks, both nonprofit and commercial, couldn't easily guarantee the safety or quality of the blood they were peddling so they sought and gained an exemption to this by getting blood to be labeled a service which is why it was so difficult for anyone to sue blood banks after being infected with contaminated blood.

Erin Allmann Updyke

Fascinating. Wow.

Erin Welsh

And in the US prisons were a huge source of plasma for a very long time and outrageously unsanitary conditions in at least one group of prisons in Oklahoma owned by a physician - yeah, he owned 6 prisons.

Erin Allmann Updyke

What?

Erin Welsh

It was a site of enormous hepatitis infections in the 1960s. And so I should point out that at this time, so throughout the 60s and 50s basically and even before then, hepatitis as you mentioned, hepatitis as a condition, inflammation of the liver was recognized and it was even known to be associated with blood transfusions.

Erin Allmann Updyke

Right. Okay.

Erin Welsh

But no one of course knew what the causative agent was for a long time and I'll get there. And so usually the hepatitis was diagnosed based on clinical symptoms, so like the jaundice and inflammation and all of that, not on finding a virus.

Erin Allmann Updyke

Yeah.

Erin Welsh

Even though hepatitis was a known problem in blood transfusions, people in the blood business looked at it as it's better to live with hepatitis than die of not getting blood. So it's an unfortunate but necessary risk. During the 50s and 60s as well, injection drug use also started to really pick up and become widespread. And so the combination of a massive increase in blood donation and blood transfusions and injection drug use really also helped to spread hepatitis and other blood-borne pathogens. And hemophiliacs were one population that experienced extremely high rates of hepatitis C and of course HIV as we discussed in that episode due to their need for multiple transfusions or factor XIII which was made from plasma. In the early 1970s the CDC put transfusion-related hepatitis deaths at 3500 per year.

Erin Allmann Updyke

Whoa. Wait, in what year again?

Erin Welsh

Early 1970s.

Erin Allmann Updyke

Wow. Just transfusion-related hemophilia deaths.

Erin Welsh

And many physicians actually argued that that number was 10 times that.

Erin Allmann Updyke

Holy guacamole.

Erin Welsh

And this wasn't just a problem in the US, this was a global problem. I'm focusing on the US because that's where a lot of the book took place. But anyway. Europe who relied solely on unpaid volunteers condemned the US practice of using paid donors but they constantly bought plasma from the US. They had a constant plasma shortage and so yeah. And when a test for hepatitis B was finally developed in 1975 which was only 40% effective actually, better than the 15% effective test from 1972, the people could finally start screening blood. And what they found was that paid donors were 3 times more likely to be infected with hepatitis compared to unpaid donors.

Erin Allmann Updyke

This is hepatitis B.

Erin Welsh

Hepatitis B, yes.

Erin Allmann Updyke

Okay.

Erin Welsh

And then there were arguments over whether to completely eliminate paid donors until the FDA said in 1978, 'Hey, let's let the market decide.' And they forced blood banks to label blood as being either from paid or unpaid donors. Almost immediately the practice of paying donors for blood was over.

Erin Allmann Updyke

Wow.

Erin Welsh

No hospital bought paid donor blood. Plasma was another story.

Erin Allmann Updyke

Yeah, you can still get paid for that.

Erin Welsh

Yeah. I remember in college I had friends who would go donate plasma for-

Erin Allmann Updyke

For beer money?

Erin Welsh

Beer money. And then they would be like, 'Oh it's great, you get so much drunker faster because whatever...'

Erin Allmann Updyke

That's a terrible practice, nobody do that.

Erin Welsh

Nobody do that. So a few years after this ruling by the FDA, rates of hepatitis B dropped but people were still getting hepatitis from transfusions. An investigation revealed that 90% of transfusion-related hepatitis was not caused by hepatitis B but by something they couldn't test for.

Erin Allmann Updyke

Oh.

Erin Welsh

They called it non-A, non-B hepatitis.

Erin Allmann Updyke

Non-A, non-B, I'm guessing it's C!

Erin Welsh

(laughs) Yep, easy. In 1984, 5 years before the new virus would get a name and a test, it infected an estimated 180,000 blood transfusion recipients, killing about 1% of them.

Erin Allmann Updyke

Is that in the US alone?

Erin Welsh

I think that's global.

Erin Allmann Updyke

Okay. Cause that seems whoa high.

Erin Welsh

Yeah, I think that's global. Cause that's just in one year.

Erin Allmann Updyke

In one year. That's a massively huge number of people.

Erin Welsh

So in 1989 and beyond, once researchers could identify hepatitis C cases, they started to get a better sense of how the virus behaved and what they saw was super concerning because of all of the things that you said. And whereas hepatitis had previously been seen as this unfortunate risk of blood transfusions, this new information about hepatitis C was like okay no, there's an increased urgency for a clean, uninfected blood supply. And that coincided also with the AIDS pandemic beginning. Those two things combined, particularly urged on by the AIDS pandemic, really led to a complete reform of blood screening and blood transfusions. But even though blood donation regulations really changed to decrease risk of any sort of blood-borne infections, damage had been done in a lot of ways. Over time the positive effects of these new regulations in addition to the introduction of things like needle exchange programs really did start to slow this hepatitis C pandemic down. Within 30 years, like the virus was discovered in 1989.

Erin Allmann Updyke

30 years ago. Wow.

Erin Welsh

30 years ago it was discovered, a test was developed for it, and an effective treatment was created.

Erin Allmann Updyke

That's so... I'm just so interested in that. Is there a story like that for any of the diseases that we've talked about? 30 years to go like that rapidly? I know it's because we discovered it so recently whereas diseases that were discovered so long ago, of course it took them longer to figure things out. But I just think that's so, so fascinating.

Erin Welsh

I mean HIV is along those lines.

Erin Allmann Updyke

That's true, very true.

Erin Welsh

It's not the death sentence it once was.

Erin Allmann Updyke

Absolutely.

Erin Welsh: But in terms of hepatitis C we're still far away from elimination or eradication.

Erin Allmann Updyke: Oh yeah.

Erin Welsh: There's still as we mentioned millions and millions of people infected with the virus around the world and new infections continue to occur. Erin, tell me about hepatitis today and what's being done.

Erin Allmann Updyke: Would love to. We'll take one more quick break before we jump in.

TPWKY: (transition theme)

Erin Allmann Updyke: This section's actually gonna be very short. We kind of already talked about these numbers so let's just repeat them for everyone. It's unclear to me exactly, I'm sure it's unclear to the globe exactly how many people are currently living with hepatitis C but we know it's at least 71 million which is what the WHO, the World Health Organization estimate is based on 2015 numbers.

Erin Welsh: Okay.

Erin Allmann Updyke: However if you look at numbers from just a couple of years previously it could be as high as 170-180 million people.

Erin Welsh: Yeah, what caused the drop of 100 million people?

Erin Allmann Updyke: I think it's just depending on what model people were using and what years of data they were using. So if they were using data from the 80s and 90s and then modeling out from there, infections were higher than if they used numbers from the early 2000s. And it's because of those blood transfusion screenings and things like that. So at least that's from what I understand, that's what it seems like. But either way, 71 million people. That's 71 million people living with hepatitis C. The WHO also estimates that there's over 1.75 million new infections every year.

Erin Welsh: Oh my gosh.

Erin Allmann Updyke: And they estimate that 400,000 people die every year as a result of hepatitis C.

Erin Welsh: How many?

Erin Allmann Updyke: 400,000 people.

Erin Welsh: Wow.

Erin Allmann Updyke: And this is now a curable disease so nobody in theory should be dying from hepatitis C.

Erin Welsh: Right.

Erin Allmann Updyke: And the biggest issue is twofold. One, it's estimated that only 19% of all people who are living with hepatitis C actually know their diagnosis.



Erin Welsh

Wow, that's very low.

Erin Allmann Updyke

Yeah, it's very low. And of those diagnosed only about 5 million people... So it's estimated that 13 million of those 71 million people know their diagnosis, only 5 million of them have been treated as of 2017. So there's a huge amount of work that needs to be done to get those people the treatment that they need.

Erin Welsh

Yeah. What's being done?

Erin Allmann Updyke

Well the World Health Organization has a huge hepatitis initiative and they have a number of different ways that they're trying to increase access to these drugs and also increase access to screening because one of the issues is while initial screening tests for hepatitis C which are antibody-based, so we can basically just take your blood and see if you have any antibodies to hepatitis C, those tests are pretty easy and pretty cheap, like less than \$2. But they're not specific so while they'll tell you yes, you were exposed to hepatitis C, remember that 85% or less of people actually go on to develop chronic infection. So it might just mean that you were exposed to hepatitis C but you've cleared the infection. The test to actually know whether you are currently infected chronically with hepatitis C are more expensive and often require expensive equipment and specialized technicians to be able to do those tests because they're often PCR-based tests or antigen-based tests, so looking for the actual virus itself in your bloodstream.

Erin Welsh

Right.

Erin Allmann Updyke

So that's one of the things is developing better diagnostic tools that are cheaper, easier to use, things like point-of-care testing which means when you have somebody there and you wanna test them, you can actually do it right then and there. That's huge not just for hepatitis C but for a number of different infections people are working on. And then the other thing is treatment. So while we have treatment it's very expensive in a lot of cases and so getting people access to these drugs is difficult even though it's hugely important. And so that honestly it takes money and it takes pharmaceutical companies being willing to sell their drugs for cheaper.

Erin Welsh

(laughs) Okay so let's find something else because that's never going to happen.

Erin Allmann Updyke

Yeah. The other thing is a vaccine. I actually don't know how much progress has been made on a vaccine thus far, it's very difficult because of how much variability there is in hepatitis C and how quickly it mutates, it's really difficult to develop a vaccine. The other issue is since we don't know a lot about how it interacts with our body, we don't know how good of an immune response we'd be able to generate with a vaccine if that makes sense. So it's unclear if we can develop a good vaccine at this point. But I'm sure there are people working on it because this is a human-specific disease, I'm not sure that I even mentioned that. But with any human-only disease it is theoretically possible that we could eliminate it but at this point that's not even an option.

And so one thing I would like to say is that while in the US and much of Europe, Australia, other places, blood products are very, very safe at this point, they're very well screened, that's not true everywhere. So in some places it is still difficult to test blood products for every possible infection but overall they're much better tested than they were in the 80s and 90s. And because blood transfusions are generally rare, blood transfusions itself are not a huge risk on a population level for hepatitis C infection today.

Erin Welsh

Okay.

Erin Allmann Updyke

The two largest sources and risks for infection, the biggest one is unsafe medical procedures. So using glass syringes, not properly sterilizing them, reusing needles for medical injections.

Erin Welsh

Right, which used to be common practice.

Erin Allmann Updyke

Yes, yeah. And is still common practice in a lot of places where they don't have access to disposable syringes and disposable needles.

Erin Welsh

Right? It's expensive.

Erin Allmann Updyke

It's super expensive. And so that's a huge source of infection. And the other is injection drug use. So like you mentioned, harm reduction practices like needle exchanges, distribution of sterile needles, this can be hugely effective in helping to reduce the spread of disease including but not limited to hepatitis C. So that brings me to what I really wanna talk about in terms of hepatitis C and that is that this is like HIV a disease that is highly stigmatized.

Erin Welsh

Right.

Erin Allmann Updyke

Because of its associations with injection drug use and I think a lot of people still associate it with sex even though that's not a huge source of infection but in our puritan culture sex is bad so, you know. Sexually transmitted infections are very... What's the word I'm looking for?

Erin Welsh

Stigmatized?

Erin Allmann Updyke

Stigmatized, yeah. And so one thing that I think is really great that has become a recent recommendation in the US by the CDC is universal screening for everyone born between 1945 and 1965. Yeah. It is now the recommendation that if you were born in those years between 1945 and 1965 and you haven't yet been screened for hepatitis C, you should absolutely go get screened. No matter what you think your quote unquote "risk" might be, even if you never used injection drugs, even if you never had blood products, it doesn't matter. You should get screened. And that's because hepatitis C was so common that any type of medical procedure could have potentially put people at risk. But what I think is great about things like universal screening is that it helps to reduce that stigma. Everybody should be screened because anybody could have been exposed to hepatitis C.

Erin Welsh

Yeah.

Erin Allmann Updyke

But the thing about screening, I think screening is really awesome and we haven't sort of talked about what diseases make sense to screen for, like when would you screen vs when would you not screen. So I wanted to talk really quickly about what makes a disease a good candidate for screening and why hepatitis C has only recently been a good candidate for screening on a large scale.

Erin Welsh

Okay.

Erin Allmann Updyke

First of all to be a disease that it makes sense to screen for, you have to have an effective screening tool. Which makes sense.

Erin Welsh

Seems pretty basic.

Erin Allmann Updyke

So for there to be an effective screening tool that means it has to be inexpensive so that it's cost effective to do this test on everyone who comes into your office basically and it has to have a good enough sensitivity and specificity that it's actually useful. So we know that we're getting the majority of cases of this disease and we don't have a lot of false positives or false negatives. Secondly you have to have a disease that's at a large enough prevalence in the population for you to actually pick it up. Since no screening tool that we use is perfect there's always gonna be some false positives and some false negatives. If a disease is really, really rare then your false positives and false negatives are gonna be out of whack and there's not really a point to screening in that case. Does that make sense?

Erin Welsh

Okay.

Erin Allmann Updyke

And third of all, and this one is where hepatitis C only now makes sense to screen, you have to be able to do something about it cause there's no real point in screening whole groups or populations if there's nothing you can do except tell them, 'Hey, you have a horrible disease. End of story.' So now that we have such effective treatment tools and of course screening tools are always getting better, screening is a really good recommendation for something like hepatitis C.

Erin Welsh

That's cool.

Erin Allmann Updyke

Isn't it? It really love that.

Erin Welsh

Yeah.

Erin Allmann Updyke

It's my little epi nerd in me. So yeah, that's basically hepatitis C. The biggest sort of obstacles that we have going forward are access to treatment and better screening tools and getting everyone who has hepatitis C to actually know their diagnosis so that they can get access to potentially life saving treatment.

Erin Welsh

It's amazing the enormous strides that medicine has made and science has made in the past 30 years.

Erin Allmann Updyke

I know. Yep.

Erin Welsh

Good job.

Erin Allmann Updyke

Good job. But also bad job on a lot of other things. Geez.

Erin Welsh

Oh yeah.

Erin Allmann Updyke

So sources?

Erin Welsh

Sources. So I got most of the information about the history of blood transfusions from a book called 'Blood: an epic history of medicine and commerce' by Douglas Starr and I recommend this book, it has more of the discussion about the racism surrounding blood transfusions which I didn't talk much about but there's a really dark history to that and screening blood by the identity of the person rather than what's in the blood has also remained a huge issue.

Erin Allmann Updyke

Yeah.

Erin Welsh	But read more of that book to find out more. Another book that I relied on also was 'Hepatitis C virus: from molecular virology to antiviral therapy'.
Erin Allmann Updyke	Cool. If you'd like to know more about what's being done for hepatitis C worldwide you can check out the global hepatitis report by the World Health Organization that was in 2017 I think is the most recent one. And then there's a number of different articles that I have on just the clinical disease and epidemiology. We'll post all of our sources on our website <a href="http://thispodcastwillkillyou.com">thispodcastwillkillyou.com</a> under the EPISODES tab.
Erin Welsh	Thank you to Bloodmobile for providing the music for this episode and all of our episodes.
Erin Allmann Updyke	And thank you to all of you for listening as always.
Erin Welsh	Yes. We appreciate you, we love you. Thank you for letting us do what we love to do.
Erin Allmann Updyke	It's unbelievably fun to talk about horrific diseases with my best friend and have so many people listen.
Erin Welsh	It's the dream, really. Well with that, wash your hands.
Erin Allmann Updyke	You filthy animals.
Erin Welsh	And hepatitis C ya later.
Erin Allmann Updyke	(laughs)