

Erin Allmann Updyke

"At a certain battle during 1917, two soldiers with compound fractures of the femur and large flesh wounds of the abdomen and scrotum were brought into the hospital. For seven days they lay on the battlefield without water, without food, and exposed to the weather and all the insects which were about that region. On their arrival at the hospital, I found that they had no fever and that there was no evidence of septicemia or blood poisoning. Indeed their condition was remarkably good and if it had not been for their starvation and thirst, we would have said they were in excellent condition. When I noticed the extent of the wounds, I could not but marvel at the good constitutional condition of the patients. This unusual fact quickly attracted my attention. I could not understand how a man who had lain on the ground for seven days with a compound fracture of the femur, without food and water, should be free of fever and evidence of sepsis.

On removing the clothing from the wounded part, much was my surprise to see the wound filled with thousands and thousands of maggots, apparently those of the blowfly. These maggots simply swarmed and filled the entire wounded area. The site was very disgusting and measures were taken hurriedly to wash out these abominable-looking creatures. Instead of having a wound filled with pus, as one would have expected, these wounds were filled with the most beautiful pink granulation tissue that one could imagine. These patients went on to healing, notwithstanding the fact that we removed their friends which had been doing such noble work."

TPWKY

(This Podcast Will Kill You intro theme)

Erin Allmann Updyke

Ooh.

Erin Welsh

I love it so much, Erin.

Erin Allmann Updyke

I love it so much. It's so good.

Erin Welsh

It's such noble work.

Erin Allmann Updyke

Such noble work.

Erin Welsh

I just love maggots, Erin. This episode has transformed me.

Erin Allmann Updyke

It is something I never thought that I would say ever. And I love them so much.

Erin Welsh

I love them. They're the best. That firsthand account was from William Baer from 1931 in a paper titled 'The Treatment of Chronic Osteomyelitis with the Maggot (Larva of the Blowfly)'.

Erin Allmann Updyke

Love it. Those blowfly larva.

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

Welcome to today's episode. It's all about maggots.

Erin Welsh: It's going to be so much fun. And what makes it even more fun is that this is kind of like a two parter.

Erin Allmann Updyke: It is.

Erin Welsh: Yeah. It's like companion pieces.

Erin Allmann Updyke: It was originally intended as a two parter that we realized was really two companion pieces because who knew there was so much to love about both maggots and next week's stars, leeches.

Erin Welsh: Leeches. I mean and I think the connection will become fairly clear when we get through these. But basically these are two organisms that carry with them a certain ick or yuck factor-

Erin Allmann Updyke: Major.

Erin Welsh: But they have been used in medicine for centuries, thousands of years even and have kind of recently experienced a resurgence in popularity. And I just, there are so many amazing things about them.

Erin Allmann Updyke: Yeah.

Erin Welsh: So it's going to be really fun.

Erin Allmann Updyke: It's really going to be a fun episode. Next week's also going to be so much fun. I am thrilled. I learned so much researching for this and like ugh, maggots!

Erin Welsh: Maggots. Who knew? A lot of people.

Erin Allmann Updyke: A lot of people did and now we get to know too.

Erin Welsh: But before we get into all of that good stuff about maggots-

Erin Allmann Updyke: It's quarantini time.

Erin Welsh: It is. What are we drinking this week?

Erin Allmann Updyke: We're drinking A Tale of Two Worms.

Erin Welsh: Wait. Oh my gosh.

Erin Allmann Updyke: No, that is actually the title.

Erin Welsh: That is the title. But I made the quarantini picture and the recipe as The Best of Both Worms.

Erin Allmann Updyke: No. Did you really?

Erin Welsh: Yes, I did. Let me pull it up. I swear I sent it over to you, Erin.

Erin Allmann Updyke: How did I not even notice, Erin?

Erin Welsh: Best of Both Worms.

Erin Allmann Updyke: You did Best of Both Worms!

Erin Welsh: That's how it was written down in my notebook. And so I was like... Oh yeah, and it literally did not cross my memory.

Erin Allmann Updyke: And obviously I looked at all of your things, didn't even read the title. Cool.

Erin Welsh: Okay. So we're drinking either... It's going to be easy to change. I think we're drinking A Tale of Two Worms.

Erin Allmann Updyke: A Tale of Two Worms. I love it.

Erin Welsh: I do too.

Erin Allmann Updyke: Because we're telling tales of these two squirmy worm things. Asterisk, we know that maggots are not worms, we're very well aware.

Erin Welsh: Yeah.

Erin Allmann Updyke: We'll talk a lot about it.

Erin Welsh: But they squirm like worms so like...

Erin Allmann Updyke: Colloquial term.

Erin Welsh: Spiders are bugs, that kind of thing. We know the difference but forgive us.

Erin Allmann Updyke: We do.

Erin Welsh: But in Best of Both Worms... Oh my god. In A Tale of Two Worms we have, it's basically like fancy fruit punch with vodka and gummy worms.

Erin Allmann Updyke: Yeah. Delicious. We'll post the full recipe for that quarantini as well as our non alcoholic placeborita on our website thispodcastwillkillyou.com and on all of our social media channels.

Erin Welsh: We will. If you're not already following us on our social media channels, you really should because we're putting out some pretty cool content.

Erin Allmann Updyke: Definitely.

Erin Welsh: We've got some reels, we got normal posts.

Erin Allmann Updyke: Normal posts. We're on TikTok even.

Erin Welsh: We're on TikTok even. Finally getting with the program right before it probably will be banned.

Erin Allmann Updyke

Yep.

Erin Welsh

And check us out there. Also our website. Let's shout out our website as we usually do. It's got some good stuff. It's got transcripts, it's got our bookshop.org affiliate account, it's got our Goodreads list. It's got all the sources for all of our episodes, links to merch, links to music by Bloodmobile, links to Patreon, links to a form where you can submit your firsthand account which is awesome.

Erin Allmann Updyke

Please do.

Erin Welsh

We get so many incredible people who share their stories with us that we cannot thank enough.

Erin Allmann Updyke

Yeah.

Erin Welsh

And so if you're interested in sharing a story or have a request for a particular topic, please reach out to us.

Erin Allmann Updyke

Well with that, shall we get into this episode all about maggots?

Erin Welsh

Let's do it right after this break.

TPWKY

(transition theme)

Erin Allmann Updyke

I have to start out just by giving a huge shout out to the pretty much only source that I used for this biology section of maggots which was a paper, except I think it's more like a book, a compendium.

Erin Welsh

Ooh.

Erin Allmann Updyke

A book called 'The Complete Guide to Maggot Therapy: Clinical Practice, Therapeutic Principles, Production, Distribution, and Ethics'. When they say complete-

Erin Welsh

That is as complete as it gets.

Erin Allmann Updyke

It was such a gem to read. I love it so much. And I loved it so much that I actually want to start off with a beautiful line from the introduction chapter. Are you ready for this?

Erin Welsh

I think so.

Erin Allmann Updyke

Quote: "The human body is fragile and therefore wounds, acute and chronic, have always been part of the human condition since time immemorial. Likewise flies have evolved to exploit during larval development the ephemeral cadavers and wounds of living animals, humans included."

Erin Welsh

Ephemeral cadavers. It's beautiful.

Erin Allmann Updyke

I just loved it. So flowery. I don't get to read things like that very often for this podcast. So I want to start off, I mean I already started off but let's first I want to talk about chronic wounds because they're a really important part of the maggot story. Chronic wounds, the idea of a chronic wound is simply a wound that doesn't heal along a typical trajectory. And so you see this a lot in medicine and there's not necessarily one specific time frame on when you would consider a wound chronic vs acute or something like that. But generally chronic wounds can be present for months to years. And if something isn't done, some kind of wound care to help chronic wounds heal, they can persist for years or decades and be very debilitating physically, mentally, emotionally, they can lead to a lot of complications down the line.

So why chronic wounds? Why are these important? Chronic wounds often have a significant amount of necrotic or dead tissue that covers them. And in order for them to heal, part of the wound care process is that they have to be debrided, meaning that the necrotic tissue has to be removed all the way down to a layer of more well vascularized, healthy bleeding tissue. What was described in the firsthand account as that granulation tissue. That granulation tissue is our body's healing from the bottom up which is actually how wounds heal.

So how can we accomplish this process? Like what does wound care entail? That is where we can enter maggots. Sometimes. So maggots, for anyone who is uninitiated, is a colloquial term for the larvae of flies. Flies? Large group obviously. Holometabolous insects, so their larvae look nothing like the adult. They have to pupate, they rearrange the whole body. Caterpillars are butterfly larva; grubs, beetle larva; maggots, fly larva. But flies are a huge, huge, huge order of insects that includes mosquitoes, house flies, horse flies. So when we say maggots, which is not like a scientific term, it's very much a colloquial term, we kind of specifically use that for the larva of flies that you probably think of when you think of the word fly. Does that make sense?

Erin Welsh

Yeah. Okay.

Erin Allmann Updyke

Like it's still a pretty general term but it's like most of the flies that you look at it and you're like that's a fly! Their larva are maggots.

Erin Welsh

Okay.

Erin Allmann Updyke

So the flies that we talk about in medicine, medicinal maggots, generally are from the specific species *Lucilia sericata*, I think is how you pronounce it. I tried really hard to look it up. But this is the common green bottle fly. And one other species, *Lucilia cuprina* which is the Australian sheep blow fly. So both of these are blow fly species. They're actually kind of pretty, they're green, they're really shiny and metallic. And again, they look like a fly just green.

Erin Welsh

Okay. I'm with you.

Erin Allmann Updyke

You're with me, thank you. Good. The maggots themselves, if anyone hasn't had the pleasure of seeing maggots, look like little wiggly grains of rice especially when they're in their first instar, they're pretty small and they just sort of wiggle around. And then as they molt through their various instars, they get a little bit larger and then you can tell that they have little segments on their bodies. And they breathe through spiracles on their butts. So they bury their heads into wounds or decaying flesh and they stick their butts out in order to breathe.

So when it comes to the use of maggots in medicine and the reason that I talked about chronic wounds at the top is that the primary use of maggots is in the treatment of chronic wounds. Sometimes maggots can be used for other wounds or acute things like burns but mostly they're used for chronic wounds. And in this capacity they have three incredible functions that I will get into in detail. First, they can help to remove that dead or necrotic tissue that prevents chronic wounds from healing. Two is that they help to control infection which is a huge issue in chronic wounds. And three, they actually promote wound healing. They're really cool. So how do they do all of these three amazing things? Like they are worm babies, how do they do this?

Blow fly larva, maggots in the wild, eat dead animal tissue. That is what they do, that is what they have evolved to do. So they will happily eat the necrotic or dead tissue on a wound. Like that part makes sense, they will eat dead tissue, any dead tissue that they can find. But there are a few things about these blow flies, especially the ones that we use in medicine that make them especially good at wound debridement. First, maggots don't have any real mouth parts so they can't bite you, they can't crush your flesh, they don't pierce you. Instead they rely on what's called extracorporeal digestion.

Erin Welsh

What?

Erin Allmann Updyke

It's one of my new favorite phrases.

Erin Welsh

Yeah.

Erin Allmann Updyke

Meaning that they are secreting a whole bunch of digestive enzymes and antimicrobial substances. They're spitting it out, they're letting that flow over their food, which if it's a chronic wound is your wound. And then they have these two little mouth hooks that they use to kind of separate out their food bits and they also use these hooks to crawl their little bodies around, that's how they crawl around. And this helps those digestive enzymes that they've secreted out to penetrate deeper into the surface of the tissue that they're digesting. And then they suck up that juice and that's what they eat which allows them to grow. Also this way of feeding, this extra... I'm so excited I can't pause for a question yet. But this way of feeding helps their neighbors as well because all of the maggots in a group will combine resources, combine all of those digestive enzymes which increases the efficiency in large populations.

Erin Welsh

Okay. I have so many thoughts. That is amazing.

Erin Allmann Updyke

Okay.

Erin Welsh

I assume at a certain point are resources limited then it's like not helpful if they run out of tissue or whatever to eat. Yes?

Erin Allmann Updyke

Okay. Yes. So they are very efficient at just finding that necrotic tissue for the most part. And we'll get into like there could be complications. But yes, they are going to find like the most necrotic tissue and that is what they are going to specialize on for the most part. And then when they're done they're gonna leave, they're gonna go someplace new, right. So on a chronic wound that's full of dead tissue, they are secreting these enzymes that are literally digesting it which is a form of chemical debridement, right. So that's the first way that they're debriding it. But on top of that, their little mouth hooks are also helping to break up that dead tissue. So they're also doing physical debridement and not passively the way that like a piece of gauze with bleach sits on the surface and does a chemical debridement. And then when you pull that gauze off, it's going to have some kind of physical debridement. But these are active live maggots who like you said, Erin, are seeking out the deepest, most necrotic tissue because that's the areas of greatest food for them. So they are incredibly efficient at this debridement process.

Erin Welsh

Do we know what chemicals and enzymes and what's in their secretions? Can we mimic it? Would we want to ever mimic it?

Erin Allmann Updyke

It's a great, great question. I feel like that is one of the big questions about so many of the things with maggots and with leeches like we'll talk about later. We know some of the compounds, a lot of them are like proteolytic enzymes and a bunch of other things as well too. There certainly are compounds that we have that we might use that are very similar. But as we'll see, it's a combination, right. It isn't just the chemicals that they're secreting, it's also the way that they're moving, it's their mouth parts doing the things that they're doing, it's them scooting their bodies along. So yes, it is possible. And I think we'll talk a lot more about that idea of like can we identify these specific compounds and can we mimic them?

Erin Welsh

Right. Well it's also like just the removal process, like you said.

Erin Allmann Updyke

Yeah.

Erin Welsh

It's not just dissolving or whatever.

Erin Allmann Updyke

Yeah, they're sucking it up too.

Erin Welsh

They're amazing.

TPWKY

(transition theme)

Erin Allmann Updyke

But that's not all. That's like not even close to all. So maggots, because in the wild they're feeding on this decaying tissue that's just ripe with other organisms like bacteria but also viruses, protozoans, other bugs, like everything. So it makes sense that they would have also evolved ways to thrive in an environment that is chock full of other microbes, right? Ways of either out competing for food or making sure or/and I guess making sure that they don't get infected with all of the other microorganisms that are around. And they do exactly that. Maggots secrete not just these enzymes that are breaking down tissue but a whole host of antimicrobial compounds that in studies have been shown to be active against things like staph and strep which are really common skin flora.

And interestingly, they're less effective perhaps against other types of bacteria which might be less common to be found on decaying carcasses. But on top of that, they're also eating a whole bunch of these microbes that could potentially be infecting a wound. So they're disinfecting the wound, they're controlling the infection of chronic wounds, and their little mouth hooks help to disrupt biofilm formation. And biofilms when bacteria are able to latch on and form a biofilm on top of a chronic wound, that is very difficult to deal with. And maggots are great at it. And if that wasn't enough, if you're not yet convinced, listeners, because Erin, I know you are-

Erin Welsh

I'm totally convinced.

Erin Allmann Updyke

That maggots are just like the bee's knees when it comes to wound healing, they literally help promote the healing of wounds.

Erin Welsh

How?

Erin Allmann Updyke

So wounds in many studies that have been treated with maggot therapy heal faster than wounds not treated with maggot therapy. So let's talk a little bit about what that means. How do wounds actually heal? There's three major phases of wound healing. There's inflammation, proliferation of the tissue, and then maturation. Chronic wounds, the type that are really like good for maggot therapy are usually stuck in an inflammatory state, like they're stuck there and they just can't progress because of the necrotic tissue, because of bacteria, because of a whole bunch of stuff. Some of the secretions from maggots act to inhibit this inflammation. And that helps the wound to actually progress further through the stages of healing. And some of these compounds also seem to help to stimulate angiogenesis. Angiogenesis is the process of which we make new blood vessels so that you can get more oxygen to a wound, which by the way is how hyperbaric oxygen therapy works to help heal wounds. And so this combination of things also helps to actually speed along the process of wound healing. So it's just amazing that maggots can do all of this.

Erin Welsh

Yeah. Why? Why do those things help wound? Like not why but do you know what I mean? Why?

Erin Allmann Updyke

Yeah. Why? Not why but also why.

Erin Welsh

Also why.

Erin Allmann Updyke

I had the same thought, especially the idea that like why would they be anti-inflammatory? Because if a lot of what they are feeding on is like dead necrotic tissue, in my brain I wouldn't expect for there to necessarily be a lot of inflammation. But it seems like a lot of it is that they reduce some of the pro inflammatory cytokines that we have circulating in reactive oxygen species.

Erin Welsh

Okay.

Erin Allmann Updyke

And reactive oxygen is something that definitely is present in the environment when cells start to lyse which is what's going to happen during necrosis and as something is decaying. So in that way it kind of makes sense that it's to protect themselves, they're reducing reactive oxygen species. That's my best, I didn't read that directly but that's my best way of understanding it.

Erin Welsh

Okay. Can I ask some questions?

Erin Allmann Updyke

Absolutely, Erin. Please.

Erin Welsh: Okay, okay.

Erin Allmann Updyke: I have like two more pages of info I thought you might ask me questions about.

Erin Welsh: Yes. Okay, let's see if we can get through it. I'm going to hit all those paragraphs.

Erin Allmann Updyke: Yeah.

Erin Welsh: Okay. So when is maggot therapy indicated and when is it not?

Erin Allmann Updyke: So that's a really good question. Chronic wounds is a very broad category. There's lots of different things that cause chronic wounds, there's lots of different types of chronic wounds. There isn't necessarily one wound that is like oh, definitely use maggots for this and other wounds that you're like ooh, never use maggots for this. In general maggots are really safe to use for most all types of wounds. But any wounds that have a lot of necrotic tissue, like that dead tissue, anything that looks black on top is necrotic, that is going to be an especially good wound for maggots to be able to be helpful for. They can be helpful in things like burns which need to debriding right away and in a pretty gentle kind of way. And they're very helpful for anything that's difficult to reach or difficult to visualize because they're going to crawl their way into nooks and crannies but then always come back up to the surface either because they run out of food or because they need air or because they're done growing and they need to molt. So really like any type of skin and soft tissue wound could be amenable to maggot therapy, less so for things like bone and tendons and ligaments just because all of these things that are so great about maggots don't work as well on those types of tissues.

Erin Welsh: Interesting. Okay.

Erin Allmann Updyke: But they're still not used as much as you would think given all of the benefits that I just mentioned.

Erin Welsh: Yeah. So like how many hospitals have a maggot colony?

Erin Allmann Updyke: It's a great question. I have no idea.

Erin Welsh: Okay.

Erin Allmann Updyke: I think most hospitals probably have access to them in some capacity. I know when I have rotated through wound care they do use them sometimes. But in general they use them very often as kind of like a last resort rather than like a first line therapy which I find really interesting.

Erin Welsh: Is that just the ick factor?

Erin Allmann Updyke: I think that's a big part of it. There's definitely a lot of research on what is preventing people from using maggot therapy. And a lot of it comes back to either education, not knowing how great they can be, not knowing that they're effective. And yeah, the yuck factor.

Erin Welsh: Yeah.

Erin Allmann Updyke: Interestingly more for practitioners than patients which I think is very interesting.

Erin Welsh: That is really interesting.

Erin Allmann Updyke: Yeah.

Erin Welsh: Huh. Okay. Let's say that you go in, you have a wound and your physician's like we think that maggot therapy is the right call here. And you say yes, I consent to this. Because I assume there's like consent involved in the maggot therapy.

Erin Allmann Updyke: Yeah.

Erin Welsh: So then what happens next? What can you expect to happen?

Erin Allmann Updyke: So this is such a good question. So generally what they'll do is they'll take 5-10 maggots per square centimeter of area that you need wound debridement on.

Erin Welsh: Ooh, that's so many maggots. Okay.

Erin Allmann Updyke: Is it? They're quite small, like little.

Erin Welsh: I know, I just... Just jam packing them in there.

Erin Allmann Updyke: Just yeah, you want them to be efficient. And then you basically put them on the wound. There's two different ways to do this. Sometimes you just put them all in a little baggie that they can't escape from and put that baggie on the wound and then kind of tape it on. And that way for sure they can't wander off. And when you're done, you literally just pick up the bag and toss them. The other option... And that's great, especially if you're like I don't want to touch the maggots, you're not really ever coming in direct contact with individual maggots. But they're much less efficient that way because they're not going to be able to wander all the way to the edges, you have to make sure... It's just a little less efficient.

Erin Welsh: So the other way is taking individual maggots and usually putting them in like a gauze or something but just not a closed system; putting them onto the wound and then enclosing the edges of that wound. So making sure that they can't just escape from and go wherever, wander off. And then you leave them on for a couple of days in both cases, usually 48-72 hours, maybe a little more depending on the area and things like that. And then you take them off and you see what it looks like and if you need another round or a few other rounds, you may or you may not. And that's it.

Erin Welsh: What happens to the maggots after they're full?

Erin Allmann Updyke: Their lives have been sacrificed. Yeah, they're done.

Erin Welsh: Okay. Okay.

Erin Allmann Updyke: Thank you for giving your lives in service of wound healing.

Erin Welsh: Of wound healing.

Erin Allmann Updyke: Yeah. And I should also mention that the maggots used for medicinal therapy are like grown in a lab, they're sterilized, this is a very rigorous, it is an FDA regulated process in the US and in most other countries it's regulated by some capacity.

Erin Welsh: How does maggot therapy use vary globally?

Erin Allmann Updyke: Oh great question. I don't know.

Erin Welsh: Okay.

Erin Allmann Updyke: And I don't think that we have a good sense of it in all honesty from what I read, it's not like I just failed to look for it. It's just that we don't really have a great sense of like... It is a great option, it's not accessible everywhere necessarily. It's probably used in some places in different ways. So yeah, we don't have a good sense of numbers globally.

Erin Welsh: Okay. So one of the things that I came across in the history of maggots and their use for medicinal purposes was that they began to realize pretty quickly in the 20th century, after centuries and millennia of using maggots, they were like oh we need to have an entomologist on hand who can distinguish between the different types of flies because not all flies create the type of maggots that will just eat necrotic tissue.

Erin Allmann Updyke: Yes. Correct. Yes. So that is very true. So the types of maggots used for wound care are a couple of very specific species. Maggots in wound care is not the same thing as maggots infesting open wounds or parasitizing healthy flesh. So the technical name for that process is myiasis which is being parasitized by fly larva, either by healthy flesh or open wounds. And that can be a very serious health problem both for animals and for humans. And that could be from a few different reasons. It could be the right kind of like blow flies but too many of them because once they start replicating, right, like they grow into adults and then they lay more eggs and then that infection can get out of control pretty quickly. Or it could be that it's the wrong type. There's literally hundreds of thousands of species of flies and many of which love to eat flesh, that's what they do. And so in those cases it is very dangerous to have a maggot that's infesting a wound. This is in a medical setting, very different.

Erin Welsh: Okay.

Erin Allmann Updyke: We also use blow flies for forensics.

Erin Welsh: Yeah.

Erin Allmann Updyke: Just throwing it out there. So Erin.

Erin Welsh: Yeah.

Erin Allmann Updyke: I know that historically this is not all the maggots were used for. So please can you tell me about how we got to this point?

Erin Welsh: Can't wait. Let's just take a quick break and then I'll get into it.

TPWKY: (transition theme)

Erin Welsh: Ancient remedies are one of the staples of our podcast.

Erin Allmann Updyke

I love it so much.

Erin Welsh

And we bring these up all the time, right? Like I think rabies featured a lot of these and when we talk about these, when we bring up these examples, I think it's pretty easy to think oh my gosh, how absurd, can you believe people ever thought that the ashes of a shrew's tail applied to the bite of a rabid dog would do anything?

Erin Allmann Updyke

We are so guilty of that too. Like 100%.

Erin Welsh

Totally. Totally. Because from our perspective in the 21st century, we know that rabies is caused by a virus and that there's no effective treatment. And we feel smugly superior to those foolish ideas of the past. But, and this is something that I think that we've gained more of an appreciation for over the course of making this podcast, that attitude, that superior attitude ignores two crucial things. The first one being that yes, many ancient remedies show little to no efficacy in what they were intended to treat. But many others do and have just been rebranded as modern medical advancements like digitalis or aspirin even, without their long history and early use acknowledged.

And the second thing that is ignored is that we're in the same boat with medicine today. We may have better methods of testing efficacy and safety but it's really arrogant to think that we're at the pinnacle of medical knowledge and that our ideas and cures today won't face similar ridicule in the future. And so this is my call, maybe especially for myself but broadly too, to like eat some humble pie and consider what these cures have to offer us today, whether that's an insight into the past or novel and effective treatments for today. Let's start with maggots.

Erin Allmann Updyke

I love it.

Erin Welsh

There is this unavoidable yuck factor that we've talked about when it comes to maggots. And it's for a good reason. The places that we're likely to encounter maggots are things like decomposing carcasses, rotting food, things that can make us sick if we get too close. And maggots, along with the stench of rot, provide a pretty good signal to stay away.

Erin Allmann Updyke

Peace out.

Erin Welsh

Yep. But these delightfully disgusting habitat preferences of flies and their larvae have been harnessed by humans for millennia. As you talked about, Erin, the larvae of some fly species are amazing at discerning healthy from dead tissue and just taking care of business, TCOB, by eating that dead tissue. And it turns out that larval therapy or biosurgery as I saw it rebranded, biotherapy-

Erin Allmann Updyke

Okay.

Erin Welsh

It has been used for a really long time around the world. There's evidence that the Ngemba people of New South Wales used larval therapy as did certain ethnic groups in the hilly regions of Myanmar and Mayan healers in Central America. And I don't really think it's a huge stretch to imagine how people first came up with using larvae from flies to treat wounds. Like you have a wound, it begins to fester, the right flies lay eggs in that wound, larvae hatch, they begin feeding on the diseased tissue, your wound heals, the larvae leave. And hey, you know what? That worked better than expected.

Erin Allmann Updyke

Right.

Erin Welsh: I did not expect this but hey, love it.

Erin Allmann Updyke: But it worked out.

Erin Welsh: It worked out.

Erin Allmann Updyke: Try it again.

Erin Welsh: We know that maggots have infested wounds since ancient times because it's what they do. But if you want written proof, I've got some in the form of some Old Testament goodness. So this is from the Book of Job. "My body is clothed with worms and scabs, my skin is broken and festering." End quote. That's myiasis, right. It's not-

Erin Allmann Updyke: Yeah, myiasis, sounds like it.

Erin Welsh: Yeah.

Erin Allmann Updyke: Sounds like not the good worms.

Erin Welsh: Not the good worms. Yeah. My body is clothed with worms. It sounds really painful and miserable.

Erin Allmann Updyke: Yeah.

Erin Welsh: But in terms of ancient medical texts mentioning larval therapy, I didn't really come across any specifically.

Erin Allmann Updyke: Interesting.

Erin Welsh: And the first written mentions of using maggots to treat wounds comes from the 1500s. And again, we know that it goes much further back across the globe. And so this is sort of like what I would say the first documented rediscovery of the practice or like reclaiming as like oh wow, I came up with this great idea. Ambroise Paré, the famous French surgeon who I've definitely mentioned on the podcast before. I have. I have, Erin, I just don't know-

Erin Allmann Updyke: I believe you.

Erin Welsh: So he used maggots in treating wounds in the mid 1500s especially on the battlefield. It seems like he came across it accidentally kind of like in the firsthand account. One of his patients had a really deep head wound where months later, months later, Erin, a quote "large number of maggots emerged from the wound". And Paré thought it could be the end for that patient because he had seen other times where maggots had just destroyed tissue. But apparently these were more discriminating maggots eating only dead tissue and the person recovered. He lost a chunk of bone the size of a hand but he recovered.

Erin Allmann Updyke: Whoa.

Erin Welsh

Yeah. I don't know how but he did. And so after this Paré would occasionally use maggot therapy. Then fast forward a little over 200 years and another French surgeon on another battlefield, this time Napoleon's army in Syria, would also recognize the benefits of maggots. Baron Dominique Jean Larrey wrote about maggots of the quote unquote "blue fly" removing dead tissue and helping to clean wounds. Quote: "They are produced in a few hours and increase with such rapidity that in the course of a night they grow to the size of the barrel of a small quill. Although these insects were troublesome, they expedited the healing of the wounds by shortening the work of nature and causing the sloughs to fall off." End quote.

Erin Allmann Updyke

I love that. Wow.

Erin Welsh

And then about 60 years after that in the 1860s, yet another war, this time, the American Civil War, would provide yet another opportunity for someone to test out maggot therapy. Maryland surgeon John Forney Zacharias wrote quote: "During my service in the hospital at Danville, Virginia, I first used maggots to remove the decayed tissue in hospital gangrene and with eminent satisfaction. In a single day they would clean a wound much better than any agents we had at our command. I used them afterwards at various places. I am sure I saved many lives by their use, escaped septicemia, and had rapid recoveries." End quote.

Erin Allmann Updyke

Wow.

Erin Welsh

I mean ringing endorsement.

Erin Allmann Updyke

100%.

Erin Welsh

And there was another civil war doctor who also saw the benefits of maggots but by and large any pro maggot physician was absolutely in the minority during this time. And that minority would shrink to basically nonexistent once germ theory came about because this concept made it very clear that wounds got infected from dirt or things that were dirty. And people definitely saw maggots as dirty and had for years, forever. Maggots fell out of style from the mid 1800s until yet another war. Are you seeing a pattern here?

Erin Allmann Updyke

Always.

Erin Welsh

Always.

Erin Allmann Updyke

Always a war.

Erin Welsh

WWI. And that's where our firsthand account of course came from. That surgeon, William Baer, was so impressed with those little friends that he went on to use them in non war conditions. But I just have to also add one little thing about the firsthand account. So he pointed out that compound fractures of the femur at that time of that firsthand account, which one of those people had, led to death in about 75%-80% of cases even with all of the care that could be provided and that person lived.

Erin Allmann Updyke

Wow.

Erin Welsh: So again, like pretty convincing. I would be convinced. I am convinced. And this is a quote from him once he began to use these maggots in non war times. Quote: "In September 1928 there were four cases of children that came into the hospital, each one of whom had been operated upon three or four times and treatment had covered a period from 1-5 years. Being baffled in their cure by the means usually employed, I thought it was time to put into active use the Observation-" with a capital O, I might add- "that I had made on the battlefield. We therefore obtained the maggots from the blow fly from our immediate neighborhood. And without sterilization of the fly or maggot, we loaded the wound up with these maggots and proceeded to watch the results. At the end of about six weeks, the wounds had entirely healed not only in the deeper structures but even as to the skin." End quote.

Erin Allmann Updyke: Wow. Wow. Six weeks.

Erin Welsh: Yeah. Yeah.

Erin Allmann Updyke: That's incredible.

Erin Welsh: It's incredible. And also just to put this in context too, this is pre antibiotics still. So even in 1928 like penicillin was not going to be widely available for another... I think this is only when it was first beginning to be discovered.

Erin Allmann Updyke: Wow.

Erin Welsh: And then it was only in the 40s that it was available. So anyway, clearly Baer was on to something.

Erin Allmann Updyke: Something.

Erin Welsh: But his methods needed some refining. I don't know if the phrase-

Erin Allmann Updyke: Just go in the backyard and collect blow fly larva? No thanks.

Erin Welsh: Exactly. With sterilization? I don't know if that stuck out to you but yeah, that was a problem. So one issue though that he had was that the blow flies he used were seasonal and so he couldn't just go to his backyard or his neighborhood and get them like all during the year. These treatments he could only do in certain times of year. And secondly was the lack of sterilization. Unfortunately some of these maggots came with hitchhikers in the form of Clostridium perfringens and Clostridium tetani.

Erin Allmann Updyke: Oh no. Oh no.

Erin Welsh: Yeah. He added, quote, "this was a rather disconcerting observation."

Erin Allmann Updyke: Yeah.

Erin Welsh: Yeah.

Erin Allmann Updyke: That's a little bit of an understatement.

Erin Welsh

Certainly, certainly. Fortunately he was able to get tetanus antitoxin into his patients and most who were infected survived. But he saw, he was like okay, we need to find a way to raise these maggots in a sterile environment if we're going to keep doing this. And that would also eliminate the problem of the flies not being available year round because he could just have this breeding ground for maggots. And so he listed the help of some entomologists and they came to a solution. And that really helped maggot therapy to become quite popular in the US in the 1930s and 40s with more than 300 hospitals in the US introducing a maggot therapy program, which is kind of amazing. Like I just had no idea that it was so popular even then.

Erin Allmann Updyke

Yeah.

Erin Welsh

But then they fell back out of style. It's like this waxing and waning, like extreme peaks in popularity I mean.

Erin Allmann Updyke

I feel like it makes sense though in that there's always going to be that yuck factor, like you said. And it's also like as new, it's probably correlates with new therapies. Like oh well we have this new dressing or we have this new debrider or whatever it is. So then it's like we don't need maggots anymore, so they fall out of favor and things like that.

Erin Welsh

Yeah. So the new medical development or technology in the 1940s was of course antibiotics. And there is something like would you rather take antibiotics than have antiseptics and go through wound debridement? Try that first and then go to maggots or would you rather just like let's hit with maggots straight up right now.

Erin Allmann Updyke

Right. Yeah.

Erin Welsh

Yeah. Some of the descriptions are like you can hear them depending on where the wound is. Like you can hear them feeding, it's incredibly itchy and there's like, yeah, this net bandage that keeps them all in.

Erin Allmann Updyke

Yeah.

Erin Welsh

But they're all there.

Erin Allmann Updyke

That's all still the case.

Erin Welsh

Yeah.

Erin Allmann Updyke

So there are definitely downsides to it and it also can be quite painful as well.

Erin Welsh

Oh that makes sense. Okay.

Erin Allmann Updyke

Yeah.

Erin Welsh

Once they get like closer to the living tissue?

Erin Allmann Updyke

And I think too just like because they're using their mouth hooks to kind of help break things up, I think that process, it's usually not painful right away but after the first 24 hours or so it can be.

Erin Welsh

Okay.

Erin Allmann Updyke	So yeah.
Erin Welsh	Okay.
Erin Allmann Updyke	Downsides, pros, cons, no.
Erin Welsh	It's a mixed bag as most things in life are.
Erin Allmann Updyke	Yeah.
Erin Welsh	Trade offs, right. But yeah, so once the 1940s came about and antibiotics were available, larval therapy fell out of favor. It still was used here and there but largely was forgotten. I found a paper by a researcher named Milton Wainwright that was published in 1988 where he writes, quote: "Fortunately maggot therapy is now relegated to a historical backwater, of interest more for its bizarre nature than its effect on the course of medical science." End quote.
Erin Allmann Updyke	Wow.
Erin Welsh	But he spoke too soon.
Erin Allmann Updyke	Wow. Yeah. Didn't age well.
Erin Welsh	It did not age well. Because as this paper was going to press with the first line stating, quote: "The conquest of bacterial infection has been one of the major triumphs of modern medicine." End quote.
Erin Allmann Updyke	Oh dear.
Erin Welsh	Yeah. As this paper was published, antibiotic resistance was on the rise, had been on the rise for a long time. And some physicians and surgeons were resorting back to the old ways to treat those stubborn infected wounds that just didn't seem to be able to heal. In the 1990s, maggot therapy, rebranded in some cases as biotherapy, experienced yet another renaissance, this time backed by clinical trials and data that supported what amazing healing properties these little guys have. And I feel like there's just like this good lesson in maggot therapy. It reminds me kind of like fecal transplants or phage therapy. It's like sometimes the solution is already there but we need to challenge ourselves to think more outside the box. I don't know.
Erin Allmann Updyke	Yeah.
Erin Welsh	But that's what I've got for maggots.
Erin Allmann Updyke	I love it, Erin. I love it so much.
Erin Welsh	I do too.
Erin Allmann Updyke	So should we do sources?
Erin Welsh	We should.

Erin Allmann Updyke

Okay.

Erin Welsh

Let me pull up. I have a lot. I'm going to shout out two in particular. One is by Whitaker et al from 2007 titled 'Larval Therapy from Antiquity to the Present Day: Mechanisms of Action, Clinical Applications, and Future Potential'. And then there's a paper from 2000 by Sherman, Hall, and Thomas titled 'Medicinal Maggots: An Ancient Remedy for Some Contemporary Afflictions'.

Erin Allmann Updyke

Excellent. I had shockingly essentially one which has never happened to me but it really was so comprehensive. And that was the volume edited by Stadler from 2022 titled 'A Complete Guide to Maggot Therapy: Clinical Practice, Therapeutic Principles, Production, Distribution, and Ethics'. Literally such a fun read. Had a couple of other papers. We'll post the list of all of the sources from this episode and every single one of our episodes on our website thispodcastwillkillyou.com under the EPISODES tab.

Erin Welsh

We certainly will. A big thank you to Bloodmobile for providing the music for this episode and all of our episodes.

Erin Allmann Updyke

Thank you to Tom Breyfogle and Lianna Squillace for the incredible audio mixing.

Erin Welsh

Thank you to Exactly Right.

Erin Allmann Updyke

And thank you so much to you, listeners. We hope that you had as much fun as we did this week and get ready because next week is going to be awesome.

Erin Welsh

Oh my gosh, it is. And honestly like if you stuck with it the whole way, props.

Erin Allmann Updyke

Yeah.

Erin Welsh

And also I hope that you gained a new appreciation for maggots. Right?

Erin Allmann Updyke

Yeah.

Erin Welsh

They're kind of cool. They're awesome.

Erin Allmann Updyke

They're very cool.

Erin Welsh

And a big thank you of course to our lovely, generous, wonderful patrons. Your support means the world to us.

Erin Allmann Updyke

So much.

Erin Welsh

Thank you.

Erin Allmann Updyke

Thank you, thank you, thank you.

Erin Welsh

Well until next time, wash your hands.

Erin Allmann Updyke

You filthy animals.