

Ally Phillips

Hi, my name is Ally Phillips and this is my story. I'm one of those genetically unlucky people where my skin is very light and I've always had a lot of moles. I inherited this from my mom who also has a history of skin cancer. So I have been having moles removed since I was a small child. I never thought anything about having moles removed, I just thought it was mainly for cosmetic reasons. I started laying in the tanning bed when I was a sophomore in high school because I wanted to be tanned for prom. That was the popular thing to do back in the early 2000s when everyone wanted that bronze look. I remember reading all the waivers that you sign when you go to the tanning salon and I remember thinking cancer from a tanning bed? That won't happen to me, never heard of it. So every spring then I would lay in the tanning bed a couple nights a week to prepare for prom. I really loved myself when I had a tan. I thought it made me beautiful.

Then college came around and there was no more prom to prepare for but I still wanted to be tan like all the other girls on campus. So I kept going to the tanning bed. Until one day in the spring of 2006 in my freshman year of college, I got a rash all over my body and I took a break from tanning because I figured that's what caused my rash. While I had this rash, I had accidentally scratched off a mole on my left thigh and it bled. I had always heard somewhere that if you scratched a mole and it bled or grew back that it was a bad sign and it should be removed.

So when that mole grew back over the summer, I had my mom schedule me an appointment to have it removed. That year by Christmas, Christmas break to be exact, that mole came back as a malignant melanoma. My mom gave me the news, I think she told me something like oh hey, just wanna take another biopsy because that mole came back as a melanoma, kind of no big deal. She was trying to downplay it a little because I was a little freaked out and I don't think she wanted me to freak out. I was only 19 years old so I didn't really know what a melanoma was and I think my mom just really didn't want me to be scared.

None of it really hit me until I was at the dermatologist's office being numbed up with a bunch of needles and having a giant parallelogram-shaped chunk removed from my left leg. Then having them having to cauterize the wound and all that extra stuff. At some point during the procedure, I heard the doctor mention stage two malignant melanoma and I thought wait, what? I know what malignant means and that sounds serious. It was incredibly painful once the numbing wore off. The swelling and the bandages I had to wear made it hard to wear normal jeans. I could barely walk anywhere because each step made me feel like my skin was going to break open. Mentally, it was a major adjustment because now I had a massive scar and I had to face the fact that it happened to me. As a vain 19 year old girl, that was a very big deal.

So as the years went on, I continued my yearly skin checks with my dermatologist and I became more responsible with my skin health and became less vain about my scar. I also found a whole new love for sunless tans. I was doing very well. I had one or so I thought. So 14 years later, I was busy planning a wedding for September when COVID-19 hit and everything was shut down, including my dermatologist's office. I had become really good at keeping an eye on my skin and determining what might need removed. So when I noticed a certain newer mole on my left thigh, I had to get it taken care of. It was large and had a smaller, darker mole formed on its border. I was going to ask my doctor to remove it at my annual upcoming appointment. But that appointment was canceled due to COVID and the shutdown and my doctor not being able to have any in-office appointments. So I had to wait til July to have it removed when the office reopened. And sure enough, it came back as another malignant melanoma.

I cried a lot. I was scared. Skin cancer is cancer. It was scary. What if it metastasizes? Every thought ran through my head at once. It had been 14 years since this happened the first time, I thought I was done. The dermatologist's office was so far behind due to the prolonged closure that the soonest they could get me in for the surgery was a month later, on the 26th of August. I was completely devastated. I had been doing all the right things. Where did I go wrong? I didn't have time to pity myself. I had a full time job as an occupational therapist and a manager of a rehab clinic and a wedding to plan. So I had the surgery and pushed through it and with the help of my wonderful husband and my family, I overcame it. In hindsight, I wish I would have known all the options of removal procedures. I learned after the fact that there's another type of removal procedure that could have been less invasive and could have led me to having a smaller scar.

I also wish I would have known the effect that just one sunburn has on your skin, how powerful and harmful tanning beds are, because I would have been more cautious even in my younger years. I now have two large scars on my left thigh but I embrace them because they're part of my story. And the process has made me a stronger, wiser, and more compassionate person.

TPWKY

(This Podcast Will Kill You intro theme)

Erin Welsh

Thank you so, so much Ally for sharing your story with us. We really appreciate it.

Erin Allmann Updyke

Yeah, thank you.

Erin Welsh

Yeah. I can't imagine how stressful and scary that must have been.

Erin Allmann Updyke

Yeah, especially so young.

Erin Welsh

Yeah. 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

And today we're talking about skin cancer.

Erin Welsh

Yes. This is textbook quantity level of information.

Erin Allmann Updyke

As usual, we've picked a topic that could easily be its whole own podcast series. It's one of our favorite things to do.

Erin Welsh

Yep.

Erin Allmann Updyke

But we're just going to cover all of it, it's cool.

Erin Welsh

Yeah, yeah. I mean you'll definitely learn something from this episode.

Erin Allmann Updyke

At least I hope one thing.

Erin Welsh

I mean I think probably many things.

Erin Allmann Updyke Okay.

Erin Welsh Fingers crossed.

Erin Allmann Updyke But before we learn anything, it's quarantini time.

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

Erin Allmann Updyke We're drinking (singing) Here Comes The Sunburn. That wasn't a very good.

Erin Welsh That was pretty good.

Erin Allmann Updyke Was it?

Erin Welsh I knew what you were doing. Maybe I like anticipated it. Yeah. Yes. Here Comes The Sunburn is a delicious little drink that has sparkling pink lemonade and some vodka and some cherries. It's simple but delicious.

Erin Allmann Updyke Very delicious. We will post the full recipe for that quarantini as well as our nonalcoholic placeborita on our website [thispodcastwillkillyou.com](http://thispodcastwillkillyou.com) and on all of our social media channels.

Erin Welsh We certainly will. And on our website [thispodcastwillkillyou.com](http://thispodcastwillkillyou.com), you can find all sorts of things ranging from links for merch and music by Bloodmobile, [bookshop.org](http://bookshop.org) affiliate account, Goodreads list. You can also find transcripts and the sources for each and every one of our many, many, many episodes. And there's Patreon, there's a firsthand account form. There's more.

Erin Allmann Updyke Wow.

Erin Welsh Check it out.

Erin Allmann Updyke That's just, what an amazing website, Erin. Gosh.

Erin Welsh I know, right? Wow. Well we've got a lot to cover, so maybe we should get started right after this break.

Erin Allmann Updyke Let's do it.

TPWKY (transition theme)

Erin Allmann Updyke So before we talk about skin cancer, let's talk about skin. Shall we?

Erin Welsh Yeah, yeah.

Erin Allmann Updyke

I'm not going to go into too much detail. There's a lot of detail that we could get into about skin. I actually remember finding it very stressful to have to learn all of the different layers of skin like in med school. I don't know why but it was a very stressful time. But we're just going to talk about the parts that are most relevant to learning about skin cancer. There are three major cell types that are involved in our epidermis or our skin. Like I said, if you get into the nitty gritty, there's a lot more layers because the cells themselves change as they migrate upwards from our basal layer and eventually slough off, which is what our skin does. But we don't have to focus on all of those individual layers. We can focus on two major classes of cells, the keratinocytes and the melanocytes.

So keratinocytes are our skin cells. They include the basal cell layer, the bottom cell layer that are kind of like stem cells of our skin, and then the squamous cells above that. And then there are the melanocytes. And melanocytes are the cells that produce melanin, which is what gives skin its color. There's a lot of other cells in our skin, they're all important. There's dendritic cells which are like white blood cells that help protect against pathogens and invaders. There's Langerhans cells, there's Merkel cells and other types of nerve cells. But we're going to focus on the keratinocytes and the melanocytes.

And it's probably not too surprising to know that you can get cancer in any and all of these types of cells. Skin cancers, like actually all cancers, are named after the type of cell that they originate from. So there's three main types of skin cancer that we're going to focus on today and they each have subtypes within them. And since you just learned the major skin cell types, it's not a surprise what types of skin cancer we have. There's melanoma which is cancer of our melanocytes, and then there's non melanoma skin cancer or keratinocyte carcinomas, and that includes basal cell and squamous cell carcinomas. The end.

Erin Welsh

Done.

Erin Allmann Updyke

That's it. The biology section is over.

Erin Welsh

I have some unanswered questions, Erin.

Erin Allmann Updyke

Okay. I guess I'll try and go into a little bit more detail then. And again because there are also other skin cells, there are other types of non melanoma skin cancer, that's a whole group of skin cancers that include the basal and squamous cells but also things like cutaneous lymphomas, adnexal tumors, Merkel cell carcinomas which is all over the news right now because Jimmy Buffett just died from Merkel cell carcinoma.

Erin Welsh

I was wondering. Okay.

Erin Allmann Updyke

Yep. And other rare primary cutaneous or skin neoplasms or cancers. But for this episode, we're going to focus on the big three. Basal cell which is, spoiler alert, by far and away the most common form of skin cancer, squamous cell which is the next most common, and of course melanoma which is the most dangerous. Basal cell carcinoma is cancer that arises from the basal or bottom cell layer of the epidermis. And like I mentioned, this is actually kind of a pluripotent or like a stem cell layer at the base of our epidermis, right before you get into dermis.

And basal cell carcinomas, there's a number of different subtypes of them, but they often start out as a small kind of pearly or almost translucent little papule or little bump. It might be a bit red or irritated looking around the edges. There might be these little blood vessels called telangiectasias, some of them almost look like a taut blister kind of on the skin, or it might just be a little spot that if you nick it or scratch it, it just kind of bleeds and it never seems to heal quite right. Or sometimes they can grow quite large and have this like ulcerated center with these like raised edges kind of around it.

Erin Welsh

What about size?

Erin Allmann Updyke

Yeah, they can range massively. And the thing about basal cell carcinoma is that it is incredibly rare for this cancer to metastasize. It's not impossible because any cancer can metastasize and a metastasis means that a cancer has spread to a different part of the body from where it originated. It's very rare for basal cell carcinoma to do that. But it can be very locally invasive, which isn't that surprising if you think about it as a cancer of the very bottom layer of the epidermis. If it's just growing upwards and outwards from that epidermis, then it may not cause that much tissue destruction. But if it starts growing down towards the dermis, then it can cause quite a lot of tissue damage, especially because 80% of basal cell carcinomas are found on the head or neck. There's a lot of places on our head and neck that don't have that much tissue to begin with and so basal cell carcinomas are the kind that can, for example, cause a lot of damage to the nose or the ears or if they're near the eye, these can be incredibly damaging.

Erin Welsh

My grandpa had on his nose, I remember he had a scoop taken out.

Erin Allmann Updyke

Yep. My dad has had so many. Sorry dad for calling you out, but so many basal cell carcinomas removed. And we'll talk more about how much the technology has improved to be able to do these removals with minimal cosmetic damage, which is incredible.

Erin Welsh

So it's interesting to me weirdly, it may be just because I don't know how the skin works, but you said that the basal cells form this layer that's almost stem cell-like in nature. And yet it's still so mostly localized. I don't know why that just makes me think like oh and then it's going to turn into a cancer cell of another kind and then migrate and then cause lots of problems. I mean it's good that that doesn't happen but I don't know.

Erin Allmann Updyke

Yeah. It's interesting. One of the questions, this is spoilers for later, but one of the questions that I really was trying to wrap my head around and I still don't know the answer is why cancers metastasize. Like I understand how it happens and we'll talk about that but why some cancers are more prone to metastasis than others. And I don't have an answer to that. I imagine that it's all dependent on the type of mutations that are found in that cancer. But I don't know what those are and I wish that I did. So spoilers, I don't.

Erin Welsh

Well maybe someday we'll do like, I don't know, just a broad strokes cancer episode.

Erin Allmann Updyke

I think it would be really fun to do that honestly, I really do. It would be a mess of an episode but it would be so fun.

Erin Welsh

It's interesting. And then you know that at the very top of the episode, we would be like why didn't we turn this into a miniseries?

Erin Allmann Updyke

Maybe we will.

Erin Welsh

Maybe we will.

Erin Allmann Updyke

Anyways.

Erin Welsh

Anyways. Going back to basal-

Erin Allmann Updyke

Getting back to skin cancer.

Erin Welsh

Yeah.

Erin Allmann Updyke

So the second type of skin cancer and the second most common type of skin cancer is a squamous cell carcinoma. And a squamous cell carcinoma is again from this uncontrolled proliferation of the squamous cells of our skin, that is all of the cells above the basal layer essentially. It's our skin cells, our keratinocytes. Squamous cell carcinoma often has actually precursor lesions which are called actinic keratoses or actinic keratosis is one of them. And these are little often white, kind of flaky, dry, scaly patches that can happen on the skin. And squamous cell carcinoma, similar to basal cell, can present in a lot of different ways and often might just look again like scabs or a place that's just not healing right but often isn't quite as pearly or translucent-looking as a basal cell carcinoma. And the way that I think about that is that the basal cell is like a deeper cell layer kind of like poofing itself up, whereas squamous cell is more of these scaly type of keratinocytes that make our skin our skin. And so it looks more like dry skin on top most often. Does that kind of makes sense?

Erin Welsh

Yeah. How is the turnover rate different for basal cells vs squamous cells?

Erin Allmann Updyke

So your squamous cells, and I don't remember the exact time frame of how long it takes for a cell to go from the bottom layer and move all the way up to the top before we slough it off, it's a period of several weeks I think-

Erin Welsh

Yeah.

Erin Allmann Updyke

But your basal cells can transform into your squamous cells, like they're made from that basal cell layer.

Erin Welsh

Okay, okay.

Erin Allmann Updyke

Yeah.

Erin Welsh

Why is basal cell carcinoma the most common or more common than squamous cell?

Erin Allmann Updyke

I don't know, Erin. If there is a thing that I do not have an answer to, it's why this skin cancer and not that skin cancer.

Erin Welsh

Yeah. It's just like how does it happen?

Erin Allmann Updyke

I wonder if it has something to do with the fact that because basal cells are continually replicating, do they already have certain mutations that make them more likely to escape that cell cycle checkpoints perhaps?

Erin Welsh

That's what I was kind of trying to get at with the turnover question.

Erin Allmann Updyke

Yeah.

Erin Welsh

If squamous cells come from basal cells, then at what point do those mutations get introduced for it to turn into squamous cell carcinoma? I don't know.

Erin Allmann Updyke

Oh Erin, I don't know.

Erin Welsh

Okay. Food for thought.

Erin Allmann Updyke

Foods and thoughts. So squamous cell carcinoma, like basal cell carcinoma, is far less likely to metastasize than the next skin cancer that we'll talk about, melanoma. Melanoma is really kind of a different beast entirely. It is quote "the bad one" when it comes to skin cancers. Melanoma is a cancer that arises from melanocytes. And melanocytes are these cells that are found in that same basal cell layer, that bottom layer of the epidermis. But melanocytes are the cells that make melanin and melanin is a pigment that actually protects us against the major risk factor of all of these types of skin cancers and that is UV radiation. All of these types of skin cancers, the primary risk factor is sun exposure. And we'll talk in a minute about how that happens. But what's interesting about melanomas is that these are cancers arising in these cells that are making this pigment that's protecting us against this radiation.

And just like with basal and squamous cells, there are a lot of different types of melanomas. There's superficial or spreading melanomas which tend to grow outward like radially before they invade deep into the dermis. There's nodular melanomas which tend to grow deep prior to or at least more quickly than they grow outward. There's acral lentiginous melanoma which presents not on sun exposed skin but on the palms or the soles of the feet or on the nail beds. There's also mucosal melanoma. There's a lot of different types. And many but not all melanoma can arise from within a nevus, aka a mole. And moles, this is probably too much to get into but there's also a lot of different kinds of moles.

Erin Welsh

I am very curious. Please, please tell me more.

Erin Allmann Updyke

So there's junctional moles, there's congenital moles, acquired moles, compound moles, atypical moles. There's a lot of different types of nevi, the official term for moles.

Erin Welsh

Wait but tell me what some of those things are? What is a junctional mole?

Erin Allmann Updyke

So they all refer to different ways in which histologically the melanocytes and the melanin pigment themselves appear. So all moles exist because of melanin, like there is melanin necessarily in a mole because that's what gives it its pigment or its color. But not every mole necessarily is a risk factor for melanoma. One main way that people might have heard of that's often used to help distinguish or differentiate benign nevi from those that are dysplastic or more likely to either be a melanoma or be in the process of undergoing a transformation into a melanoma, is what's called the ugly duckling sign.

Erin Welsh

I've heard of that, yeah.

Erin Allmann Updyke

Yeah. Because while not all and in fact not most nevi are risk factors for melanoma, having many of these melanocytic nevi or having a bunch of moles is a risk factor for melanoma. So when trying to look at a person who has a whole bunch of moles and figure out which ones might be risky and which ones are no big deal, it's the ones that look off, the ones that look a little different from the rest are potentially of the most concern. And there's a few ways or a few characteristics that you memorize in medical school to look out for. And they're easy to remember because it's ABCDEF.

Erin Welsh

Yeah.

Erin Allmann Updyke

So it's A for asymmetry, so moles that have asymmetry to them are slightly more concerning than ones that are symmetric. Irregularity in borders. Color, and this doesn't necessarily just mean what color is it but differences in color, especially like spots that are dark or light or apigmented all of a sudden, especially a mole that used to be pigmented and now isn't. And then D used to be diameter but it turns out that you can definitely have melanoma even at very small diameters, so now D stands for dermatoscopic features.

Erin Welsh

Okay.

Erin Allmann Updyke

And a dermascope is this really cool tool that uses polarized light and a magnifying glass to be able to look underneath the top layer of skin to be able to see features of moles and freckles and things that you can't see with the naked eye.

Erin Welsh

That's cool.

Erin Allmann Updyke

E stands for evolutionary changes or a mole or a spot that changes over time. And F is funny looking. And I think that that kind of goes along with something that's changed, right? Something that didn't used to look like that and now it looks different.

Erin Welsh

Yeah.

Erin Allmann Updyke

Those are the types of features that people look for when trying to decide does a mole or does a spot need to be biopsied or removed or is it not of concern? So those are the three main types of skin cancers. And like I already mentioned, the single biggest risk factor for all of these is sun exposure, UV light exposure specifically. There are of course huge differences in risk between individuals because of genetic or phenotypic factors, the phenotypic factors driven by genetics. And these tend to be markers of UV sensitivity. So these genetic or phenotypic factors are things like light skin, light eyes, light hair color, or like the quote "inability to tan". And we'll talk a little more about that. And also the accumulation over time of benign sun-related skin changes. And those are things like I mentioned like actinic keratoses or solar lentigines which are just sort of large freckles that can appear over time because of the sun on your skin.

Erin Welsh

I have lots and lots of those.

Erin Allmann Updyke

Oh I am like essentially one giant freckle.

Erin Welsh

Same.

Erin Allmann Updyke

Spotted with moles. And what's really interesting is that especially for basal cell and in some ways for melanoma as well, there's data to suggest that it's not just sun exposure but it's intense sun exposure and especially intermittent periods of intense sun exposure that might put people at higher risk rather than just low level sun exposure chronically, if that makes sense.

Erin Welsh

So what would that look like, intermittent levels of high sun exposure?

Erin Allmann Updyke

In the literature it's often described as holidays, right?

Erin Welsh

Okay.



Erin Allmann Updyke

So people who are not exposed every day to sun but who maybe go on holiday somewhere where the solar radiation is much more powerful than a place where they live and they're out in the sun all the time for a week or two and they get a big sunburn. And then they go back to not being exposed to the sun very often, etc.

Erin Welsh

Yeah, yeah.

Erin Allmann Updyke

Especially during childhood and adolescence.

Erin Welsh

Okay. So I was wondering, I have like so many questions that I don't even know where to begin or even how to articulate any of them. But what about age? Like how does age come into it in terms of when you get your bad sunburns? Does it matter? I mean you said adolescence.

Erin Allmann Updyke

Yeah. You can think of it as an additive effect. Let's go into how this happens and then I think it'll make more sense why age plays a big role in it. Shall we?

Erin Welsh

Okay.

Erin Allmann Updyke

So in essentially all cancers, and we've talked about this in several episodes now, like our hepatitis episodes and our HPV episode, cancers are the result of a disruption in our normal cell cycle. Our cells replicate, right, and our skin cells happen to replicate quite a lot. But they do so in a very controlled way. They move through certain checkpoints and these checkpoints are there to prevent damaged cells from multiplying. Cancers are the result of a disruption in this cycle when damage or mutations in our DNA allow for cells to grow unchecked in some way, to either live forever or to continue multiplying in an abnormal and an uncontrolled way, therefore spreading and causing damage. That is what all cancers are and that is what they do.

When it comes to skin cancer, UVA and UVB radiation which comes from the sun does a few different things to cause these types of disruptions. First, UVB radiation especially directly damages our DNA and our RNA. You can see our radiation episode for slightly more detail on that. But essentially this radiation breaks the bonds in our DNA and it leads to the formation of these dimers that aren't supposed to be there and like substitutions, for example, of C for T or T for C. And these mutations can lead to a variety of different mutagenic products depending on where they happen. UVA radiation also causes damage but it does so a little bit more indirectly by increasing oxidative stressors and reactive oxygen species formation and just causing inflammation, like low level inflammation in our skin kind of all the time.

Now in general, for the most part, our body is able to recognize, identify, and repair this DNA damage. And in the case of UV damage, it does so by literally excising these dimers, like being like you don't belong here, and replacing them with the correct sequence. But over time, these mutations can accumulate as these repair mechanisms fail to excise and replace every possible mutation or dimer that pops up. And if these mutations happen to occur in certain genes, including for example p53, which is a tumor suppressor gene, or a whole bunch of other genes, especially when it comes to skin cancer, then what you have is a disruption in this typical cell cycle. So now all of a sudden you don't have a checkpoint in place that should say hey, this cell isn't right, stop growing.

Instead you have unchecked, uncontrolled growth. And this is the process again by which all cancers happen. It just so happens that UV radiation is the primary or at least the biggest source of initial DNA damage that leads to the mutations that lead to skin cancer. So the reason why skin cancer happens primarily in older adults, so skin cancer is something that doesn't happen in children as often, is because these mutations occur over time. They have to be incorporated into the DNA and a lot of times it takes more than one mutation for a cancer to actually arise as a result.

Erin Welsh

How deeply can UV radiation penetrate from the sun?

Erin Allmann Updyke

Oh, such a fun question. So that question depends on your skin. Remember I said that melanocytes synthesize melanin. So melanin's role is to help protect against UV light. So what happens when our skin is exposed to light is that our melanocytes synthesize melanin, melanin is then transferred to the keratinocytes, to the upper layers of our skin. And what melanin does is it absorbs and dissipates that UV radiation. So variation in the amount of and the size of the melanocytes and the amount of melanin that they produce as well as variation in the pigmentation and the tanning response that happens as a result of sun exposure plays a big role in the variations in both melanoma and all skin cancer susceptibility. So what's really interesting is that while of course every human is exposed to UV radiation, right, like all the time, every day, maybe not every day but at some point in our lives-

Erin Welsh

Some point in our lives.

Erin Allmann Updyke

Obviously not every human is going to develop skin cancer, even maybe people who are exposed to quite a lot of UV radiation. So not only is it going to depend on things like melanocytes and how much melanin, there are at least some specific genes that we know are related to increased risk of skin cancer, especially melanoma, and a lot of these have to do with melanin. There's a gene called MC1R or melanocortin 1 receptor, and certain alleles of this particular gene that are associated with things like very fair skin, red hair, freckles, these allelic variants essentially make it so that the melanin that is produced is a slightly different type of melanin that is not as protective or might mean that less melanin is produced overall. There are other mutations that can happen that can put people at even higher genetic risk. There's a disorder called xeroderma pigmentosum which is a very rare disorder. But this causes an inactivating mutation in genes that are involved in that excision and repair process.

Erin Welsh

Okay.

Erin Allmann Updyke

So they can't cut out and repair that damaged DNA. So there's a lot of different potential sort of gene mutations that someone might have at baseline that makes their individual cells more susceptible to another mutation induced by UV radiation.

Erin Welsh

Tell me about the melanomas that happen on skin that is not typically exposed to the sun.

Erin Allmann Updyke

Yeah. What about those?

Erin Welsh

Yeah.

Erin Allmann Updyke

It's fascinating. So a lot of these are acral melanomas, those are the types of melanomas that can occur on your palms or your soles or even in the nail beds. There is some suggestion based on genetic studies of these melanomas that even though they're occurring on less sun exposed areas, they often still have UV signatures, meaning they have certain mutations that are very strongly associated with UV exposure. Which is fascinating. Yeah.

Erin Welsh	How?
Erin Allmann Updyke	That's honestly the most that I have for that because you're right, all of these types of skin cancer can happen potentially on areas that are not exposed to the sun or at least not exposed to the sun very often.
Erin Welsh	Yeah.
Erin Allmann Updyke	That's all I got. It's fascinating.
Erin Welsh	Yeah. Do basal cell carcinomas or squamous cell carcinomas happen in places that don't receive sun?
Erin Allmann Updyke	Yeah, they can, they can. Yeah.
Erin Welsh	Wow.
Erin Allmann Updyke	I know.
Erin Welsh	Interesting.
Erin Allmann Updyke	There's also suggestion, and maybe this plays more of a role in these cancers in areas that are less sun exposed, that another virus very familiar to TPWKY listeners that is HPV can also be associated with some skin cancers, especially some non melanoma skin cancers like squamous cell carcinoma. But we don't know very much at all about the specific subtypes or anything like that.
Erin Welsh	Within these skin cancer types, if you get diagnosed once, you are more likely to develop another skin cancer. Now does that apply across these types or is it just like if you get basal cell, then you're more likely to get another basal cell? Or is it any of them?
Erin Allmann Updyke	Yeah, it's a good question. In theory, you definitely could get any of them. And I don't have great numbers on for example if you have a melanoma, what's the likelihood that you may also have or get a squamous cell or a basal cell or any combination thereof? Part of that is because as we'll talk about later, we don't have tumor registries for basal cell and squamous cell carcinomas. So those are not reportable data. But because they all share common risk factors, certainly not uncommon to have multiple types of skin cancer.
Erin Welsh	What makes melanoma so bad, so much deadlier?
Erin Allmann Updyke	So melanoma is so dangerous because melanoma is the type of skin cancer that metastasizes. And the rate at which it metastasizes depends greatly on the depth. So the single most important factor when looking at the risk of a melanoma is how deep was it when you first saw it or found it and tried to cut it out? If a melanoma grows to greater than four millimeters, which is pretty thick, then it has pretty high rates of metastasis. And when it comes to metastasis, it is not often a good prognosis because we don't have great treatment for metastatic melanoma. So that's really the reason that melanoma is the most kind of dangerous one and the one that by far is the most deadly when it comes to skin cancers. Now why is it that melanoma metastasizes so easily? I still don't fully know. And that comes back to kind of what we were saying at the beginning, like why does one cancer metastasize so readily when another does not?

Erin Welsh

Right.

Erin Allmann Updyke

And again, my sense of it is just that it's the particular mutations that are happening in melanoma or perhaps a characteristic of melanocytes themselves that make them more likely to break off from the primary tumor, travel through the lymph system, and thereby cause metastatic disease.

Erin Welsh

So you mentioned that there was not good treatment for metastasized melanomas. What treatments are typically used for these different types of skin cancers?

Erin Allmann Updyke

So most skin cancers you can detect and then treat kind of at the same time with excisional biopsies or with excision itself. So depending on where the lesion is, if it's on the face or the trunk or the arms or the legs, you essentially just cut it out. And the key to cutting it out is making sure that you get the entirety of the cancer, that you have good margins, right. And depending on what type of cancer it is and how large it is, the recommended width of these margins will differ. When it comes to melanoma, especially as they get deeper, you have to take out quite a wide margin of tissue to make sure that you've really got all of the potentially cancerous cells. But even for basal and squamous cell carcinoma, if you're not able to get all of the cancerous cells, then of course you're going to have a risk of recurrence, right. And that of course can be a problem if you have cancers like I mentioned on the face, right, where you don't have that much tissue that you're able to actually remove without having significant cosmetic or structural damage. So there is a relatively new, I actually don't know when this was invented, technique called Mohs surgery. Have you heard of this?

Erin Welsh

No.

Erin Allmann Updyke

Mohs micrographic surgery. It's very, very cool. It's the surgical technique that allows you to take the thinnest possible margins around the entirety of a cancer because as you cut it out, as a surgeon cuts it out, they slice it and then look at it underneath the microscope, the entirety of it, to make sure that they got all of the cancer, if that makes sense.

Erin Welsh

Yeah, yeah.

Erin Allmann Updyke

So it's a way of doing it like in the moment rather than having to cut out a chunk, send it to pathology, wait a couple of weeks, come back, cut more, etc.

Erin Welsh

Wow. And so is this like the same surgeon doing the cutting is the same person who is doing the identification of the margins and stuff?

Erin Allmann Updyke

So I think a lot of times you have to have a second person there to identify but it is also the person doing the cutting who then also looks at it too. So you have two people.

Erin Welsh

Okay, okay.

Erin Allmann Updyke

And this is incredible especially for places like the nose or the ears. But of course it takes very skilled personnel, it's not necessarily available everywhere. But it's a really incredible technique that has been developed and it's a really powerful tool. It also has the lowest five year recurrence rate for any treatment, especially for basal cell carcinoma.

Erin Welsh

Wow.

Erin Allmann Updyke

But it's also used very commonly for squamous cell carcinoma.

Erin Welsh: That's really cool.

Erin Allmann Updyke: When it comes to melanoma, you still do usually have to have pretty wide margins. And depending on how deep it is, you would then also have to do lymph node biopsies and screen for metastatic disease and then potentially do chemotherapy. And there are various chemotherapy agents, some of which target some of these specific mutations that we know are really common in melanoma. But there just aren't as many as compared to a lot of other cancers that exist.

Erin Welsh: Yeah.

Erin Allmann Updyke: But that's skin cancer.

Erin Welsh: My head is just full of information now.

Erin Allmann Updyke: Well that's good. So tell me, Erin-

Erin Welsh: Yeah.

Erin Allmann Updyke: I mean how did we get here?

Erin Welsh: Yeah. It's a roundabout journey that we will take right after this break.

Erin Allmann Updyke: Okay. I can't wait.

TPWKY: (transition theme)

Erin Welsh: We humans have this weirdly fraught relationship with the Sun. It's kind of like filled with contradictions. We've worshiped the sun since ancient times and built temples to honor the god of the sun. We've invented countless ways to mimic the effects of the sun, like tanning beds, as well as to block the effects that it has on us, like sunscreens and various sun clothing and sun hats. We've attached various meanings to how much sun you get and we've created a whole host of myths about when or when not to use sun protection. We've battled skin cancers for centuries and we've massively improved the outcome of those battles as our methods for detection and treatment have evolved. We love and fear the sun and for good reason.

But despite this rich history, despite just how much we've learned about sun exposure over the centuries and then applied that knowledge to skin cancer prevention and treatment, the amount of miss and disinformation about the possible health effects of sun exposure, both good and bad, is staggering. Sifting through that information to find the good stuff is in and of itself challenging, but then there's actually applying it to your life, which like most behavioral changes is difficult. When we decided to do this episode, I honestly had no idea like what area I wanted to focus on, which story to tell, because they're all really interesting and they're all full of their own rich, deep history. And so instead of just picking one, I kind of decided to do like a little bit of all of it, a little mash up of like how long we've recognized skin cancers and understood the link between skin cancer and sun exposure.

Erin Allmann Updyke: Okay.

Erin Welsh: Why tanning beds were invented and how they got so popular.

Erin Allmann Updyke

Okay.

Erin Welsh

The earliest sunscreens and a bit of myth debunking, not very much, I have papers to send you to instead of me doing all of that. And finally like a little bit of reflection on like where we stand or why we don't do the things that public health tells us to do, including myself sometimes, right. Just, I don't know. Let's get started and see where we end up.

Erin Allmann Updyke

Okay. I can't wait.

Erin Welsh

And what better place to begin than with a couple of classics. Hippocrates and mummies.

Erin Allmann Updyke

Love it.

Erin Welsh

The word melanoma, which by the way is mostly what I'll be talking about in terms of the history of skin cancer, first shows up in the Hippocratic texts from the 5th century BCE. Melanoma of course comes from the Greek words for dark, 'melas', and tumor, 'oma'. So we know that melanoma was recognized at least that long ago and we also have physical proof of it in the form of diffuse melanotic metastases found on the skeletons of pre-Columbian mummies from about 2400 years ago in Peru. Yeah. And there aren't enough writings or mummies to give any indication of overall prevalence but it seems pretty likely that these were not isolated cases or that it was like a particularly rare condition.

But what I couldn't fully figure out was what physicians in ancient times thought caused melanoma or other types of skin cancers. Because the link between skin damage and even skin cancers and UV radiation wasn't established until centuries later, like the 19th century at the earliest. But this doesn't mean that sunscreens or other methods of sun protection were only invented after that association was made. It's not like you need to know how mechanistically UV damages your cells to know that spending long periods in the sun can lead to some pretty painful burns. And that it's probably then in your best interest to avoid that much sun exposure. Beginning at least in Ancient Egypt, though probably dating even further back, people began to use plant extracts like rice bran, jasmine, and lupin to protect themselves from the effects of the sun. Ancient Greek athletes would often cover themselves, I read, in olive oil and sand when they were training for long periods of time outside. And I read that olive oil has an SPF rating of about 8 by the way.

Erin Allmann Updyke

Okay.

Erin Welsh

Which might be better than the baby oil that my mom used when she would tan.

Erin Allmann Updyke

Yeah, yeah.

Erin Welsh

And and around 500 BCE, Ancient Indian physicians wrote about zinc oxide as a sun protectant as well as a salve for open wounds and burns in the medical text the Charaka Samhita. But sun protection wasn't limited to plant extracts or mineral compounds of course, various types of weaving, like how tight the weave was, was used to create clothing, veils, head coverings, and other types of clothing materials for added sun protection and umbrellas have been around since ancient times in Egypt, Mesopotamia, China, and India, not just for rain but to block the sun.

Erin Allmann Updyke

I don't know why I love that idea. I never thought about umbrellas back then.

Erin Welsh

Yeah.

Erin Allmann Updyke

But like duh, I love that.

Erin Welsh

But these methods of minimizing the effects of the sun didn't come down just to avoiding getting sunburnt. How much sun exposure you got, which was indicated by the tint of your skin, often took on a cultural meaning. And often that meaning was that the shade of your skin relative to others said something about your class, your occupation, your standing in society. Not everyone could afford an umbrella for sun protection or even if they could, they probably couldn't afford the time spent holding it or paying someone to hold it for you if you're doing physical labor outside. Nor could everyone afford sun protective clothing or to replace torn or worn out clothing as frequently as other people. So historically, in many places and many cultures, paler skin was held as an ideal within these societies since it was interpreted as you being wealthy enough to not spend your days laboring outside. And this is further illustrated by the many skin bleaching or whitening products going back hundreds of years, many of which contain toxic metals like arsenic or mercury.

And this is obviously like very broad strokes, very in a nutshell that I acknowledge lacks important nuance and doesn't represent all places at all times. But for many cultures, for large chunks of history, staying out of the sun was considered a luxury, at least until the early 20th century at which point attitudes began to shift in some places dramatically. And to get at the drivers of the shift, the embrace of the tan, I'm going to talk specifically about the US because perceptions of sun exposure were not consistent across the entire globe. As the 19th century came to a close, the negative sentiment towards sun exposure was mostly still in full swing. For instance, take the Pond's advertisements from the early 20th century that warned women to quote "beware the kiss of the sun, the summer girl has no charm as great as the appeal of a complexion as clear, transparent, and like an apple blossom in its delicate, soft coloring."

Erin Allmann Updyke

Oh dear.

Erin Welsh

Yeah. Endquote. And of course this isn't just about sun exposure and classism, there's obviously much more going on underneath the surface here in terms of general racism and the rise of the notion of white supremacy around this time and earlier and after. So keep that in mind of course. But teasing apart how those were tied into this and the rise of the tan is just a bit beyond the scope of today. But in terms of the sun specifically though, it didn't just come down to sun exposure is bad because it means you're poor. People also had begun to attribute negative health effects to time spent in the sun. I'm not talking about UV damage and skin cancer and the other things we now know are clear signs of sun damage. I'm talking about the idea that extreme sun exposure was thought to be the cause of many tropical diseases which white people seemed especially susceptible to. Yeah.

In 1905, Dr. Chaz Edward Woodruff published a book titled 'The Effects of Tropical Light On White Men' in which he detailed how the sun led to the deterioration of health and the development of quote unquote "tropical neurasthenia", which included vague symptoms like quote "restlessness, irritability, fatigue, memory loss, insomnia, headaches, diarrhea, ulcers, heart palpitations, alcoholism, and insanity". Endquote.

Erin Allmann Updyke

Oh my goodness.

Erin Welsh

Quite the range. And he went on to say that the US was too sunny for the white people who lived there. Quote: "The American girl is a bundle of nerves. She is a victim of too much light." Endquote.

Erin Allmann Updyke

Oh my goodness.

Erin Welsh

And another physician, Dr. Percy Brown who was at Harvard, said that chronic exposure to the sun was the cause of quote unquote "Americanitis", a condition characterized by quote "irritability and extreme activity". Endquote. I mean I do feel like often irritable and extremely active at times but like do I have Americanitis?

Erin Allmann Updyke

Does that explain me?

Erin Welsh

Yeah. I don't even know what that means.

Erin Allmann Updyke

I don't either.

Erin Welsh

I truly don't. I think it might be meaningless is the answer.

Erin Allmann Updyke

Oh my goodness. And this is all just about like white Europeans who came to the Americas. Like that's what they're talking about?

Erin Welsh

Yeah.

Erin Allmann Updyke

Which is like just the invaders.

Erin Welsh

Yeah.

Erin Allmann Updyke

Cool.

Erin Welsh

Yeah.

Erin Allmann Updyke

Okay.

Erin Welsh

But attitudes towards the sun and sun exposure were about to do a complete 180.

Erin Allmann Updyke

Okay.

Erin Welsh

And warnings about too much sun or the health effects of sun would disappear for decades. Sun began to be hailed as a healer of all. The quote unquote "sun cure" developed in the early 1800s and refined in the 1870s when researchers found that exposure to UV light killed bacteria and fungi, it grew tremendously in popularity. In 1882, Robert Koch, longtime friend of the pod, discovered that the tuberculosis bacteria were killed when exposed to sunlight which caused quite a bit of excitement because it suggested that maybe sun exposure could cure the disease. And that led to the invention of artificial sun lamps by Niels Finsen, which is the first time that humans were able to produce sunlight in less than 20 years after light bulbs were first invented.

Erin Allmann Updyke

What?

Erin Welsh

Isn't that cool?

Erin Allmann Updyke

And it was to try and cure TB? What?



Erin Welsh: And the Finsen lamp apparently did actually effectively treat the cutaneous form of tuberculosis.

Erin Allmann Updyke: What?

Erin Welsh: Yeah. And for this, Finsen was awarded the Nobel Prize in 1904.

Erin Allmann Updyke: What? I love this.

Erin Welsh: I know, I know. And so treatment for all forms of tuberculosis became centered around sunlight, this is in the pre-antibiotic era, with the construction of countless sanitariums, particularly in areas with lots of sun and fresh air, such as the Adirondack Mountains in New York where the first sanitarium in the US was built. At that sanitarium, a key part of this sun therapy was spending long chunks of the day reclining on specially designed chairs to soak up the sun.

Erin Allmann Updyke: Adirondacks?

Erin Welsh: Adirondack chairs.

Erin Allmann Updyke: Oh my god, stop it.

Erin Welsh: Yeah. Isn't that good?

Erin Allmann Updyke: Adirondack chairs were invented to cure TB by laying in the sun.

Erin Welsh: Yep. That is one of my favorite like fun facts of the podcast.

Erin Allmann Updyke: I will never forget it.

Erin Welsh: I will.

Erin Allmann Updyke: I will until someone says the word Adirondack and I'll be like did you know?

Erin Welsh: Did you know? But the sterilizing and healing effects of sunlight weren't enough alone to drive this massive change in attitude. There had to be something more. And there was. Our old favorite, the Industrial Revolution.

Erin Allmann Updyke: Always.

Erin Welsh: Always. With more and more people moving to cities and working in factories or in mines away from sunlight, a lack of sun exposure no longer meant that you were too wealthy to work. In other words, thanks to the Industrial Revolution, you couldn't tell how wealthy or which socioeconomic class someone was in based on their tan. This was unacceptable. The only way to not be mistaken for a poor person was to work on your tan, which wealthy white people began to do. Spending time at beach houses or resorts for long weekends, recreational swimming, golf, tennis, and bicycle riding became more popular and sporty clothing for these activities tended to reveal more skin. And the pale skin that was once held as the pinnacle of refinement and beauty now carried with it a different meaning, that of the quote "feeble, sunlight-starved lower class". Endquote.

So-called diseases of darkness, like rickets and tuberculosis, rose in prevalence during the Industrial Revolution as we've talked about on the podcast. And a common medical belief of the day was that quote "pale, dull, and perverse children get so as a result of dark gloomy schoolhouses and tenement rooms". Endquote. This negative association with pale skin even found its way into fiction with villains like Dracula sporting extremely pale skin. The combination of pale equals poor and sun equals health created a powerful and lasting shift in the US's relationship with the sun.

Erin Allmann Updyke

It's fascinating.

Erin Welsh

Soon sun lamps and UV bulbs found their way into homes and businesses and physicians began exploring the potential uses of heliotherapy, which is from natural sunlight, and phototherapy from artificial sunlight. These bulbs were literally just exuding UV radiation all over the home.

Erin Allmann Updyke

Love that. Wow. Great.

Erin Welsh

Everywhere. Yeah. WWI demonstrated that sunlight did seem to help with the healing of compound fractures and ulcerated wounds. Tuberculosis and rickets soon found themselves surrounded by a whole host of other diseases that could allegedly be cured by UV light like pneumonia, constipation, hypertension, hypotension, cirrhosis, arteriosclerosis, diabetes, and gastric ulcers. Not saying any of those can be cured by sunlight but people tried to do it.

Erin Allmann Updyke

I'm sure they did.

Erin Welsh

Oh yes. But sunlight was held not just as a curative therapy but also a preventative one necessary to stave off colds and infections, help your metabolism, improve circulation, you name it. Parents were told to take their children outside for hours each day for their sun bath regimen. Listen to this quote from an article in the American Journal of Public Health from 1926. Quote: "We have found that the best results are obtained by telling mothers that they must get their children sunburnt. The infant should be taken out on bright days for a time between the hours of 11 am and 2pm and the sun allowed to shine directly on its face." Endquote.

Erin Allmann Updyke

Oh my gosh.

Erin Welsh

I can't believe it. I can't believe it. I can, I can believe it.

Erin Allmann Updyke

Ah!

Erin Welsh

In 1923, Literary Digest wrote that quote "nothing is better for babies or grown people either than a good coat of tan. We have it on good scientific authority." Endquote.

Erin Allmann Updyke

Oh do you?

Erin Welsh

Do you indeed? Being tan was also the height of fashion. In 1929, Coco Chanel returned to the US after a vacation in the French Riviera and declared quote "the 1929 girl must be tanned, a golden tan is the index of chic." Endquote.

Erin Allmann Updyke

Wow.

Erin Welsh

Yep. Of course what remains unsaid in that quote is that it wasn't just the 1929 girl but it was the 1929 white girl who must be tanned.

Erin Allmann Updyke: Yeah.

Erin Welsh: And I think that's such an interesting part of this whole history of tanning.

Erin Allmann Updyke: Yeah. I think again there's like whole entire podcasts that could be had about the context of pale being beautiful vs tan being beautiful in the context of the US and systemic racism and anti blackness.

Erin Welsh: Yes.

Erin Allmann Updyke: But it's a very interesting part of the history of tanning as it relates to skin cancer especially.

Erin Welsh: Yeah. It's complicated.

Erin Allmann Updyke: Yeah.

Erin Welsh: Like I said, there's a lot going on under the surface here that plays into this.

Erin Allmann Updyke: Yeah.

Erin Welsh: Yeah. But all this tanning was not without its obvious risks.

Erin Allmann Updyke: Yeah.

Erin Welsh: City health commissioners around the US sent out warnings about too much tanning and you could find sunburn clinics popping up all over beaches all over the US.

Erin Allmann Updyke: Oh gosh.

Erin Welsh: As a result, the first sunscreens began to be developed and commercially sold with the first US sunscreen, Coppertone Suntan Cream hitting shelves in 1944. And there had been other sunscreens before then like Hammer's quinine mixture from the late 1800s, Unna's chestnut extract concoction, who was the first by the way to suggest a link between sun exposure and skin cancer, Schueller who founded L'Oréal, his benzyl salicylate, and even dark red veterinary petrolatum which the military had found to be the top contender when looking for sun protection methods in case WWII soldiers got stranded on life rafts or in the desert. Beyond the very apparent link between sun exposure and sunburn that drove the invention of these sunscreens, a more concerning finding came to light in 1928, which was the association between UV radiation and skin cancer, which was clearly demonstrated in a mouse study by Dr. G. M. Findlay. While it would take another almost 30 years for the link between sun exposure and melanoma to come to light, which pun absolutely intended, I wrote it in here.

Erin Allmann Updyke: Come to light, I get it.

Erin Welsh: Yeah. This finding between UV radiation and skin cancer was highly concerning, especially for the many public health departments or medical organizations that had previously endorsed sun as this cure all and told parents to get their babies full sun sunburnt for 2-3 hours each day.

Erin Allmann Updyke: Aye aye aye.

Erin Welsh: Yeah. Like only stop when they're sunburnt? No.

Erin Allmann Updyke: It hurts to think about.

Erin Welsh: I can't get over it. JAMA for instance revised their position on sun exposure in 1936, saying quote "as far as is known, man actually requires only a relatively small amount of sunshine for the maintenance of normal health and the greatest danger perhaps at the present time lies in too much exposure to sunlight rather than too little." Endquote. Probably like whoops.

Erin Allmann Updyke: Whoops.

Erin Welsh: By the 1930s, it was widely accepted in medical circles that sun exposure caused skin cancer. But for whatever reason, maybe the messaging was off, maybe the lure of the tan was just too great, tanning and sun exposure only grew over the decades. The 1960s was a 'celebrate the beach' decade with bikinis and beach movies. And as destination travel grew more accessible, a winter tan became a status symbol and a fabulous souvenir. Tanning guides popped up in countless magazines. Still today, they're in countless magazines. For instance, the rotisserie method, you can find that. Yeah, it's just like oh to get full maximum sun exposure, rotate every 15 minutes or something.

Erin Allmann Updyke: Okay.

Erin Welsh: When to go out to seek the peak noonday sun and when to use things like baby oil or an aluminum reflector to enhance the power of the sun's rays. My mom did both of those.

Erin Allmann Updyke: Oh my goodness. Yeah, yeah, yeah.

Erin Welsh: Yep. And if you wanted sunscreen, you were more likely to find sun tan creams guaranteed to get you the tan you desire. Barbies with tan lines were sold, Sun Loving Barbie, in the 1970s. Yeah. In the 1980s Baywatch came out and so tans basically continued to be the trendiest fashion accessory. And people overall just didn't seem to be concerned. Naturally there were consequences. The public health campaign of the 1980s called Fry Now, Pay Later, not great, was inspired by the rising rates of melanoma which in the 1930s was thought to be a pretty rare skin cancer with a lifetime risk of 1 in 1500 people.

Erin Allmann Updyke: Wow.

Erin Welsh: By 1980, that risk had shot up to 1 in 250 and just five years later was estimated to be 1 in 150 still rising.

Erin Allmann Updyke: And this is just in white people.

Erin Welsh: Yes.

Erin Allmann Updyke: Okay.

Erin Welsh: And so I also don't know about detection methods too. Like how much of that is detection, awareness not just of sun exposure but like melanoma-

Erin Allmann Updyke: Right, right.

Erin Welsh: And other types of skin cancers. But I think-

Erin Allmann Updyke: You can't attribute that.

Erin Welsh: Yeah, yeah, exactly.

Erin Allmann Updyke: Yeah.

Erin Welsh: And while public awareness of the risks of sun exposure had at least increased, it didn't seem to have a big effect on the tanning industry which was very much still in its glory days. There was the tanning bed side of things. The first indoor tanning salon, Tantrific, opened to the public in 1978 in Arkansas and was quickly franchised. 1978. Doesn't it seem like late?

Erin Allmann Updyke: Also I don't know why... Arkansas is not the place I would have guessed.

Erin Welsh: I don't know. I don't know. But I mean like 1970, this was decades after the link between sun exposure-

Erin Allmann Updyke: And skin cancer.

Erin Welsh: UV radiation and skin cancer was found.

Erin Allmann Updyke: Yeah, yeah. Why?

Erin Welsh: Yeah. Well within one year there were 81 Tantrifics and by 2000 there were at least 50,000 tanning facilities around the country.

Erin Allmann Updyke: Wow.

Erin Welsh: Yeah. Suntan lotion and sunscreen represented the other major tanning industry with companies advertising their products as a way to achieve a quote unquote "safe tan", which is a line that the tanning bed industry also used without a scientific basis for that claim. And I do think it's fair to ask, okay but how much did science know at that point? Quite a bit, quite a bit. The effects of UVB radiation on the skin had been known about since the early 1800s or so, not necessarily as it related to skin cancer but as it related to skin damage.

Erin Allmann Updyke: Okay.

Erin Welsh: And most of the sunscreens developed through the 1980s blocked or were supposed to block this type of radiation, UVB radiation. But they often let UVA radiation through even though UVA radiation had been found in the 1960s to be linked to skin cancer and skin damage. Even into the 1990s, most sunscreens did not have UVA filters, just UVB. And that actually has played a role in one of these sunscreen myths that sunscreen doesn't actually protect from skin cancer. And part of that is backed up by like oh, well look at this paper and this paper and this paper. A lot of those studies were done when sunscreen only protected against UVB radiation.

Erin Allmann Updyke: Got it.

Erin Welsh

And so the UVA sunscreen was not widely available. Anyway. So these quote unquote "safe tans" advertised by tanning bed salons and sun tan manufacturers, what exactly then made them safe? What's the safe part of this? Mostly by filtering out UVB radiation only. Some salons advertised their UVA only lamps.

Erin Allmann Updyke

Oh dear.

Erin Welsh

In other words, we're still blasting you with radiation but it's just a different kind and it's still not safe but yep. Not safe. Not a safe tan. And eventually the FDA stepped in to regulate things like the contents of sunscreen and provide guidelines on application which very few people follow correctly today, myself included, like how thick you apply it. And of course tanning salons were required to display warnings and have customers sign a disclaimer. Did these regulations actually do anything to cancer rates? I don't know.

Erin Allmann Updyke

Yeah.

Erin Welsh

From what I can tell, and I know Erin you'll tell us more about current incidents of different types of skin cancers, it hasn't really seemed to. Maybe there's a lag between cause and effect because these cancers can take years to develop, so we're still experiencing the consequences of that high risk period. But I'm not sure it's just that. Because even if tanning beds have fallen out of style in 2023, sunscreen use among American adults is still incredibly low. A paper from 2015 reported that only 14% of men and 30% of women regularly use sunscreen on their face and other exposed areas. And there are many cited reasons for this. One paper found that some of the most commonly reported reasons include cost, dislike of feel or appearance of sunscreen, and time constraints. Even when people are using sunscreen, a very small proportion of them are using it appropriately, reapplying often, using the right SPF, applying enough, rubbing it in, and so on.

And I absolutely count myself among those improper users. In high school, I used to lay out without sunscreen to try to get a tan for when school started. I don't really tan. And so as a result I got so many bad sunburns. Like my mom had to reschedule my senior pictures because I was just red and peeling. Red or peeling, like one of the two. That was my summer skin. I remember for one sunburn I had to lay on the cold basement floor because my back hurt so bad. And I knew about sun damage and skin cancer then and I know even more about it now and while I'm better overall about putting on sunscreen before going outside, especially here in Denver where it's perpetually sunny and higher altitude, I'm still not perfect by any means. Why? Like why, not just me but broadly speaking, where is this disconnect coming from? And how do we overcome it?

And I think if we knew the answer to that, we'd have lower rates of skin cancer and higher rates of sunscreen compliance. But I think a big part of it probably comes down to having to make behavioral changes, a notoriously difficult thing, as well as the perpetuation of some pretty damaging myths surrounding sunscreens and skin cancers that have served in some ways to decrease overall confidence in sunscreens. Things like I don't need sunscreen on a cloudy day. You definitely do. Or there is no practical difference between SPF 50 and SPF 100. There is, especially when applying a thinner layer than recommended. Or sunscreen use prevents me from making enough vitamin D. First, it's not clear that it does, and secondly, there are supplements. Or sunscreen is bad for you.

And while it's true that there were studies showing that some sunscreens had ingredients that were absorbed by the body, in 2019 the FDA now requires sunscreen manufacturers to describe which ingredients are quote "generally recognized as safe and effective" endquote, and ingredients that are not considered to be so are no longer included in any sunscreens sold in the US. And this is also a very active area of ongoing research. And that's just a small sampling of sunscreen myths with many more out there. And I'll post a great paper from 2020 titled 'Dispelling Myths About Sunscreen' where you can find a whole lot more.

But there is something, there is still this disconnect and I think it would be really interesting, I didn't dive into the literature but I think it would be really interesting to kind of read more into which approaches have been the most effective. Like is messaging surrounding sun exposure and anti aging, is that more effective than just skin cancer and sun exposure? Maybe, I don't know. Like we've come so far in so many ways when it comes to understanding our relationship with the sun in a biological sense, in testing for and identifying risk factors for melanoma and other skin cancers.

We've come a long way in treating skin cancers and developing ways to protect ourselves from the sun. But we're still really far behind when it comes to actually using that protection. Shame is never going to be a helpful tool to get the job done and I know that there can be a lot of shame or blame when it comes to skin cancer. And the battle of good information against bad information is perpetually ongoing. There's a big hill to climb. And so Erin, I'll turn it over to you to tell us a bit more about that hill.

Erin Allmann Updyke

Oh I will try to do my best right after a short break.

TPWKY

(transition theme)

Erin Allmann Updyke

So when it comes to the epidemiology, it turns out that the incidence of skin cancers as a whole is pretty difficult to understand, to have numbers on. Because like I mentioned, it's only melanoma that's reported to tumor registries, which makes sense in that melanoma is the one predominantly that metastasizes, that causes mortality, right, But there is no doubt through all of the literature that it is non melanoma skin cancer, basal and squamous cell, that by far is the most common and in fact might be the most common human cancers, period.

Erin Welsh

Wow. Okay.

Erin Allmann Updyke

Basal cell carcinomas account for 70%-80% of all carcinomas especially in the US, that's where a lot of this data comes from. And while squamous cell accounts for about 20%-30% and the total incidence of these two non melanoma skin cancers in the US is estimated to be over a million cases each year. And in the UK, estimates are around 100,000 cases each year. That's all I've got.

Erin Welsh

Okay.

Erin Allmann Updyke

For those. But what's important to know is that, and this is true of all types of skin cancer, a lot of the rates of incidents and prevalence are reported predominantly just in white people, in Caucasians. But all types of skin cancer happen in people of all skin colors, they just are more or less prevalent in part because of the effect of melanin, right. But what's important to know about basal cell, squamous cell, and especially melanoma is that in people with darker skin, it often goes unnoticed, these cancers, and so they have been found to be in many cases more aggressive or identified at later stages of progression and therefore have worse outcomes. And that's a really important part of the skin cancer story as a whole.

Erin Welsh: Yeah.

Erin Allmann Updyke: Because it means that we're missing it. We're not seeing it because we don't think that it's happening in people in darker skin tones, which is not true.

Erin Welsh: Right.

Erin Allmann Updyke: When it comes to melanoma, which we have better data on, a 2018 paper estimated that worldwide there's over 230,000 cases or 1.7% of all new primary malignant cancers that are attributable to melanoma. And that's specifically cutaneous melanoma, meaning skin melanoma, because you can also get melanoma inside of your body, not only on your skin.

Erin Welsh: What?

Erin Allmann Updyke: Yeah, these melanocytes can just cruise around. And melanoma likely causes about 55,000 deaths each year, which is about 0.7% of all cancer deaths.

Erin Welsh: Okay.

Erin Allmann Updyke: That is global averages and these incidents vary widely across the globe. So in Southeast Asia, the estimates are like 0.2 per 100,000 person years as an incidence. In the Americas, the estimates are like 7 per 100,000. And Australia and New Zealand have by far the highest incidence, some studies I read said 30-40 per 100,000 people but some studies said as high as 60 cases per 100,000 people in Australia and New Zealand. And some studies reported much higher cases in Europe and the US, like 20-30 per 100,000. All of these types of skin cancer are on the rise. They are continuing to increase despite the fact that we have more and more technology in the form of sunscreen and sun protective clothing to actually prevent against the majority of these cancers. Now I wanted to talk a little bit about sunscreen because I don't know if everyone knows how sunscreen actually works.

Erin Welsh: Oh I'm so glad you're talking about that.

Erin Allmann Updyke: There's two different major forms of sunscreen. There's physical sunscreens that provide a physical barrier and there's chemical sunscreens. All of sunscreens essentially block UV radiation so that they don't cause damage to our skin. So sunscreens prevent photoaging and that's like a whole other podcast topic, as well as the actual DNA damage that puts people at risk of the development of skin cancer. Chemical sunscreens, which if you read the back of your sunscreen label, are things like oxybenzone or avobenzone. These compounds essentially absorb the high intensity UV radiation, UVA and UVB, and then convert that energy into lower energy wavelengths like infrared radiation or heat. Which when I read that I was like is that why you get so sweaty when you wear sunscreen or is that just me?

Erin Welsh: I mean I think if I'm wearing sunscreen I'm likely to be outside.

Erin Allmann Updyke: Fair enough.

Erin Welsh: In the summer. Although it's true that I do wear it in the winter here too because it's always sunny.

Erin Allmann Updyke: It's always sunny in Denver.

Erin Welsh: I love it.



Erin Allmann Updyke

Physical sunscreens, these are things like zinc oxide, titanium dioxide, they mostly reflect and refract the UV radiation, just bounce it off your bod. Or there is also micronized zinc oxide that can absorb the UV light and it behaves like a semiconductor and like whooshes it away so that it doesn't it cause damage.

Erin Welsh

Whooshes it?

Erin Allmann Updyke

Yeah.

Erin Welsh

That's the technical word?

Erin Allmann Updyke

Uh-huh.

Erin Welsh

I love it.

Erin Allmann Updyke

And so what is the actual evidence? Because I think that it's important to kind of put this sunscreen in context. There is very good evidence that sunscreen protects against a lot of different forms of sun damage. It protects against forms of photoaging like wrinkles, it protects against telangiectasias which is when you get little tiny blood vessels that form in response to this UV radiation. It protects against other pigmentary changes like solar lentigos and all of these things. And there's very good evidence in the prevention of squamous cell carcinoma with the use of sunscreen and some evidence for the prevention of melanoma, which like all of those is enough for me. The data is not as strong interestingly for basal cell carcinoma, the prevention of basal cell carcinoma. It's unclear why. But something that I think is important when we look at the data, because there are a lot of studies that are not hard to find that rail against sunscreen for some reason.

Erin Welsh

Yeah.

Erin Allmann Updyke

Like there's no data for it, which just is not true.

Erin Welsh

Right.

Erin Allmann Updyke

But this is difficult data to gather.

Erin Welsh

Very.

Erin Allmann Updyke

So let's talk about the data that does exist. There is copious amounts of data to show that sunscreens of all the various kinds prevent all of this sequela of UV radiation exposure in human skin under laboratory conditions when you're using it exactly the way it's supposed to be used. There's also a ton of mouse model data that shows the slowing down of development or the prevention entirely of things like melanoma in mice models of skin cancers. There is as far as I could tell only one randomized control trial that was done in Australia to actually under real world conditions try and say does the regular use of sunscreen prevent melanoma? And these are really hard studies to do. But in this study, people that were assigned to quote "daily sunscreen use" had significantly lower incidence of melanoma than those who were assigned to quote "discretionary use". So just use however you use sunscreen.

Melanomas, squamous cell carcinomas, and basal cell carcinomas like most cancers take a long time to develop. So to do a study to look at the prevention of a cancer like this by the use of sunscreen takes a very long time. And we know that sun exposure during childhood and adolescence is when you're at highest risk. So it's really difficult to be able to have studies that gather enough data to say that using sunscreen like on a population level prevents cancers. That doesn't mean that we don't have a ton of data to show that sunscreen and other sun protective methods do help reduce the risk of UV radiation and UV radiation is the major risk factor for all these skin cancers.

I think it's really important and most if not always overlooked in popular media representations of science is data quality and what those data look like. And so if you come to the conclusion based on a study that's like oh, we found pretty decent moderate support that sunscreen use reduces the risk of developing squamous cell carcinoma. And you'd be like well moderate support, like that only it kind of does? But then considering just like you said how difficult it is to get these data and how they are often not... You know, certain data sets are beautiful and some are just a little messier, that's just the nature of humans. I mean don't get us started on like nutritional epidemiology and remembering what you ate and so on 10 years ago.

Okay, don't get me started on that because it's my favorite thing to talk about. But yes, sunscreens protect against UV damage and UV damage is the primary and really the only preventable risk factor for skin cancer. That's like period, the end. When it comes to future directions of research, there's a few areas that I think are really interesting and that have a lot of promise. Of course there's a lot of research to be done and being done on treatments for skin cancers, especially when it comes to melanoma and metastatic melanoma. That's a whole field of research in itself. There's also really interesting research being done on AI and using AI to identify skin cancers.

Erin Welsh

Okay.

Erin Allmann Updyke

Deep learning computer stuff.

Erin Welsh

Cool.

Erin Allmann Updyke

All of this is fraught with, again, the knowledge that we are bad in general, and we being the medical community and the scientific community, at identifying skin lesions in skin of color, that's like across the board a problem. And it leads to, like I already mentioned, not identifying cancers as early in skin of color compared to white skin or light skin. But that I think is somewhere where if trained with the right data, AI could potentially be really beneficial in aiding clinicians in identifying skin cancers earlier. There's already some programs out there in some studies that have come out for things like breast cancer, like identifying breast cancers with computers compared to radiologists, which is really interesting. So it's not like this technology exists yet but it's definitely a realm of future research because skin lesions are things that you can take a photograph of and if you can take a photograph of it, then you can give it into a computer and teach that computer how to identify things, which is just awesome.

Erin Welsh

That's pretty cool. When you said AI I thought you were going to say that we're trying to get it to write prompts like public health safety announcements, awareness campaigns for sunscreen.

Erin Allmann Updyke

No, nothing about that. Australia apparently had one of the most comprehensive skin cancer prevention like national public health campaigns that was called Slip Slop Slap.

Erin Welsh

Yeah. I love that. Love that.

Erin Allmann Updyke

I know. And then they had after that, this is like the early 1980s and then they had this whole sun smart campaign that really focused on adolescents and young people and trying to get them to wear sunscreen or sun protection and they went into schools and they did all these things. But I couldn't find a lot of data on how effective it's been because the rates of melanoma are still rising.

Erin Welsh

Yeah. I do think it's really interesting to think about targeted campaigns and how different ones work for different people. Because I feel like one thing that we didn't really touch on at all is occupational exposure.

Erin Allmann Updyke

Oh my gosh, yeah.

Erin Welsh

For sun damage and skin cancers. That's like one of the biggest areas.

Erin Allmann Updyke

Yeah, yeah.

Erin Welsh

There's a lot.

Erin Allmann Updyke

There's a lot, Erin. There's a lot that could be done, there's a lot that could be better. We could all wear more sunscreen.

Erin Welsh

I mean do you remember that thing that was circulating in 1999? Wear Sunscreen.

Erin Allmann Updyke

No. What? What?

Erin Welsh

Okay, I'm going to send it to you. It was like a spoken word essay that was played I feel like it so many high school graduations in the late 90s, early 2000s. And it's like if I could offer you only one tip for the future, sunscreen would be it. Okay, I'm going to send this to you and you have to listen to it.

Erin Allmann Updyke

Okay, I love it. I feel like all I remember from high school graduations was like Vitamin C.

Erin Welsh

Oh yeah. This played right before that.

Erin Allmann Updyke

Oh I see.

Erin Welsh

Yeah.

Erin Allmann Updyke

Well sources?

Erin Welsh

Sources. I got everything from that essay called Wear Sunscreen. I'm just kidding. I have many, I'm going to shout out a few. One is a book called 'Shedding Light On Indoor Tanning' by Heckman and Manne. Then there was a paper from 2020 by Bennett and Khachemoune called 'Dispelling Myths About Sunscreen' which I already mentioned. Then a paper from 2012 by Rebecca et al titled 'A Brief History of Melanoma: from Mummies to Mutations'. And then finally by Urbach from 2001, 'The historical aspects of sunscreens'.

Erin Allmann Updyke

I had a lot of sources for this episode, many of which have so much more detail about the specific tumor suppressors and proto oncogenes and all of the very detailed detail about these different types of cancer. So if that is what you're looking for, ooh, I got you. There is a paper in The Lancet just titled 'Melanoma' from 2018. There's another one called 'Non Melanoma Skin Cancer' in The Lancet from 2010 that was really great. I have specific ones on each type of skin cancer, basal cell, squamous cell. We've got more on the current status of sunscreen use and skin cancer and oh my gosh, everything you could ever want on our website [thispodcastwillkillyou.com](http://thispodcastwillkillyou.com) under the EPISODES tab. You can find all of these and the sources from every other one of our episodes too.

Erin Welsh

Thank you again so much, Ally, for being willing to share your story with us and with all of our listeners. We really, really appreciate it.

Erin Allmann Updyke

Yeah, thank you. Thank you also to Bloodmobile for providing the music for this episode and every one of our episodes.

Erin Welsh

Thank you to our amazing audio mixers at Exactly Right.

Erin Allmann Updyke

And thank you to Exactly Right.

Erin Welsh

And thanks to you, listeners, for listening. This is a long episode I think.

Erin Allmann Updyke

Yeah. I had fun with it though.

Erin Welsh

I did too.

Erin Allmann Updyke

And a special shout out as always to our patrons. Thank you so much for your support.

Erin Welsh

Yes. Thank you. Thank you. Thank you. Until next time, wash your hands.

Erin Allmann Updyke

And wear sunscreen, you filthy animals!

Erin Welsh

Yes, yes.