Smologies #40: HAIR with Dr. Valerie Horsley
Ologies Podcast
March 20, 2024

Oh hey, this is an episode of *Smologies* and if you are unfamiliar, *Smologies* are shorter and classroom-safe, kid-friendly versions of our classic episodes. So, this has been cut down, a lot of my potty mouth and the juicier details have also been removed so if you want the full episode, you can find it in the link in the show notes. But this one, this one is safe for the whole car. All right? Cool. Enjoy.

Heyyy, it's me! It's your hairdresser's daughter with the cool perm, Alie Ward. I'm here with another episode of *Ologies*, are you ready to hair trichology? Yes, you are, you wispy beast. Let's do it. Okay, trichology, the study of hair. Here we are. So, *thrix* means hair in Greek which morphed into *trich*, which means hair.

So, I'm going to give you a super quick overview to give you some context for this episode. So, hair. It's made of three parts, there's an inner part called a medulla, then around it there's a cortex which contains keratin, that's a protein that makes it strong. It also contains different kinds of melanin pigments that give it color. Then there's an outer cuticle that looks like a series of overlapping scales, kind of like a pangolin, and it repels water. You've got your vellus hair, that's your fine, barely visible peach fuzz unless you're standing in bright light at a barbecue and then you're like, "Can everyone see my face hair?" And terminal hair, that's the big wiry guys. So, boom! You know a lot about hair right now.

Okay, so in this episode of Trichology, I sat down with a Yale researcher and professor who focuses on skin and hair regeneration. So, I met her through an internet pal and ologite, Aaron Herdman, who I got to meet in three dimensions when he and this ologist came to California. Aaron sat in on the interview so you may hear him chuckling a little bit here and there, shifting in his seat. But this ologist sports a blonde bob and very down-to-earth southern ease and I was just thrilled to have them over to talk about mammalian hair trends and growing hair and losing hair and then regrowing hair, and lightening it, loving it, hating it, all the things in between. You're never going to look at your own furry body quite the same. So, please get ready to run your fingers through this next episode all about hair with trichologist, Valerie Horsley.

Alie: So yeah, just hold it like an ice cream cone. I'll check your levels.

Valerie: Valerie Horsley.

Alie: Doctor.

Valerie: Doctor.

Alie: [*laughs*] Now, what is your title? What's your official title?

Valerie: Associate Professor in Molecular, Cellular, and Developmental Biology and Dermatology.

Alie: I saw that on the Yale website, and I was like, "She has so many words in her title." [*both laugh*] Can you explain a little bit about what you do?

Valerie: Yes, so I'm a professor at Yale so I wear lots of hats. I run a lab which is like running a small business and our product is the science we produce and discover and it's mostly in the

regeneration of skin and hair. [*Alie gasps*] And then I teach undergraduates, Introductory Cell Biology.

Alie: Now, you work with trichology.

Valerie: Correct.

Alie: And when I found this out, I lost my mind. [*Valerie laughs*] Why hair and skin?

Valerie: So, I'm very interested in how the tissues in our bodies maintain themselves. So, most of our lives, we're pretty okay, we're not sick and how does that work? Because our cells and our skin and our hair are constantly regenerating.

Alie: Now okay, dispel a myth. Every seven years, are you a completely new person? Do you regenerate enough where you're like, I'm the same person but I'm all different cells?

Valerie: So, it depends on the tissue. So, it's thought that your skin turns over every two to four weeks, totally new skin every month. [*Alie squirms*] Your intestine, every three days.

Alie: [*squeals*] WHAT?!

Valerie: Mm-hm.

Alie: That's so many makeovers happening.

Valerie: Totally.

Alie: Woooah! [*Valerie laughs*] But we're the same person but we're different people. Does that ever trip you pout emotionally? If you ever have a beef with someone, are you like, "Well, technically they are a different person?"

Valerie: No.

Alie: Okay. [*laughs*]

Valerie: [*laughs*] Brains don't really regenerate at the same level as your epithelial tissues which are the coverings and linings of your body like your skin.

Alie: Okay, so tell me a little bit about... Skin and hair, why is it such a different beast than the rest of you bo-day? Like, what is it doing? Why is it such a hustler?

Valerie: So, your skin is your presentation of yourself to the world but it's also the first way you're protecting yourself from your environment. So, it's there to protect you from any pathogens in our environment, it's also there to hold in the water in our bodies and keep everything inside. And so, it's going to get insulted by damage, so it has to regenerate.

Alie: Is that a scientific term, insulted?

Valerie: Sure!

Alie: That would be so great if you were like, "An insult to the dermis..."

Valerie: No, yes, totally. I know I've written that sometime.

Alie: Really?

Valerie: I'm sure. [*chuckles*]

Alie: It's more than just a glove slap, it's like sun damage and stuff.

Valerie: Yeah.

Alie: Oh my gosh. And how are skin and hair kind of lumped together?

Valerie: So, it's very important that we understand all the cell types that go into making the skin and that's sort of been a major area of research in the last, probably, 15 years, just trying to understand what are all the different cell types that make up the skin. That's one of the focal points of my lab, trying to understand, in the dermis in particular, what are the cells that go into making the skin.

Alie: And still the largest organ? I know there's been research saying that there's an intermesh under our skin that is now the largest organ. Have you heard of that? Some spongey-like, fluid-filled intermesh that they're like, "This is a new organ, this is the biggest organ."

Valerie: No.

Alie: Skin is the biggest organ?

Valerie: Correct.

Aside: So, in March of 2018, which is like five seconds ago in historical medical history terms, researchers at NYU may have discovered the largest organ in the body, thus knocking our leathery blood bag right off its pedestal. So, this *very* heavy air quotes, "new largest organ," is called the interstitium and is a spongey network of connective tissue. It's made of elastin and collagen, and it holds a bunch of your body juice so like, fluids, lymph, other things I don't want to touch. Now this newest, biggest human organ made for some pretty splashy headlines but not all doctors are on board, not all of them are like, "Yes, it's the new biggest organ!" So, for now, let's just say, skin remains the biggest organ, which is still weird.

Alie: Why is it an organ if it's a big, like, it's essentially fondant? How is fondant a cake layer? Do you know what I'm saying?

Valerie: Yeah, but it's smarter than that. So, I like to say the coverings of cells are not like saran wrap, it's not that we just have saran wrap we have smart saran wrap. [*Alie laughs*] So, it actually has to respond to our environment, like if you get sun, you get a tan and that goes to protect you from the UV rays that you might have later. So, you know, it has a function. All of our tissues have function, and the skin is a protective barrier to our environment.

Alie: What's hair doing? Let's get to hair.

Valerie: Yeah, so hair is also a protective... We call it an appendage.

Alie: No.

Valerie: Yes.

Alie: Really?

Valerie: Yeah.

Alie: So, you have millions of appendages growing out of all of your body?

Valerie: Mm-hm.

Alie: That's disgusting. [*Valerie laughs*] I mean, I love it but it's disgusting.

Valerie: Yeah, so it grows from the same cells that make up our epidermis, the outer part of the skin during development, and some of those cells are told to be hair follicles so that's why we have hair in certain places.

Alie: And so, what is the evolutionary function of hair? Why do we have these long, flowing tresses on our scalp but other hairs give up at a certain length and they're like, "I'm out of here, I grew enough on your thigh, I'm jumping ship."

Valerie: So, I think the function of hair is warmth and I believe also that there's some sort of social selection probably for why we have hair in certain regions. It's not clear to me why we have hair only on our heads that is long whereas monkeys, our next closest ancestor, have it pretty much all over their whole body.

Alie: Oh my god, can you imagine if monkeys had ponytails? Can you imagine? [*both laugh*] If you saw a monkey with one of those ponytails that like, a dude who works on motorcycles would have, I'm having a moment.

Aside: Hold up, I looked into this and as Valerie will expound upon, the length of time in the anagen or growth stage determines how long a hair can get. And the reason why humans may have longer growth phases on head hair could be because we evolved with less body hair, so we needed the head hair for warmth and cooling, and protection from the Sun. Or... Or... Or, it could have evolved because styling is a form of looking good to a potential mate.

Alie: Monkeys have all over similar types of follicles?

Valerie: Correct.

Alie: Is it a different type of follicle that makes our head hair grow long?

Valerie: So, we do have different hair follicles. The thicker hair is different than the thin hair that we have like, on our forehead. But the reason it grows so long is something called the hair cycle. So, there's a growth cycle that all of your hair follicles go through and when it's growing, it can stay there for years, such as when they're on your head, or for a short time, like the small hairs that you have on your forehead.

Alie: So, a growth cycle. What's the typical growth cycle for a body hair?

Valerie: So, we don't actually know that much about how the hair cycles in humans, but we know that the hairs on your head can grow for years and years and years, and then eventually, the growth portion will die and regress and then it'll just sit there and rest.

Alie: Really? So, your hair is growing, growing, growing, and then at one point it's like [*gasps for air*].

Valerie: All done.

Alie: And it just sits there.

Valerie: All done, yup.

Alie: Doesn't grow.

Valerie: Yeah. And then there are stem cells that are at the base of the hair follicle that say, okay it's time to grow a new hair follicle. So, it'll grow a new hair follicle and then the old one gets ejected. [*ploink, ploink... ploinnnnnk*]

Alie: And then can you explain to me– I'm so sorry, I don't know why there's a parade of MAC trucks on my street right now. I'm going to close those windows, hold on. [*distant voice*] Literally, I'm like, "Is it garbage day? What is happening people?" I mean, my apartment is always loud but that is next level, you guys. [*Valerie laughs*] Come on!

Aside: Note, I paused the recording here to close the windows.

Alie: I am a little bit embarrassed that I just don't know this. what is a stem cell? I should know what this is, and I don't.

Valerie: So, stem cells are cells that are long-lived, and they have the ability to regenerate themselves as well as form or differentiate into a tissue-specific cell. So, we have stem cells in all of our tissues

and we start from a stem cell, the embryonic stem cell that can build every cell type in the body. But in adults, all of our tissues have stem cells that allow us to regenerate our tissues.

Alie: So, a stem cell is saying, "Okay, I'm here, I'm going to turn into a new hair follicle," and it starts morphing into a hair follicle.

Valerie: Correct.

Alie: So, do you do research on stem cells as well and like, their potential for therapeutic use?

Valerie: Yes.

Alie: Oh! How's that going? [*Valerie laughs*] Like in general, in life for all of us.

Valerie: So, it's going well I would say. I believe it's definitely going to be therapeutic in the future.

Alie: When I was a kid I remember, do you remember the *Guinness Book of World Records*? And there would be people like the longest nails and hair and stuff?

Valerie: Yeah.

Alie: I remember being like 7 and being like, "When I grow up I'm going to have the longest armpit hair in the world. [*Valerie laughs*] I'm never going to cut it." And then was very dismayed to learn that armpit hair is like...

Valerie: Doesn't grow that long.

Alie: Sorry dawg, I'm out.

Valerie: Yeah, it only has a short growth cycle, growth stage and then it stops growing.

Alie: And so, the hair on our heads, some of it is, we don't know, has stopped growing and is about to go buh-boink.

Valerie: Correct.

Alie: Now, is it different for different people? Why do some people have really thick hair? I have llama hair, which is presently unwashed and I'm sorry, I wanted to wash it before you guys got here and I just didn't.

Valerie: I can't tell.

Alie: it's a mess. Why do some people have thick hair? Some people have thinner hair. What's happening?

Valerie: So, you can have a different number of hair follicles.

Alie: Oh okay.

Valerie: You can have different-sized follicles. So, I think blondes tend to have thinner hair than brunettes that can have thicker hair follicles. And it's probably also the structure of the hair follicle which gives you what we call body.

Aside: Soooo, I did a little follow-up on this and blondes, your strands are thinner, at least they tend to be. But you do have more strands, like around 150,000 hairs while brunettes have around 100,000. Because part of hair's function is to make sure your scalp doesn't turn into sun bacon. So, if you have less bulky hairs with less protective melanin, you're going to have more of them. Now, if you have glossy rich dark hair, you're going to need fewer of them. So, no matter, your hair is like a big dead pile of tiny ropes, telling the Sun to find a different head to scorch.

Now, those curls, if your hair follicles are asymmetrical and oval-shaped, one side of the hair shaft might have thicker keratin and kind of like a gift wrap ribbon that curls when you shave down one side with scissors, Boing-oing-oing, you got springy coils. Now, straight hair is the result of a symmetrical, round follicle, that's whether you're a muskrat or a sheep, or your cousin, or whatever.

Valerie: So, we use mice for our research and there were some strains of mice that had wavy hair so we kind of know a few molecules that can induce curly hair because of those genetic studies.

Alie: And for you yourself, do you think about your work when you– Because you have lovely blonde hair...

Valerie: Oh, thank you.

Alie: Do you think about your hair when you're getting it cut or done?

Valerie: Yes.

Alie: Do you think about it like, structurally? Because my hair is a... If my hair could write a book it would be on *Oprah*, it would be a sad book. My hair is curly and gray and brown, and I straighten it and dye it red. What am I doing to it?

Valerie: It's okay.

Alie: You sure?

Valerie: Yeah. Because really, your hair shaft, that's the part that you see outside the hair follicle, is mostly protein and we call it dead because it's not really living cells that are reproducing themselves, it's just a fiber that's made into this rope-like structure that forms a hair follicle.

Aside: It's a dead appendage. You have over 5 million dead appendages growing out of your body. Can you handle that? We are such weird goofy monsters. [*"It's just beautiful."*]

Alie: So, is it almost like it's alive until it sprouts out of your skin? At which point it's dead? Because it's got to be alive somewhere in the bulb, right?

Valerie: Correct. So, there's this very crazy robust structure that makes the hair shaft that we see outside, it's seven different cell lineages form the hair follicle.

Alie: What? Okay, explain this.

Valerie: Yeah. So, at the base of the hair follicle, there are cells that are highly proliferative and they're dividing and making new ones, and those go up into seven different lineages and they sort of make these concentric circles. So, three of them go into making the hair shaft that you see outside and then three of them go to make this channel that guides the hair out of the skin's surface...

Alie: Woah!

Valerie: And then there's a couple more that sort of allow the regeneration and the stem cells to be maintained.

Alie: So, it's a real teamwork effort.

Valerie: Very much so.

Alie: Rapid fire round, you ready?

Valerie: I'm ready.

Alie: So many questions. So many questions. It's really... We'll just go through them as fast as we can.

Aside: But before we take questions from you, our beloved listeners, we're going to take a quick break for sponsors of the show. Sponsors? Why sponsors? You know what they do? they help us give money to different charities every week. So, if you want to know where *Ologies* gives their money, you can go to AlieWard.com and look for the tab "Ologies Gives Back," there are like 150 different charities that we've given to already with more every single week. So, if you need a place to go donate a little bit of money but you're not sure where to go, those are all picked by ologists who work in those fields and this ad break allows us to give a ton of money to them. So, thanks for listening, and thanks, sponsors.

[Ad Break]

Okay, your questions.

Alie: Zoe Teplick wants to know: I need to know, I swear I lose so much hair in the shower and through brushing and styling, but somehow I'm not bald yet. In fact, my hair is still thick. How is this?

Valerie: that's the hair cycle, the regenerative cycle. So, when you're losing hair it's just the normal process of growing a new hair follicle.

Alie: So, it's like, don't trip, it's already dead.

Valerie: Yes.

Alie: And it was chilling taking a nap anyway before it popped out of there.

Valerie: Correct. Right.

Alie: Okay. Some people just have more hair follicles per square millimeter or something right?

Valerie: Correct.

Alie: All right, good to know. So, you're fine Zoe. Brian Edge wants to know: Why do I occasionally get these really thick hairs in my beard? They're much darker than their comrades. What is happening?

Valerie: So again, it's the cells that are attaching to the hair follicle that are making it a different structure and then it's darker because there's more melanin, that product that's made by the melanocytes that's pumping in to make it darker.

Alie: I always think it's interesting how dudes' beards are sometimes like orange, but their face hair or head hair is brown.

Valerie: Yeah. So, during development, the cells that are going to make the pigment, they come from what's called the neural crest and they kind of migrate from the spine area into the different regions and so they populate the beard differently than the scalp.

Alie: What? Wow. So, red beards... I always wonder about that because I'm like, "It doesn't match at all." You know what I mean? This copper face carpet [*Valerie laughs*] and then what's happening, you know? [*suspiciously*] Interesting.

Aside: A little further poking around reveals that red beards are caused by a mutation on the MC1R gene so if you have two mutated genes, you're a ginger all the way but only one of them can cause red hair to pop up in weird places, like for example, your handsome face.

Alie: Mark Larsen wants to know: Can you get stem cells from hair? Like, can you harvest them?

Valerie: Yes, I can, I know how to.

Alie: Really? How do you do it?

Valerie: You take the skin, and you treat it with an enzyme that's going to basically break up all the bonds between the cells, and then we can use a machine that we call a flow sorter where we basically sort them out from the other cells.

Alie: Is there something about their weight or their size that makes them easier to sort?

Valerie: No, it's the proteins that they have on their surface so we can use that to our advantage to get them away from the other cells in the tissue.

Alie: Now, it's the proteins but not the carbohydrates, so this is now glycobiology-related?

Valerie: Well, we could use some carbohydrates if we knew but most often, we use specific proteins.

Alie: Okay. Amber and Jonathan Mead have a joint question: How does gray hair work? Why do some strands turn gray earlier than others? I feel like I've seen hair that's gray at the root but not the rest of the strand. I will say that my temples are very professorial, they're very George Clooney in the temple area. Why is that?

Valerie: So, like stem cells that grow the hair shaft, there are stem cells for the melanocytes that put the color in the hair and when those cells die, you have a gray hair.

Alie: Oh!

Valerie: What can cause that? Stress can cause those cells to die.

Alie: Nooo!

Valerie: Yup!

Alie: So, that's not a myth? I feel like they always show side-by-side of like, "Before they were President, After they were President."

Valerie: Yeah, stress. Exactly.

Alie: The gray hair is crazy. My grandma, completely gray by 30. She also had 11 children.

Valerie: Wow, yes. A little stress in there.

Alie: A little.

Valerie: A little bit.

Alie: Okay, so I didn't know that stress could do that.

Aside: BTW, when I was writing this, a friend happened to randomly text me to say she found a hair to say she found a hair that was white at the end and darker at the root and I was like, "Girl! I'm writing the Trichology episode," and she was like, "Whaaaat? No way!" Anyway, I looked it up and it's called stuttering and a hair can pick up pigment as it grows like "Oops, oops, here you go!"

Alie: I love that it's like our melanin cells are like, out to lunch. Eva wants to know: Do hair and nails grow at different rates? In your work researching the regeneration of skin and hair, are nails kind of part of the same bag?

Valerie: So, nails are also an appendage, and they have their own stem cells.

Alie: Wow.

Valerie: And we're just starting to learn about those. I don't study them but there's a woman in New York that I know that does.

Alie: Do they have different rates? Can your nails grow really fast, but your hair is like, bum-ba-dum-ba-dum? That's the international noise for slow.

Valerie: Yes, they definitely have different rates.

Alie: What's your favorite thing about what you do? What makes you super, super excited?

Valerie: Discovering new things about biology is awesome but I think also mentoring the students and watching them grow over the years is really amazing.

Alie: Aww, just seeing them grow their own hairy wings and fly. [*giggles*]

Valerie: Yes, they become little scientists, it's very cool.

Alie: This was amazing. Thank you so much for being on!

Valerie: Yeah, yeah!

So, you know what? Remember, feel free to ask smart people all the questions you want because they're super nice. To find out more about Dr. Valerie Horsley's work, you can visit Horsley.Yale.edu. now, *Ologies* is @Ologies on Twitter and Instagram, I'm @AlieWard on both. Also linked is AlieWard.com/Smologies which has dozens more kid-safe and shorter episodes that you can blaze through. Thank you, Mercedes Maitland of Maitland Audio for editing those. Since we like to keep things small around here, the rest of the credits are in the show notes.

And if you stick around until the end of the episode, I give you a piece of my worldly Wardly advice. And this one is sometimes, if you are getting up in the morning and you're having a sluggish morning and you're like, "Oh gosh, we got a whole day ahead of us," maybe you're brushing your teeth, maybe you're having oatmeal, maybe you're on the bus, I don't know, it helps me to think of things that went right the day before. So, if I ever feel intimidated by something I think, "Hey, that went a lot better yesterday than I thought it was going to do. Hey, that went right. Hey, that went right." And it always gives me a little pep in my step, in terms of you don't know how today is going to turn out, chances are there's going to be a lot of things that go right so get right into it. All right, berbye.

Transcribed by Aveline Malek at TheWordary.com

Links to things we discussed:

Follow Dr. Valerie Horsely on Google Scholar and X

Visit The Horsely Lab at Yale

Full-length (*not* G-rated) Trichology episode + tons of science links

More kid-friendly Smologies episodes!

Sponsors of Ologies

Transcripts and bleeped episodes

Become a patron of Ologies for as little as a buck a month

OlogiesMerch.com has hats, shirts, hoodies, totes!

Follow @Ologies on Twitter and Instagram

Follow @AlieWard on Twitter and Instagram

Sound editing by Steven Ray Morris and Mercedes Maitland of Maitland Audio

Smologies theme song by Harold Malcolm