Field Trip: An Airport Full of Neuroscientists
Ologies Podcast
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Oh hi, it's that lady with a microphone walking around your airport terminal, quite literally, I'm Alie Ward. This is *Ologies*. This is a weird one, and I love it. So, if this is your first-ever episode of *Ologies*, please know this one breaks the format quite a bit. Instead of me hunting down some perfect ologist for some niche topic for a one-on-one interview in a studio, I recorded half this episode while I was waiting for a flight from San Diego to Portland for my other job; I'm a science correspondent for this CBS show called *Innovation Nation*.

So, I get to the airport, I see a lot of passengers at TSA and their gates, and they're holding these long, cardboard tubes [*through a tube:* "*Durdurdurdurdurdur"*] and I stopped one of them and I asked if they were all going to, like, an architecture convention or if they were comic book artists. And she told me there was a neuroscience convention in town and everyone carrying a cardboard tube was a neuroscientist headed home, carrying their large rolled-up research poster that they'd just presented. So, there's hundreds of neuroscientists everywhere I looked. It was like spring break but for nerds and I loved it. People who study food cravings, and addiction, and dopamine, and motivation, and consciousness, just low-key geniuses everywhere I looked, and I had 90 minutes until my flight.

And so, I did what anyone would do, and I got out an old purse full of professional recording equipment and I repressed *all* of my dignity and social anxiety and I asked strangers to talk to me. And I should note, earlier that day I'd been in San Diego shooting a story about ice baths and so, my morning began with, like, sheer terror and discomfort and I think it gave me like a "Well, fuck. Might as well," kind of moxie that this episode required. So, the first minute or two as I'm walking around has muffley audio; stick with the journey, it improves greatly as soon as people start talking into microphones.

Also, super quick, thank you to everyone supporting at Patreon.com/Ologies for as little as a dollar a month. Thank you to everyone who rates, and subscribes, and also reviews. I read all of them, including one that was left by ChrisWaylett who said:

> *I have been stung by bees 12 times today. Hey Alie! I started listening to Ologies at the beginning of last year. Your melittology and entomology episodes inspired me to pursue my passions and I'm now assisting with honeybee ecology research. I'm on a fieldwork trip in California and I've been stung by LOTS of bees today. Thanks for inspiring me and keep on ology-ing.*

Chris... I'm glad you're there.

Okay, tray tables up, sit back, and enjoy information on why people are buying black market Ozempic, cocaine relapses, water filters, mammalian monogamy, some stats on cocktails, how to be a good mom, why sleep deprivation sucks, vaping with rats, and why asking smart strangers unsmart questions can make a layover just fly by with this special Field Trip: Neuroscientist Airport Ambush.

Alie: Here's what we're doing, we're already rolling. If they say yes, then we're in. [*airport announcements ongoing in background*] Wish me luck... [*muffled*] I was wondering if I could ask you just a couple questions about what your poster is about.

Aside: This person was like, "Uhhhm, no comment please."

Alie: Are you allowed to talk about any of your work? [*muffled response, "Not particularly."*] Not yet. Oh, that's cool.

Aside: So yeah, no, the research is top secret and also just, like, no. So, I'm zero for one right now. It feels great. So sweaty. 100% making a scene in a very crowded San Diego Airport terminal. It's fine.

Alie: Can I ask you a question? Do you listen to podcasts at all?

Speaker 1: I do.

Alie: Have you heard of one called *Ologies*?

Speaker 1: Yes.

Alie: It's a different ology per episode. [*loud ambient noise*]

Speaker 1: Yes.

Alie: Okay. So, I hosted it.

Speaker 1: Do you really? Oh my god!

Alie: Yeah! And I was wondering if you have, like, two minutes to tell me what you do.

Speaker 1: Yeah, absolutely!

Aside: Hallelujah, all right. Let's get officially started with this episode and better audio.

Georgia: My name is Georgia Kirkpatrick and I use she/her pronouns.

Alie: Mm-hm. And MS, PhD, undergrad?

Georgia: I'm 6 months out from my PhD.

Alie: Oh my gosh, congratulations! What do you study?

Georgia: So, I study the reward system in the context of drugs of abuse and highly palatable foods.

Alie: Wow!

Georgia: Yeah, it's fun.

Alie: Is this the dopamine center, or what is the reward system called in our brains?

Georgia: Yeah, so I study the dopamine system circuitry, so I look at the prefrontal cortex specifically.

Aside: So, the prefrontal cortex, side note, it's that bulge right at the front of your brain. You know how U-Haul trucks have the attic space at the top? You can shove more blankets and stuff? That's the part of your brain we're talking about. It's that wrinkly hump behind your eyes and according to the paper, "Stress signaling pathways that impair prefrontal cortex structure and function," this brilliant Jell-O intelligently regulates our thoughts, and actions, and emotions. And according to British psychologist and an expert on memory, Alan Baddeley, your prefrontal cortex is like a mental sketchpad, he called it. We call it working memory. So, it's the PFC, you can abbreviate that because you've got one. It also makes sure that we're paying attention and that we just generally don't fuck things up.

So, what if you're, what we call, neuro-spicy? You might be wondering, "What if my brain juices make life hard?" So, according to the 2019 paper published in the journal *Cell*, "Dopamine and

Cognitive Control in the Prefrontal Cortex," they say, "Dopamine enables successful cognitive control in the prefrontal cortex." Cognitive control? I don't even know her. What is that? Cognitive control is, "The ability to orchestrate behavior and accord with our goals." Cognitive control is called getting shit done.

And to learn more about this and why this episode is coming out a day later than I wanted because of my own brain, you can see the three-part episode we did in 2022 on ADHD with Dr. Russell Barkley. I'm going to link it in the show notes, so you don't have to scrawl this on your mental sketchpad. But on the topic of impulsivity, and goals, and "why am I like this?"…

Alie: I was just at lunch talking about whether or not we get addicted to sugar or if we just really like it.

Georgia: Yeah, so that's a huge debate in the field, actually, because when you're trying to apply addiction specifications from the DSM-5, food doesn't necessarily meet all of them because you have to have food to survive. There's a difference between liking and wanting, for sure, and we do kind of crave sugar in similar ways that we crave drugs of abuse and so, we do see some of those same effects that happen to the brain. But that could just be increasing seeking behavior so that we go out and get those highly caloric foods that our brains just haven't figured out how to deal with in a really calorically dense environment.

Alie: Yeah, I mean it's so much easier to eat some Sour Patch Kids than it is to pick 20 tangerines.

Georgia: Exactly, I literally just ate Swedish Fish because I couldn't find food I could eat. [*both laugh*]

Alie: I've done that so many times! Are you allowed to say what your poster is about or is it not out yet?

Georgia: Yeah, so it's unpublished data but I can definitely talk about it. This poster is actually about junk food diet, so looking at high fat, high sugar. I study a structure called a perineuronal net that's kind of involved in, when they're altered, they help drive seeking behavior, so that we want to go out and get those foods.

Aside: Okay trust me, if our flights weren't about to board, I would have asked her to unroll this poster and read it to me like a bedtime story. But rather, you can read up on Georgia's research via her April 2022 published paper, "Acute high-intensity interval exercise attenuates incubation of craving for foods high in fat." And if you're driving through North Dakota right now and you're like, "I cannot pore through a journal article," I'm going to give you just a couple of the highlights which include that the goal of the study was to determine whether or not forced exercise can knock down high-fat food craving.

The results suggest that high-intensity exercise can prevent craving foods high in fat and it can also reduce maladaptive food-seeking behaviors that contribute to overeating. So, huh, how about that? Hmm. My stopping jogging, and my never going outside, and also eating an entire net full of those Babybel cheeses for dinner, could all be related y'all. Ahh! I'll say if you're feeling right now personally attacked by me, like I am, try to think of what activities make you happy while you do them, whether it's running around and chasing a frisbee, or belly dancing, or climbing a hill, pole dancing in a garage, wind sprints to classical music, I don't know. Find something you love and try to do it.

Alie: Oh my god, and do you have a Twitter? An Instagram?

Georgia: Yes, my Instagram is @TheBellyDancingNeuroscientist. [*laughs*]

Alie: Amazing! What a niche! [*Georgia laughs*] Oh my gosh, fantastic!

Georgia: I am on Twitter @GeorgiaKirkpat9.

Alie: Love it! Oh my gosh, thank you for doing this!

Georgia: Thank you!

Alie: You're the first person who said yes but I've only... [*third person in background, "I'm so glad you came up. It was such an honor to meet you."*] [*Alie chimes in:*] She's a neuroscientist who studies the reward center of the brain! [*squeals*] I know, it's so exciting.

[to Isabella:] Do you want to talk about what you're studying at all on a podcast? You don't have to.

Isabella: It's just… I'm a very small part of it. Hi, I'm Isabella Montano and I use she/her pronouns.

Alie: Amazing. And now, you are a cognitive neuroscience student?

Isabella: Yes. I'm an undergraduate student. It's my second year at Reed College and I did some cognitive neuroscience research this past summer.

Alie: And what brought you to the Society for Neuroscience festival? [*Isabella laughs*] I know it's a conference, but I want to call it a festival.

Isabella: The principal investigator of our study, there's four of us that are part of it, Lucy, Angelica, and Avanthi, we decided to just come and present what we have. It's very, very preliminary but it's all on consciousness, and it's really cool, and I'm so excited to share it! It's unpublished data; we were the ones to start this project. We have three different paradigms; we hook people up to EEG and we have them complete certain tasks, and we eventually want to look at the data from all three different paradigms and see where those differences are because we think that consciousness may be somewhere there. [*laughs*]

Alie: What are the three different paradigms?

Isabelle: There's inattentional blindness, backwards masking, and dichoptic color fusion. [*"Tell me more."*] It's hard to explain, but it's like, a participant comes in and looks at a monitor that has these three different paradigms. So, for inattentional blindness, the participant is told to complete a specific task but then there are images of faces and houses flashing and sometimes participants don't notice the faces and houses because they're so focused on the task. And we believe consciousness may be somewhere there. So, it's pretty cool. [*laughs*]

Alie: I mean, that's amazing. How do you even define consciousness [*Isabella laughs*] or is that kind of a willy-nilly description as we learn more?

Isabelle: It's... Yeah, there's definitely no one definition. It's funny because during the conference people would come up and be like, "So what is consciousness?" And we're like, "We have no idea." There are people that write so many books on this, they write articles and everything, and it's just… we don't know. I guess we're trying to figure out the biological basis of it.

Alie: Oh my gosh.

Isabelle: My personal Instagram is @IsabellaMontana_NothingFancy.

Alie: Thank you so much for letting me come up to you in an airport like a weirdo!

Isabelle: Yeah!

Speaker 2: The gentleman that's sitting there, he's also a neuroscientist.

Alie: Oh, he is. Do you think he'd mind if I ask him?

Speaker 2: He might. He's also a PhD candidate.

Alie: Oh sweet!

Speaker 2: He most likely will be probably open to it.

Alie: I'll go slide... [*slurs a few words*] [*sings*] Wish me luck!

Aside: I'm just cruising around this crowded airport wearing a mask, carrying a mic, just a normal day for a person who will do anything to interact with a living scientist.

Alie: Excuse me, hello. I saw all these people with tubes, and I was wondering if I could ask you a couple of questions about your work.

Pique: Sure. Hi, my name is Pique Choi, my pronoun is he/him.

Alie: So, are you allowed to talk about your PhD research? I understand you're defending soon.

Pique: Oh yes. Yes, I study how the catecholamine neurons in the ventrolateral medulla modulates feeding behavior by its projection to the lateral hypothalamus.

Aside: Literally, what does that even mean?

Pique: Yeah sure, so whether you are exercising on an empty stomach, so your blood glucose level drops in an extreme fashion, or you're a diabetic patient who gave yourself a higher dose of insulin so that your blood glucose drops extremely, your brain has the ability to detect it and make your body go search for food to replenish your energy. And the neurocircuitry of that function is what I study. I believe in humans and rats, if you go under anywhere between 70 to 60, your brain can detect the low blood glucose and you will feel hungry and want to go get food.

Aside: So, according to the 2018 paper, "Activation of catecholamine neurons in the ventral medulla reduces CCK-induced hypophagia and c-Fos activation in dorsal medullary catecholamine neurons," which was co-authored by the late Dr. Sue Ritter, whose lab Pique works in, "Catecholamine neurons within the A1 and C1 cell groups in the ventrolateral medulla potently increase food intake when activated by glucose deficit." So, allow me to translate if you are one of us who was not carrying a poster tube in this airport.

So, two parts of the brain kind of work in opposition promoting hunger and satiety, and when your glucose is low, between 80 to 100, or you're fasting, or even lower, the hunger chunk area of the brain blocks the, "Nah, I'm good" apparatus so that you don't accidentally stop feeding before your blood glucose gets up. So, low blood sugar can cause you to keep eating after you have to. And for more on insulin and how that works, you can see the excellent Diabetology two-parter with the superb Dr. Mike Natter for more on that. I'll link it in the show notes.

But what if you could press a button and just end your cravings? Some people are doing that, but instead of a button, it's a syringe. And if you've been hearing the term Ozempic bandied about, it's a medication that's working really great for folks with diabetes. And Pique tweeted about it yesterday and said:

> *Should I be excited that if I ever run into a Hollywood actress we can talk about GLP-1 receptors, or should I be worried that this will have a huge impact on rich people's relationship to food and the diabetes patients who actually need the drug?*

So, first off, I had to look up GLP-1. And a GLP-1 is a glucagon-like peptide and those are hormones in your gut that have a really powerful effect on insulin, and blood glucose, and how fast your stomach empties, and your food intake, how hungry you are. And GLP-1s can

suppress food intake because of how they enhance your insulin signaling. Okay, but what if your appetite varies... by circumstances?

Alie: Does anyone know why we get the munchies when we get high?

Pique: [*laughs*] I do not know; I think it depends on what you're smoking.

Alie: Oh man. I gotta tell you, it's like I'm a locust. [*Pique laughs*] If I get high, I'm like, [*desperate tone*] "What else do we have to eat?" I don't know why it happens.

Aside: I was like fine, this poor stranger doesn't want to talk to me about it, I'm just going to look it up later. And I found the 2019 paper, "Vapor Cannabis Exposure Promotes Genetic Plasticity in the Rat Hypothalamus," which was published in the journal *Nature.* In it, some scientists describe how they made these clear compartments, and they popped a rat in there and hotboxed it, and then offered the rats some tantalizing snackies in the form of chocolate-flavored Ensure. And they found that the vaporized cannabis turned on signals including the hormone ghrelin, in amounts comparable to humans who had been fasting for many hours leading to "Hedonic feeding behavior" AKA the munchies. So yes, scientist is like, "Weed does make you hungry."

For more on rats though and their snack preferences, and yes, they have them, you can see the Urban Rodentology episode we did, and I'll link it in the show notes. We also talk about how sewer rats in New York like different food depending on the local restaurants on their block, which is precious.

Also, when I looked at the university associated with the hot box rodent study, it was in Washington in the city of Pullman, and I was like, "Wait. Did Pique go there?" And guess what? Pique was one of the co-authors on the paper about getting rats high... He was! I was in the presence of greatness, and he knows more than he lets on, and I love him for that.

Alie: When do you defend?

Pique: I'm aiming for early next year.

Alie: Oh my gosh, [*sings*] Dr. Choi! [*Pique laughs*] Are you going to change your handles on all your social media to "Dr" as soon as you defend? Please say yes.

Pique: Yes, probably. [*chuckle*]

Alie: I'm going to call you Dr. Choi.

Aside: Also, PS, I checked Dr. Choi's Twitter bio...

Pique: @PiqueChoi.

Aside: And it still says PhD candidate, but he'll be Dr. Choi in probably like 5 minutes, so I'm sticking with it.

Okay, so I passed by Georgia on my way to the next gate over where I saw some people in the distance holding cardboard tubes, they were everywhere, we also call cardboard tubes 'durdurs' if you listened to the Vampirology episode, Part 2. But this little gaggle of people were staring at me from afar. Were they laughing? I don't care.

Alie: Hi. I understand there's some nerds over here. [*excited agreement from several voices*] Yes, I knew it, I could tell by the posters! So, I host this podcast, it's called *Ologies*.

Marissa: Are you Alie Ward??

Alie: I'm Alie Ward.

Marissa: Oh my god!

Alie: Oh my god, are you a neuroscientist? Can I talk to you?

Marissa: Sure!

Alie: [*grunts*] Yes! This is– I've never been so sweaty in public because I'm creeping up like a goblin being like, "Talk to me about your poster."

Speaker 4: Portland, area neuro gang. We're all going to Portland.

Alie: Oh my god, you guys are going to be on my flight. It's going to be so awkward if we're sitting next to each other but that's okay. I have a middle seat.

Marissa: Hi, I'm Marissa, Marissa Co and she/her.

Alie: Is this your poster?

Marissa: Yeah, it's in here. So, I'm studying a transcription factor, which is a protein that influences gene expression in the brain during development. I've always just been interested in how brains are built using genes because, you know, all the cells in your body have the same repertoire of genes but those are used in different ways in different cells. So, I want to know what particular genes are involved in brain development.

Alie: Do you study models? Do you study humans? Do you study rats?

Marissa: I study mice.

Alie: Mice!

Marissa: Yes.

Alie: I mean, get real with me. I understand, you're a neuroscientist, you're working with mice. Sometimes you've got to go through a lot of generations of mice, right?

Marissa: Mm-hm, yeah. For sure.

Alie: How long do you have your mice? And do you ever fall in love with the mice and you're like, "I'm so sorry"?

Marissa: I mean, I do feel for them. But we go through so many mice and at some point, you just think about the broader implications of your research and hope for the best.

Alie: It happens. I mean, everyone's out here eating chicken sandwiches.

Aside: So, just a personal side note – and when are they not – but my goal is to be more vegetarian, or even vegan. So, that's an intention I'm stating publicly. Moving on.

Alie: And then what is the title of your poster?

Marissa: Oh, umm. What *was* my title? "Uncovering genotype-phenotype relationships across the TBR1 allelic spectrum."

Alie: Oh, what a banger. Is there anything when you were doing the research that you were like, "Oh my god. Holy shit, I figured this thing out."?

Marissa: Hmm, sort of. It's preliminary so I try not to get my hopes too high, but it is exciting to see something in the microscope that you weren't expecting for the first time. That's really exciting in science. I look at mouse brain sections, and you know, you stain for different protein markers of different cells, and I stained for one marker, and it was just something I wasn't

expecting at all in the mouse brain, and I was like, "Woah, this is very unexpected." And I don't know how to explain it still, but it's cool.

Alie: When that happens, do you run out into the hallway and you're like, "I've got to tell somebody about this!"

Marissa: Yeah sometimes, if someone's around to hear it.

Alie: Anywhere people can follow you to learn more about what you do?

Marissa: Yeah, I'm on Twitter @MarissaCoconut.

Alie: Any advice for aspiring neuroscientists?

Marissa: Just stick with it, find a life outside of the lab. [*laughs*]

Alie: Do you have a hobby that's saved your brain when you were working on brains?

Marissa: Oh gosh. I picked up knitting during the pandemic and I also like indoor rock climbing, like 90% of neuroscientists.

Alie: Why do so many neuroscientists rock climb? I didn't expect to get this out of accosting neuroscientists at an airport.

Marissa: I think it's the puzzle aspect of it. There's a lot of thinking involved in solving the routes, [*Alie sighs*] so I think that appeals to a lot of scientists.

Alie: Oh my god, you heard it here first. This was amazing, thank you so much, Doctor.

This is by far the weirdest *Ologies* interview I've ever done.

I'm going to look for somebody with a poster... Oh, someone told me to come to his, I think, roommate over there. Okay, this is like trick-or-treating for me. This is very exciting. [*laughs*] [*more airport announcements*]

Aside: Okay, so my flight was boarding, that background baby was still crying, but I cried that day. I cried today, it's okay to have emotions. But I'm not giving up yet.

Alie: I might talk to one more person with a poster. They can't leave without me.

Aside: Well, they can, and they have. But I was the B boarding group, so I had a few minutes before I stood in line on the jetway to get to my middle seat, after a long day of sitting in 36-degree water, for money. So, I talked to a guy who was familiar with this show, and he was holding a tube.

Noah: Noah Millman, he/him.

Alie: Are you allowed to talk about what's on your poster?

Noah: I think so maybe. [*Alie giggles*] Hopefully.

Alie: So, you're a neuroscientist, correct?

Noah: In training, yes.

Alie: If you're studying it, you're an ologist; thems the rules. What factor in neuroscience do you study?

Noah: Development.

Alie: Ooh, what kind?

Noah: Sleep and its role in social behavior.

Alie: Oh, shut the fuck up. Give me the TLDR.

Noah: TLDR is if you disrupt sleep in a specific period of development in prairie voles, the males do not form pair bonds in adulthood.

Alie: [*gasps*] No! How young in development?

Noah: Second postnatal week of life to the third postnatal week of life.

Alie: And are you talking like, rousing them in the middle of their sleep?

Noah: It's a cage-shaking apparatus that just disrupts REM sleep.

Alie: Now, does that factor into oxytocin?

Noah: Prairie voles have been used in the study of oxytocin, but this current study is not specifically targeting or quantifying that.

Aside: So, a prairie vole, side note, is this round, furry little rodent and it looks like a hamster. And the species has been studied a bunch for its long-term monogamous mating behaviors because so many humans just want the kind of love that only these grassland rats have. Why don't sleepy ones settle down and start a family? Their aunts want to know.

Noah: It's possible that they're missing out on normal sleep in development, which is very– the level of REM sleep is normally high there. And we don't quite know the mechanism, but we think that REM is necessary for social behavior. Still working on the specifics.

Alie: Are they dicks too? Or are they just, like, uninterested?

Noah: Well, they... I can't say they're dicks.

Alie: I know, no one can. [*"My bad."*]

Noah: They don't prefer their partner or a stranger whereas the control animals do spend a lot of time with a partner, and they are monogamous. Yeah, I can't comment on the previous description.

Alie: We can't make character judgments on a prairie vole. Do you sleep any differently now that you're studying this?

Noah: Sleep is important and I do have a pretty solid sleep hygiene going.

Alie: Good for you!

Noah: I don't know if it's related to prairie voles though.

Alie: But just in general, being a neuroscientist, I feel like you can't skimp on the sleep, you know that about the brain, right?

Noah: Yes, totally. It's really important for quality of life, and my emotions, and my emotional regulation. So, I can see the feedback. I haven't slept in 8 days so...

Alie: Whyyyy? [*laughs in background*]

Noah: We've been at this conference grind, and you have to pack all your social interactions in with all these people. [*to third person*:] You do, it's required.

Alie: I just started sleeping recently and it's great.

Noah: What changed your mind to sleep?

Alie: I said "Fuck this, I'm sick of running myself ragged because of the hustle culture."

Noah: Hustle culture is bad.

Alie: It's so bad! And it tells you that if you're sleeping, you're not working hard enough and that's just garbage. So, it was an act of rebellion. And it's free, I love that about it.

Noah: Yes.

Alie: And I've felt a lot better and I'm less of a dick. It's great.

Noah: How much do you sleep?

Alie: Lately? Like 9 or 10 hours sometimes if I feel like it.

Noah: Wow.

Alie: I have years to catch up so I'm doing it.

Noah: That's amazing.

Alie: I'm like, "No one can stop me other than obligations and an alarm clock." So, thank you for your work in sleep hygiene because it's *important*, very important. What about, Noah, anywhere people can follow you or follow your work?

Noah: I am a graduate student in behavioral neuroscience at OHSU. It's a really cool program, everyone's really lovely. And if you want to look into it, you can look it up on Google.

Alie: Love it.

Aside: How did this guy just end up getting an interview out of me? We'll never know. But I did need answers about why he was wearing a hat embroidered with a chaotic-looking dill pickle.

Noah: Portland pickles.

Alie: Portland pickles. Go pickles.

Noah: Go pickles.

Alie: Get sleep. Go pickles.

Noah: Get sleep. Go pickles.

Alie: I'm getting a tattoo...

[*to Chancey:*] Hi, do you want to talk about neuroscience?

Chancey: Sure, I'll try.

Alie: Yeees!

Chancey: My name is Chancey Garrett, he/him.

Alie: What kind of neuroscience do you do?

Chancey: I do alcoholism research, basically, and a plethora of other things. But mainly my lab focuses on alcoholism, and treatments, and genetics, and behavior, and all that stuff. I work at the Oregon National Primate Research Center in Portland, Oregon, part of OHSU, and I'm a research assistant under the lab of Verginia Cuzon-Carlson.

Aside: So, this lab is the largest national primate center; it houses around 5,000 monkeys and about 2,000 at any given time are involved in medical and scientific research. And Chancey works in husbandry, taking care of the breeding populations. And the lab he's involved with

published the 2021 paper, "Synaptic effects of IL-1β and CRF in the central amygdala after protracted alcohol abstinence in male rhesus macaques."

And I know it's grim to consider research on animals, especially primates. And it's also grim to learn that just in the US, more than 140,000 people each year die from excessive alcohol use. It's the third-leading cause of death, the first being tobacco use and the second being poor diet and physical inactivity combined. So, smokes, snacks, sitting, and booze, all this delicious chilling, in excess, can come at a cost.

Alie: I'm sure that people ask you this a lot, but has it changed the way that you look at the use of alcohol at all?

Chancey: Ooh. Not necessarily. I think, like, people that have told me that have a lot more experience in life than me, that alcoholism is a problem and you or others around you think that it's a problem, or you have behaviors that tend to have detrimental effects to your well-being in life. And I think people do have this issue. On my poster, I have that 140,000 or more people a year die because of excessive alcohol use, and it's a major issue that really needs money and focus.

Alie: Yeah, but I'm sure the money is not going to come from any of the alcohol companies.

Chancey: [*laughs*] No.

Alie: For sure. Is it true that alcohol anesthetizes the brain starting at the frontal lobe? Or was that something that they told us in 9th grade?

Chancey: It definitely– So, I'm not an expert at this, I will say, but I do know that it generally, throughout the whole brain, it increases your GABA input into your neurons, so it kind of slows down the processing, generally, and has a major effect in the cerebellum. So, that's why you tend to wobble and stagger when you walk.

Alie: Do your friends introduce you as a neuroscientist?

Chancey: Sometimes, yeah.

Alie: Do people ever try to make you do things because you're a neuroscientist? Like, "Hey, *you* figure out how the remote works. You're a neuroscientist!"

Chancey: If anybody, I'd say my mom. I think I have made her proud in life and she thinks that I can handle a lot, but that's not always the case. Especially with remotes. [*laughs*]

Alie: Oh, come on, remotes are hard. Do you want to give a shoutout to your mom?

Chancey: Yeah, my mom is Marnie Stuart. She lives in Missoula, Montana; she's the best mom in the world.

Alie: Aww.

Aside: So, I got on the flight, but when I de-planed my extraordinary friend and colleague and *Innovation Nation* producer, Stephanie Himango, had nabbed me another subject. Her seat neighbor happened to be Dr. Barbara Sorg, a senior scientist and a chair of neuroscience at Portland's Legacy Research Institute. She very casually studies coke-addicted rats or "agents in the prefrontal cortex to disrupt consolidation of the memories associated with cocaine, thereby suppressing drug-seeking behavior and relapse."

Alie: And when you say addiction is kind of, coded in memories, how much of addiction is biological and how much is chemical?

Barbara: I would say all of it is chemical because that's all the same. It's all driven by chemistry.

Alie: Can you reroute your brain?

Barbara: We hope so. That's my hope, is that you can reroute it and that's what some of the news that you hear about psychedelics, they might be able to somehow rewire your brain. We're doing a little bit of work with that right now, but we are hoping that that is something we'd learn how to do, for the benefit of the individual.

Alie: Is there a part of the brain that houses more memories that are related to addiction, or no?

Barbara: That's a good question. It's probably housed in many parts of the brain, kind of distributed, processing. But the hippocampus is really important; the prefrontal cortex you hear about is important for decision making and executive function. So, those are some key areas.

Alie: What about a predisposition toward addiction? Are some people just because of their neurobiology predisposed, you think?

Barbara: Yeah, I do.

Alie: How many years have you been in this field?

Barbara: Oh... 25. A long time.

Alie: A long time.

Barbara: A long time.

Alie: Has it changed a lot with recent technologies? Have you seen...

Barbara: I see it changing a lot, yeah. Part of this meeting is trying to catch up with the latest technologies, and what's doable, and you know, some of those technologies are how you take this from an animal where you can surgerize in their brain, but you can't do that in humans. So, how do you get those treatments to get into the brain? Which turns out to be pretty tricky. So, the techniques are driving the field.

Alie: That's interesting that psychedelics are a place where people might be looking. I know that there's a fraught history with it in terms of the research being stopped kind of too soon.

Aside: Okay, so this aside would be hours long if I tried to cover it all, but the fun parts are, in the 1940s, a Swiss chemist accidentally tripped so many balls after absorbing synthesized LSD that he created. Then, a few days later, he went on a very intentional trip to be like, "What have I created? What was that?"

Organization then a decade later in the '50s, this groundbreaking story in *Life* magazine exposed the whole world to the wonders of Indigenous psychedelic medicine in Mexico. Then around the same time, the mid-1950s, the co-founder of Alcoholics Anonymous experimented with LSD and he was a big proponent of the use of psychedelics to help people suffering from alcohol use disorder.

And so, psychedelics started being considered for all kinds of ailments but then fast forward to people like tuning in, turning on, dropping out from things like the Vietnam War. And let's just say, Richard Nixon once called Timothy Leary the most dangerous man in America. But today is not the olden days.

Barbara: Some of that research was done 50 years ago and they just kind of pushed it under the carpet, and rolling it all back out now is really great. I'd love to see this because things that work for people... I mean, we don't have a lot of solutions right now. So, I say keep going. With caution, of course, and I don't always see that.

Speaker 5: We invited you guys to our house, but we understand you're only hanging out for the day, so…

Speaker 6: We had so much fun meeting you.

Alie: Oh my gosh, are you kidding? Rain check.

Aside: But first we'll give to a worthy cause. This week's recipient is the Society for Neuroscience at SFN.org, who organized the conference that brought me in contact with so many ologists in one giant airport terminal. Donations to SFN boost efforts to build a more inclusive and global neuroscience community. They help with educational and training initiatives, and they enabled 272 neuroscience trainees to travel to this conference in 2022 to present at the dedicated poster session and to meet more neuroscience professionals there. So, the donation also helped support public neuroscience outreach via BrainFacts.org. So, thank you sponsors for making that donation possible.

[*Ad Break*]

Okay, so I landed home and then I got a Twitter DM from someone who wished she was there in the airport. So, after learning a little bit about her field I said, let's hop on the horn and chat. Boy howdy!

She's a PhD candidate studying toxicant exposures and neurodevelopmental outcomes, so poisons and what they do to our brains, at the University of Rochester Medical Center. So, meet Elizabeth Plunk, she/her.

Alie: Were you in the airport at the same time as me?

Elizabeth: No. But my flight was the next day, and I was just like, "There's no way she's flying two days in a row! I've missed my opportunity."

Alie: Not at all, as it turns out! How many posters were on your flight? Do you remember? Was it a lot?

Elizabeth: There were a lot. I don't know how many but there were some, yeah. [*laughs*]

Alie: Someone was saying that because it's so hard to fly with posters they just need to do them digitally, but as someone who likes to spot scientists in the wild, I'm like… that poster tube is clutch. I'd never encountered so many.

Elizabeth: People are doing alternatives. You can get your poster printed on cloth so you can fold it up and put it in your luggage. I mean, there's pros and cons to every option. You have to turn that poster in like three weeks before and a lot of times we're not ready to turn them in three weeks before. [*both laugh*] I don't know. I guess maybe it's going to be old-fashioned, but I really like the rolled-up poster, putting it up, having the gloss on it. I love it. [*laughs*]

Alie: What was your poster about?

Elizabeth: So, I'm a toxicology student in a neuroscience lab. So, my poster was on a short-chain PFAS chemical and how it affects brain development, but specifically the cerebellum.

Alie: And can you explain, what is a PFAS?

Elizabeth: I would love to explain. So, PFAS stands for per- and polyfluoroalkyl substances. [*"This is Pauly."*] So, it is a class of chemicals. The per- and polyfluoroalkyl means that there's a carbon chain and it has fluorines all on it, and then at the very end there's some other kind of chemical group. And then substances. There's over 9,000 of them, they've been around since the 1940s. And because they have the carbon and the fluorines in them, they don't degrade; our bodies don't break them down, the environment doesn't break them down. So, they're also called

'forever chemicals' because the ones that have been created are still with us and they're continuing to be created and continuing to still be with us.

Aside: We just happened to cover this in last week's Environmental Toxicology episode which is about forever chemicals and all sorts of stuff as well as a ton of info about the Ohio train derailment. Oh, and...

Alie: You know, we had on a discard anthropologist on to talk about garbage, Dr. Robin Nagle, and she mentioned that pretty much any living creature has traces of forever chemicals. Are we finding that's true? Even if they don't even have a cerebellum?

Elizabeth: Yes, because it's able to get to the brain, it's able to be in the serum, it binds to a protein that's in your blood. There's over 9,000 of them and I'm only studying one of them. And one of the papers that kind of drove that decision was scientists had polar bears that had naturally died, and they were looking at the brains and blood, and these polar bears had them in their brain and their blood. [*Alie sighs*] And so, they're traveling through the water, they're very mobile in the water and the soil. So groups of people, of plants, of animals have been touched by it.

Aside: And for more on this, you can see the 2019 paper, "Levels and trends of poly- and perfluoroalkyl substances in the Arctic environment," in a delightfully named journal, *Emerging Contaminants*.

Also, if you haven't listened to the Ursinology episodes about bears, one thing you would have learned is that 'Arctic' means 'bear' so in the Arctic Circle, they got polar bears. Antarctic means 'no bears here': no bears in the Antarctic. But no matter where the bear, they have forever chemicals. So, we all have that in common on planet Earth.

Alie: Do we have any idea what they're doing to our bodies?

Elizabeth: Yes. We do know. So again, there's over 9,000 of them and they haven't all been studied. So, I'm studying one that has never been studied in neurodevelopment. So I will learn, and we will learn, what it is doing to the brain. But we know that the ones that have been more popular in industrial uses, it has been associated with all sorts of cancers, with thyroid disease, with autism spectrum disorder, ADHD; so a lot of organs are affected. They've also been shown to weaken our immune system. There's been studies looking at levels of these chemicals in your blood and your response to COVID. So, we know that they are weakening our immune system. But there's over 9,000 of them and we can't study every single one of them.

Alie: Where does the one that you study come from? Or where do most of them?

Elizabeth: Why they are used and why they were created was originally for industrial reasons. If you've heard of Teflon, the nonstick pans, that's what the pans are coated with to make them nonstick. I always joke with my friends, [*giggling*] "What do guitar strings, tampons, pizza boxes, and waterproof mascara have in common?" And it's, they have PFAS in them.

So, because of the two, the chemical group at the end, the carbon and fluorine, that makes them great at waterproofing things, stain-proofing things, water-repelling things, as well as quenching fires. And so, they're found in consumer goods, waterproof makeup, your pizza box. Why does the cheese on your pizza box just slide right off? [*Alie shudders*] Why does it do that? [*Alie shudders again*] It's because it has a chemical on it separating it.

But the one that I'm studying, it's called perfluorohexanoic acid, so it's got a real ugly name. [*AI voice says "Perfluorohexanoic acid"*] But it is a huge component in aqueous film forming foam, so the things that firefighters use to put out fires, in your fire extinguisher, also the military uses it, airports use it to reduce the likelihood of fires on the outside of airplanes or on the

outside of naval craft carriers. So, it's used to prevent fires, to prevent chemical assault, but it ends up in the water and it ends up in the soils. And so, areas around these military bases, or airports, it's just at higher levels in the soil, which is where we grow our food, and it's where cows and chickens eat, and then it ends up in our water. And so, it's in tap water, it's in a lot of things.

Alie: ... Everything. [*"Literally everything."*] Can you filter it out? Do water filters suck it up or is it just too tiny?

Elizabeth: So, a traditional filter does not. I have a BRITA filter, that does not. There's a group in North Carolina that is working on, instead of filtering it out, breaking it apart and I think that they have been successful in creating this type of filter but they're *so* expensive. Like, a regular consumer would not be able to house this facility in their home.

Aside: Also, as we recorded this with Elizabeth, I had just cracked open a nice frosty LaCroix and I just learned today that they do have PFAS in it. PFAS in your bubbles! So, heck and darn, we're all going to die.

Alie: I mean, this is one of those things where if you are maybe a little bit opposed to germs on you, and maybe you've gotten over that, and then you find out about PFAS, and you're like, "Oh, I've got this *whole* other thing to worry about." [*laughs*]

Elizabeth: You do. [*Alie laughs*] I'm just a student, I am forming my opinions on things, but I really don't think it's the consumers' responsibility to read the label on everything, trust the label on everything, purchase this $10,000 water filter for your home. I really think it's the big corporations that are creating it who are maybe not responsibly using it.

I said it yesterday and it's horrible, but I think it's not our responsibility, but it is our problem. I try to live my life, knowing everything I know, I cannot prevent exposure to this. And I try not to scare people because it is everywhere. But you can't avoid your exposure.

Alie: Even polar bears can't.

Elizabeth: Right! If they can't do it, we can't do it.

Alie: We can't. No polar bear is cracking open a LaCroix right now. [*Elizabeth laughs*] Now, what about you in particular, what drew you to this field? When did you first hear about this chemical? And were you just interested in studying neuroscience in general or did toxicology lead you toward neuroscience?

Elizabeth: Yeah. So, I didn't take a neuroscience class until the spring, this spring, and I'm a third-year graduate student.

Alie: Wow!

Elizabeth: [*laughs*] So, I was in undergrad, I went to the University of Tennessee at Chattanooga, and I majored in biology because I did not know what I wanted to do and there were a lot of very broad classes. And my last year, I was actually going to go to occupational therapy school, and I heard that toxicology was the hardest course on campus. [*"Sign me up."*] And on the first day of the lecture, I was like, "This is what I want to do. I want to be a toxicologist."

And through that semester, it was an introduction course, but we did have a lecture that included studying PFAS chemicals. We were introduced to them in the context of, our carpets have it, the furniture has it. And I didn't really understand how big of a problem that was.

So, I ended up applying for toxicology programs and I came to the University of Rochester. And I had always been interested in neuroscience, but my undergrad did not have any neuro

courses. And so I always kind of thought, I can't be a neuroscientist, I'm just going to… by proxy, I'm going to be a neurotoxicologist and study how we can mess up the brain. And I found my mentor, Ania Majewska, she's my PI and she is a neuroscientist, a fantastic neuroscientist, and she gave me the freedom to create my own project.

And I'd been hearing about PFAS chemicals in the news, I'd been reading a lot of papers on them, so it only made sense to me to study them because I think they're so important to study. And I was able to marry that interest, and I've always wanted to learn about neurodevelopment. I have an affinity for knowing about that and so, I got to create a project that mirrored my interest.

Alie: And how do you even detect PFAS? Is it... Not something you can see under a microscope, but when you're doing the toxicology work, I imagine that's one reason why it's so difficult, but how are you even detecting 1 out of 9,000 of these?

Elizabeth: Yes, and this is a huge problem in the field so I'm happy you're bringing this up, because you have to know what you're going to measure. You can't just throw a test on it and it's going to tell you what's in there, you have to know what you want to find. So, a lot of people use mass spectrometry to measure it.

Aside: So, how does that work?

Elizabeth: Once you're able to have a biological sample and you put the proper primers in the machine to know, "I want to detect this chemical specifically." And when you do that, you can get the levels or the concentrations back on your system.

Aside: Okay, well what if you don't know if it exists?

Elizabeth: And so, there are some chemical engineers right now who are kind of discovering new PFAS and they're publishing it so you, as a scientist, you're able to go read and say, "Okay, now there's way more than 9,000 and maybe I need to plug this one into my study, or I need to start looking and asking questions about this one that's showing up in the soil, in the water, and see in my biological samples, if it's there."

Alie: And why did you pick the perfluorohexa-blah blah blah blah? [*AI voice repeats, "Perfluorohexanoic acid."*]

Elizabeth: Perfluorohexanoic acid, [*laughs*] The tongue twister. So, I picked it because I knew I wanted to study neurodevelopment and this one is a short-chain PFAS, and these short chains were created because we knew the long-chain ones were bad so they were just like, "We're going to make these shorter and put it in things and it's going to be fine because it's shorter, people will pee it right out." And I started reading studies, the polar bear study found it in the brain, and I'm just like, okay, if it was found in the brain of a polar bear, let's look at human studies. And there were several studies conducted in Europe on post-mortem tissue that found this one in brains of humans who had died natural deaths.

And so, that just piqued my interest, and there were no studies on how it affects neurodevelopment, none at all. And so, that is terrifying as a person. We know it is in our brains and we do not know what it does. [*Alie lets out a gargled scream*] Yeah. So, they found it in our brains, but there was another paper that came out that was also showing it in breast milk and how, since the '90s, every year when samples are taken, it's doubling, and doubling, and doubling. So, we know babies are exposed while brain development is happening. And we know people who have lived happy, healthy lives are dying and it's in their brain. So, I'm just like... What happens? I need to know!

Alie: Like, [*voice trembles*] what are you doing here?

Elizabeth: Yeah. [*laughs*]

Aside: Here being everywhere, according to research from Elizabeth's poster, "Characterizing microglia and the developing cerebellum."

Alie: What does the cerebellum do for us and our bo-days?

Elizabeth: Yes. So, the cerebellum, it's Latin for the 'little brain,' it's the very beautiful part in the back of your head. [*laughs*] Traditionally, it is known for helping with motor coordination, but in the past few decades, scientists have been starting to realize that it's also involved in cognitive functions; it's involved in a lot of other things, not just coordination and motor movement. And in the past 20 years, people have been looking at neurodevelopmental diseases and have found that alterations in the cellular architecture of the cerebellum have been associated with different neurodevelopmental diseases. The reason for that is not known but these patterns are being seen. And so, I don't think we know everything that the cerebellum does. [*laughs*]

Alie: Cool.

Elizabeth: But it's very important in a lot of things.

Alie: When you talk about your poster, how far are you down the road of figuring out the interaction of this chemical and our neurodevelopment?

Elizabeth: So, I am just a third year; all of my things are preliminary data, but I have a great mentor who is helping me produce science that is rigorous and responsible. But I'm hoping within the next year I'll be able to publish something that has the correct sample size, has the correct statistics to go with it.

And I'm doing a very– I think it's a very fun project. I'm doing a very like, general cerebellum; how are the genomics of the cerebellum? How are all the cells affected in the cerebellum? That's what I'm working on right now. But then I'm going to dive into a specific cell type to understand what's happening to microglia, so I'm planning on taking a deep dive into microglia. But if there's another cell type that appears to be way more affected and it deserves our attention, I will shift gears toward that.

Aside: And just in case you're like, "I must know the abridged facts." So, microglia means 'small glue.' And these little babies, which comprise 10 to 15% of your brain, are the immune cells of the noggin and of the spinal cord. So, right now, I don't know what you're doing, maybe you're having a Boba, maybe you're trying to remember if you forgot deodorant today, but your microglia are up there, they're kicking ass, they're cleaning up plaque, they're getting rid of damaged neurons and they're saying, "Hell no," to brain infections. So, let's keep those microglia healthy so they can keep this whole ship running.

Alie: Do you have any advice for anyone who is maybe thinking about toxicology, is terrified of toxicology being the scariest course on campus, or is maybe going into neuroscience?

Elizabeth: Yes, I have so much advice or tips. [*Alie laughs*] Toxicology is awesome, I love it, it does give me general anxiety but it's okay. [*both laugh*] I think, just as a person, it's great to know these things; but also, as a scientist it's so interdisciplinary. I'm getting the opportunity to study neuroscience because of toxicology. Like, I am one of the few in my program studying neuroscience, other people are able to study pulmonary, the cardiovascular system, the immune system, the reproductive system. I think that that's super exciting and that is a pro to the field of toxicology.

And then neuroscience, I also love neuroscience, it's so cool. We're using our brain to understand the brain! [*both laugh*] And so, I would say… I mean, neuroscience is a lot scarier to me, I think we, as a society, put neuroscience kind of in a different kind of field, or at least I did. And so, I think, just from my experience, you don't have to have experience. If you are curious and you are excited, you can study it. It is not unattainable. [*"We're all rooting for you."*]

Alie: What about the hardest thing about what you do?

Elizabeth: I guess... Well, it is the hardest but also the best part is every day I get to learn something new. But studying specifically what I study, that is the hardest part. But also, I think grad school is hard. I've been very lucky, I have a fantastic mentor, I have a fantastic family, I have a fantastic group of friends, but I think sometimes it can be isolating and so I think some of the hardest days of graduate school are when your path is just so individualized.

Alie: Was there ever a moment when you were working, when you discovered something or had an aha-moment where you were like, "Oh my god!"?

Elizabeth: Yeah. Every time I analyze my data and one of my lab mates, McKenna, she has the keys for everything, so I blindly analyze it, and whenever she decodes it and sends it back to me and then I'm able to graph it. Every time that happens, no matter what the results are, that is the most exciting... I love it! That dopamine reward system is just lighting up and I love it. The months and months of work, I finally get to know what the answer is, and then for a split second, you're the only person in the world who knows it. Which, of course, I'm a loudmouth, so within seconds, everyone in my lab knows, [*both laugh*] but there's a split second where it's just like, "I did that and now we know this," and I love it.

Alie: I mean, keep at it. My brain is like, "Please, please, please figure this out," because who knows what I've got rattling in there. And what about you, where can people find you or follow you or learn more?

Elizabeth: So, I have a Twitter and it's very simple, it's @Elizabeth_Plunk. I'm on LinkedIn and it's just Elizabeth Plunk. And I'm happy to talk to anyone about anything I do. I love it! [*laughs*]

Alie: You are the best. I'm so glad that you tracked me down.

Elizabeth: It was a little embarrassing, but I thought, I should just shoot my shot.

Alie: I mean, text your podcast, cut or grow out bangs as you will. [*Elizabeth laughs*]

So, just ask the smartest people in the country, all gathered around one airport hot dog place not-smart questions and then boom, look what you've learned. Big thanks to my *Innovation Nation* producer, Stephanie Himango, for cheering me on and saying "Yes, go do this," as she watched my luggage.

And I will include links to all the ologists' socials on my website at AlieWard.com/Ologies/FieldTripAirport, which will be linked in the show notes here along with the cause of the week SFN.org and more episodes you might enjoy, including *Smologies* episodes which are shorter versions that are safe for kids and classrooms. Those are in the feed and they're also at AlieWard.com/Smologies, all collected. Links to sponsors are also in the show notes. We are @Ologies on Twitter and Instagram and I'm @AlieWard on both and I'm @Alie_Ologies on TikTok so you can say hello. You can also join Patreon at Patreon.com/Ologies where we have discussion threads each week about the episodes and I love to see what you all think and chime in, so that's Patreon.com/Ologies.

Ologies merch is available at OlogiesMerch.com, thank you Susan Hale for managing that and so much else. Thank you, Noel Dilworth for all the scheduling. Erin Talbert admins the *Ologies* Podcast Facebook group with assists from Boni Dutch and Shannon Feltus. Emily White makes our professional transcripts and Zeke Rodrigues Thomas and Mercedes Maitland work on *Smologies*, the kid-friendly shorter versions. Kelly R. Dwyer makes our website, she can make yours too. The giant-brained heartthrob Jarrett Sleeper did additional editing on this episode alongside lead editor and chief sweetie-peetie, Mercedes Maitland, who is wonderful. She has her own Maitland Audio, that's linked in the show notes too. Nick Thorburn did the music; he's in a band called Islands.

And if you stick around to the end of the episode, I tell you a secret. And this week, it's another life hack from DadWard. Okay, listen, I'm trying to drink more water, just regular water, not carbonated PFAS seltzer, okay? I'm using a thermos, it's a metal thermos, and I also have all these tiny magnets that I bought for a magnet board, I use them all the time. They're like the size of a mini Altoid but they could pick up a car, they're so strong. So, I have this metal... You're like, "Where are you going with this?" Just… *p-cha*! I have this metal thermos and I just realized the magnets will stick to the thermos and I can put a bunch of magnets in one area of the thermos and then as I drink water, I can move the magnets to another area of the thermos to count how much water I've had. This also works on your refrigerator but sometimes you're not always near your refrigerator. Anyway, a good way to track water. Do you love it? It was free advice.

Okay, that's it for me today. Thanks for hanging out on this Field Trip episode. Patrons, let's talk on the discussion thread and talk to me about some more field trips that you want to go on, or what you thought of this one, first one ever. Yeah? Okay. All right, berbye.

Transcribed by Aveline Malek at TheWordary.com

More about the Ologists:
Georgia Kirkpatrick on Twitter and Instagram
Isabella Montana
Dr. Marissa Co
Pique Choi
Dr. Barbara Sorg
Chancey Garrett
Noah Millman
Elizabeth Plunk

Links to things we discussed:
A donation went to the Society for Neuroscience at SFN.org
Pique's advisor
Georgia Kirkpatrick's paper, "Acute high-intensity interval exercise attenuates incubation of craving for foods high in fat"
Safety of Semaglutide
Dopamine and Cognitive Control in Prefrontal Cortex
Activation of catecholamine neurons in the ventral medulla reduces CCK-induced hypophagia and c-Fos activation in dorsal medullary catecholamine neurons
Exendin-4 reduces food intake via the PI3K/AKT signaling pathway in the hypothalamus
Safety of Semaglutide
The science behind 'the munchies': WSU researcher aims to help cancer, anorexia patients with pot
Vapor Cannabis Exposure Promotes Genetic Plasticity in the Rat Hypothalamus

Lab of Verginia C. Cuzon Carlson, Ph.D.
Dr. Verginia Cuzon-Carlson & Dr. Kathleen Grant present New Approaches to Drug Addiction
Stress signaling pathways that impair prefrontal cortex structure and function
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