

Food Dyes

Firsthand Food Dyes: Blue Smarties were dropped in 2005, only to return in 2008 as a distinctly less blue. M&Ms have come under attack for their use of red, yellow, and blue artificial dyes. Green ketchup was a revelation for Heinz when it was introduced in 2000. At its launch, then-global ketchup manager, Casey Kelley said the company was, "on track to ship in the first 90 days what we thought we would sell in the first year."

"This thing has taken on a momentum of its own," Kelley said, illustrating with his use of the term "this thing" the sinister fascination with a new, inappropriately colored sauce. Soon there was orange ketchup, and purple ketchup, and teal and blue and pink. But it didn't last. Heinz withdrew those product lines in 2006, and the world was left with plain-old red ketchup. It might well have been the last hurrah of a generation's rainbow of nonsense food. We might be healthier for it. But we are less colorful, too. So, next time you stroll down the bland cereal or snack aisle, spare a thought for the proud chemical factories, where scientists in white coats once injected a vast palette of colors into everyday foods. Imagine what we could have been eating by now. Rainbow bread. Yellow steak. Pink cheese. Imagine now a gray factory. A decaying factory. Windows long since smashed, roof in disrepair. A laboratory full of test tubes and conical flasks lying on their sides. A solitary Cheeto, proudly orange, blown past in an icy wind. A flash of color among the dreary scene, it briefly lifts the spirits before getting caught up in the dust, doomed to fade and fester. Imagine this, and lament.

EW: You cannot be serious.

EAU: I know it's, it's the most dramatic re like I just love all of the imagery of that. So,

EW: do too. I mean, and like, I really don't think that it is serious,

EAU: no, it's not, it's not serious at all.

EW: I am not the audience. Like I'm just thinking my favorite cereal these days, you know, historically Cracklin' Oat Bran. But these days just plain bran.

EAU: Not even crackling oat, bran.

EW: Love a bran cereal.

EAU: Uh, that by the way, was excerpt from an article in The Guardian from 2015 by Adam Gabbatt. And I, I just loved the imagery of it. Um, I love a cinnamon toast crunch. I know we've talked about this before, but I haven't checked lately to see what colors are involved.

EW: That's fair. That's fair. I mean, I, I think a surprising number of things do have artificial food colorants, and it's possible that some of the brans that I have purchased over the past few years absolutely do.

EAU: Very, very likely. In fact. Oh, green ketchup.

EW: I'm Erin Welsh.

EAU: I'm Erin Allmann Updyke.

EW: this is, This Podcast Will Kill You.

EAU: Can you guess, we're talking about food dyes today.

EW: We are this. Oh, I'm excited for this one.

EAU: Are you

EW: I am, because it's just, it's a fun little story

EAU: okay?

EW: And it forced me to evaluate the feelings that I have about food Dies and maybe form some of those feelings.

EAU: you wanna tell me about those feelings?

EW: We can do that, that later

EAU: Oh, okay. Okay.

EW: Yeah. Yeah. We'll get, I'm sure that there'll be plenty of time to get into the various feelings that we have about these things, these substances. Um,

EAU: Yeah, it's gonna be, it's gonna be fun. We're gonna focus mostly on the synthetic food dyes.

EW: yeah. Yeah, yeah. Coal tar does.

EAU: tar dyes now mostly manufactured from petroleum. Um, it's gonna, it's. Let's just get into it, shall we?

EW: it. First things first.

EAU: Quarantine time.

EW: Is, what are we drinking this week?

EAU: We could drink nothing other than over the rainbow. So many meanings to

EW: So many. And of course this is a Food Dyes Like, what, what are we supposed to not do? Blue curacao?

EAU: No, there was only one choice and it was blue curse out. And there is only one other choice and it must include maraschino. So Erin, you wanna tell us what's in it?

EW: I do. I do. It has a blue curacao, as we have discussed. It has rum, it has a cream of coconut, pineapple juice, uh, and uh, yeah, Marimaraschinorries. It's a blended bev.

EAU: Yeah, like a little blue, uh, uh, pina colada

EW: It is a beautiful drink, which is the purpose that food

EAU: That's the point. T-L-D-R-T-L-D-L we learned.

EW: TLDL, uh, and we'll post the full recipe for over the rainbow on our website, uh, but also especially on our social media channels. So make sure you're following us.

EAU: Yeah. Check it out. We're trying to do these like, uh, videos of these things these days.

EW: it's real. It's [00:05:00] it's taking some, getting used to.

EAU: Give Erin some props for it. Come and tell us how much you like them.

EW: You

EAU: the like button, you know, the little heart. Yeah. Uh, yeah. And, uh, if you're not following us yet on social media, uh, please, we'd love it if you did that. Um, also, if you haven't yet rated and reviewed and subscribed, uh, on wherever you like to listen. Is it on iHeart podcasts? Is it on Apple Podcasts? Is it Spotify? I don't know. But just, you know, do the things. Um, YouTube. We're there and we have a website. This podcast will kill you.com. There's lots of things on it. Check it out. Boom.

EW: Done. Nicely done. Uh. I guess there's nothing else that we need to do before we get started.

EAU: Yeah. And you're starting, right?

EW: Um, sure. I guess, did we talk about this?

EAU: I thought, I think we talked about it one time briefly, a long time ago,

EW: Oh, man. '

EAU: cause I don't have any, all my stuff is like current events, so I don't really have any like biology section to tell you about. So

EW: All right. Uh,

EAU: learn about the history of food dsm?

EW: let's do it. Wow, how fun. Okay.

EAU: Oh wow. Totally scripted.

EW: Let's, uh, take a quick break and get started.

EW: It's Saturday morning, and you feel like cooking a big old breakfast, eggs, pancakes, bacon, you know the whole shebang. But when you pull out that pack of bacon shoved into the back of your fridge for who knows how long, you notice that it looks kind of off like it's awfully gray, a little bit brown. Better not.

EAU: Mm.

EW: It's Wednesday evening and you're in the produce section of your grocery store, picking through the clam shells of strawberries, trying to find the one that has the reddest and juiciest looking fruits, while also keeping an eye out for any signs of mold. It's Friday morning and you're eyeing the bananas you got at the beginning of the week trying to decide whether the last of the bunch is still snack worthy or if it they're destined as ingredient in banana bread. How yellow or speckle do you like your bananas on the scale of

EAU: is this a, this a question for

EW: a real question. Yeah.

EAU: Um, le much less speckled, like,

EW: I like a, I like a speckled.

EAU: I feel like I knew this about us, that we have different banana preferences. Um, no, I like mine not green, but like just after.

EW: Wow. See, that's too, that's too, too much for me.

EAU: Yeah. I

EW: I

EW: mean, I'll eat

EAU: it.

EW: but it's just, it's a preference.

EAU: That's how I feel about the brown. The brown, actually, once they start to have like more than a couple, I'm like, eh, it's just too soft. It's

EW: Ah. See, I like that texture.

EAU: No. Then they go banana bread. I love

EW: Yeah. For many of us, taste begins not with our mouth, our taste buds, but with our eyes. Our visual perception of food has a powerful influence over the

way that we taste that food. Even acting as a deciding factor in whether or not we're willing to eat something like speckled bananas.

EAU: Yeah. Like hide the broccoli in the mac and cheese, it's not gonna go well. Yeah.

EW: This link between vision and taste, along with smell is evolutionarily ingrained. Our ability to evaluate food quality based on its appearance might help us select the most nutritious foods like the ripe strawberries, or avoid food that is spoiled or poisonous like that gray bacon or moldy bread. But it's also learned over our lives, we develop strong preferences for foods or expectations for taste based on their appearance. Yellow pudding signals, lemon or banana flavor. Anything else would be weird.

EAU: Right. Imagine like yellow strawberry pudding. That would be weird. Uhhuh.

EW: jarring. Yeah. Light green ice cream, probably mint or pistachio. It would be alarming. I guess maybe alarming is not quite the right word, but it would be a shock if you got a scoop of green ice cream and found out that it was actually orange flavored, like you took your first little bite or lick. Yeah.

EAU: Yeah.

EW: Strange. Our expectations of the way that food should taste can be so powerful that they can lead to disgust or aversion if the reality does not match those expectations. Like Pepsi discovered in 1993 when they're highly anticipated, clear Pepsi completely flopped. Clear soda should taste citrusy, right? Like that is what a clear soda

EAU: Right.

EW: even though, or I guess cream soda. But even though the brown

EAU: I always, yeah, cream soda, but usually it's at least like a light brown.

EW: yeah, you're right. It's like slightly tan. Yeah. To indicate that it's not citrus, right.

EAU: right. Lemon, lime.

EW: But the brown of cola comes from coloring seven up, which is a clear soda was initially dyed [00:10:00] brown until they removed the dye to distinguish it from other sodas.

EAU: Oh my

EW: That was like a marketing tactic. Yeah. And then of course, like in the firsthand account, green and purple ketchup, I remember that my brothers loved green ketchup. They were so psyched about it, and I was disgusted. I was like, I can't eat it.

EAU: I babysat for a family who I remember very distinctly bought at one point, um, blue and pink margarine, like squeezable butter. Yeah. And it was like, you know, like barbie pink and like if there's an equivalent of Barbie, pink and blue, it was like very blue and pink

EW: Jump scare. I'm not like,

EAU: for butter.

EW: not, I'm not into it. I'm not into it,

EAU: Yeah.

EW: the power of preference,

EAU: power of, yeah.

EW: but one study demonstrated how strong these expectations can influence our, you know, overall feelings. When, uh, the study they fed participants a dinner that consisted of steak, peas, and french fries. But the, uh, people who were doing the conducting the study altered the lighting so that participants couldn't see that the steak was actually dyed blue.

EAU: Okay.

EW: The peas were dyed red and the french fries were dyed green. And when they put the normal lighting back into place so that people could actually see the true colors of what they had eaten, some people were so disgusted that they got ill, they got sick.

EAU: Wow. They like, they ate it just fine. They were like, yes, this was tasty. Then they saw it and they were like, whew.

EW: Yeah, exactly. But it wasn't just like these colors alone, like we've encountered blue candy or popsicles before. It was, even though blue is like as, as I saw somewhere like the, uh, not a very common color that we find in nature for food. And so it's tends to be reserved for like fun foods today. Yeah.

EAU: Yeah.

EW: Um, but it was this mismatch between expectation and reality. The relationship between vision and food color is evolutionarily rooted. Try chromatic color Vision may have evolved to help us detect red fruits, ag against green foliage, or to see snakes. Check out our Snake Venom episode from years back

EAU: Well, and our color Vision episode.

EW: and our color vision episode. But Oh yeah, that is, I was like, who else did we talk about

EAU: Yeah.

EW: But it's also something that we learn and grow preferences for starting in early childhood. And these preferences, of course, greatly affect which foods we might select or find appetizing, which has made them a very relevant issue for those producing the foods who might opt to add a bit more of this or of that color to enhance the appeal of their product. So that you pick the pink filet of farm raised salmon that actually gets this pink, uh, color, not from the carotenoids in the food that wild salmon eat, but from dyes. Or you pick the orangest orange, whose skin might actually be dyed to saturate the natural orange coloring. And it might seem like the controversy surrounding food dies is a fairly recent one, at least within the past few decades, and growing in volume every year. But in fact, it dates back millennia, and at the heart of it, the arguments against artificial food colorants have fallen into the same two categories throughout that entire time, deception and toxicity.

EAU: Mm-hmm.

EW: Before we go back to ancient Egypt, I wanna make a quick note about the language that I'll be using to talk about food dyes, because there are so many different descriptors for

EAU: Yes.

EW: And so since this episode mostly focuses on coal tar dyes or synthetic dyes, I'm calling these synthetic dyes. And if I say natural dyes, which I know the word natural,

EAU: a meaningless word. Mm-hmm.

EW: it's not great. I'm referring to the dyes derived from nature plants or animals, like those little cochineal insects

EAU: Uhhuh,

EW: food dye or saffron, which comes from plants and any coloring or dye added to food, I'm calling artificial.

EAU: that's the perfect, and exactly how I was gonna do it, Erin, so I'm glad we're on the same page. Yep.

EW: Okay. Back to ancient Egypt.

EW: Yes. Even millennia old papyri describe colorants added to medicines. Yeah. But the first conclusive evidence or like written descriptions that humans added artificial dyes to food comes from ancient Greece and Rome. Dyes were added to wine to make them look more robust. Have a bigger body.

EAU: Bigger bodies. Yeah,

EW: Bo I don't, I don't know how you'd talk about wine.

EAU: darker colors. Yummier wine.

EW: there you go. Exactly. And then there were things like saffron, squid, ink, paprika, turmeric, beets, et cetera. So these like naturally derived colors that [00:15:00] were, um, added to various foods. These colors often carried with them additional meaning. So for instance, the rarer, the colorant like saffron, the more it was valued or considered to have more nutritious qualities. Often certain colors were associated with wealth or royalty or divine healing. You could easily imagine that someone might up their cake or wine with a sprinkling of natural colorant, which is exactly what some bakers did in England in the Middle Ages, teaching us that natural does not necessarily mean better.

EAU: Oh, yes.

EW: Flour at the time was considered top tier, but if a baker couldn't get their hands on white flour, they resorted to adding lime chalk or crushed bones, so their bread would turn out white. Ooh.

EAU: Oh no. Crushed bones. Whose bones,

EW: that's a great question. I do not know. Do not know. Does it matter?

EAU: no, it doesn't, but I'm just curious, like what was the market like?

EW: Uh, yeah. I mean, I not regulated, that's for

EAU: Yeah, yeah, yeah.

EW: And this practice actually inspired one of the oldest laws against food adulteration in the late 13th century. Quote, if any default shall be found in the bread of a baker in the city the first time, let him be drawn upon a hurdle from the Guild Hall to his own house through the Great Street where there be most people assembled and through the streets, which are most dirty with the faulty loaf hanging from his neck.

EAU: Oh my gosh.

EW: That's the first offense.

EAU: That's the first

EW: Yeah,

EAU: I would

EW: a,

EAU: not a second. My gosh.

EW: there, there had to be not only a second, but also a third. Are

EAU: Oh dear.

EW: If a second time he shall be found committing the same offense? Let him be drawn from the guild hall through the great street of Cheepe to the pillory and let him be put upon the pillory and remain there at least one hour in the day. And the third time that such default shall be found. He shall be drawn and the oven shall be pulled down. And the baker made to force swear the trade in the city forever

EAU: my gosh. Three strikes and you're out.

EW: totally. That's where baseball got the idea. Don't laugh my terrible

EAU: Sorry. That was funny.

EW: It's not. Oh my gosh. Um, other laws that I guess later were repealed based on your story of babysitting prohibited coloring butter.

EAU: Specific? Well, this was margarine, technically,

EW: and the, the margarine thing later became, I didn't even go into it, but this whole episode could have been about the margarine wars

EAU: Oh,

EW: coloring margarine and, you know, could restaurants, uh, be allowed to serve margarine under the, you know, but pretend like it was butter, you know, there was

EAU: you ask for butter and they hand you margarine. Fascinating.

EW: like yellow coloring in margarine, mar margarine is not naturally yellow

EAU: it's like Crisco color

EW: And so adding, adding yellow makes it look like butter. And so it's like, it kind of toes a line of deceitful marketing practices or deceitful food practices.

EAU: Interesting.

EW: Yep. Um, and there were other laws that prohibited adding colors to pastries that made it look like they contained eggs because. They didn't, uh, these, these laws were designed to protect consumers from deceitful sales as

well as poisonous additives. And so there definitely was some awareness of the addition of dyes and other substances to foods and drinks to enhance color or in part flavor and the potential danger inherent in those practices. But things remained fairly under control until the 17 hundreds and into the 18 hundreds. And this is when increasing trade and long distance travel encouraged people to look for ways to keep food fresher and looking tastier over longer periods of time. Vividly Colored foods came to represent the quote unquote success of colonialism

EAU: Hmm. Okay.

EW: Since saturated and bright colors were more likely to be found outside of the city streets of Charles Dickens London, such as in India, the "jewel of the crown of the British Empire", and the demand for these brighter colors from quote unquote exotic lands rose. The industrial Revolution only deepened this need for food enhancement as people moved to cities where food had to be transported into, where it had to have a longer shelf life, and where demand for year round availability was high

EAU: Mm.

EW: and at the same time, it provided a means to develop new preservatives and colorants through the growth of science and technology. [00:20:00] Whether these substances were safe was of secondary importance as as long as they kept the pickles of Vivid green and the coffee grounds nice and dark. It was a okay. Even if that vivid green was achieved through copper or the coffee color gotten through beef blood for example. Yeah. That's just a problem for future, the future producers.

EAU: I just feel like that wouldn't taste good.

EW: I don't think that was, that mattered. You bought it, right? Like you already paid for it.

EAU: Okay. Yeah.

EW: Um, yep. But this like, you know, quote unquote future problem was actually the not very distant future as it would turn out. As early as 1820 chemists were ringing the warning bell for the increasing use of harmful dyes in food products. Uh, but it was largely unheeded in much of Europe. E even if it was heated, chemists were faced with the substantial challenge of identifying which compounds were toxic and at what levels they were toxic.

EAU: pretty key.

EW: Right. You know, doses in the poison. How much lead in your cayenne is safe?

EAU: Okay. That one we

EW: none.

EAU: Yeah.

EW: How much arsenic in your candy?

EAU: Okay. Yeah. Easy.

EW: Um, but things were gonna get even more challenging in the second half of the 19th century with the explosion of coal tar dyes.

EAU: Hmm.

EW: In 1856, 18-year-old English chemist William Henry Perkin was tasked with creating a synthetic alternative treatment for malaria to replace quinine, which comes from cinchona bark, and was expensive and difficult to get.

EAU: Hmm.

EW: He didn't succeed, but he did stumble upon a different breakthrough that would revolutionize food and fashion and industry. In one of his experiments with aniline, which came from coal tar, he noticed that swirling inside his flask was a vivid purplish color, which he later called mauvine.

EAU: Hmm.

EW: Perkin immediately saw the potential this could have as a dye and enlisted the help of, of his friend and his brother to scale up production. He applied for a patent. This is an 18-year-old kid, I love this. Left to the academic lab, gathered funds to start a factory and changed industrial chemistry and the pharmaceutical industry forever.

EAU: Wow.

EW: This is basically what kick started the dye industry. And this, so the, the dye industry. I find this fascinating 'cause it's like a really kind of fun, fun for full circle, uh, story where, you know, it started out looking for a replacement for. Quinine. So it started out with a pharmaceutical goal and then it turned into this massive dye industry. But then the dye industry also had still kept its foot in like the pharmaceutical ventures it, which is why you have, you know, um, Bayer producing, which was started as a dye company producing aspirin,

EAU: Oh wow.

EW: And then a lot of these, like later then started to develop medications for, you know, cancer drugs and, and other types of medications.

EAU: That all started as dye.

EW: that all started as dye. So do you remember back in our acetaminophen paracetamol episode? And we were like, yeah, these two dudes found it accidentally because they were looking at coal tar dye. Who knows? Why were they

EAU: Oh my

EW: That's why I finally realized, yeah,

EAU: It really is full circle. That's so interesting. And I mean, it kind of makes sense when it's just like we're just over here doing chemistry and trying to figure out what these we're doing chemistry stuff and seeing what kind of chemistry chemicals we can make

EW: kind of things

EAU: and then what we can do with them.

EW: It's so, I mean, like, maybe I just don't know enough about the biochemistry of coal tar. Uh, yeah. But like, why is it so pharmacologically active?

EAU: No clue. Great question. Maybe we should do a whole episode on it.

EW: I mean, we kind of are avar,

EAU: Oh, I'm not.

EW: Okay. Well, anyway, okay. That, yeah. Future episode

EAU: future episode. Yeah.

EW: Um, okay. But going back to mauvine, mauvine became, I hope I'm saying that right question. It became the first widely produced commercial synthetic dye. Within a few years of its development, it was the color to wear. It was the color of the season. Clothes had been dyed with natural dyes before, but mauvine was much more vivid colorfast and importantly, fairly inexpensive to produce. Since coal Tar is a byproduct of the gas

EAU: industry mm-hmm.

EW: as Carolyn Cobbold, who's the author of this book, Rainbow Palate puts it quote, "in a seemingly alchemical act of transmutation, they synthesize the molecules of [00:25:00] coal tar from dead dark matter that had laid for centuries in the depths of the earth into new substances that would transfigure society and science"

EAU: Hmm.

EW: end quote. Um, I also just, I don't have this in my notes, but I just like the word natural. I think this just goes to show how meaningless it is because coal tar comes from the earth as well.

EAU: It's just dead dinosaurs and stuff. Just like really, really deep down there. Yeah. The word and the word na. I mean, minerals are counted as natural dyes as well too. Lead would be counted as a natural dye. Arsenic would be counted as a natural dye, like the, the word does not have meaning. And I'll get into the problems with that when we talk about how we regulate synthetic versus quote unquote natural dyes today. Later.

EW: Okay. Well, yeah. This, it's a, it's a mess. The word natural is, yeah. But the invention of coal tar dyes was like finding the philosopher stone only. Instead of turning mercury into gold, chemists turned coal tar into a rainbow of colors. At first, the explosion in coal tar dyes seemed like a testament to the promise of science. We can make the world more beautiful, more appealing, more dimensional with this array of colors now available. Songs and poems were written about these dyes,

EAU: Wow.

EW: but soon the cracks began to show. These dyes clearly weren't as inert as the chemist claimed, and some were downright toxic. Initially, mauvine and the other coal tar dyes that followed were mostly used to dye fabrics, but eventually manufacturers begin putting them in food. And this allowed people to more readily make the connection that some of these dyes could be harmful. Like it was a faster sort of intake and

EAU: Right.

EW: to ingest versus

EAU: You're just touching it. Yeah.

EW: And so began a pushback against the widespread use of these dyes and. It's important here. I feel like I'm always saying this, but like it is important to put this pushback in the broader context of food regulation around this time, let's say the 1880s or so, because food dies were just one issue of many facing the food industry. More people living in cities, more food trucked in more food, spoiling more preservatives and other questionable substances added to foods. And when I say preservatives, I mean early preservatives that were not well tested. Combine this with less oversight and regulation. You've got a disaster on your hands.

EAU: Oh, yeah.

EW: Yeah. People were buying cinnamon that was really ground, brick, dust, arsenic, dyed candy milk, adulterated with formaldehyde, and who knows what else? I mean like all the things that we've talked about before on the podcast.

EAU: It's actually amazing to me how many times this has come up on the podcast, like in so many different

EW: So many different episodes.

EAU: time period was not great for food regulation.

EW: No, no. And I think it really did kind of illustrate how when you don't have any framework in place to evaluate and experts like declared experts to make these decisions, um, you're gonna get a mess on your hands because there are so many different competing interests.

EAU: And like at the bottom line of it, it is manufacturers and people who are selling us this food whose goal is profit. They are not going to be the ones looking out for the safety. Of their food, of this, of the consumers. That's not their job. Their job is to make money.

EW: Mm-hmm. Yep. There you go.

EAU: let's go.

EW: I mean, essentially in, in this time period, what you were paying for, you weren't really getting, and what you were really getting was making you sick

EAU: Mm-hmm.

EW: Health overall during the Industrial Revolution deteriorated in many ways, especially for the working classes who spent long hours in factories, inhaling toxic dust, living in close quarters, breathing in tuberculosis and other respiratory infections, and drinking raw milk, consuming the microbes that would sicken them and kill their children. Germ theory was catching on, but overall, this quote unquote degeneration was blamed on modern society and industrialization and adulterated foods were seeing were seen as playing an outsized part in this. Fresh food was a rare commodity for much of the working class, and inexpensive sugar and adulterated foods were far more accessible. By the late 1800s. One third of recipes in a standard American cookbook were for puddings and cakes.

EAU: Wow.

EW: Yeah,

EAU: Okay.

EW: I mean, this is not a sugar episode, maybe someday, but I, I bring this up where like, I wanted to share that statistic because it demonstrates a shift in the types of foods that people could afford, which tended to be [00:30:00] adulterated and cheap and what they were wanting to make with that food. And many people blamed that shift for what they saw as the degeneration of society.

EAU: Okay.

EW: So it was like, we have this massive change in the food that people are eating, especially the working classes. And that is what is causing the downfall

of society. That is what is leading to this higher rates of tuberculosis. That is what is leading to, you know, children in, you know, working in, in factories. I, I don't really know everything

EAU: the root

EW: that was, that was one of the root causes. Yeah, artificial food dyes. Were part of that shift. Included to deceive the consumer. So like this bright red strawberry jam is totally strawberries. Trust me, buy it. It's definitely not, apples dyed

EAU: Mm-hmm.

EW: With sometimes the side effect of, of making people sick. I mean, clearly some type of regulation was needed. But what? Across the board regulators like Harvey Wiley, who I've discussed many times now on the podcast, had a really difficult time drawing up guidelines for food adulteration, let alone getting people on board and enforcing these regulations. Part of the challenge for food dyes was determining which were safe to consume and in what quantities, because at the time there was no standardization in the chemical makeup of these dyes or any agreement on the names for them. So dye companies would sell dyes under different names and compositions to food manufacturers who really had no guidance on how much to put in. It was just like, I don't know. This is butter yellow. I don't know what its chemical name is. How about half a gram per 10 pounds or something

EAU: Mm-hmm. Until it looks like the yellow that you want it to be.

EW: Exactly.

EAU: Yeah.

EW: And chemists had no way of detecting specific dyes or their concentrations. The technology just was not there yet. Color standardization was in its infancy, which I've never really thought about, but color standardization was a big part of this. Mm-hmm. Because it was like, what yellow is this? Is this butter yellow? Is this a different type of

EAU: Having like a naming system and a and a everything pan Pantone, is that what it is? Or something? Pants.

EW: Yeah.

EAU: I clearly don't know what I'm talking about.

EW: Um, but the other thing is that analytical chemistry was just starting out and really grew in part out of the need for food and drug regulation during this period to be able to test things and be like, that's what the substance is. That's how much there is in here. Yeah. And so the testing of individual dyes for their safety was crudely done mostly through animal studies. Like how should it be administered? Should it be oral, should it be injected? Uh, which animal do you wanna test? A rat mouse, Guinea pig. Frog, whatever, beagle. I don't even know. If they were testing beagles back then, probably. Um, at what concentration does this rat die? die at what point does it cause neurotoxic symptoms in a mouse? Like more nuanced health outcomes weren't really considered and results were generally quite mixed. Some studies found to die to be completely safe while others found it to be toxic. And were the results even applicable to humans? Sometimes chemists experimented on themselves, concluding that a dye was non-toxic across the board if they did not experience what they considered to be significant side effects. then there was like, what if the dye is interacting with something else? Another ingredient in the

EAU: In the food? Mm-hmm.

EW: Whatever. The method of testing, the only consistent thing was how inconsistent the results were. Consensus of safety among chemists, politicians, consumers, producers, and retailers was a pipe dream. Different countries handled this in different ways. Some took an approach that was kind of like considered safe until found toxic, so they would like ban harmful dyes, but everything else was kind of like

EAU: for all. Okay.

EW: While others, including the US, allowed a short list of quote unquote safe dyes. So seven were included in the 1906 Pure Food and Drug Act that could be added to food and had to be included on the label. And so this is the, when I talk about the safe dyes, I'm specifically referring to the coal tar dyes. The seven. Yeah. And in effect, this act that, that identified the seven safe dyes transformed these dyes from adulterants to ingredients.

EAU: Hmm.

EW: Wiley who orchestrated this act later, said that he regretted including dyes because he felt that regardless of their safety, artificial colorants were deceitful to the public, just across the board.

EAU: Interesting.

EW: But safety testing of these dyes continued over the next decades and into today, and some were removed from the list. Others have been added. Demand for more transparency in the 20th century led to additional regulations in the US that required manufacturers to [00:35:00] list ingredients by their chemical name or by the nomenclature created by the FDA. So this led to things like F, D and C, yellow number six. And so that means like that yellow number six. Then F, D and C refers to it being, uh, permitted to be used in food, drug, and cosmetics. And then there are other ones that are just in like drugs and cosmetics and so on. The unintended consequence of this was that such scientific sounding names made people more wary of their food, not reassured as to its safety. And over the following decades, lawsuits were brought forward, court challenges were heard, and legislation was introduced or changed to accommodate new information about the safety of these dyes or when and where they can be used without being considered deceitful to the consumer like margarine in a restaurant.

EAU: Right?

EW: This is a constantly evolving landscape, and you could do textbooks about like the different regulations and the each individual dye over the history of the second half of the 20th century alone. And so, Erin, I know I, I knew that you were going to like deep dive on the current concerns with artificial colorants, and so I didn't go too deep into that literature. But I was curious about the origin of this purported link between hyperactivity or ADHD and dyes. And I know you're gonna talk a little bit more about this, but it turns out it emerged in the 1970s after an allergist named Benjamin Finegold published a book describing his observation that symptoms of hyperactivity were reduced when children were fed a diet that did not have artificial food additives and dyes and other things. And he named this The Fine Gold Diet

EAU: I wear the Kaiser Permanente

EW: or the Kaiser Permanente Diet. Yep. And it made a big splash. It was very big news. A lot of people were very interested in this. And as, and the scientific community was absolutely interested, they immediately set out to further investigate this possible link. And, um, I won't do any spoilers because I know you're gonna take us through all of that and sort of like the, the past few decades and the current landscape of what's happening with food dyes today. And

EAU: Oh yes.

EW: I, I'm gonna stop here when it comes to like, the history of food dyes, but I did wanna share a few thoughts that I found myself having when putting together this episode. And this is without me knowing what you're about to tell me,

EAU: I can't wait. I, that's what I'm most excited about. 'cause then I'm gonna tell you my feelings 'cause that's how I was gonna start my part. So it's kind

EW: Okay, perfect. Okay. It's, it's feelings

EAU: time. Erin and Erin's feelings corner.

EW: Um, but yeah, it, it turns out that I have more feelings about this than I realized. I mean, I think the bottom line is that like, kind of like we talked about, it's not that

EAU: Mm-hmm.

EW: but at the same time, the bottom line as I see it is that artificial dyes. Whether synthetic or quote unquote natural impart no nutrition to food, they're there for aesthetics. Many of us have been raised to expect apples to be shiny and unbruised tomatoes to be giant and red and juicy salmon to be a lovely pinky orange. Imperfection will not be tolerated. These expectations have been formed in part by the widespread use of artificial dyes. Do you remember in The Wizard of Oz, when the film switches to color and you can feel the world getting bigger, like more beautiful, more real? You and I, Erin, like many others, grew up in technicolor, Oz, Oz we don't know what it's like to exist in monochrome Kansas with bruised apples and pale oranges. And frankly, it'd take some getting used to,

EAU: Mm-hmm.

EW: which isn't to say that we shouldn't, right? To be honest, I don't think I have heard any convincing argument for keeping food dyes natural or synthetic. I just haven't.

EAU: It. Erin, I don't wanna interrupt your flow 'cause it's so good. But a hundred percent like, and you, you can take it one step further. 'cause you said they have food dyes impart no nutritional value. They also do not extend the shelf life of our foods. They do not make our foods more cost effective unless you're talking about the comparison of synthetic dyes, which are more cost

effective than so-called natural dyes, which are much more labor intensive and expensive and not as potent. So you have to use

EAU: more of them.

EW: ecologically damaging.

EAU: Exactly. So, but no, there, there is literally no benefit to our health or our pocketbooks in any way, shape or form when it comes to food dyes. Their Only purpose is to make us want to eat things more because they look better. So I genuinely feel like at this point, I have no skin in [00:40:00] this game. Like we take them all out. Great, no problem. We keep them there. As long as they're safety testing. Great. No problem.

EW: Right. That's how I, I feel like, yes, since we use them, we should keep evaluating every dye included in do, do keep evaluating. We should continue to weigh the cost and the benefits, including who is paying the cost and receives the benefit. we should not assume that replacing synthetic dyes with natural ones solves the issue. Just because something is derived from a plant rather than coal tar does not make it inherently healthier. We just did an episode on strychnine, which comes from a plant strychnine kills you. And strychnine is used as a, as a dye, but still

EAU: this the exact, this is the conclusion of the, the end of this episode as well too. So we could honestly stop here. We won't, but we could.

EW: Oh. But yeah.

EAU: a hundred, percent. A hundred percent.

EW: it's like all food drug and cosmetic dyes should continue to be held to the standard that they are, and we should be wary of companies that claim superiority or better, better nutrition because of quote unquote natural ingredients. And so I just like, I don't know to, I think to place this in the current context of like, the arguments today, it's like, I want there to be, the reason that we should take out food dies is because it doesn't impart nutritional value. And if it harms, if there are harms, then we should take them out. But like, I, I just, it doesn't make sense to me and I am open to hearing reasons to keep food dyes in, but I did not come across any in my reading.

EAU: Well, it's also what I think is really interesting, Erin, is that you brought up that in the past there was a lot more, it seems like emphasis on the idea that these food dyes were deceptive in a

EW: Yes, they are.

EAU: And today, but today, that's not the conversation that's going on. The conversation is only surrounding only surrounding the synthetic dyes. There's really not conversation ongoing about the natural dyes, which is a problem. Um, and it's only around the potential for health harms, which I'll get into that come with these synthetic dyes. And there is no discussion ongoing about the fact that. This is still a form of, you could look at this as a form of deception, especially like you were saying, Erin, the way that we market these so-called natural dyes, a lot of companies are really leaning into that in a way that makes you assume that a food is going to be healthier for you because it is dyed with natural colorants and that, and they're still artificial clearance just derived from natural sources.

EW: the labeling requirements are very different too,

EAU: can't, can we get

EW: two. Yeah, yeah, yeah, yeah. Let's do that

EAU: Okay. So what I'm gonna get into is how these things are currently regulated in the US and in other countries because the amount of mis- and disinformation out there about the way that food dyes are regulated in the US versus the EU is astounding. So I'm gonna give you the truth. Um, and what is the data that exists, especially for these synthetic dyes on what harms they could potentially be causing, and what are we doing about it? What, what is the future gonna look like? Okay. I'm

EW: thrilled.

EAU: Good. Um, just to bring us up to speed from where you kind of left us off, Erin, in the like mid to 19 hundreds ish, in the 19, late 1950s, early 1960s, there was over 200 food dyes, but natural and synthetic that were like, approved for use. Um, and at that point people were like, this feels wrong. There's too much. We need more data. So at that point, the FDA undertook reviews of all of those colorants and reevaluated them. And since that time, the list has been whittled down. I think, and I wish I had written the exact number down, but I think it's around 28 quote unquote, naturally derived food dyes and nine

synthetic dyes that are approved in the US currently. And the nine is an asterisk. It's actually eight, but let's get there. Okay.

EW: Mm-hmm. Mm-hmm.

EAU: The way that food dyes are regulated today is that they have to be. Specifically approved for use before, they are allowed to be used as a colorant, which means that regardless of the source coal tar petroleum, meaning synthetic dye or natural vegetable mineral bugs, whatever, it has to be approved. The FDA has to. Receive safety data to be able to consider the properties of that dye. Consider the amount of that dye that somebody might be consuming in their foods, any possible health effects, [00:45:00] impurities or byproducts that might be in the dye as a result of the manufacturing process. And then the FDA and the European Food Safety Administration does the exact same thing in Europe. They set an appropriate level of use determination for every single one of these food dyes. And then they set limits on what specific foods, these dyes or cosmetics or drugs that these dyes can be used in the maximum amount that you can use, et cetera. There is no generally recognized as safe or GRAS provision for color additives, which means that our color additives, any color additives that are in our foods are more tightly regulated than a lot of other stuff that is in our foods and our drugs and our cosmetics and our supplements. Okay? Because remember, so many things that are in supplements are fall under this GRAS category. That is not true for food colorants, no matter where they come from

EW: Okay.

EAU: in the us. These types of color additives that we all can call artificial colorants are split into those two groups that we've mentioned a few times now, synthetic meaning derived from coal tar, or now petroleum and so-called natural dyes. But the way that they're actually labeled in the US is that the synthetic dyes are. Called certification required and all of the other dyes that are come from natural sources are exempt from certification. So what does that mean?

EW: Yeah.

EAU: They all still have to have safety data, but synthetic dyes are subject to batch certification, which means that manufacturers of these dyes have to send a sample from every single batch of the dye or the pigment that they are making to the FDA for the FDA to analyze it. And what the FDA is going to analyze it for is purity and the presence of any impurities in the dye. They're gonna analyze it for heavy metals, for moisture, for any unreacted intermediates,

because with the production of these synthetic dyes, especially, a lot of times the intermediates in the reaction do have data of harm. And so that's, uh, one of the reasons that a lot of people don't like these synthetic dyes specifically, is because the like chemical process that it takes to make, that the intermediates can be toxic, including causing cancer. And so the FDA has to batch certify every single batch. Of these synthetic colorants before they can be used in our foods,

EW: Um, I just find this really interesting that synthetic dyes are subject to this, but natural dyes are not when, if you're deriving this from natural sources like a plant, plants individually vary so substantially in what they are made of and like the concentrations of various

EAU: Correct.

EW: Compounds.

EAU: Erin? Correct. And And all vegetable fruit animal mineral. Natural based colorants are exempt from the certification process, which means that nobody, other than the manufacturer who should be following good manufacturing practices, hopefully, uh, are the only ones that are testing them. They do, again, have to provide safety data before they can be certified for use, but there's no like oversight process of the manufacturing of those colorants because they are exempt from certification. Also, that means that synthetic colors have very explicit ways that they have to be identified on our, on our labels, on our food labels. Like you mentioned, Erin, they have to list F, D, and C yellow number five, right? Because those are batches that have been approved for use. Exempt colors do not have to be explicitly identified in the us. They can actually just be listed as added color or artificial color. Like you don't even have to say the exact thing that's in there.

EW: Yeah.

EAU: Or sometimes it can be listed under a whole bunch of different names, right? Because some different colorants actually have a bunch of different like common names that people use, and so you might have one colorant that has multiple different names, so you'd have to be able to identify all the different names that it has in the eu, the regulation for labeling and things is different, and every single food additive, whether it's a colorant or like a preservative or other food additives, whether it's a synthetic dye or whether it's a naturally derived dye, it has what's called an E number. So like E 1 23, E 1 0 2, E 1 29, blah, blah, blah. Every single thing. And that means, you know, quote unquote

natural colorants that we might list as paprika or, you know, beet dehydrated beets. They would list as E1 didn't, I don't know the numbers of those, but that's what they would list it as if it was used as a colorant. So that is one [00:50:00] difference is in the labeling that we have here in the US versus the eu. Okay.

EW: Right.

EAU: Let us focus a little bit more specifically on these synthetic dyes.

EW: Yeah. Yeah. Yeah.

EAU: There's a lot of different like chemical groupings of them. If you're looking at like the chemical structure, they're all derived from coal tar or nowadays mostly from petroleum. Most of the dyes that we use in the US fall into the Azo dyes group, which means that they're like, uh, usually these like carbon rings and then they've got two nitrogen groups that are double bonded together. That's what makes them an azo. But there are, I know there, there's other groups as well too, but there are in the US only eight slash nine ish of these that are currently permitted for use for food in the us and they are, I will list them for you so we can talk about each one in specific.

EW: Wow.

EAU: I know, 'cause there's not a lot of 'em. So we've got F, D, and C. They all have that at the beginning. Blue number one, blue number two, green number three. Yellow number five, most famous, yellow number six and red 40. And that's only what six right there. Those are the ones that we are eating because those are the ones that are really used in the

EW: Okay,

EAU: Okay,

EW: other two are not used.

EAU: there's a couple more. Let me tell you about them because these are also the subject of some like, uh, the April 22nd, uh, press release that the FDA came out with has some information about some of these. So let's get into it.

EW: All right.

EAU: There's two more that are likely going to be banned very soon, but they are still, uh, allowed right now. One of them is called Citrus Red number two.

EW: Hmm.

EAU: This is allowed in the us it's banned in the eu. It is only permitted to be used at really low concentrations. I think it's like less than two parts per million on the outside of oranges. This is so specific, Erin, that are not meant for juicing or processing.

EW: Yeah. Also, I did not know that oranges could be

EAU: Me neither. Okay.

EW: disappointed in everything. Like I'm just like, do why? Like,

EAU: Yeah, and it's not, it's not super common. Apparently what I saw, it's mostly only in Florida oranges. I don't know if that is just like, that's where they use it more, but it's not used very commonly. It's only permitted because again, the FDA sets very strict regulations on the amount that you can use and what foods you can use it in and in what context. So it is only permitted on the outside of oranges that are meant for consumption, where you're not eating the outside of that orange.

EW: Right.

EAU: And this is a controversial dye because there is some data at higher concentrations than two parts per million. But there is some data of cancer. I think it's bladder cancers, mostly in mice and rats. Um, and so that is one that the FDA has recently announced that they are planning to, they have not yet, but they are planning to revoke the authorization for citrus red number two in the coming months. Presumably there's another one that is still technically approved for use, um, that I just find. This is where you just get, like, this is just silly sometimes it's called orange B,

EW: Okay.

EAU: it is technically still on the approved list. Only for use in hot dog casings,

EW: Oh my God.

EAU: but it gets better. It has not been used since 1978.

EW: What's being used in hotdog casings today?

EAU: I don't know. Erin, probably red 40. Okay. And like yellow number five.

EW: Costco. What are you using in your hot dogs?

EAU: Costco's all natural. Erin, they're using paprika.

EW: Mm.

EAU: But

EW: you know that for a fact? Oh,

EAU: no, I don't, but I would guess. But, but, so this is one that in the 1960s when the FDA was reviewing all these things, they actually recommended, I think it was in like 1966 or 70 something. They were like, yeah, we should probably revoke Orange B because like there's some data that is probably carcinogenic and it's on a list of probable carcinogens. But the one and only company that was using Orange B for their hot deck casings stopped manufacturing them. So then the FDA was like me. Just never followed through on the

EW: like I don't wanna file the paperwork. That sounds exhausting. Like this is pointless. I've got other things to do on this Friday

EAU: So that's the only reason that it is still on the technically approved list, which is just so silly to me.

EW: The I, I've, I've rolled my eyes like now eight times, and

EAU: I know, I know. Sorry. There's probably gonna be a little more of

EW: Yeah. Yeah. [00:55:00]

EAU: yeah, so, so that one is also now actually going to be banned

EW: Okay.

EAU: in the next few months. But again, it has not been used, no one has been eating Orange B since 1978. Unless you're eating really old hot dogs, I guess someone somewhere. Now there's a ninth one, um, that is now banned, but it might still be in existence because the manufacturers have a couple of years to actually remove it from their products. And that is red number three. Red number three was banned officially in January of this year, 2025. So it's in the process of being phased out. The reason that it was banned is because of data on the increased risk of thyroid tumors in, and I think it's specifically in male rats. There is no evidence that directly links red three to causing cancer in humans. But because of this, what's called the Delaney provision, which was what went into effect in 1960 by the FDA, any evidence of the cancer causing properties of any food dye means it should be pulled.

EW: Right. Even if that is like, you know, one in 1 billion lifetime risk of cancer or something like that. Yeah.

EAU: Yeah. Even if it's only in animal studies, like et cetera. So red number three is now banned and companies have to phase it out as of now by 2027 for food and 2028 for drugs. Um, although the FDA has requested that manufacturers do this on a speedier timeline, so we'll see if that happens.

EW: Mm. Mm-hmm. Mm-hmm.

EAU: Now of the other six, blue one and two green, three, yellow five, yellow six and red 40, 90% of our synthetic dye consumption comes from just three colors. Yellow number five, yellow number six, and red 40. Do you like that?

EW: I do like that.

EAU: And I added pink because I like it. So those are the three dyes that are 90% of our synthetic dye consumption. We don't really need to use green that much 'cause we can make it from yellow and blue, and then we use blue one and two sometimes. So just looking at what is approved, I wanna address another misconception that always comes up in talking about these. When we look at the regulations in the US versus Europe, these dyes are not banned in Europe. People online love to say that all these dyes are not allowed in Europe, and that is a hundred percent untrue.

EW: Is it just the labeling discrepancy?

EAU: Erin. Like I said, the European Food Safety Administration, which is their version of the FDA, has different labeling requirements. The only

synthetic dye of those six that are used, so citrus number two and orange B are not allowed in the eu. Red number three still is, so it's banned now in the us. It's still allowed in the EU, though only in Marascino cherries. I believe the only synthetic dye though that's approved in the US that's banned in the EU is green. Number three. That is banned in the eu, but it's allowed here in the US there are three other synthetic dyes, cochineal red, ponceau four, and Quinolone yellow that are approved for use in the EU, but are banned in the us.

EW: Okay.

EAU: And I think that the reason that people say this is just 'cause they don't understand how labeling laws work. Like the EU system is logical and ours is not. And so yellow number five is called E 102. Red number 40 is called E 129, yellow number six is E one 10. They're all allowed. Now, when we talk about the hyperactivity stuff, which we'll, I'll get into, I swear eventually. There are some other differences in labeling laws in the EU and the UK that I think has probably led to differences in the way that artificial and specifically synthetic dyes are perceived in the EU and the uk, which has led to companies choosing to manufacture with more of the natural dyes than the synthetic dyes.

EW: I have a question about just dyes die use in general. Like what proportion of or, okay. The bottom line is I'm trying to ask. What the difference in dye consumption, artificial dye consumption is in the US versus the EU overall, like are greater concentrations used? Do more foods have dyes in one place versus another? You know what I

EAU: Yeah. Yeah, that's a really good question. I don't have, I don't have like hard data on that. At all. Um, the EFSA, the European Food Safety Administration sets their, um, acceptable daily limits, similar ways that the FDA does. They might have [01:00:00] different, they might come to different conclusions based on the safety data. Um, and the EFSA recently went through and reevaluated all of their ADIs in the last, like 10, 15 years, um, since like 2010 ish, I think. And so that was like a big process that they undertook. Um, but yeah, I, I don't know if we have good data honestly on the, like differences in consumption. I think anecdotally there seems to be more of a shift towards natural dyes in the e EU and the UK compared to in the US and I think it might come down to some of these labeling differences. So let's get more into the health data so that we can look at those labeling differences and why those might exist. Um. There's two big categories of potential for harm that the literature mostly focuses on, and that is the risks of cancer and hyperactivity in kids.

EW: Yep.

EAU: And so there's also though, I will say, and this is I think really important and often under appreciated. Um, there's also the potential for hypersensitivity reactions, AKA allergic reactions, and there's evidence that some of these synthetic dyes, yellow five, possibly also red 40, can cause allergic reactions in some people. Natural dyes can also cause allergic reactions. A lot of these natural dyes actually can cause allergic reactions as well. So that

EW: as clearly labeled, which is also trickier.

EAU: Right in the US they're not as clearly labeled. And so that is tricky because if you have these natural dyes, like a NATO extract is one that definitely can cause hypersensitivity reactions, but that doesn't necessarily have to be on a label that's a problem. But let's focus on the cancer part and the hyperactivity part. And the cancer part is kind of short because I already mentioned the big ones that we know have some associated information or data that suggest an increased risk of cancer. And those are the dyes that have since been either banned or are on the chopping block. So orange B citrus red number two, and red number three. Again, none of these have data for cancer in humans, although I think that citrus red number two, uh, is on like the IARC list of potentially carcinogenic in humans. Um, but all of these are now either banned or in theory will be banned soon in theory by the FDA.

EW: Okay.

EAU: For the other dyes that exist that are still approved. The other synthetic dyes, there's not any real data of cancer in these. So there's very limited and pretty controversial evidence of reticular endothelial cancers in mice, but not rats for red number 40. And it seems like this data is like, based on, a lot of these studies are honestly just not great. Um, so that's a problem in and of itself. There was, um, a study in blue number two that was like maybe an increased risk of bladder or brain tumors in rats. But again, it was like not a great study. So people were like, maybe it's not accurate. Um, with green number three, there's no evidence of carcinogenicity yellow number five, yellow number six, no evidence of carcinogenicity. There's a colorant called amaranth, which is red number two in the us, or E 123 in the EU that is now banned in the US that did have some increased risk of tumors in female rats. So that's why it's banned here. It's still permitted for use in glace cherries in the eu, in the uk.

EW: Okay.

EAU: Lots of cherries. So overall, like there are studies that have looked at the risks of cancer, mostly in mice and rats in each of these synthetic dyes, and the evidence is not, does not show an increased risk of cancer for these thus far. Might that change in the future? Perhaps? But the big one, of course that gets, I think the most press is not cancer, it's hyperactivity.

EW: Yeah.

EAU: So Erin, we will need to do ADHD someday.

EW: Yeah, we will.

EAU: Okay. It's on our list, but the. the idea that food colorants might be related to ADHD or hyperactivity stems, like you mentioned, Erin, from studies that date back to the 1970s that were conducted by a guy named Feingold. What he did was he put kids who had hyperactivity and I don't know if it was technically diagnosed as ADHD at the time.

EW: not sure what the criteria were then.

EAU: 'cause they, they have changed over time. But in any case, kids who had hyperactivity put them on pretty restrictive diets, very restrictive. kind of elimination diets where they had no artificial colors, no artificial flavors, no preservatives. Right. A [01:05:00] very limited diet. And he saw that on this restrictive diet, kids had a reduction in their hyperactivity symptoms. And this was

EW: was this self-assessed, was this subject, was this, uh, parental, uh,

EAU: This is a really great question. Great question. I don't, I did not read his study and so I, I don't know exactly what his exact metrics were, but that study and that book that he published sparked decades of research into diet and ADHD. food colorants was one part of those restrictive diets. And so since then, people have also said, okay, well if we want to parse out food colorants specifically, then we actually have to look at kind of controlled trials where we expose people to food colorants. We expose kids to food colorants and look for behavior

EW: increases. Yeah. Okay.

EAU: So I'm gonna just kind of summarize these last few decades of data leaning heavily on some recent meta-analyses that have been conducted to, to

look at all of this. The basic summary is this. There is some evidence that some kids might have an increase in symptoms related to ADHD, like inattentiveness, fidgeting, impulsivity, overactivity, and other symptoms that we see with ADHD with exposure to synthetic food colorings. So I wanna be very clear about what this data shows and what it does not show. 'cause it's important.

EW: Yeah.

EAU: There are no studies that are providing any evidence of a causal relationship, so there is nothing that shows that food dyes or other additives for that matter, are what are causing ADHD, ADHD is a condition that has really strong genetic components that we don't fully understand, and there are likely these like gene by environment interactions and environmental triggers. There's a really wide spectrum of symptoms. There's not evidence that food dyes are causing ADHD, but there is evidence that for some kids, some of whom might have a diagnosis of ADHD and some of whom might not, exposure to some of these synthetic colorants might worsen some of those hyperactivity symptoms.

EW: Okay.

EAU: And this seems to be the most pronounced in younger kids. Now. You asked Erin, how are we measuring this? Is it based on parental, is it based on blah, blah, blah? There's a really wide range of that. And because these studies and there's, there's a number of them and they've been done over the last few decades, but they've, they're not a ton of standardization in the way that all of these studies are done. So in some of these studies, you actually can't disentangle the effects of food colorant from a preservative called sodium benzoate that they've used in a lot of these studies. So some of those like you see an effect. But is it the sodium benzoate or is it the colorant? We don't know for sure. Some of these studies only show significant effects of increased hyperactivity when we look at parental reports, but not when we look at teacher observations or clinic observations.

EW: are like double blind studies

EAU: Most of them are, um, they're blinded and they're crossover studies, the good ones. And so that means that you're exposing a kid to a, you have them go on a restrictive diet ideally so that they're not being exposed to food color in their regular diets. And then you're giving them usually a juice that has either preservative or food coloring or

EW: Mm-hmm.

EAU: either one or a mixture. And that's another issue is that a lot of these studies look at mixtures of food, colorants, many of the mixtures, 'cause many of these studies were done in the uk. Many of the mixtures contain food colorants that are not approved for use in the us. So some of those synthetic colorants that we don't

EW: So we don't know, like, I like the, the specific food dyes that might be associated with this.

EAU: Yellow number five is the most implicated. It's the one that's had the most studies on a single food colorant, but a lot of them look at a combination, so we don't know for the other food colorants. Um, and then, yeah, so then you expose the kid, you have them drink this drink that either has food coloring or doesn't. You observe them, you do these clinic observations, parental reports are given, and then you do a washout period and then you give them something else that doesn't have it and vice versa. So you randomize them to whether they receive that first or whether receive that second and you observe them at both times. Some of these studies, they only really saw an effect in kids who maybe had a history of atopy so like allergies or asthma or something. And in nearly all of these studies, the effect sizes are pretty small. So we're looking at and effect sizes are hard to like interpret. Um, but overall it's like a small increase in these symptoms of hyperactivity.

EW: Okay.

EAU: that's, you know, even a small increase in hyperactivity in kids, if you're talking about like a classroom full of kids, that could have a [01:10:00] huge effect,

EW: And so just so I I, I understand this is if you, if, if a kid has been diagnosed with ADHD or not, this is a deviation, is an increase in the symptoms of hyperactivity specifically. And so by putting them on an elimination diet, it's not going to cure ADHD, it's not going to lead to an alleviation of symptoms.

EAU: Well, um, that is what the Finegold data shows and, and that is what a lot of these restrictive diets show that yes, if you take away food diets, you put a kid on a restrictive diet, you can improve their symptoms ADHD.

EW: so it's not just like food dies lead to increased symptoms or food dies are associated with increased symptoms, but it's also that a complete elimination of food dies will cause an

EAU: symptoms, correct? Yes. And so one of the meta-analyses, specifically looking at kids with ADHD suggested that it's about maybe 8% of kids with ADHD have symptoms that are related to synthetic food colorants, was what their estimate was overall.

EW: Mm-hmm. Mm-hmm.

EAU: So that that is what the data shows. And because of this data and because of how much we've had over the last few years in the EU, and I believe also in the UK foods that include some of these synthetic colorants, especially yellow number five, and some of the others too that we don't use in the US have to include a warning label on the food that says "may have an adverse effect on activity and attention in children." End quote. That. I don't know the exact year that that went into effect, but I very much suspect that that has contributed to this shift that we see in the EU towards natural food dyes rather than synthetic food dyes.

EW: Have similar studies been performed on natural food dyes?

EAU: Not that I found Erin,

EW: That's interesting.

EAU: It is because the restrictive diets are no artificial colorants, which includes artificial colorants derived from natural sources.

EW: Okay. And what would the possible mechanism of action be?

EAU: I knew that you were gonna ask that, so I have a tiny little paragraph to tell you. We don't know. The studies that have tried to look into this have not all come to the same conclusions. Obviously they're also all based on like mouse and rat studies, which is pretty limiting. There's maybe some suggestion like, is it because these are pro-inflammatory in some way? Is it actually the metabolites from these dyes? Is it some like gut brain axis type of stuff? The bottom line is we don't know what the possible mechanism could be here, so it's all based on this, you know, like these, these studies looking just at kids, and again, also no data in adults that there's any issues with hyperactivity. Not that adults don't have ADHD, but nobody's done those studies. Nobody's looking at adults.

EW: what's, what is the degree of impact?

EAU: it's, it is a small effect and it is not all kids with ADHD and I think that that's the most important part. So none of these studies and like the, the kind of community at large in terms of how we treat ADHD does not suggest restrictive diets as a cure. It's not a cure for ADHD

EW: Okay. Yeah.

EAU: Point blank, but there is some data that for some kids. A reduction in their exposure to these synthetic colorants and maybe other food additives. And again, there's like, there's more data that needs to be out there, right? Because it's, especially when we're looking at like kids with ADHD put being put on these restrictive diets, it's way more than just the food colorants.

EW: Mm-hmm.

EAU: So there is a lot more like data that needs to be parsed out in that. And there are a lot of people that are working on that. So I'm not here saying that, you know, eliminating food dyes is a cure for ADHD. That is not the case and that is not what the data shows.

EW: Right.

EAU: But there is an increase in hyperactivity symptoms for some kids with exposure to some of these synthetic dyes.

EW: How interesting.

EAU: Yeah, it's interesting and it's like really hard to know, like what do we make of it, right? What do we do about that? What percentage of the population has to be affected for the FDA to say that we think that this constitutes a harm and therefore these should be banned? The EU and the UK have not banned them. They've decided that what they're going to do is put a warning label so that consumers can decide, you know, I don't want my kid to have this because I am worried that they might have an increase in difficulties with activity and attention. So it's, the question is, how, how do you decide this? And that's not for us to answer. It's for the FDA to answer what the FDA has decided that they're going to do according to their press release from April of 2025, [01:15:00] is ask nicely that manufacturers please stop using these synthetic dyes and instead switch to natural dyes. That's what they said. And a lot of the press about this was like FDA banning synthetic dyes. It has not.

EW: So it was just like a, Hey, would you mind? Like, if it's not a problem, hope you're doing well.

EAU: asking manufacturers to stop using these other synthetic dyes. Red number 40, yellow five, yellow six, blue one and two green three. And they're saying, will you please? And the manufacturers apparently are like, yeah, sure. But they've apparently said, yeah, sure. Before, by the way, this is hilarious. In 20, I think it was 2016. General Mills who makes Trix was like, we are gonna switch to natural food dyes. 'cause that's what our consumers want. So they switched Trix to be natural food dyes and everyone hated it. And they were pissed. So in 2017 they switched back?

EW: Yeah. I mean, like, this is, this is what I was saying is that like it's going to take some getting used to, and I feel like it needs to happen across the board if it's going to happen. Otherwise, companies will not be on board.

EAU: Well, and here's the other thing that I think is, is really important that we need to remember as we're talking about all of this and the thing that made me the most, like, I guess frustrated with this episode, I we've said already, food dyes. Serve no purpose other than to make our food look better and make us want to eat more. Manufacturers have a really strong reason to want to keep as many as cheap and as potent, right? Like so you use as little as possible, food dyes available so that they can keep consumers happy and have us buy their product instead of someone else's.

EAU: The FDA absolutely should have very strict requirements and regulations on what can be approved as a food dye, whether it is derived from a beet or a beetle's' butt or petroleum. And that means that the FDA needs to be empowered to do this. They have to have the budget, the human power, the expertise.

EW: The expertise.

EAU: To be testing these dyes, to be reviewing these studies, whether they are natural or synthetic, and we as consumers should expect a really high degree of safety testing and scientific rigor because the risk benefit ratio has no benefit. Our risk tolerance should be very low. This all makes sense.

EW: right. Right.

EAU: But we can first of all do that without distorting the data that exists, right? Without lying about what's approved here in the US versus the uk.

EW: That's what I think bothers me about this. Or like, I was trying to articulate like, I want this, I want these decisions to be made for the right reasons. The evidence-based reasons,

EAU: We can do that without making blanket statements that dyes are poisoning us and with recognizing that natural food dyes are not free from risk. These also need to have their safety profiles adequately addressed. And right now, the FDA has announced in this press release in April that they, are going to expedite the approval process of at least four new natural based food

EAU: dyes.

EW: Because they're natural.

EAU: Because they're natural. So what it feels like we are doing with food dyes is the same thing that we have done with a lot of other issues that we've talked about this season already. We are pinpointing a single aspect, in this case of our food system, and we are demonizing it. We are pinpointing something that seems bad because it's synthetic or it's not natural, and we're putting all of our focus and blame on this one thing. Synthetic food dyes instead of looking at the bigger picture. And the bigger picture, if we really take a step back, is that these food dyes, synthetic or natural, are predominantly found in our ultra processed foods, which account in the US for 60% of our diet and ultra processed foods are more energy dense and way less nutrient dense, packing more calories and less nutrition than unprocessed or minimally processed foods. And yet these are less expensive per calorie, less expensive per gram of food, and their cost has increased less over time compared to the cost of unprocessed or minimally processed foods. Hello, eggs versus Eggos right now.

EW: Right. right, right.

EAU: So why can't we focus more on this? Switching our food dyes from red 40 to dehydrated beets or yellow five to turmeric is not going to change anything about our health. If we're all still eating lucky charms and trix for breakfast, it just like feels like a distraction.

EW: Uh, you know, it is, and I feel like there is so much, it's such a complicated topic because there's so much to it. There's so much to it.

EAU: And like you said, Erin, I hadn't even really like articulated what you said about this. As we start switching to quote unquote natural, that's a whole new marketing [01:20:00] gamut for companies, right? Oh, this is healthier. Oh, if I

look at a label and it says it's got beets in it, now my kid is eating beets. No, they're not. It's just a colorant. It's not beats.

EW: I mean, it is, it is just a, a, a marketing. It is. It's all, it's all marketing. I mean, that, that's the thing. And, and it's a, it's a shame because like. I don't know. I love color is, I think it is human to love color and to want to enrich our world with color.

EAU: a hundred

EW: percent. I mean, look at your shirt.

EAU: Look at my shirt, look at my nails. Look at everything.

EW: Yeah. Um, but I think that, yeah, there needs to be real consideration with where we are using that color and why we are using that color when it comes to the foods that we consume.

EAU: A hundred percent.

EW: Yeah.

EAU: So if you would like to read way more about where we got all of this information from, let us tell

EW: Let us tell you. Okay. I have a, I have a bunch of sources, but I'm gonna show up two right now. One is a book called A Rainbow Palette, how Chemical Dyes Change the West Relationship With Food by Carolyn Cobbold. And Another is a Paper from 2009 by Burrows titled Palate of Our palates, A Brief History of Food coloring and Its Regulation.

EAU: I love it. Um, I relied very heavily on the actual FDA websites and the EFSA websites to tell me about how these colors are regulated and what they do. But there also was a paper from 2017 by Leto et al, um, that was titled Comparison of Food Color Regulations in the EU and the US A Review of Current Provisions and then. The meta-analyses. There was a lot of them and, and like bigger studies looking, there was one that was by. Kabi, Luki and Jacobson from 2012 called the Toxicology of Food Dyes. There was a really great meta-analysis from Nigg Etal 2012 titled Meta-Analysis of Attention Deficit Hyperactivity Disorder or Attention Deficit Hyperactivity Disorder Symptoms Restriction Diet and Synthetic Food Color Additives. And there were several others that were more recent as well, both on restrictive diets as

well as. Um, food colorants and I have some data to back up what I said about ultra processed foods at the end too. So you can find the sources from this episode and all of our episodes on our website. This podcast will kill you.com under the episodes tab.

EW: Thank you to Blood Mobile for providing the music for this episode and all of our episodes.

EAU: you to Tom and Lianna and Brent, and Pete, and Mike and Jess and everyone else at exactly right for everything that you do, helping us make these episodes.

EW: you. Thank you, and thank you to you listeners. We hope that you enjoyed this episode.

EAU: Did you tell us, tell us please, how do you feel about food dyes I'm really curious what the like non, not just the internet consensus is.

EW: Yeah.

EAU: So tell us

EW: And a special thank you to our patrons. Of course. We appreciate your support so, so very

EAU: Yeah, we do. Thank you so, so, so much.

EW: Well, until next time, wash your hands.

EAU: You filthy animals.