

# Fluoride 1

[00:00:00]

**Fluoride 1 Firsthand:** It is now 25 years since the late Trendley Dean and I journeyed by train from Washington, DC to Grand Rapids, Michigan, to be joined by Philip Jay for a meeting with the mayor to gain his approval for a water fluoridation experiment. There were no signs of apprehension, of daring, or of pioneering. There was no suggestion that we were being foolhardy in subjecting a population of 160,000 people to a procedure which might have either short- or long-range hazards. We were merely replicating nature's best, based on an extensive background of study data in nature's laboratory. In the United States alone, some 7 million people in 1,900 communities had, throughout life, used drinking water which was naturally fluoridated with a fluoride concentration of 0.7 parts per million or more. We knew what too much fluoride did. We knew what too little did. We knew what the optimum amount was, and we had reassurance that 1 ppm fluoride in the drinking water had the same biological effect, whether it got there from flowing over rocks or from a feeding machine. Twenty-five years ago, there were no antifuoridationists to becloud the issue or distort our efforts.

The opponents of fluoridation act collectively as merchants of fear and doubt, implicating fluoride as either causing or exacerbating virtually every disease and biologic malfunction known to mankind. They discovered early that the public referendum method afforded them excellent opportunities to exploit fear and doubt while posing as protectors of human rights and religious freedom. The antifuoridationists sought opportunities to engage us in debate on the platform, on radio, and on television. In retrospect, it is clear that it took us much too long to learn that these public debates, these confrontation dialogues increased confusion rather than understanding, and thereby helped serve the cause of the antifuoridationists. On July 27th, 1969, the assembly of the World Health Organization, at its annual meeting in Boston, endorsed water fluoridation. This endorsement adds another asset of great potential use. That potential will not be activated, however, unless it engenders commitment and political action by the proponents of water fluoridation. It has been said that only a fool learns from his own mistakes. You are invited to escape that classification by learning from the mistakes committed by me and my colleagues during the past 25 years.

**EAU:** Erin,

**EW:** Yeah.

**EAU:** that's very interesting.

**EW:** it? Yeah. So that is a, like a reflection article about fluoridation after 25 years by one of the people who like led the charge, John Knutson. And that paper was published in 1970.

**EAU:** Oh wow.

**EW:** Yeah.

**EAU:** Long time.

**EW:** it's just, it's fascinating to me. I think also the reflection of like, we made mistakes. We made mistakes by not being by, by just assuming that the public would accept facts and science. Right?

**EAU:** Yeah.

**EW:** yeah, we have science on our side, but that doesn't really

**EAU:** Doesn't mean all that much. Yeah.

**EW:** So it's, so it was really interesting. The whole, the whole paper is very interesting to read.

**EAU:** I also, I love that I tell my five-year-old that all the time. I'm like, you could learn from our mistakes. We're just trying for you to learn from our mistakes so that you don't have to make the same one.

**EW:** know.

**EAU:** doesn't work with the five-year-old. I don't know if it works with grownups either.

**EW:** No, certainly not. Rarely. Ah.

**EW:** Hi, I'm Erin Welsh

**EAU:** And I am Erin Allmann Updyke.

**EW:** This is, This Podcast Will Kill You.

**EAU:** Welcome to episode one of two on Fluoride

**EW:** Fluoride. There's a lot there. We wanted to get it all, you know, out in the open, the full story.

**EAU:** I am really excited about this. Uh, we split this episode into two episodes. This series, we're making a series out of it, um, very much like we did with Raw Milk. So today I just get to listen. So excited about that. Uh, well, you tell us all about the history of fluoridation and how we got to where we are today, and then next week I'll go through what the heck is a cavity anyways,

**EW:** What is, yeah.

**EAU:** and what do we know about the, like, biological effects of fluoride?

**EW:** Yeah.

**EAU:** I can't wait.

**EW:** I, I am really [00:05:00] excited. I mean, like, it's, it's very funny to me because when I was doing this, and I'll tell you more about this like in the actual episode, but the parallels between raw milk and fluoride are just off the charts where I'm like,

**EAU:** I expect nothing less. It feels also very anti-vax too. Like it's all the same. It's all the same playbook, like we've talked about you, you and I a lot.

**EW:** Yes. The playbook. That's what I think reading that paper. It's funny 'cause like we talk about this in our, in our presentations where we're like, this is how, um, disinformation, spreaders this is, these are the strategies they use. Debate equal sides or equal time to both sides. And I'm like, oh my gosh.

**EW:** Um, there were so many other things, just like fear and doubt. And then I

**EAU:** The maverick scientist.

**EW:** The other thing being inaction, that like people don't feel well informed enough about fluoride because it is a really complex scientific topic to vote at all. So then even if they might be pro fluoridation, they're like, but it feels safer to not vote. It feels safer to not vaccinate despite what we know anyway. It's, there's

**EAU:** Because it feels like not doing something is like not taking a side when in fact it is still taking a side. So yeah, it's, Ugh. Erin, I

**EW:** people to like be pro fluoride and not just like, you know, indifferent is really like pulling teeth.

**EAU:** Is it Erin?

**EW:** Did you like that?

**EAU:** That was really good. Your face was so straight when you said it.

**EW:** I was trying to find the best transition to quarantini time.

**EAU:** Oh yeah. It's quarantini time.

**EW:** quarantini time, but we're drinking, pulling teeth. Um,

**EAU:** Uh, pulling teeth,

**EW:** pulling teeth. It is. It's delicious. It is. Um, it's got elderflower liqueur, mint, Prosecco. Mint because like, you know, freshness,

**EAU:** toothpaste.

**EW:** water. Yeah. Toothpaste.

**EAU:** bring a little toothpaste in your

**EW:** Don't consume toothpaste.

**EAU:** No, it has too much fluoride.

**EW:** much. Too much fluoride. Uh, it's a great little summery, refreshing bev. And we'll post the full quarantini recipe as well as the non-alcoholic placeborita, on our website. This podcast will kill you.com as well as on all of our social media channels, which if you're not following us on those, you should be.

**EAU:** Check it out. We're there.

**EW:** we are.

**EAU:** Uh, also, if you haven't yet rated, reviewed and subscribed on whatever platform that you love to listen, uh, where you're listening right now, do so. We'd love it. It would appreciate. We would appreciate it. Um, if you are not already subscribed to the exactly right YouTube channel, you could do that as well too. Um, we're there,

**EW:** We're there, we're also, we have a website, but you've listened to episodes before. You know what's there. Let's

**EAU:** And if you haven't, this podcast will kill you.com. Goodbye.

**EW:** Goodbye. Goodbye. And hello. We'll, um, we'll get started, uh, just after this short break.

**EW:** Born in 1874, Frederick McKay had spent his childhood, like many others in his hometown of Milford, Massachusetts. He worked in his father's dry goods store. He played in bands. He went to school. But when he turned 16, he noticed that something felt off. Maybe it was a lingering cough, maybe it was night sweats, persistent fever, the diagnosis, tuberculosis.

**EAU:** Mm.

**EW:** Like many others at this time, I mean, tuberculosis was rampant. He sought to cure his disease with a better climate, dry air, so he traveled to Colorado Springs where he recuperated for a while until he felt well enough to move back to Massachusetts. Upon returning to the Northeast, he decided on a life of dentistry, and just as he was completing his education, McKay's tuberculosis flared up again, driving him back west where he set up his dental practice in Colorado Springs in 1901, I think he was like, there's no point in me, like I should just stay out west forever. Right? And before long after his arrival there, he began to notice an unusual pattern in the teeth of some of his patients. And even just like talking to people around town, he noticed this something on their teeth. And this was not anything that he had come across in his dental training. Their teeth were streaky

**EAU:** Mm.

**EW:** or yellow spots, something that he called mottled enamel. And that the locals called Colorado Stain or Colorado Brown Stain, which was a term not entirely welcomed by city officials who were trying to get people to come to the springs, not repel them. Um, and so McKay got kind of obsessed with the mystery of mottled enamel, like what the heck was causing it, and why did no

one know about it? Why was this not in any dental textbook that he had [00:10:00] come across? Other local dentists knew about it and they weren't all that interested, and they just kind of figured, well, it was specific to the Colorado region. It was kind of like, yeah, we've seen it before.

**EAU:** How interesting to not to just be like, yeah, this is how it is here, but I guess if you have no other frame of reference, so it makes sense. He like trained in one place, came to somewhere else and was like, this is different.

**EW:** Yeah. Yeah, exactly. So he was like, what do you mean this is not, like, this is not what

**EAU:** This is not just

**EW:** look like. Yeah. Um, and uh, and, but when he, so he briefly moved, McKay briefly moved to St. Louis, and that's when he like confirmed for him. Okay. This is not like a. A nationwide issue. This is something that is specific to the Colorado region. Um, and so when he moved back to Colorado, again, tuberculosis driven, he was like, okay, someone's gotta get to the bottom of this. I guess it has to be me. I think secretly he was like, oh my gosh, I really wanna know what's happening here.

**EAU:** Yeah,

**EW:** And so the first steps to solving this puzzle were raising awareness, which he did by attending various regional and state dental meetings, sometimes with a patient in tow to be like Colorado Brown stain. Open up. Yeah. And also just by getting a sense of the incidence and the geographical scope of the issue, which he did by examining children in Colorado Springs public schools, 87.5% of the kids had mottled teeth.

**EAU:** Wow. Okay.

**EW:** Huge. That's a huge proportion.

**EAU:** Yeah.

**EW:** McKay's efforts made it clear that there was a real issue here that was worth looking into. It wasn't just like a local curiosity. This was affecting a great number of people's lives. And as McKay cast a wider net traveling around the state to look for more cases and receiving help from dentists across the country, he realized that the Colorado stain was not at all limited to Colorado or even the

us. I think there was like another term for it. I wish I had written this down in Texas. It was like maybe like Texas teeth or something like that. 'cause there were some communities that had mottled teeth. Yeah. Or mottled enamel. And so this, this finding that it was like much more widespread and he was like, okay, there's gotta be what is driving this. It led him to team up with a, the dean of Northwestern University's dental school whose name was Dr. Greene Black, which. Is hilarious to me that it's, yeah. Uh, and he, they wanted to partner to systematically study like what was happening with the stain at the tissue level. You know, what, what is the stain coming, where is it

**EAU:** Right. What is it in there?

**EW:** Yeah. And then try to find its root cause

**EAU:** Okay.

**EW:** as they collected more samples and more data on where and how the staining occurred, one thing stuck out to them, even though the enamel on mottled teeth was rough and uneven, that didn't seem to make the teeth more susceptible to decay, which is what they would've predicted. In fact, what they noticed after examining thousands of patients was that decay was much lower in people with mottled enamel than it was in other populations.

**EAU:** Hmm.

**EW:** I mean, this could be huge, like this finding had huge implications, except they still didn't know what caused the mottling,

**EAU:** Okay.

**EW:** but they had a suspicion. It was in the water.

**EAU:** Hmm.

**EW:** Yeah. In his investigations, McKay had seen that children who lived elsewhere for the first two to three years of their life before moving to a mottled teeth area were not affected.

**EAU:** Okay.

**EW:** So he also noticed that basically all members of a community, regardless of their diet, whether they were rich or poor, where their house was, they all had mottled teeth. He added stronger evidence to the water hypothesis when he visited a dentist in South Dakota who had reached out asking for McKay's advice on the mottling that he saw in his own town. And it turned out that the town had switched their water supply 18 years prior, and you could draw a sharp line between those born before the switch, no mottling. And those born after lots of mottling.

**EAU:** Ooh.

**EW:** Like really compelling. And so over the next 15 years, McKay continued his search for the answer and had, by the late 1920s, accumulated ample evidence that the water held the key.

**EAU:** Okay.

**EW:** The final piece of the puzzle fell into place when McKay was sent by the US Public Health Service to a small town in Arkansas called Bauxite. And this is a mining community built for employees of the Aluminum Company of America, ALCOA in 1909, uh, Bauxite had switched their water from shallow wells to a deep well, and kids born after the switch had extremely mottled enamel. This was not welcome news for ALCOA. The, [00:15:00] the company, the aluminum company who was already under fire from claims that their aluminum cookware was toxic. so they were like, this is gonna be used as evidence that we're poisoning the water to now, like everyone's gonna hate us even more. Um, and so the chief chemist of ALCOA examined the water for rare elements using sophisticated tech, not readily available.

**EAU:** Okay.

**EW:** And he wrote to McKay about what he had found. We have discovered the presence of hither two unsuspected constituents in this water. The high fluorine content was so unexpected that a new sample was taken with extreme precautions. And again, the test showed fluorine in the water. They detected fluorine at a level of 13.7 parts per million.

**EAU:** That's very high.

**EW:** Very high. Yeah. For context, the recommendation today is 0.7 parts per million. And it used to be one, but then it was revised downward. And so that

0.7 recommendation is enough to protect against decay, but too low to cause fluorosis. Yeah. 13.7.

**EAU:** That's quite, quite a lot higher.

**EW:** very, very high. Yeah. So, but this was also, this was not necessarily, it's kind of interesting, I, I came across this later, but this is not necessarily the first time that fluorine had been linked to this, but for some reason McKay either like, missed, like, missed the, the memo on those or just like didn't, it didn't seem as compelling as this example here.

**EAU:** Okay.

**EW:** And so then McKay like this really was like, whoa, this seems like this seems pretty, uh, strong, at least like suggestive,

**EAU:** right, right, right. Like we should look into

**EW:** look into this. And so that's, that's what he did. He sent additional samples from other endemic areas where there was a lot of, uh, mottled enamel. And yes, the results were like, okay, this, every single one of these places where there is high, uh, teeth, like high mottling, um, the fluorine levels are high. Either, you know, ranged from two parts per million in Colorado Springs to 12 in Kidder, South Dakota.

**EAU:** Okay.

**EW:** The US Public Health Service was pretty excited and worried about these results, which, like, historically they were not, they didn't seem that interested in it. Um, but now this was finally like, okay, we have, we have something to go on

**EAU:** Right. Wait, wait. We have some data here and not just like observational stuff. Yeah.

**EW:** And so they sent, uh, a young dental officer, Dr. H Trendley Dean to get a clearer picture of the relationship between fluoride and mottling. And in his investigation he found that not only was there a clear relationship between the degree of mottling and fluorine concentration, which was like in kind of like a dose, like there was like a continuous relationship essentially.

**EAU:** Mm-hmm.

**EW:** He also observed the striking connection between fluorine and dental caries

**EAU:** Mm.

**EW:** in children who lived, where the water supply had 0.6 to 1.5 parts per million, only four to 5% were caries free.

**EAU:** Okay.

**EW:** in Whereas in areas where the water was 1.7 to 2.5 parts per million, 22% were caries free. So like five times

**EAU:** it. So the higher the concentration of fluorine, then the more kids had no cavities whatsoever.

**EW:** The higher the the protective ability. Yeah.

**EAU:** Okay.

**EW:** And then there was a study of 21 cities that showed that children aged 12 to 14, that had grown up in a city with 0.5 parts per million or less had on average more than seven decayed missing and filled permanent teeth. These are kids aged 12 to 14.

**EAU:** wow.

**EW:** Yeah. Further studies showed that the caries protection provided by fluoride plateaued around one part per million, which was a level that only led to quote sporadic instances of the mildest forms of dental fluorosis of no practical aesthetic significance. So it was like, okay, we don't need to add more and we're not gonna add, we're not gonna get more protection. If we add more. If we add more, we're just gonna get dental staining.

**EAU:** got it.

**EW:** And so Dean concluded in 1938, quote, in as much as it appears that the mineral composition of the drinking water may have an important bearing on the incidences of dental caries in a community, the possibility of partially controlling dental caries through the domestic water supply warrants thorough epidemiological chemical study

**EAU:** Okay.

**EW:** Yeah.

**EAU:** I'm on board.

**EW:** So nearly four decades after a tuberculosis flare up sent Dr. Frederick McKay back west where he embarked on unraveling the mystery of mottled teeth. Dentistry in the US and around the globe was about to undergo a massive transition where prevention now occurred [00:20:00] alongside restoration as the primary goal. Previously it wasn't really possible, like there wasn't enough known about what causes tooth decay to, to enact any sort of preventative measures,

**EAU:** So this also like this finding also allowed for just like preventive dentistry period, which is now like the cornerstone of dentistry. Ha,

**EW:** yeah, yeah. Uh, but as we'll see, not everyone welcomed this change and some actively fought against it.

**EAU:** Classic.

**EW:** So next week, Erin, you're gonna take us through more of the nitty gritty biology of how dental caries forms and what, uh, fluoride does to reduce decay. But I want to take some time here to talk about dental caries over history, because when else am I gonna get to do this? And plus, like any opportunity to talk about paleo pathology, even the littlest bit is fun. So humans and many other species have been impacted by dental caries since, well before we were humans, of course, fish hundreds of millions of years ago. Dinosaurs, tens of millions of years ago.

**EAU:** Stop it. Wait, wait, wait, wait. Do we have like fossil dinosaur teeth with cavities?

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

**EAU:** Oh, I love

**EW:** I know, I know. Uh, also our hominid, an relatives and ancestors, wild animals today, like bears get, get carries. Our domestic animals like dogs, I mean, carries for, all right? So let me just take a second here to define what carries is. Essentially it's tooth decay. So the hard enamel on the surface of a

tooth begins to wear down and the inner soft dentin gets exposed and slowly decays. Sometimes reaching the pulp cavity, the initial hit that enamel loss is helped along by bacteria in our mouth producing acid, fluoride, by the way, acts to help strengthen that enamel. And so that's how it protects us from caries and a, a cavity. Just to distinguish, because I was like, what is the difference?

**EAU:** versus, caries, you're doing this. I don't have to next week.

**EW:** Okay. I mean, the cavity is essentially when that tooth decay turns into a hole.

**EAU:** Mm-hmm.

**EW:** So that's it. Like, it's

**EAU:** So like caries is the first initial bit and then

**EW:** I think caries is I well, okay. Now I'm not entirely sure if it's like more of a general term or just like, like caries is tooth decay and cavities is specific to when there's like, uh, tissue loss maybe. Or like when there's a hole formed. Yeah. Yeah. And so given that caries affects teeth and teeth stick around for a long time after we die, we can make some judgements on how the prevalence of caries has changed over human history. And it certainly has, um, in ways you can probably predict. So in general, dental caries increased as humans moved from a hunt, a hunter gatherer lifestyle to agriculture. And you can see this with different, um, groups like in the same region or era. Right? So as some groups, let's say you have like a same, a similar region in the same time period. Some groups are still mostly hunter gathering and some are, um, farming. You can see within those groups even changes. Yeah.

**EAU:** Okay.

**EW:** And so yeah, those that incorporated more farming and carbohydrates into their lifestyle had more caries

**EAU:** Because of the foods they were

**EW:** Exactly, yeah. Specifically, uh, carbohydrates like cereals and potatoes and

**EAU:** Yeah. Yum.

**EW:** Yeah, and I mean the things that I love so much so, and this pattern continues today as groups adopt quote unquote Western diets, their rates of caries increase. So let's put some numbers to this. If we look at the percentage of individuals within a population that have caries, so let's say like Europe, we can go back to around 4,500 BCE, which is post agricultural revolution. So rates are already higher than historically, and around that time we see around 29% of adults impacted

**EAU:** Okay.

**EW:** this percentage rises and falls. So goes up to like 36%, around 1500 BCE, back down to the upper twenties percentages closer to the first century ce. We see another rise in the seventh century to 56%, which is when refined sugar became a commercial product apparently.

**EAU:** Interesting.

**EW:** And today global values are over 95%.

**EAU:** I was gonna say 20%. That sounds so

**EW:** low. I know. Yeah.

**EAU:** Wow.

**EW:** Yeah. Uh, we know that it's diet causing this, but how, okay, so I'm just gonna read you a quote 'cause this does it better than I could do it. It's from a book chapter, quote, "A cariogenic diet [as in one that produces more

**EAU:** caries]

**EW:** has been [00:25:00] defined by the following features, frequent intake of meals with a high content of carbohydrates quickly fermentable, mainly sucrose, with retentive and sticky consistence that produces repetitive lowering of pH values and changes in the ecology of dental plaque." End quote. More sugar, more carbs like potatoes and cereals equals more lesions and faster development of lesions.

**EAU:** right. And different microbiome in your mouth.

**EW:** different microbiome in your mouth. Totally. And so since the advent of agriculture to the mid 20th century, it's like we were hurtling towards the state where caries was omnipresent and unavoidable. For centuries caries and other dental woes had featured in medical texts along with some creative treatments, um, including the Ebers papyrus. But dentists were largely powerless to prevent the development of tooth decay. And so their efforts focused on restoration and keeping things from getting worse. Even after germ theory helped to, uh, make the connection between acid producing bacteria and tooth decay, and also diet and acid producing bacteria. There wasn't much that they could do to prevent caries, just treat it when it happened. I've never thought about germ theory in the context of dental care and like knowledge about cavities. Right? Isn't that wild?

**EAU:** Yeah,

**EW:** Love it.

**EAU:** me too.

**EW:** Um, yeah. And so, so there, it was mostly dental care was focused on, was focused on restoration or even like maybe detection or measuring the rate of progress through like x-ray technology, which was new as of the, you know, early 20th century. Late, uh, 18 hundreds. And that was the case until fluoride, specifically water fluoridation.

**EAU:** Huh.

**EW:** Erin, there are like so many more topics that we should do in dentistry that I like. I wanna do like gum health in certain diseases. You've, I like, I feel like I've seen that a lot. Braces grinding your teeth at night. Hello? I mean, like, there's just like, there's like so much that we could do. So that's just my petition for more dental episodes.

**EAU:** Okay. I mean, you don't have to work hard to convince me. Although I always like doing these episodes. I get It's so, so interesting how we don't learn any of this in medical school.

**EW:** Well that's, that's another thing I would love to learn about when dentistry became a field,

**EAU:** And like, why is it so separate from quote unquote medicine, like the rest of your body medicine? It's like eyes and teeth. We gotta pull 'em out and they gotta be totally separate.

**EW:** get separate insurances for eyes and teeth. They're a part of our bodies. Yeah.

**EAU:** Why? They're part of our overall health too. Like oral health is part of your

**EW:** 100%.

**EAU:** But then people come in with like a mouth complaint and I'm like, uhoh.

**EW:** Yeah. Um, yeah, we should definitely, we should definitely do

**EAU:** Right. The history of dentistry. I would love it.

**EW:** Yes. Okay. But that was just the briefest detour through No, through the history of, of caries. And so, uh, we left off before this little detour in the late 1930s with the knowledge that certain levels of fluoride in the water seemed to protect against tooth decay. So the obvious next step would be to implement that knowledge

**EAU:** That's what I, what I would think happens

**EW:** Yeah, it is. What happens next? So in 1942, the US Public Health Service began talks with two cities in Michigan, Grand Rapids and Muskegon, to conduct an experiment with artificially fluoridating the water to one part per million with Grand Rapids, getting the fluoride and Muskegon acting as the control. The experiment was set to begin on January 1st, 1945, and within a few days, foreshadowing what was to come in later decades, the complaints started rolling in rashes, rapid weight gain, headaches, tumors, I mean, fluoride was blamed for a wide variety of health issues of the residents in the residents of Grand Rapids.

**EAU:** Okay.

**EW:** The thing was, fluoridation hadn't actually started yet.

**EAU:** But it was like they knew, so,

**EW:** knew it was coming. Yeah,

**EAU:** The, the residents, did the residents like agree to this?

**EW:** I don't think so. I think it was like a, um, like a agreed upon by the city officials.

**EAU:** Okay. So they didn't, they didn't necessarily agree, but they, they knew that this was coming and they had maybe like a start date or something on their calendars, and then they started having complaints about things. But they didn't actually, they hadn't actually started yet.

**EW:** Right. There was, there was like a, an unexpected delay in the shipment or like the delivery of fluoride. And so it didn't get added to the water until January 25th. But even before [00:30:00] then, people had started to blame

**EAU:** Write in and complain about things. Interesting. Please keep going.

**EW:** yeah, yeah. So there was no, no evidence, of course for fluoride causing these complaints because fluoride wasn't in the water yet. And, and in fact, what the evidence did show was that fluoride was a safe and effective way to drastically reduce tooth decay in a population. I mean, like the firsthand account said there were 7 million people who were getting their water from naturally fluoridated sources. Right. Um, and there had been a lot of studies, I don't know all of the studies examining the, the different communities with and their health, you know, aspects, those who were in Fluoridated water, those who did not have fluoridated water and found pretty much that one of the, the only difference was cavity Or caries Yeah. Yeah. Okay. So how did this experiment go? 15 years after water fluoridation was introduced to Grand Rapids, the rate of decayed missing and filled teeth in 15-year-old children had dropped 50%.

**EAU:** 15 years. Also, like they're studying this 15 years, so that's a long, this is a very long term thing.

**EW:** wanted to make sure that it was actually worth implementing. The other thing too is that, uh, and I don't know if I mentioned this or not, but systemic fluoride in order to, like, when your teeth, and I know you'll get more into like this part of it, but it is important in development when your teeth are developing. And so it would have taken a long time to see the benefits of that because these kids had to be born and then, yeah.

**EAU:** Yeah. Although we'll talk more later. It's also topical, so it's like in your mouth. Two, but yes. Especially for kids, and

**EW:** and then if it's in your saliva, it's washing over your teeth and helping with enamel. But like for developing kids to see those big effects in the reduction of caries

**EAU:** Yeah. Especially because we're talking about very, very low levels. It's not the same as like the sealants that your dentist might be putting on your teeth.

**EW:** Yeah. Yeah. Yeah. Yeah. Yep. And, um, the, and also just to kind of like bolster this, these findings, the data show that the tooth decay rates in Fluoridated Grand Rapids were similar to other regions with naturally fluoridated water. So it was like this, even though we are putting fluoride into this water, the effect is the same as places that have naturally fluoridated water,

**EAU:** And we're doing it at this lower level than most of these natural sources at one part per

**EW:** right. Optimized level. Mm-hmm. Mm-hmm. So the cause and effect relationship because before these, I mean these were highly suggestive, correlative studies results. Like where it was like, okay, caries rates lower in areas with higher fluoridation, but this actually showed like a cause and effect

**EAU:** Right. You're doing a randomized controlled trial

**EW:** Yes.

**EAU:** rather than just an epidemiological observational study. It's beautiful. It's science in

**EW:** yeah. And this was also happening in other, um, fluoridation experiments in cities in the us, in Canada, in the uk, in New Zealand and elsewhere around the world. Other communities were fluoridating their water and many cities and towns began fluoridating their water even before the results from Grand Rapids were out because they felt that the safety and efficacy of fluoridation had already been proven.

**EAU:** Okay. Okay.

**EW:** In 1958, the WHO released a report concluding that fluoride was an effective and feasible public health measure to reduce dental caries, and they followed that up a few years later with an expert panel tasked with reviewing the safety data of fluoridation. I'm gonna read you a quote from their conclusion quote. "The results have shown that for the climatic, nutritional, and

environmental conditions under which the surveys have been carried out, a level of approximately one part per million fluoride in temperate climates has no harmful effects on the community. The margin of safety is such that it will cover any individual variation of intake to be found in such areas." End quote. So it's like someone's drinking a lot of water, they're still gonna be fine. Someone's drinking not very much, they're still gonna be fine. Yeah. Yep. And so starting in the 1960s with these promising results, cities and towns across the US and the rest of the world began fluoridating their water. Some states issued like a blanket fluoridation mandate, while others allowed communities to exempt themselves by popular vote. In 1989, 135 million Americans, so 62.1% of the population were getting fluoridated water from public systems at optimized levels. There were some more that were getting fluoride, fluoride from, um, or fluoridated water from naturally fluoridated, but I don't know if it was like controlled or optimized.

**EAU:** Yeah. Okay.

**EW:** The goal. So that was [00:35:00] 1989, 62.1%. The goal for 1990 was to get 95% of the population on optimally fluoridated water. Obviously, this was not achieved, and the new goal was revised down to 75% by 2000. We're still not quite there, but we are close, although we'll see what happens because of stuff that's been happening.

**EAU:** Because they're trying to take it all away.

**EW:** it all away. In the nearly eight decades since water fluoridation began, the health benefits have become clear, an average drop of 35 to 50% in caries rates in, in fluoridated communities. This translates also to economic benefits. Less money spent on restorative dental care in communities with fluoridated water, less time missed from work, having to go to dental appointments. Not to mention, like, I know you'll get into some of these, like bigger picture how dental health is health and how it, like, there are so many other systemic effects of that, and then there's like the, um, self-esteem and so on, like to have dental repair. Yeah. And I know that next week you're also gonna get into more of like the, some of the claims that people are making. But from my reading, water fluoridation at the recommended level has not been linked with data to any negative health outcome. Of course, overconsumption of fluoride can occur, which can be harmful, but at the recommended level, like what it is in our water, it is safe and effective. So why has there been such a strong and sustained opposition movement to fluoride? Let's get into it.

**EAU:** I also, I don't think that I knew that it was, I mean, it's this podcast We Kill You. I'm not surprised, uh, that there's been like opposition from the get go and like, you know, like so strong and whatever, but I, I. It's the same thing as so many other things that we're hearing so much more about today where like, I never thought about it for so long and now I can't stop hearing about it

**EW:** Yeah. Yeah. And it's not just like, it, like people are actually talking about it more. I mean, yeah, like RFK is talking about it more

**EAU:** You can't, you can't not talk about it when it's, yeah. Literally like on the news from the, the people who are the highest up making the decisions about our health in this country.

**EW:** Yeah, yeah, yeah. And I mean, and like those other things like vaccines, like pasteurization, water fluoridation has long had its fair share of detractors and which have been also like raw milk and vaccines have been growing in number as of late.

**EAU:** Mm-hmm.

**EW:** And the Venn diagram of these three groups is like a circle, basically. It's just boop. So we can trace the origins of the anti fluoridation movement to Wisconsin. In the 1940s.

**EAU:** Okay.

**EW:** The Grand Rapids Muskegon experiment was on the horizon, but there was one outspoken Wisconsin dentist, Dr. John Frisch, who didn't wanna wait 15 years for his community to start Fluoridating. He had followed the work of McKay and Dean and concluded that fluoride at an appropriate level was safe and effective, and they should get started right away because he was a dentist and he cared about his patients and wanted them to not have cavities and caries. Right? Like he's like, we can, we can prevent this.

**EAU:** Right. Which is also.

**EW:** Oh, I know. Are you gonna talk about like big fluoride? And now it's like,

**EAU:** Well, it's, it's interesting to think about in the context of like in the context of a profession where at the time their main source of business was restorative dentistry. You might think that a dentist would want less fluoride

because then their patients would have more cavities and they would have more business. So

**EW:** coming in to, it's like a, a family med doctor being like, Ooh, my patients have diabetes and kidney disease and heart disease. This is great for me. And it's no, not.

**EAU:** No, it's not. Exactly. And that, and that's the point, right? It's like the people who go into these fields do it because they want to help people because they care about people's health because they want for their patients to, to be better, to have healthy teeth. Like so, but I, so I

**EW:** But big fluoride, Erin, but big fluoride

**EAU:** raking in that dough.

**EW:** I honestly, it's. I mean, it's, it's baffling, but not surprising. Yeah.

**EAU:** I know.

**EW:** there's no logic, but

**EAU:** But so this

**EW:** ever any to begin with. Yeah.

**EAU:** in

**EW:** dentist was like, I'm hyped about fluoride. Let's do this. Like, let's, we don't need to wait for that. We've already, we have had decades of people collecting data that show that this is like a good thing to do. And so he started this like very active and enthusiastic campaign for water fluoridation across the state. And within a few years, many communities had [00:40:00] started adding fluoride to their water after this, because, you know, he was like gung-ho. And so when in 1950, the US Public Health Service approved fluoridation for all communities in the us, Frisch declared victory in a letter that he wrote to McKay, cease Firing The War is Over. Direct quote from that. Yeah.

**EAU:** Okay.

**EW:** Which turned out to be, uh, a bit of a premature celebration.

**EAU:** Hmm.

**EW:** Frisch's, very vocal campaign, won many over to the side of fluoridation and raised awareness overall. But it also attracted some critics, especially the very outspoken Alexander Wallace, who was a resident of Stevens Point, Wisconsin, and self-appointed watchdog of the public treasury, local poet, and author of many letters to the editor. Notice how I didn't mention any scientific or dental training, 'cause I don't believe there was any. Right.

**EAU:** I also just can picture,

**EW:** 100%. I mean, basically I'm picturing like parks and rec and like someone who goes to one of the town halls. Yeah.

**EAU:** I'm picturing my parents' neighbor who lives not too far away. I will not mention names, but has run for the board multiple times, et cetera.

**EW:** On the platform of anti fluoride.

**EAU:** No, just on the platform of anti fun, mostly.

**EW:** got it. Okay.

**EAU:** Yeah, like, don't like the swim team and they don't like the anything

**EW:** Letters to the editor. Yeah,

**EAU:** Letters to the editor, we, they're important. Okay.

**EW:** They are. Love him. Um, sometimes, um, but yeah, his, he, his stance, this guy Alexander Wallace, his stance was that fluoride was poison. He, um, you know, and, and his evidence ranged from the misused, like for instance, the USP, the US public Health Service at the time, uh, still classified fluoride as experimental. And then it, that did not stay, but he said it was totally untested. Right.

**EAU:** Classic. That's a classic thing to say.

**EW:** a classic thing. Yeah.

**EAU:** Yeah. Covid Vaccines totally untested.

**EW:** Exactly. mRNA, forget it. Um, and then a lot of the time he just manufactured evidence, right? Like he said, fluoride is rat poison and will cause irreparable harm.

**EAU:** Oh, he should listen to strychnine

**EW:** That's what I was gonna say. I'm like, strychnine is rat poison. We don't put that in the water.

**EAU:** Yeah. Okay. Yeah.

**EW:** And so despite not having any scientific evidence to support his claims and the fact that existing evidence refuted them, in fact his opposition was highly publicized and ultimately successful.

**EAU:** Okay.

**EW:** set the precedent for this debate to be held in kind of a public forum with him on one side and the data on the other.

**EAU:** So interesting, Erin.

**EW:** So classic Erin.

**EAU:** Yeah.

**EW:** Naturally, this equal viewpoint representation confused the general public who were led to believe that Wallace had as much data supporting his side as the scientist did, as the dentist did.

**EAU:** Yeah.

**EW:** In September, 1950, the citizens of Stephen's point rejected fluoridation the first to do so in a monument to anti-science anti expert.

**EAU:** Mm-hmm.

**EW:** This proved to not be a one-off as pro fluoridationists had hoped. The outcome was plastered across national headlines and served as encouragement to other opponents of fluoridation. The message was, who needs science and facts when you've got fear and doubt?

**EAU:** Mm

**EW:** They realized it was a heck of a lot easier to instill doubt and fear than dispel it. The anti fluoridationists of the 1950s. Were a Motley Crue mostly quote unquote independent thinkers like Wallace, alternative medicine advocates, supplement brands, really supplement brands. Not surprising, but also just like

**EAU:** Like, could you be more basic?

**EW:** know it's like predictable. Um, uh, then there were chiropractors and, um, groups like the John Birch Society, which if you haven't heard of it, is a right wing libertarian conspiracy theory, anti-communist group. That is also an inspiration to the current administration. And the Ku Klux Klan. The KKK was big in the anti fluoride movement in the

**EAU:** I, I, uh, I could see that. I could see that, yeah.

**EW:** I was very like, wait, what? What?

**EAU:** It's one of those where you go, what? And then when you think about

**EW:** oh, yeah.

**EAU:** because this is something that's working on the public health, and so it's gonna be helping everyone, right. All including peop quote unquote undesirables. And in fact, maybe more. So we'll talk more about that next week for sure.

**EW:** For sure. Yeah. Yes, that is, I mean, and that is like a big, I think part of the, like the, the point is also cruelty.

**EAU:** yeah.

**EAU:** we should withhold this from [00:45:00] people who don't deserve it, because if you can afford it, you can just buy fluoridated toothpaste. If you can afford it, you can just go get fluoride sealants if you can afford it.

**EW:** Yep.

**EAU:** Okay?

**EW:** Um, and so that is, that is one big motivator for why people were and are anti fluoride, but there were many other reasons as well. And so, you know, just like raw milk, this, these groups are not a monolith or like this anti fluoride movement is on a monolith. And there's a mix of people who have been preyed upon and those who are doing the preying,

**EAU:** Mm-hmm.

**EW:** looking into the perpetrators or originators of this mis and disinformation, the reasons they give for why fluoride is bad have evolved over time. And they can generally be split into three categories, sometimes overlapping. All right, you've got number one, fraudulent health claims. Number two, feelings of personal freedom violations slash conspiracy theories. And number three, claims that fluoride doesn't work. Slash economics.

**EAU:** Oh, okay.

**EW:** Yeah. So the first concrete fraudulent health claim that proved to be quite sticky was that fluoride causes cancer. And I think this is still touted today. Occasionally this misconception originated from leaked preliminary results of an animal study out of the University of Texas that was specifically looking at this question. And early results seemed to suggest that mice that drank Fluoridated water developed cancer earlier than those that did not. And the press ate that story up.

**EAU:** Of course.

**EW:** with it before any closer examination. I mean, these were preliminary, preliminary results. It didn't matter. Right? And then once, once the researcher who was involved in this did like a closer examination, it was revealed that the experiment was totally invalid. All of the mice, both the experimental and control groups were being fed chow that had a fluoride level of 42 parts per million,

**EAU:** Wait, all of them,

**EW:** All of them. Both the experimental and the, so it was

**EAU:** so it didn't matter what was in their water. Yeah.

**EW:** Yeah, yeah. But it was too late. Like this, this correction was too late. This, the follow-up was not nearly as widely publicized as the initial results.

And even if people came across the correction, the association between cancer and fluoride would be in their minds already where it's like, I'm not saying that fluoride causes cancer. You know what I mean? Or they, they would be like, I read a news story about fluoride and cancer, but I can't

**EAU:** Oh, isn't that the thing that, yeah,

**EW:** Right. And you're like, I'm not sure what it was, so I'm just gonna err on the side of caution.

**EAU:** caution.

**EW:** Yeah, yeah. Um, and then reputable studies. So like since then, since those that experiment and that news story, reputable studies, there have been so many of them because the fear was so high that examined cancer and fluoride have found no association.

**EAU:** Hmm.

**EW:** But that didn't stop. The anti fluoridation is claiming that fluoride causes cancer. And again, we're talking about the levels that are the optimized levels in public drinking. Water

**EAU:** Mm-hmm.

**EW:** and cancer was far from alone in being blamed or fluoride was far from alone. Cancer was one of the one of many things. There we go.

**EAU:** One of many ill health effects that was blamed on

**EW:** Uh oh. So many, and I know that you're gonna go into more next week, but like vaccines, fluoride has been held responsible for whatever health threat, preoccupied the general public at a certain time. You know, like at one point it was Alzheimer's, another time it was blamed for AIDS, um, IQ, infertility, brittle bones. Take your pick. The more fringe ones were oily sweat, undue financial anxiety, and nymphomania.

**EAU:** Okay.

**EW:** Isn't that bizarre? Yeah,

**EAU:** All of it's bizarre.

**EW:** I know, I know. Uh, I just saw undue financial anxiety is, yeah. Uh, cca.

**EAU:** on a daily. Just kidding.

**EW:** I was gonna say like "undue", like

**EAU:** Is it undue?

**EW:** is it undue? Right. And occasionally they ventured into the more conspiracy side of things, especially with the anti-communism fears so widespread during the 1950s and 1960s. And I think that's also where the KKK got involved, where it was like, we don't, like, this is communism, essentially. This is socialized medicine. And

**EAU:** Right. They're forcing it on us. Yeah. Yeah, yeah. Okay.

**EW:** Some people genuinely believed that it was like a Soviet plot designed to harm the American public. And this belief was pored in the 1964 movie. Dr. Strange Love, or it was a strategy. One person claimed, and I'm sure this was not just one person's opinion, there was a strategy to quote unquote weaken the Aryan race. Again, the parallels with raw milk are astonishing, but not surprising.

**EAU:** So interesting, Erin,

**EW:** And so this is kind of where these health concerns bleed over into the personal [00:50:00] freedom, conspiracy side of things. So from the beginning of fluoridation, one of the leading complaints was that flu that fluoridation in water represented a violation of personal freedoms that parents should be able to choose what to feed their children. And that fluoride was mass medication, starting us on a slippery slope where the government could put whatever they wanted into the water without our knowledge or consent. Or just that it represented a deadly step towards socialized medicine where people could, you know where health is a right, right. Or healthcare is a right

**EAU:** Yeah.

**EW:** and this seems, dare we even imagine that possibility. This seems to be a consistent sentiment. Motivating people at the ballot box 70 years ago as well as today. Like those, these are all things that are still around. The mass medication

complaint arose and gained traction at a time where things like DDT or asbestos were found to be highly toxic after decades of use and like being freely used and everyone being, you know, reassuring that, no, it's fine, it's fine, it's fine. Where thalidomide slipped through the cracks and where a quote unquote, back to the soil natural movement was taking hold. And so to some fluoride represented yet another chemical we're adding to our bodies without enough research. And I think what I find truly. Fascinating about that is that fluoride is in so many sources of water naturally. Like it's in water.

**EAU:** It's interesting to look at it in that way. Like, oh, this is something that we're adding, this is something that is naturally quote unquote, naturally found in so many sources, sometimes at such a high level that it is causing potential ill effects,

**EW:** Mm.

**EAU:** but then putting it into our water at lower levels is seen as potentially harmful when it's really just trying to replicate something that exists in nature. I mean, and it, and it's, and it is valid that we have done things without a lot of data, right? Like yeah, it's, we have done things that are quite harmful. So it makes sense to, I don't know. It's so complicated. Erin.

**EW:** Well, and I think the other facet of that too is that, you know, going back to naturally fluoridated sources of water is that, that, that have been shown, that have been linked to, you know, whether it's teeth mottling or something else, antifluoridationists don't make any effort to reduce the fluoride that occurs naturally. If they think that fluoride is such a big problem, then they, they don't really

**EAU:** I shouldn't be surprised. I

**EW:** with helping to remove or limit fluoride in communities with naturally over fluoride water. Yeah. They're just like, it's only, don't put fluoride in my water.

**EAU:** Don't put it in my water. But if you move to Colorado Springs, you're on your own.

**EW:** Well, I think, I think now I think they, they take it out

**EAU:** Yeah, I'm sure they do. I'm not to hate on Colorado

**EW:** Yeah.

**EAU:** I'm sure they're doing fine.

**EW:** Uh,

**EAU:** Yeah. No, that is, it is interesting. And I think that that just kind of points out, it's like who, I think what it, what it shows is like, who is it that is the one perpetuating these claims, and what is the intent behind what they are doing it for? Are they using any data that may or may not be legitimate, maybe, but what is the intention behind that? And is it just to discredit science, because that's what it often comes down to.

**EW:** Yeah. I mean, and it also, like, again, I think it, it comes back to those who are hearing this information

**EAU:** Mm-hmm.

**EW:** buying into it, and those who are originating it and perpetuating it. So there are different motivators, I think, for

**EAU:** Mm-hmm. Mm-hmm.

**EW:** Uh, and the, so the final argument against fluoride was that it doesn't work or that the benefits of fluoride can be achieved solely through fluoride containing products such as toothpaste and mouth washes, topical fluoride. Uh, following that, the argument goes that water fluoridation is wasteful since only a small proportion is actually ingested, as opposed to being used to like wash dishes or shower.

**EAU:** Okay.

**EW:** I know you'll get more into the details of systemic versus topical fluoride, but systemic fluoridation does make a difference, as we discussed in the prevention of tooth decay. And in fact, Calgary in Canada had previously voted to stop fluoridation around 10 years ago, and then recently voted to put it back in since the rate of tooth decay in children increased. But it, it seems like from where I'm standing, that the trend has been more often than not in the other direction with states like Utah banning fluoride in the water, which means that even if a community wanted to Fluor date, they couldn't. And so now if you want systemic fluoride in Utah, you have to get a prescription. And so of course, yes, you have to get a prescription.

**EAU:** From whom?

**EW:** Uh, you can go to the dentist. I think you can get one from a pharmacist. Your doctor. And so of course, just like with every other personal freedom medical issue, this disproportionately impacts [00:55:00] those who are the most disadvantaged, who lack access to a dentist or can't afford supplements, but that rarely concerns anti fluoride activists who are more than happy to sell you their purification systems or their book outlining how to eliminate fluoride from your diet. When it comes to fluoride, it's more of the same with what we see for raw milk and vaccines. A focus on deregulation, on privatization and redefining expertise. And this debate over fluoride has continued because it has been framed as a debate with science and evidence on one side and sentiment on the other, and. Again, like we get it right. We, the, the historical opposition especially, I'm not sure just how many health outcomes were evaluated in naturally fluoridated versus unfluoridated communities, um, before they started artificially fluoridating,

**EAU:** Right. Did they look at every possible outcome

**EW:** right? Probably not. Yeah. But at that time, no, it has been 80 years. 80 years since water was, since Fluoridated Water was started in Grand Rapids, Michigan.

**EAU:** Mm-hmm.

**EW:** And that means that over those 80 years we have collected a wealth of data that would allow us to detect an association between fluoride and so many things. And we haven't really found those associations. And people are still looking, people are still continuously evaluating because that is what science does, that is how it works. But when you've got tiktoks and forums claiming that fluoride is harmful for your kid or it's giving you cancer, it's hard to shake those fears, that doubt, especially when the pro fluoride movement is much quieter. I mean, like I knew so little about how fluoride worked before we picked this as a topic. I didn't know that it was like in a development. I just thought it was like, oh. Mouthwash, that's fine. Right. And I can't help but think that the lack of awareness and understanding is contributing to the gains that the antifluoridationists have made in the past few years, despite being named as one of the top public health achievements of the 20th century. It the top 10, it's in the top 10.

**EAU:** Wow.

**EW:** Fluoride does not have enough hype people talking about how many teeth have been saved, how much less people have had to spend all thanks to a relatively straightforward and inexpensive solution.

**EAU:** Hmm.

**EW:** Fluoride man, tell you what.

**EAU:** Tell you what,

**EW:** Yeah,

**EAU:** you're right, Erin. I don't really hear any fluoride hype people. I can't, I can't remember a fluoride hype person.

**EW:** Me either. And I think that it's because, like on an individual level, um. You go to the dentist and you, you get fluoride. Like, where is the political activism from? Prof fluoridation. It's just a really interesting thing, and I think that fluoride doesn't really get the attention it deserves in the public health arena as like a way to prevent, okay. It's like, okay, dental carries. It's actually, the, the significance of that is much bigger than we think it is.

**EAU:** Well, it's also like, like we've said many times on this podcast, Erin, when public health is working well. You don't know that it's working at all. Right? When we are preventing caries with, you didn't even know that your water was fluoridated and you have less caries than a community that doesn't have fluoridated water, you don't think about it, right? And then if you start hearing that something is bad, that's when you then start questioning, what are you doing to me? Without my knowledge, without my consent? Who made this decision? What data are you using?

**EW:** We've been doing this for 80 years and it's, but it really seems like gains are being made for the anti-fluoridationist Ugh. Yeah.

**EAU:** And there's a lot more to say, Erin, about what we know about the effects of fluoride. Positive, negative, neutral. How is it working? What's up with caries, cavities?

**EW:** Yeah.

**EAU:** Um, and we're gonna get into all of that next week, and I cannot wait.

**EW:** Oh my gosh. Yeah, me. I am really excited. I, I feel like this was just a teaser to be like, now we have

**EAU:** Well, but it's so good to set the stage of like, this is how, you know what I mean? Especially as we talk about like what is the evidence now we can also look at like, this is how long things have been going on for,

**EW:** Yeah.

**EAU:** I can't wait.

**EW:** in the meantime, if you would like to read more, i've got some sources. Okay. Um, okay. So there was a book called Fluoride in Caries Prevention by John Murray, published 1982, maybe. A paper by Ripa from 1993, a half century of community water fluoridation in the United States. A great paper by McNeil, 1985, America's Longest War, the Fight Over Fluoridation And a if you wanna learn more about, just like caries in generally. [01:00:00] And over time, Caselitz 1998 carries ancient plague of humankind,

**EAU:** Ancient plague.

**EW:** and I've got so many more honestly. Um, but those are the ones that I'm gonna shout out. So yeah, take a look at our website if you wanna see all the sources for this episode and all of our episodes.

**EAU:** This podcast will kill you.com.

**EW:** Yeah. Uh, thank you to Blood Mobile for providing the music for this episode and all of our episodes.

**EAU:** Thank you to Tom and Lianna, and Brent, and Pete, and Mike and all. Exactly right. Jess. Thank you all. We have so many people that help out with this and we really appreciate it.

**EW:** Yeah, we do. Uh, thank you also to our listeners. We hope that you enjoyed this episode. Did it answer some of your questions?

**EAU:** Any of your questions, do you have more questions? We'll answer them next week

**EW:** Yeah,

**EAU:** And as always, a special shout out to our patrons. Thank you so much for your support. It really does mean the world to

**EW:** it does well. Until next time, wash your hands.

**EAU:** You filthy animals.