

Biogerontology with Dr. Caleb Finch

Ologies Podcast

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Oh heeeyyy, it's your ol' Dad here, saving you some pancakes even though you sleep until 11 a.m. when you visit, Alie Ward, back with another episode of *Ologies*. I have been promising you for *weeks* an episode about aging and marching toward our demise, molecule by molecule. Here we are, folks! We made it! This is an interview that is like concentrated laundry detergent. It's like eating spoonfuls of instant coffee like cereal. It's to the point. It's intensely powerful information; minimal buffoonery. Aging: Why? How? Let's get into it.

First, let's get some business out of the way. I want to thank everyone supporting on [Patreon.com/Ologies](https://www.patreon.com/Ologies) for submitting their questions, making the show possible. Anyone wearing *Ologies* merch out and about, I hope you find each other and fall in love. Have me officiate your wedding. Thank you to all the folks who have rated, and subscribed, and left reviews. I read them all. You know that.

For example, GlassFullOfSass, who said they, "changed two passwords and signed into four different accounts to leave a review," which was very hilarious and sweet. Also, thank you for the review CateVF, who says:

Every week I wait with bated breath for the latest episode to drop. Alie and her guests are so captivating. And one episode even brought attention to a medical condition I didn't realize I had! And may have saved my life. Thanks, ol' Dad Ward!

Thank *you* for continuing to live!

Let's talk about old age. Okay, biogerontology etymology. *Bio* means 'life' and *geron* means 'old man'. So, the biology of an old guy. Not super inclusive in terms of its roots, but it's a subset of gerontology. It examines the processes of aging. How does 'olding' happen? Now, I came across this ology after recording Cheloniology about turtle lifespans back in November and a Wikipedia page whispered, [*whispering*] "Biogerontology is a thiiiiing," which ushered me to an article about how one particular ologist has been studying this since the 1950s, and lo and behold, his office was a few miles away from me in LA. What?!

So, I gingerly begged him via email to hang out and I freaked out when I got a reply. Then, I navigated to USC with my vintage purse full of microphones and hope, and I knocked on his door 12 seconds after our appointed time. [*door creaking*]

There he stood, a person who is ranked in the top half-percent of the most-cited scientists in the world; 500 papers with his name on them! Decades of research, thousands of students, scores of studies. This dude in the cardigan and the khaki pants, standing before me with a long white beard and office piled with books, he is the dude! Now, for a visual, just Google Image search, "Father Time," and then add a laser-focused expression and a furrowed brow.

He's like a human fountain of knowledge on how our youth slips away. In the Death and Dying episode, I talked to Cole Imperi, who makes ballpoint pens inscribed with the motto: I don't have time for bullshit. I should have given this biogerontologist one of these pens as a parting gift because as you will hear: when you are an expert on mortality factors, you don't suffer fools. You don't waste any time. This man does not have time for bullshit, and I love him.

Let's get right into it. Let's talk about metabolisms, modern lifespans, risk factors for losing your memory, thoughts on a possible cause and cure for Alzheimer's, why we age, secrets of

centenarians, and what a 78-year-old professor and globally-lauded science hero does to stay so fit and so sharp. So sit up straight, take some notes for the concentrated crash course on the forward march of molecules with world-renowned biogerontologist, Dr. Caleb “Tuck” Finch.

Dr. Caleb Finch: Remind me of where the radio program is?

Alie Ward: It’s on Apple’s iTunes and anywhere on the internet. Thank you so much for doing this. Let’s go into your background a little bit. Can you tell me why you decided to study aging?

Dr. Finch: Well, as an undergraduate, I was looking to work on fields that had not been fully developed in which there would be the chance to work out some of the basic questions. One of my professors at Yale, who was a physicist named Carl Woese, was coming into biology in 1958. He said, “Well, why don’t you think about aging? Nobody knows *anything* about the biology of aging, even much less than how embryos develop.”

And this was 1958, which was just five years after Watson and Crick and we didn’t know what the genetic code was. So that stuck in my mind. Then when I got to graduate school in New York at Rockefeller University, I did my PhD on aging and sort of the first papers on the neurobiology of aging came out of my work there.

Aside: So yes, Dr. Caleb Finch attended Yale on a scholarship, working in labs to help pay his tuition and he graduated in 1961 with a degree in biophysics. Then he went on to Rockefeller University to get his PhD in cell biology, studying cellular activities during aging in mammals. He gave a talk on this subject and afterward some jabroni came up to him to say, “Don’t bother, everyone already knows what they need to know about aging.”

That tall drink of Haterade was pathologist Peyton Rous, who had recently won a Nobel prize. Finch was like, “Whatever dude,” and went on to become one of the foremost voices in the highly respected field of senescence research, which is a fancy word that means the condition or process of deterioration with age.

Alie: So what part about the aging process fascinates you the most? Is it the effect neurologically or is it the entire body?

Dr. Finch: It’s the unknowns that we are still working out, the basic mechanisms. We know that it is under some genetic influence. If you have the genes of a mouse you’re only going to live two years. If you have the genes of a human, you might get to 70, 80, or 90. So, it is genetic, but then among individuals, the role of genetics seems to be much less. Identical twins’ lifespans, you can attribute... 20% of their heritability in aging is due to genes that influence aging. It’s really a minority of the individual differences in humans and in other animals that can be attributed to inherited genes.

Aside: Only 20% is attributed to genes, which is terrible news for those of us who like to deny personal responsibility.

Dr. Finch: I’ve been working, in many parts of my career, on environmental aspects of how individual gene responses to the environment, to diet, influence outcomes of aging. I’m now, in the last six or seven years, been focusing on air pollution, which shortens lifespan in proportion to the number of particles per cubic meter and also accelerates almost all of the diseases of aging, including the risk of Alzheimer’s.

Alie: Was that inspired at all by living in Los Angeles?

Dr. Finch: Indirectly because I have had colleagues in the epidemiology group on the Health Science Campus who were pointing out to me that the rate of arterial aging in Los Angeles scaled in proportion to the density of air particles in your residence. The arteries that they were studying were the carotids, which go to the brain. They kept saying to me, "Well, Finch, you're interested in the neurobiology of aging, you really gotta see if there's a relationship to the arterial aging that we've described as driven by air pollution."

So, that's what I undertook to study, and last year we published a definitive paper in collaboration with an epidemiologist, J.C. Chen, at USC's School of Medicine. In that same paper, a mouse model showed that air pollution increases the Alzheimer's processes; and we know what molecules are involved in the mouse anyway.

Alie: Let's go to the super basics. As someone who is not as well versed in this as you, what exactly is aging? How do you define aging?

Dr. Finch: Well, the basic way is at a population level, that after the age of 40 your risk of mortality essentially doubles every seven or eight years.

Alie: Oy!

Dr. Finch: There's an exponential increase in mortality risk and preceding that is a parallel risk in chronic diseases: heart disease, cancer, and at later ages, Alzheimer's. The individual pathways in this are not understood, but by age group, aging increases the risk of chronic diseases that are causes of death. Then you can ask at a more fundamental level, "What are the mechanisms behind that?" That's where the mystery is.

Aside: So, our risks of disease and dying go exponentially up. Rather than bum you out, let that fact encourage you to write the novel you've been intending to, or call in sick and go to Six Flags tomorrow. Wear the shoes you think you should save for fancy occasions. Wear 'em today! We're all getting old. Just go for it, champ! Speaking of, how do you ask a genius expert the most basic bitch question ever? You just do it, people. You live in the now. Watch.

Alie: Is it that our cells don't regenerate as fast?

Dr. Finch: That's part of it. Our molecules don't regenerate as fast and there's some molecules that are as old as we are in our blood vessels, and our connective tissue, and in our eyes that undergo molecular deterioration.

Alie: I know they say you're kind of a new person every seven years, is that-

Dr. Finch: That's not at all correct.

Alie: Okay. [*laughs nervously*] So that's some flimflam to debunk for sure.

Dr. Finch: It's just not true. That's one of those inherited tales that has no scientific substance. I have no idea where that comes from.

Alie: I gotta look it up.

Dr. Finch: Yeah, there's no science there.

Alie: Right. I didn't think so. I don't know where that came from, but it's an interesting myth.

Dr. Finch: No, it's *not* interesting. It's destructive because it's wrong.

Alie: Right.

Aside: By the way, if you're like, "Was Alie just dying at this point?" The answer is, "Yes." [with crickets in background: "Man, I am dying up here..."] Both from a molecular standpoint and psychologically. But stick around, because like life, there are twists and there are turns around every corner.

PS: Where did that destructive myth start? I did a little digging, thinking the origin would be an ancient tale, but it seems like it started in 2005 with a Swedish stem cell scientist, Jonas , who had been curious about the ages of different cells in the body and used radioactive carbon-14 tracers, conveniently deposited in humans from nuclear warhead tests in the '60s, to track the age of different cells.

So how old are you, really? Okay, there's a cool math trick you can do. You take your age, and multiply it by 16, then divide it by 16. Which is your age. You're just your age. I made you do math for nothing. Here's the deal; your body is a bunch of different ages. The lining of your guts, which are constantly splish-splashing in an acid bath, they're newborns. They turn over every five days or so. But your skeletal muscles are 15. They're about to get their learning permits. Some parts of your brain are just as old as you are, just about. Other parts turn over faster. The core of your eye lens (see the Ophthalmology episode for more on that) is exactly your age from pre-birth. That never turns over.

This is fun. This is like *Antiques Roadshow* for your meat-covered bone scaffolds. [clip from *Antiques Roadshow*, Ted: "Nobody's ever looked at it that I'm aware of." John Buxton: "Well, Ted, did you notice when you showed this to me that I kinda stopped breathing a little bit? Not only that, but the condition of this is unbelievable."]

In his 900-page book, *Longevity, Senescence and the Genome*, Caleb Finch covers the lifespans and aging processes of everything from apple trees, to 40-year-old clams, to lobsters who molt away their exoskeleton and avoid some mechanical aging that way, to sturgeon fish that can outlive humans, to relatively old teenaged salamanders. If you listened to the Cheloniology episode you might remember my aside about the Etruscan shrew that has a heart rate of 1,500 beats per minute and lives two years versus tortoises with slow metabolisms, like ol' Jonathan, a giant tortoise kickin' it retirement style on an island at age 187.

Naked mole-rats can live up to 32 years, perhaps due to an uncanny ability to just slow down their metabolism when they need to, or repair their wonky DNA, which humans can also do. I don't think Dr. Finch would enjoy the term 'wonky', but here we are.

Alie: Now, how do different animals age? I know you mentioned a mouse might have a lifespan of two years.

Dr. Finch: Each species has its own pattern of aging. Mice don't get Alzheimer's disease and they don't get blood vessel disease and have heart attacks, but they do get cancer. Their arteries become more rigid and their lungs become more rigid because of molecular aging. That part of aging happens in humans at a much slower rate. In addition, we have diseases that are special to the human species, including Alzheimer's disease.

Alie: You've said that other primates don't get Alzheimer's the way that humans do?

Dr. Finch: They have a very much milder aspect of brain aging. There's nothing equivalent in the great apes or in the Rhesus monkey to the devastation in the brain of Alzheimer's

disease where there's huge amounts of death of neurons in particular pathways. There's major gaps that still remain to be filled before we have a definitive conclusion. At the present time, I'm comfortable in saying there's nothing that has yet been shown to be equivalent to the level of brain cell damage that happens in Alzheimer's in any other primate.

Alie: And what is causing that? I know there's many, many factors, but primarily–

Dr. Finch: Well, that's a huge set of unknown questions that the field of Alzheimer's is – and I'm in that field in a significant way – is trying to understand. There are changes in the brain that are going on from the age of 30 onwards. In my lab in the 1970s, I had the first evidence that there's a progressive loss of synapses in the brains of healthy mice and healthy humans in middle age.

So there's changes that are happening in the 30s to 40s that are a pathway that, in some individuals, takes a more steep dip leading to a degeneration of neurons. We don't know what triggers that steep dip from a more gradual progressive change that everybody experiences.

Aside: Sidenote: just about a week or so ago, a study was published that had the internet all abuzz. It had the catchy title: "*Porphyromonas gingivalis* in Alzheimer's disease brains: Evidence for disease causation and treatment with small-molecule inhibitors." ["Wow!"] In short, researchers found that a bacteria that cause gingivitis, aka inflamed gums, could lead to brain inflammation, leading to Alzheimer's. This seems like huge news! But of course, I'm primed for flimflam debunkery.

Also, I saw there was a study from 2005 by Dr. Margaret Gatz about gum disease and Alzheimer's, so maybe this isn't new news. Maybe this is just internet sensationalism. So I emailed Dr. Finch, expecting either crickets or a "*Pshaw!*" But I got a note right back. He said, "Just looked this up. As a mouse study, it is impressive and supports Margie Gatz's prior conclusion that oral infection increases Alzheimer's Disease risk, but now gives a mechanism." Exciting! He was on board. This was great.

Even more exciting, he had cc'd Dr. Gatz who said, "Thanks all!" back. Had a little fangirl moment. So yeah, a tiny bacteria in your gums can make big brain trouble later on, and this news is getting us closer to keeping healthier noggins in the future.

Alie: Is the brain the part of our body that ages the quickest, or where do we see aging happen?

Dr. Finch: Well, I'd say blood vessels are... In terms of shared anatomy across men and women, the blood vessels are already beginning to age even before puberty.

Alie: Really?! So we're already...

Dr. Finch: Yes. We're already accumulating fat and plaques on our arteries. If you're in a household with smokers as a child, it's accelerated. If you're in an area of high air pollution, that's accelerated, as a child.

Alie: Wow.

Dr. Finch: Then there are differences between men and women by reproductive status. The ovaries of women start to lose egg cells even before birth.

Alie: Oh, wow.

Aside: So yeah, you start dying before you're born, cool. Cool, cool, cool. Just cut bangs, text your crush, we're all gonna die.

Dr. Finch: So by the time of puberty, half of the egg cells a woman was born with have disappeared, and then the rest of them are lost by age 50, which is menopause. There isn't anything equivalent to that in men. The testosterone levels do decline. Fertility does decline, but it doesn't have a steep drop off as is the case from women. This is an important example of how our embryonic development defines different patterns of aging because the ovary is fully formed in the embryo, and those genes turn off and no new egg cells and follicles are formed after birth. There's nothing like that that happens in the male gonad. [*"Testes, one, two, testes, check check."*]

Aside: I just want to acknowledge that the terms men and women, and male and female, are along a gender binary that doesn't apply to everyone. Dr. Finch is talking about broad strokes in historical studies. I just want to let the nonbinary folks know out there that I see you, and I love you.

Alie: What about male versus female lifespans? Have we seen that change over the last few decades, or is it pretty steady?

Dr. Finch: Well, no. They both increased as overall health has increased and it is observed in the health-rich populations of the world – and our upper-income people in this country are a health-rich people – that women are living five years longer than men.

Alie: Why is that?

Dr. Finch: We don't know!

Alie: I'm trying to think if it's stress or not, but I feel like–

Dr. Finch: No, it's not simple like that. It's hard to define stress because a completely stress-free life is impossible. On the other hand, there are people who have apparent high levels of stress; women who have eight kids and who will live to be 90. So it's not at all clear how we define stress.

Aside: Sidenote: quick shout out to my grandma Teresa Ward, who lived to be 99 years and nine months despite having [*echo effect*] 11 children. [*DJ airhorn*]

Alie: So what are we doing that is helping progress aging? What are we doing wrong, essentially, when it comes to aging?

Dr. Finch: Well, the major health concern across the country is people are eating more energy-rich foods than they need and not getting enough exercise. That simple lifestyle take-home is, it's boring to say, but if you are even mildly obese in midlife and you're not exercising, you're having a shorter life expectancy.

Aside: As the fit Dr. Tuck Finch explained this, I wondered if he had a turning point in his life and started to pay more attention to his health. Such as I was doing, sitting in his office at that moment.

Alie: Has your work changed the way that you live?

Dr. Finch: I would say no. I've always been athletic and physically active and I never smoked. I don't eat or drink sugary or fatty foods. That's always been my preferred avoidance. So, nothing interesting to say.

Alie: Well, do you play basketball? Do you ski? What's your secret?

Dr. Finch: I used to be a competitive swimmer. I swam in college. I get modest amounts of exercise, not too much to wear my joints out. I do some hiking. I do some swimming. I do some weightlifting. I mean, nothing exotic or overly strenuous.

Alie: No Zumba or Tae Bo? No kickboxing?

Dr. Finch: No, no. No.

Alie: Okay, good. That means I don't have to start that.

Dr. Finch: It's very dull. Nothing unusual.

Alie: You mentioned something about sugar, and I know that inflammatory foods and inflammation is part of your research. How does inflammation affect the human body, in terms of aging?

Dr. Finch: Well, all of the diseases of aging that we worry about – blood vessel disease, obesity, Alzheimer's disease, cancer – involve the molecules of inflammatory responses. It's deeply built into our systems and in the processes of aging. That's just a fundamental fact.

The term inflammation comes from an ancient understanding of when you have a cut, it swells up, and it's red, and it's hot, and it causes pain. Well, the basis for that are the inflammatory cytokines that come in to help the body clean up the damaged tissue. But responses to damaged tissue happen, inflammatory responses, in arterial disease, cancer, obesity, and in Alzheimer's disease. So there's a shared core of inflammatory proteins that are at work during aging from the day we're born. [*clip from Clue, Mrs. White: "Flames! On the side of my face! Breathing, breaths, heaving breaths!"*]

Alie: Is there a way that we should be keeping inflammation at bay?

Dr. Finch: Well, that's part of the idea of exercise and diet, which reduces the level of inflammation. Some people are still looking for pills that will do the equivalent of exercise and proper diet, but that's the strongest starting place.

Aside: Soooo, move your bod and eat your greens. We fixed it, America! [*choir singing: "Glory, glory, hallelujah!"*]

Alie: Where has the average American lifespan gone? I mean, are we still increasing or have we hit a point–

Dr. Finch: No, we're decreasing. In the last 10 years, the average lifespan in the United States has decreased and we're now 20th or 30th in the world in our adult lifespans, because of all that we've been talking about and the epidemic of obesity has a direct relationship to that. Plus the health disadvantages of lower-income people who don't see doctors and can't afford medication. And then this terrible epidemic of drugs. Those are all pushing lifespan down after remarkable gains in the 20th century.

Alie: What's happening in other parts of the world, in blue zones where longevity is higher?

Aside: Sidenote, what is a blue zone? This came up in the Hematology episode and I only know that because I searched my Google Drive for the word legumes.

A blue zone is a place identified by author Dan Buettner who has studied some scientists' data and concluded that people in five places live the longest: Okinawa, Japan; Sardinia, Italy; Nicoya, Costa Rica; Icaria, Greece; and a small posse of Seventh-day Adventists in the LA suburb of Loma Linda, California.

What, sayeth Dan, are commonalities among these groups? Apparently, they are prioritizing family above everything else, they smoke less, they eat a lot of veggies, are semi-vegetarian. They have constant moderate physical activity, and good social engagement. Which does not mean likes and comments on Instagram but hanging out with many generations in the community. Also, legumes. They eat a lot of legumes. Does Dr. Finch think this is just a hill of beans?

Dr. Finch: Well, I'm not enthusiastic of something unique about the blue zones. There are peoples on all the continents who live a little longer than the average, but most of my colleagues don't think there's anything unusual about that. But if you look globally, lifespan has been increasing as early life mortality decreased because of reducing infectious disease. Pushing against that is the global epidemic of obesity, the global sale of tobacco, which is huge in Africa and Asia, and the global issues of air pollution which is getting worse in most of the world because of fossil fuel consumption and global warming.

Alie: Is global warming and temperature change contributing directly to the way our bodies work or age?

Dr. Finch: That story is emerging. This is a book that I wrote that talks about this. This came out this year.

Aside: This book is called *The Role of Global Air Pollution in Aging and Disease*. The title appears in stark white ALL CAPS against the veiled, smoky silhouette of a polluted Parisian skyline. I am truly confounded as to how one human can be so prolific.

Alie: I did wonder... I mean, you've published over 500 papers and four books.

Dr. Finch: Actually, this is my sixth book.

Alie: Your sixth book! How do you approach life? How do you get all of this done? How do you balance all of this personally?

Dr. Finch: I have a very happy home life. I work very hard, but I give myself personal time and avoid feeling ground down.

Alie: Oh, that's very smart. That's a very good life lesson.

Dr. Finch: Well, what works for me might not work for other people.

Aside: Don't mind me. I'm just having a moment here... evaluating everything I've done wrong in my life. [clip from *The Police* song, *I'll be watching you*: "Every breath you take..."]

Alie: What do you think... As the baby boomer generation starts to age, what do you think the best thing our society can do to-

Dr. Finch: 'Our society' doesn't have much meaning. There is no such thing as our society, right? I mean, who is our society? There's hundreds of societies, so every community has its own lifestyle. The main point is a healthy diet, and exercise, and avoid cigarettes. That's totally boring to say, but that's really the basis for optimizing outcomes of health at later ages. You need to maintain a healthy lifestyle from childhood onwards.

Aside: So now is the time when we dive into listener questions, and also I mention that a portion of the podcast income goes to a charity each week. This week Dr. Caleb Finch chose CureALZ.org, a non-profit organization dedicated to funding research with the highest probability of preventing, slowing, or reversing Alzheimer's disease. To date, they have raised over \$86 million to fund almost 400 studies, and 100% of funds go

directly to research. So thank you listeners for helping a lab buy some pipettes, getting closer to a cure for Alzheimer's.

Okay, your listener questions. Now, I didn't want to take up too much of the professor's time so I blazed through these questions without reading off a bunch of names, but I will insert them when I can. For example, the first two questions here were asked by Liz Sundin, Athena Balistreri, Dionne Dabelow, Mike Monikowski, Anonymous Bob, Anna Thompson, Lucille Audinet, and Taylor Munich.

Alie: I have some listener questions. Almost everyone is just asking: What's the secret to aging well? It seems like diet, exercise, rest.

Dr. Finch: Yeah.

Alie: Yeah. Do you think that there's a maximum age that the human body can reach?

Dr. Finch: Well, the evidence is very clear. Almost nobody gets beyond 100. There's one person in the last 30 years who reached over 120, Jeanne Calment. There are more people getting to 100, but they still, in the last 30 years, she's the only one to get beyond 120.

Aside: Sidenote: Jeanne Calment lived to be 122, the oldest human on record, and she was fond of wearing headphones, and doing chair gymnastics, prayer, fruit salad, and smoking. [*record scratch*]

Well, one Dunhill cigarette a day and a small glass of port wine until she was 117, which proves that you're never too old to quit a bad habit and turn over a new leaf. Seriously, let's Nope the Smokes, Folks. Love, ol' Dad.

Alie: Do you think that there's anything to the secrets that they claim 'a glass of whiskey a day'? A hard-boiled egg? Staying single?

Dr. Finch: Who says this?

Alie: I think every time someone reaches a remarkable age.

Dr. Finch: I have never heard that said. People *say* that about them, but I have never any of them say that. You have to distinguish between what people say about centenarians and what the centenarians actually said. If you talk to Nir Barzilai in New York at the Albert Einstein Medical College, he's a great expert on this. What he's shown is that his group of centenarians have the same diseases as other people. Some of them smoked and some of them are still working. There isn't really any genetics or lifestyle that makes it obvious as to how they got there.

Aside: Super quick: this lab at Albert Einstein Medical College is great and focuses on the metabolic decline of aging. They hypothesize that the brain leads this decline. But, just real quick, let's get back to if I was hallucinating stories about eggs and whiskey.

Good news! My brain still works because the internet is just littered with stories of centenarians with quippy secrets to longevity that are just bogglingly bad advice. One of the oldest living WWII vets, Richard Overton – who passed away in December – he lived to be 112 and he drank four times as much coffee as me. [*Richard Overton: "I get me a cup of coffee. I drink four cups of coffee in the morning. This morning I drank about that much whiskey."*]

And four cups of whiskey a day! So, okay, he is going to be the only one. Right? Mmm? Nope. Nope. Mariano "Pops" Rotelli said at 107 that everyone should have a little whiskey nip a day, telling a newspaper, "I've had a shot of whiskey in my coffee every

morning for 100 years.” He continued, “I went to the doctor three times in 100 years. He’s dead. I’m still living.”

Okay, so that’s two people. Wait. Wait. A 105-year-old British man, Jack Reynolds, credits his long life to a daily regimen of whiskey. Agnes Fenton, 111, told reporters that she drank three Miller High Lifes and a glass of Johnnie Walker daily. Also at 111, Grace Jones credited a shot of scotch every single day for the past 58 years, which I don’t think is how you are supposed to drink scotch, but you live that long, you do what you want!

Did I make up the egg part? I did not! Italian, Emma Morano, lived to 117. She consumed eggs every day; also a glass of brandy daily. But put the bottle down, friends. The current oldest person alive, 116-year-old Kane Tanaka, of Japan credits family, sleep and hope as her secrets for longevity. She also drinks a lot. Of water. She eats a lot of small fish and soup and she keeps faith in religious spirits. What I’m saying is, it’s anyone’s guess. And by anyone, I mean Caleb Finch; and by guess, I mean conclusions based on decades of research.

Alie: And you mentioned that genetics is only about 20% of a factor.

Dr. Finch: 20-25%, somewhere in that.

Alie: So it’s a minority. What’s the role of telomeres in aging?

Dr. Finch: We don’t know. So telomeres are the ends of chromosomes that get shortened during cell division. Some of our cells do show shorter telomeres in the immune system. Its actual functional consequence is not clear.

Alie: So that clearly hasn’t been the secret to—

Dr. Finch: There’s no secret. There’s nothing in aging that is a secret.

Aside: Does he hate me? Again, twists and turns. Listen to the end. Also, I wanted to take up the least amount of his time, so apologies for not always reading Patron names. Ya girl here was flustered. But Kelli Meeker, Julie Noble, Sarah De Smet, Kristen Long, all had questions about Alzheimer’s, which we go back into here.

Alie: What’s been the most exciting find for you and your work?

Dr. Finch: Well, we made a finding in the realm of Alzheimer’s disease, that has been important, that the most toxic form of the amyloid peptide that people still considered to be one of the major factors in Alzheimer’s, is small aggregates rather than the large amyloid fibrils. Oligomeric A-beta was discovered in my lab here and it’s recognized as the most toxic component in the amyloid cascade. So that was one of our discoveries. And I would say the other discovery that we publish this year is that air pollution increases the production of the amyloid peptide.

Alie: Really?

Dr. Finch: Yeah, that’s published.

Alie: The difference in smaller plaques versus bigger plaques, does that signify that it might be more gradual of an onset?

Dr. Finch: Well, people don’t think that this plaque size is the importance. This point is, in the vicinity of the amyloid plaque, which is outside of the cells in the brain substance, the neurons that are nearby are less healthy. Their projections are more twisted and they have more protein abnormality. That’s really the total plaque load that is associated in

some still mysterious ways with the loss of synapses in the brain. At the end of the day, all of my colleagues and I are in uniform agreement that it's the loss of synapses that causes the deterioration in Alzheimer's when neurons can no longer talk to each other across synapses.

Alie: And that might be impeded by the plaques, then?

Dr. Finch: Yeah. The plaques in some ways seem to be causing loss of synapses. The chemistry, biochemistry, and molecular biology, this is immensely complicated and there isn't a single pathway that seems to account for it.

Aside: So it's the plaques that cause the loss of synapses and the question is: How do we arrest the plaques? They're working on it. A few folks, such as Katelyn Donald, Rose McCathran, Shannon Patterson, Doreen Ullom-Buchan, Caroline Lewis had this next question.

Alie: Do you find any particular strategies for keeping your brain sharp or for maintaining neuroplasticity?

Dr. Finch: Well, I told you all I know. Exercise and have an active life.

Alie: Yeah. Puzzles, anything like that? No?

Dr. Finch: My science is an endless set of puzzles. I don't have to play games to challenge my brain. [*clip from Backstreet Boys song: "Quit playing games with my heart."*]

Aside: Patron Christopher Yarsawich asked about diets and Juan Pedro Martinez asked this next question, specifically:

Alie: What about vegetarian, veganism diets? Any evidence for those?

Dr. Finch: The main point is: whatever you eat, keep your blood lipids and blood sugar low. There are people on vegetarian diets who live as long as people who eat meat-rich diets, but it's harder to keep your blood properties healthy if you're eating a lot of fatty meat and a lot of salt.

Aside: Patron Euan Munro said: I intermittently fast, partly for weight loss and partly because of the apparent benefits to longevity. How much reliable proof is out there that fasting, or strict calorie reduction, leads to longer life in humans?

Alie: What about fasting and caloric restriction? Any evidence that it slows aging or gives the body a break?

Dr. Finch: Well, in humans there's no evidence that fasting or starvation does more than lowers blood lipids. But on a long-term basis, extreme caloric restriction for most people is simply not sustainable. Doctors who treat obesity have agreed that you can only go so far with somebody who has been obese to diet and exercise. There's something else that causes them to bounce back. My colleague Valter Longo, who has the lab right down the hall, a former student of mine, has made some important discoveries that a fasting-mimicking diet, really only a couple of days a month, improves blood chemistry.

Aside: I looked him up and boom. ValterLongo.com has the secrets to life, which apparently are not secrets if you just give them away for free on a webpage. Seriously, check that out. Among the bullet points was:

Eat mostly vegan, plus a little fish, limiting meals with fish to a maximum of two or three per week. Choose fish, crustaceans, and mollusks with a high omega-3, omega-6, and

vitamin B12 content (salmon, anchovies, sardines, trout, clams). Pay attention to the quality of the fish, choosing those with low levels of mercury. Confine all eating to within a 12-hour period; for example, start after 8am and end before 8pm. Don't eat anything within three to four hours of bedtime. There you go.

Now, *regardé*, there is no mention of Miller High Life or spiking your Folgers with gas station whiskey, or smoking cigars, so probably don't do that. Anyway, that information was it. ValterLongo.com.

Alie: What is the hardest thing about your job or the part about your job that you dislike the most?

Dr. Finch: Oh, there's nothing that I dislike. I'm happy to say that I'm no longer running large training grants and I'm no longer the director of the Alzheimer's Center, which was another 20 to 30 hours a week on top of everything else I do. So, I'll be 79 and I am enjoying the freedom to not have a large number of people answering to me. I have a group of highly talented, highly motivated people in my research lab and we're doing a lot of good science.

Alie: What's your favorite part about the field or what you do?

Dr. Finch: Surprise.

Alie: Yeah?

Dr. Finch: Yeah.

Alie: Still get a lot of it, right?

Dr. Finch: Well, the complexities of biology are just awesome. Amazing. Every year there's a new level of mechanisms, sub-cellularly, or in how organs talk to each other. It's just endlessly fascinating.

Aside: [*high pitched voice*] Does this man slow down?

Alie: Do you have a seventh book on the way?

Dr. Finch: Yes, there's going to be a popular-level book on air pollution in the next year or a year-and-a-half.

Alie: That's great. Do you drink a lot of caffeine? How do you do all this?

Dr. Finch: I have two cups of coffee a day.

Alie: Seems to be working.

Dr. Finch: That's all I need.

Alie: That's all you need.

Aside: I'm spending the last two minutes of my time with him just really going for it, y'all.

Alie: Very stupid question. Did you ever see the movie *Benjamin Button*, and how did you feel about it? **Dr. Finch:** I did see it. I thought it was clever.

Alie: Okay!

Dr. Finch: I enjoyed the script writer's imagination and could second guess some of the decisions he made. I saw that 5 years ago.

Alie: Yeah. I was just curious. It seemed like it would be ripe for a lot of mistakes in aging.

Dr. Finch: Well, I mean, you go to the movies to be entertained. You read a novel to be entertained. This is not a scientific experience.

Alie: *[laughs]* It was not a documentary, from what I recall.

Dr. Finch: Of course not! It was an amusing fantasy.

Alie: Any other things that you're excited about working on or you think people should know about the aging process or taking care of themselves?

Dr. Finch: Well, I'm collaborating with some anthropologists in a group of people who live in the Bolivian Amazon. What's fascinating about these people is, they're living under conditions of 200 years ago, without medication, and they're growing their own food, and they all have high levels of infection. Some of them get to age 70 or 80, but what's remarkable, a small percentage, 10% percent... Nobody lives much over 80.

What's remarkable is that their levels of arterial aging are 25 years slower than in North America and they have almost no heart attacks or strokes. So we're trying to understand what aspects of their environment, their diet, and interaction with their genes might slow the arterial aging to such a degree.

Alie: Do you think there's anything about the gut biome that's at play there?

Dr. Finch: That's an open question. I don't know.

Alie: We'll see. I guess there's a surprise and a puzzle waiting for you with that.

Dr. Finch: Yep.

Alie: Thank you so much for letting me ask you so many questions.

Dr. Finch: Okay. Well, good questions.

Alie: Thank you so much.

Good questions! He said I had good questions, y'all! He does not hate me! After the interview was over and the mics were off, Dr. Finch said I asked great questions, that I was doing a service for science by making the podcast. I honestly almost joy wept in my car on the drive home. He's just super focused and all science on the outside with a very warm and curious heart. I love him. He's great. And he returned my email so fast. I am a big fan.

To learn more about Dr. Caleb Finch's work, go to AlieWard.com/Ologies or follow the links in the show notes to my site. I post all kinds of info about his studies and other studies mentioned in the episode. Again, his latest book, *Global Air Pollution in Aging and Disease: Reading Smoke Signals*. It's even available on Amazon, as are many of his other books.

Ologies is @Ologies on [Twitter](https://twitter.com/Ologies) and [Instagram](https://www.instagram.com/Ologies). I'm @AlieWard on [both](https://twitter.com/Ologies). Thank you Hannah Lipow and Erin Talbert for moderating the wonderful nook of the Ologies Podcast [Facebook group](https://www.facebook.com/OlogiesPodcast).

Thank you Ologies transcribers for all the work you're doing to make the back catalog accessible to our deaf and hard of hearing friends. Merch is available at OlogiesMerch.com. Thank you, Shannon Feltus and Boni Dutch, for helping manage that.

Thanks to new interns, Haeri Kim and Caleb Patton, who just started a very fun new podcast called *You're Never Too Old* about anime, and comic books, and pop culture. Check that out.

Thank you to assistant editor Jarrett Sleeper of the podcast *My Good Bad Brain* for helping with edits and with a little research, too. And of course to editor, ride or die 'til at least age 122, Steven Ray Morris, who puts the pieces all together. He also hosts the podcasts *The Purrrrcast* and *See Jurassic Right*.

If you stick around to the end, you know I tell you a secret. This week's secret is that I have Christmas gifts I haven't mailed yet. I see them every day. It produces a shame wave. So, I gotta do that. I'm sorry Jennifer, and also Sofia, and Hannah, and Erin. I love you all. I have to go to the post office.

Also, as long as I'm apologizing, I'm sorry to ER/ICU RVT of 13yrs who left a 4 out of 5-star review because they were PO'd that a turtle episode implied veterinary medicine was more routine and less dirty than fieldwork. I was so wrong to say that. Vet medicine can be very gross and difficult and I'm sorry to have minimized that aspect. Vet medicine is dope as hell. I'm so sorry that I made it sound more routine. It was hyperbolic and jocular and I apologize. I hug you and high five you.

If you want to say hi or have a suggestion for improvements to the show, maybe before leaving it in a review, just email me at [HelloAlieWard@gmail.com](mailto>HelloAlieWard@gmail.com). You can also tweet at me or DM me on the 'grams. I respond to as many as I humanly can. I read pretty much everything that you guys send me, even if I am not able to write you back. I truly love and welcome suggestions on how to make *Ologies* even better!

One more secret, I drank Taiwanese cheese tea 3 times this week and I loved it every time.

Okay, berbye.

Transcribed by Azalia Worden.

Edits by Mike Melchior

Some links which may be of use:

This week's donation was made to CureALZ.org

[Another reason to floss: gingivitis study](#)

[Breezy reading: Inflammation as a potential mediator for the association between periodontal disease and Alzheimer's disease](#)

[Dr. Finch's work with CureALZ.org](#)

[I forgot to mention that Dr. Caleb Finch is also a fiddler in the Iron Mountain String Band](#)

[His genius, 900-page book on aging, "Longevity, Senescence and the Genome" on Google Books](#)

[To buy "Longevity, Senescence and the Genome:"](#)

[How old is your bod?](#)

[Jean Calment, 122, liked chair aerobics](#)

[Naked mole rats, forever nubile](#)

[Blue zones: family, veggies, community and ...beans](#)

[Valter Longo has the answers to longevity](#)

[Nir Barzilai, M.D.'s lab](#)

[Grace Jones, 111, loved whiskey](#)

[More diet secrets: bacon and Scotch?](#)

[Mariano "Pops" Rotelli, 107, also loves whiskey](#)

[WW II vet Richard Overton lived to 112 despite whiskey and cigar habits](#)

[Please enjoy more Richard Overton](#)

For comments and inquiries on this or other transcripts, please contact OlogiteEmily@gmail.com