



Speaker 1: 00:02 This is the *Thank You, 72* podcast, brought to you by the Wisconsin Alumni Association. This podcast salutes outstanding Badgers from Wisconsin’s 72 counties. Here’s your host, Tod Pritchard.

Tod Pritchard: 00:14 Welcome to the podcast. I’m so glad you could join us. Our mission is to share the stories of amazing University of Wisconsin alumni and how they’ve changed the world. In this episode, an extraordinary conversation with Dr. Ann McKee. Anne grew up in Appleton and earned her geology degree from UW–Madison in 1975. She has gone on to become the world’s foremost expert on the degenerative brain disease, known as chronic traumatic encephalopathy or CTE. CTE is triggered by repetitive blows to the head and is most commonly found in combat veterans and athletes participating in boxing, hockey, and America’s most popular sport, football.

Tod Pritchard: 00:54 CTE causes symptoms such as cognitive impairment, depression, memory loss, and aggression. The condition is currently untreatable and only detectable after death, when the brain is examined. I’d like to share more about Ann’s story and her amazing research into CTE. Dr. McKee’s honors include the Distinguished Alumni Award from the Wisconsin Alumni Association as well as a lifetime achievement award from the Alzheimer’s Association. She’s also made *Time* Magazine’s list of the world’s 100 most influential people, and I understand Dr. McKee, you’ve also added a couple of other honors to your list recently, correct?

Dr. Ann McKee: 01:32 Yes. I just this Monday was elected into the National Academy of Medicine, which is a very high honor.

Tod Pritchard: 01:39 Congratulations. I want to welcome you so much. Thank you for participating in this podcast.

Dr. Ann McKee: 01:47 I’m delighted to be here.

Tod Pritchard: 01:48 Dr. McKee, we mentioned you're a Wisconsin native. You were born in Appleton 1954. Tell us a little bit about your life growing up and how you came to the University of Wisconsin.

Dr. Ann McKee: 01:57 Wow. So I grew up in Appleton. I was the youngest of five children. I was youngest by a long shot. I was a surprise — surprise baby. And all my brothers and sisters went to Lawrence University, which is the local college. My dad actually was on faculty at Lawrence University. There was every expectation that I would go to Lawrence, but having lived there my whole life, having been two blocks from the school, I really wanted to experience more. I really wanted to get out in the world, and I had to really struggle with my dad to talk him into paying the tuition for the University of Wisconsin.

Dr. Ann McKee: 02:36 He was very reluctant, and he made me actually do a year at Lawrence University first, but then I got my wish, and I came to the University of Wisconsin, where I was excited to come because it was a time during the '70s of a lot of disruption. There was a lot of questioning of authority. There were a lot of demonstrations. I felt that the university was alive with possibilities that I could be exposed to all sorts of things, all sorts of disciplines, all sorts of different people, and I really wanted that exposure.

Tod Pritchard: 03:13 So how did you convince your dad to let you come here? What was the turning point of that?

Dr. Ann McKee: 03:16 Well, I have to say it did help that I was an art major my first year in college —

Tod Pritchard: 03:22 Really?

Dr. Ann McKee: 03:22 — and I had an epiphany towards the spring of that year. My brother, my next-oldest brother was a doctor, and I did have an epiphany. I remember going into my dad's room and saying, "You know dad, I've been thinking about it, and I think I really want to become a doctor," and of course he was just beside himself with happiness. He was so delighted that I made that decision, and so he was happy to support me going to the University of Wisconsin as a pre-med major.

Tod Pritchard: 03:53 Of course, you grew up in Wisconsin, and like most of us, a devoted Packer fan. What your dad played football and your brother, right?

Dr. Ann McKee: 04:01 Both my brothers. I had two older brothers, both played football. Yeah, our family friend was the high school football

coach. I learned how to play football. In the summers we would have these pickup games of flag football, and I know that if I hadn't been born female, I would have been a football player, too.

- Tod Pritchard: 04:21 It's ironic that your life's work really, then, revolves around football in a way that I'm sure you had no idea it would.
- Dr. Ann McKee: 04:30 Yes. It's actually shocking that I work on the brains of football players. I am fascinated by brains. I was historically an enormous football fan. I was a huge Bret Favre fan. I used to listen to him on the radio in Boston, after the game, conversations. I couldn't get enough, and I knew that they damaged their hips and sometimes their knees and had arthritis later in life, but until I saw my first case, that brain under the microscope, I had no idea that they were damaging their brains, and that was extraordinary to me. It was shocking to see it in that first football player who was 45 when he died, and I just knew it was something that I had to tell people about and that we had to know more about because it was such a surprising finding.
- Tod Pritchard: 05:25 Yeah. We'll get more into the process that took you there in a second, but I think a question that really comes up a lot, and we want to talk about it right off the top, is that it's not so much one hit, right? It's that kind of the misconception that it's not one or two or three or four concussions. It's the multiple hits that you're really looking at.
- Dr. Ann McKee: 05:47 Yeah. I mean, when we first started, we thought it was the concussions, too. We thought that it was the concussions that could sometimes lead to this long-term neurodegeneration, but our studies then showed over and over, it was the cumulative small hits, the little hits that the players play right through. They're seemingly unaffected, but if you endure thousands of those hits or hundreds of those hits, and most football players do experience hundreds per season — in fact, most football players in every position, on every play, experience hits — it's the cumulative effect of those small hits that leads to this chronic deterioration.
- Tod Pritchard: 06:29 Let's go back in time a little bit. You graduated from UW—Madison. You went on to become a neuropathologist. You conducted groundbreaking research in the field of Alzheimer's disease and you were at Boston University, and CTE, chronic traumatic encephalopathy, began to emerge. There's so many ironies in your life I'm sure. One of them is probably that the first person really studied for this was a Wisconsin native, right?

Rhineland native, a University of Wisconsin grad, Mike Webster. Mike was a standout Badger, was first-team all-Big 10 in 1973. He was drafted by Pittsburgh in the fifth round of the 1974 draft. You were here actually at the university when Mike was here. Did you ever see him play football?

- Dr. Ann McKee: 07:18 No, I never saw him play football that I can remember, but we were here at the same time. There are a lot of parallels. Our family cottage is very close to Rhineland. It's a strange synchronicity in this life that, yeah, Mike Webster very severely affected with the disease that I've now studied almost nonstop for the last 12 years.
- Tod Pritchard: 07:42 Tell us a little bit more about Mike. I know you weren't directly involved with his case, but that's what started this whole thing, right?
- Dr. Ann McKee: 07:49 Right. I started out being very interested in boxing. It was actually in the early 2000s. I had been studying Alzheimer's disease, and we had an individual come in who was a famous boxer, a world champion boxer, twice fought Sugar Ray Robinson for the title, very well-known in the Northeast, and he developed a dementing condition, memory loss, cognitive changes, but also very bizarre behaviors. Very paranoid, belligerent, violent. He was diagnosed with Alzheimer's disease, but then when I looked at his brain, it was anything but.
- Dr. Ann McKee: 08:24 It was clearly not Alzheimer's disease and more importantly, even though I'd been studying these diseases for some 20-odd years, very, very obsessively because I was absolutely fascinated by tau and the brain diseases characterized by tau, I'd never seen this pattern before. And I found that just extraordinary. It's a very florid pathology. It circles around small blood vessels. It's very clustered in the brain. It doesn't affect the brain smoothly. It really hits certain areas very hard. I'd never seen anything like it, so I became extremely fascinated with what happened to the brain after boxing. Then several years later, after studying a few boxers, I had the opportunity to look at a football player.
- Dr. Ann McKee: 09:12 And what just floored me was that the first football player was 45 when he died, and if you study neurodegeneration, that's a disease process that affects people in their 70s, 80s, 90s. Sometimes their 60s, but 45 is just extraordinarily young, and to see a football player with very profound damage in his brain at that age was truly extraordinary.
- Tod Pritchard: 09:45 In Mike Webster's case, he was 50 when he passed away, and for years, the National Football League denied that there was

any kind of relationship between head injuries and brain damage. In fact, the league at one point said that if a player sustained a concussion, they could go right back in that same football game. Fast forward to 2008, and that's when you did your first examination, right?

- Dr. Ann McKee: 10:10 I had seen the report on Mike Webster, and I'd looked at the pathology. I wasn't sure it was the same disease. There just wasn't enough information in that early report for me to be certain, and so I was very, very curious to look at the disease myself, but I remembered that report from Dr. [Bennet] Omalu and colleagues, and I was curious to see if it was the same. Then I didn't get the opportunity till a bit later.
- Tod Pritchard: 10:38 Mm-hmm (affirmative).
- Dr. Ann McKee: 10:38 A couple of years later.
- Tod Pritchard: 10:44 When you looked at that first player's brain, what struck you? What was going through your mind as you were examining that?
- Dr. Ann McKee: 10:54 Well, my brother and I are both doctors and shoptalk. He was the doctor for several football teams and ice hockey team, and we traded stories. I think we were, "So-and-so's got some difficulty with movement. I wonder if it could be possibly related to previous history of football." It was something that — you know and then there was the San Francisco 49ers with the ALS. I mean, there were clusters of issues. It was something I was curious about, he was curious about, and when I saw it under the microscope, the first thing I did was show it to him. Both of us had this — we felt this obligation. I remember thinking, "We've got to show this to the NFL," because who could believe this? Players are at risk, and we need to understand more immediately.
- Tod Pritchard: 11:56 Before the 2009 Super Bowl, you held a news conference? In Tampa Bay, they were going to kick the game off at the stadium just down the street from where you were doing the press conference. What did you tell the media at that event?
- Dr. Ann McKee: 12:11 Well, Ted Johnson was there. Lisa McHale, who is the wife of Tom McHale, who had been one of my brain donors. We told them those stories. We told them about John Grimsley. We told them about Tom McHale, and then by that time, I'd also had the brain of Eric Pelly, who was a 18-year-old high school player, and his brain showed early signs of CTE. We felt this was an extraordinary issue for public health, that we needed to raise

awareness, so that we could do something about a potentially or entirely treatable disease. We had a press conference, and it was attended by about four or five people. It was not well attended and it looked as though the whole thing was going to be a gigantic bust.

Tod Pritchard: 12:59 But you got some attention because just a few months later, the NFL gives you a call and says, "Hey, could you come over and present your findings to our concussion committee," right?

Dr. Ann McKee: 13:11 That's right. To our mild traumatic brain injury. I got a call from Ira Casson. I was very surprised to get this call, and I said, "Of course, I'll do that." It was a month or two later that I went to, what is it, Park Avenue, New York City, and presented my findings.

Tod Pritchard: 13:31 And what was the reaction?

Dr. Ann McKee: 13:33 Well, I asked them ahead of time if it would be all right if I brought Chris Nowinski with me, who was a former professional wrestler. He's a big tall guy, and they said, "Yes, you can bring him, but he's not allowed to say anything," and I thought, "Well, fine. I just need the moral support of not being the only one in the room." Well, for a lifelong Packer fan, it was extraordinary to be in this big, beautiful building, and you go up to the top floor, and they've got the Lombardi statue there. They've got images, Super Bowl I and II. I mean, there's a part of you that's really absorbing the museum and all of that it entails.

Dr. Ann McKee: 14:21 Then I was ushered into a room, a very large board room, which is very nicely appointed, and a lot of men. A lot of men around the table. Probably, I don't know, 12 to 15 men and one woman, but she was taking notes. So it's me and these high-powered men, and I started presenting my findings. By now, I'm a pretty well-experienced neuropathologist. I've been in a lot of NIH committees. I've written a lot of papers. I was expecting them to at least consider my opinion and take me seriously, but there was this real sense that I was falling on deaf ears, that it was like, if they'd had a hook, I think I would've gotten it. They just kept coming up with reasons that I was mistaken or reasons that it was something else.

Dr. Ann McKee: 15:17 They clearly were in very deep denial. There was a lot of shoot-the-messenger sort of feeling, and I had very little support in the room. I left feeling very despondent, like I don't know. I was surprised, even though I've been around a long time and I know people behave differently, but I was surprised by their reaction. I didn't expect it. I expected them to at least consider it. Maybe

not consider it as seriously as I'd hoped, but I didn't expect to be dismissed, and it was a very dismissive — I was marginalized. I was very aware that I was a woman and I was talking to men who didn't believe me. It was a familiar feeling. It's a very uncomfortable feeling. It's a little depressing.

- Tod Pritchard: 16:11 Well, later that year, an internal NFL research document was leaked to the *New York Times*. It turns out an NFL commission study showed that former players had brain disorders at higher rates than the rest of the community. That sparked congressional hearings in October 2009, and NFL commissioner Roger Goodell could not answer the question, "Do concussions hurt pro football players?"
- Speaker 2: 16:32 I just asked you a simple question. What's the answer?
- Roger Goodell: 16:38 The answer is the medical experts would know better than I would with respect to that, but we are not treating that in any way in delaying anything that we do. We are reinforcing our commitment to make sure we make the safest possible field for ...
- Speaker 2: 16:51 Right. Okay, I've heard it.
- Tod Pritchard: 16:53 Shortly after those hearings, the NFL came up with new concussion rules, a new committee to study concussions, and finally admitted that concussions do have long-term effects on players. The NFL also gave Boston University a \$1 million gift to study CTE. The tide had turned, but the research was only beginning.
- Speaker 1: 17:14 This episode of *Thank You, 72* is brought to you by Wisconsin Alumni Association Travel with more than 40 amazing tours offered every year. Your bucket list will runneth over with dream trips to take. Just look at what's coming up at uwalumni.com/travel. Along with a wide array of destinations to choose from, WAA Travel takes care of all the details, so you can enjoy the ride and nothing compares to traveling with a group of Badgers. You'll make almost as many friends as memories. Begin your next journey now by visiting uwalumni.com/travel. Now back to the *Thank You, 72* podcast. Once again, here's Tod Pritchard, director of media and public relations at the Wisconsin Alumni Association.
- Tod Pritchard: 17:57 We're speaking with UW grad and neuropathologist, Dr. Ann McKee. Again, doctor, thank you so much for being here. Really appreciate it. We want to go forward now to 2010, and you started studying multiple cases. Tell us about a few that really

were landmarks to you, that had the biggest impact on your research.

- Dr. Ann McKee: 18:19 Every time we look at a brain of a player who's died and we find CTE, it teaches us. We learn from every brain no matter how old, no matter what. Each of their stories is important, but some notable individuals are the ones that I got to know during life. One of those was Kevin Turner, who first came to us because he was having problems with cognition. He was in his late 30s. He noticed he was making decisions that he wouldn't otherwise have made. He considered himself a very fiscally conservative individual. He was making hundreds of thousands of dollars playing for the Patriots, and then he found himself making very poor financial decisions and wasting away all his money. His marriage had declined.
- Dr. Ann McKee: 19:16 He was on the verge of divorce, and he just knew there was something wrong with his mind. He first came to us in his late 30s, but then it was later in his early 40s, he developed motor neuron disease. I had just published a paper on ALS in the setting of CTE in three individuals. When he decided to come see us, I was immediately very concerned that that's what he had as well. Of course, you hope it isn't so, but ALS is a devastating diagnosis. People don't live much beyond five years, two to five years, and there's nothing we can do about it. We watched Kevin decline, and over the years, he became progressively unable to care for himself and then died.
- Dr. Ann McKee: 20:06 He donated a brain to our science, and he had the most extraordinary example of CTE that you can possibly imagine in a player that was 46 years old when he died. It just breaks your heart. You just say to yourself, why aren't we doing more to prevent this? We've got all these players playing now, some of them playing from early ages, like four and five years old, believe it or not, and we just got to keep them safe.
- Tod Pritchard: 20:39 That is doable.
- Dr. Ann McKee: 20:40 That is doable, but we have to want to do it. We have to stop pretending this disease doesn't exist. We have to stop arguing about the fine points and just take it on ourselves. Have the leagues take on some responsibility for this. There will be solutions. There are solutions, but we have to want to find them.
- Tod Pritchard: 21:03 One of the solutions is when a player takes matters into his own hands, and that's what's happened recently with Chris Borland. He's a former Wisconsin linebacker, incredible rookie season

with the San Francisco 49ers, but he decided to leave football to preserve his long-term health, and he did that because of your research.

Dr. Ann McKee: 21:27 Yeah, and I think Chris Borland did the right thing. He's one of those extraordinary individuals who decided to do something to really preserve his brain, and I just think that's just the most courageous thing he could have done. Especially given the financial compensation of what he was doing, the feeling that he's disowning something that's so popular, but it was a courageous stance, and I'm just so glad that he decided to take his future in his own hands.

Tod Pritchard: 22:09 Let's talk about kids and football. Now I'm the parent of a 12-year-old, and I know that every parent whose child wants to play football — and my son's case, it's hockey — has the same question, are these contact sports safe for kids? Your most recent study indicates that children who play contact football before age 12 may suffer problems like CTE years earlier than other kids.

Dr. Ann McKee: 22:38 Yeah. It suggests that they get the symptoms of CTE years earlier, and that's something that we've been studying for now a number of years, that individuals who start to play tackle football before 12 have greater consequences in late life. We've found that they have more emotional difficulties, more cognitive changes, more depression, and that they experience the symptoms of CTE if they develop CTE at a younger age. Some 13 years younger. We know that football damages brains, and there's mounting evidence that it especially damages young brains.

Tod Pritchard: 23:22 I know it's maybe impossible to answer this question right now, but do you have a recommendation on when kids could safely start to play contact football, tackle football?

Dr. Ann McKee: 23:34 Well, with regard to football, what I would recommend is that they become physically mature. Now I'm not giving it an absolute age, but there's a lot of technique involved in football. There's a skill set that you can acquire, where you have less head contact than others, and if you train yourself properly, neck strengthening, there are ways to lessen the amount of head contact just by your individual playing style. Then I would like to see a player physically mature, because when you're young, when you're relatively short for your head size because your brain is fully grown by age four, and you've got this heavy head on a thin, underdeveloped neck and a tiny little body,

you're more likely to have head injuries, and you're more likely to take a long time to recover from them.

- Dr. Ann McKee: 24:29 Not only are children more vulnerable, they don't recover as well, and they can have greater late-life consequences. My advice is if you're dead-set on playing football, that you play it when you're physically mature, and that's different for every individual. Ice hockey, I think they are doing a lot of things to reduce the amount of head contact in hockey. It's not an intrinsic part of the sport. We can eliminate a lot with rules and rule enforcement. We want our kids to play contact sports. We want our kids to play team sports. We know they're very important for their physical development, their psychological maturity. There's nothing that replaces the physical fitness of sport, and those are all things that encourage brain health.
- Dr. Ann McKee: 25:18 In fact, that's one of the best things you can do for your brain is maintain physical fitness. We want to encourage kids in sport, but we want to keep them safe at the same time.
- Tod Pritchard: 25:28 Mm-hmm (affirmative). Let's go back to your adult research for a moment. At this point — and I know the number changes all the time, but as we're recording this — how many brains have you examined?
- Dr. Ann McKee: 25:41 Well, it does change every week. We had about 10 brains a year when I first started, and those we had to go out and ask the families for. Now we're getting as many as two or more a day. They're coming in fast and furious. We've got over 630 brains in the brain bank. They're coming in so quickly that we're having difficulty keeping up with their analysis. We've analyzed about 470. We've found about 330 with CTE. We run about a 70 to 80 percent hit rate. Everyone criticizes the brain bank for its selection bias, but the selection bias isn't as great as people would have you believe. Certainly, people are more likely to donate the brain of a loved one if they were experiencing symptoms, but the people who are giving these brain donations and making them happen are ordinary citizens.
- Dr. Ann McKee: 26:42 The brain donors are very commonly not evaluated by medical individuals and have not had a lot of laboratory tests. These are your average citizens noticing something wrong in their loved one and wanting their brain examined. To find the high percentage that we're finding, 99 percent of NFL players, 91 percent of college players: that says there's a public health problem. No amount of selection biases accounts for those numbers.

Tod Pritchard: 27:15 Do you suspect almost every football player has CTE?

Dr. Ann McKee: 27:19 No, I don't because I know we've seen individuals without it, and we know of many cases where people are doing well. We see them later in life, and we see that they're doing well, but we do see it in a shockingly high percentage. What I would call an unacceptably high percentage. Whether the percentage of former NFL players is 10 percent or 90 percent, it doesn't matter. It's too many.

Tod Pritchard: 27:49 Mm-hmm (affirmative). Do you think there's something that accounts for that, that a lot of players get it, some players don't? Is it a technique or is it genetics or what are your suspicions?

Dr. Ann McKee: 28:05 Well, we're looking into all of those things, but certainly genetics plays a role here. We're just starting to understand the role genetics play, and we're finding that there's some variations in genes that make it more likely that if you develop CTE, it will be pathologically severe, and conversely, we're looking at other genes that may make you relatively resistant to the disease. Genetics usually takes hundreds of cases, thousands to really make concrete statements. We're just at the point where we can start to identify genetic risk factors as well as resistance factors. We certainly see cases where they've had a lot of head trauma and they don't have CTE, so what made those people resilient?

Dr. Ann McKee: 28:53 There could be other factors from contributing things — heart disease, for example. Cardiovascular health is often related to brain health, so there maybe an interaction there. Other environmental factors, potentially stressors or substances or other factors in their environment that may make them more likely to get it. We're looking at all of these things, but I would say that if an individual has enough head trauma for a long enough period, I think almost everyone will get CTE.

Tod Pritchard: 29:30 Where do you see your research going from here? Where do you think the next steps are?

Dr. Ann McKee: 29:33 Clearly the next step is identifying the disease in the living. If we could identify it in living people, we can first of all establish the prevalence. How many kids have it, how many high school players, how many college players, how many professional players? We'll have prevalence, and that will satisfy many of the critics, but more importantly, if we can detect it, we can monitor it, and if we can monitor it, we can treat it. There's many substances that may be helpful in the prevention of

disease or the lessening of a disease, but we don't have a way to monitor the treatment, so we don't know if it's effective or not. If we have a diagnostic, we also have a way to evaluate treatment.

- Tod Pritchard: 30:16 Do you think we're months, years, decades away from that?
- Dr. Ann McKee: 30:20 I think we're at least years away from that because all of these techniques — developing a biomarker to diagnose it in the living — they have to be very sensitive and very specific before they can be rolled out for general use, and that, in itself, takes years. You want to be very, very sure that you're not identifying it incorrectly and people that don't have it, and you want to be very sure that you're detecting the exact disease that you're detecting. You don't roll it out until you've had a lot of tests and balances to make sure that you're doing the right thing. I'm thinking years, hopefully five years, maybe longer.
- Tod Pritchard: 31:04 Dr. Ann McKee, you are really a champion and a hero for a lot of folks. You're very courageous. You've done a lot of great things, and we really appreciate you being on the podcast and explaining this to us and sharing your story. If there's one last thing, is there any last words of wisdom that you'd like to leave people with on this disease?
- Dr. Ann McKee: 31:26 Well, since we're at the University of Wisconsin, I would like to say that I do think my being from Wisconsin makes a difference here. We were taught a truthfulness. We were taught an authenticity that really resonates, especially when the truth is unwelcome, and this is bad news. This isn't good news by any stretch of the imagination. It's nothing I wanted to be true, but we're also practical people. We've got a problem. It's not going to go away unless we actually address it, and that's the Wisconsin spirit that I think has really led me on this path.
- Tod Pritchard: 32:07 You truly do embody that Wisconsin spirit. Dr Ann McKee, thank you for being here on the podcast.
- Dr. Ann McKee: 32:12 Thank you.
- Tod Pritchard: 32:12 By the end of 2019, McKee's CTE Center had amassed more than 700 brains. In new research, McKee and her team discovered a strong link between the amount of time a person plays football and the rising chance of acquiring chronic traumatic encephalopathy. For example, a player's risk of developing the disease increased by 30 percent for each year they played the sport. Organizations from Pop Warner to the

WIAA, NCAA, and the NFL are all making rule changes and equipment changes in an effort to increase player safety.

Speaker 1:

32:51

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