The Science of Addiction

INTERVIEW

Dr. David Van Nuys interviews Dr. Carlton Erickson on the topic of addiction.

Dr. Dave: My guest today is award-winning research scientist Dr. Carlton (Carl) Erickson, who is Director of the Addiction Science and Research Education Center at the University of Texas at Austin and author of *The Science of Addiction: From Neurobiology to Treatment*, which has recently been updated in a second edition (Norton, 2018).

Dr. Carlton Erickson, welcome to Shrink Rap Radio!

Dr. Carl: Thank you, Dr. Dave!

Dr. Dave: You published the first edition back in 2007, and a lot of water has gone under the bridge since then, because here we are in 2018 and in the clutch of one of the worst if not the worst addiction crises ever. I'm referring of course to the opioid crisis. What have you learned in the 11 years since the first edition of your book?

Dr. Carl: I think in order to be able to set the stage for what I'm going to do today in this hour and to answer your question, I have to give the audience a little bit of a background of me, because I have an unusual background. I am now an addiction science educator, but I wasn't always that. I have a Pharmacy degree from Ferris State College in Big Rapids, Michigan. And then I went to Purdue for my Ph.D. in Pharmacology. And after I graduated there, I was recruited to the University of Kansas where I spent 13 years, and then I was recruited to the University of Texas. I have been here for almost 39 years, and as we discussed before, I'm about ready to retire.

But getting into the field of drug addiction—that was reasonable for a pharmacologist, because I liked to call myself a former mouse researcher. And my very first grant was from the National Institute of Health to do work on how alcohol produces intoxication. I did such great work that we still don't understand how alcohol produces intoxication in the brain because it's much more complex than I ever realized. But during this journey what happened is that I didn't know anything about alcoholism. I'm not an addict. I'm not an alcoholic. I don't

have any in my family, I thought. So I began to attend 12-step programs in Kansas just to learn what the disease was about. And it was amazing to me to listen to the stories of the people who had the disease.

I kept that interest after I came to Texas, and I befriended a now 45-year-old alcoholic who is still in recovery through Alcoholics Anonymous (AA), and his name is John, and he's Irish, and he taught me the early parts of what I know about alcoholism as a disease. And

> ***"Carl, we ought to get together and go around the country and give workshops called 'Where Science and Addiction Meet'"***

his first comment to me was, "Carl, we ought to get together and go around the country and give workshops called 'Where Science and Addiction Meet'". He said you could be the science and I will be the addiction, and we'll talk with counsellors and whoever will show up and talk and dialogue in front of them and have them ask questions, because he says, "Frankly, I want to know what's wrong with my brain that makes it impossible for me to stop drinking, and you said you want to know something about the disease, and what better way than to talk to recovering addicts, there will be enough audience." . . . many of whom turned out to be counsellors who were working at helping alcoholics get better. And so we did that for five years.

We gave 126 workshops in 27 different States in two countries, and we learned a lot. And what I learned was that, as John used to say, he never took a normal drink. And that got me really interested intellectually as to why that would be the case. And he said, "Yeah, Carl, I learned in my early drinking years that I just couldn't stop." There's an awful lot of people who can drink alcohol and can stop. I'm one of those. I have my two glasses of wine at night and that's all I need. But John found out that he couldn't stop; he kept going. He had periods of no drinking when he was trying to stop, but that was the difference in it.

And so we began to learn something about addiction through alcohol, and that's where I got my early federal funding for my mouse research, my rat research, which I continued in Texas. And about 1994 I was invited to the Betty Ford Institute in Rancho Mirage, California, in their Professionals in Residence program, and I spent a week on the units with the patients, talking to them and seeing what they go through during what is so-called recovery. I was just smitten. It changed my life because those individuals were not bad people; they were not crazy; they were not just people doing bad things who wouldn't stop; they really couldn't stop.

Dr. Dave: I'll bet there were some famous people there because isn't that the clinic that the famous people go to?

Dr. Carl: I didn't see any! And it's kind of a misnomer because yes, they come and go rather rarely, and it's still the case. But remember that was 1994, and they had that reputation because it was so darn expensive. And it's still expensive today, though not as expensive because there's insurance, and we can get into that later. But the quick end to my story is that I came back from there and decided that I wanted to be an addiction science educator as a scholar at the University. I went to my Dean . . . it took about a year to figure this out, and I said to my Dean that I would like to shut down my laboratories. I had three laboratories with two federal grants, and I just stopped them, gave the money back to the Government . . . and I started to go round the country giving talks, at people's invitation actually, because I found that the recovering people and the treatment community were thirsty for the new science that was coming up. And I was able to do that. Very fortunately they liked my presentations, and so I turned it all over to that. And I started studying audience reactions along with a number of other colleagues, where we measured changes in knowledge over six hours of listening to the neurobiology of addiction. We studied their belief changes and we studied their behavior changes. [Dr. Dave: That's good.] I published a number of articles on that, and then it just kind of grew from there until I wrote the book. And that brings you up to date.

So, what did I learn? I learned a lot about the disease before 2007, and then from 2007 to 2018 I've learned that we've made huge progress in understanding what goes wrong with the brain in people who can't stop drinking. And the big deal is that we have to let everybody know that John was not a normal drinker. They're mostly normal drinkers out there, but the ones who are not normal, who have the disease, are about 15% to 20% of that population, and that percent changes with each drug that you talk about. That's the big thing I learned. The other chapters in the book cover genetics and other advances. . . . I like to think that we're on a trajectory towards finding ways in which we may not be able to cure the disease, but arrest symptoms and help people who are struggling with the disease now to find full-time recovery.

Dr. Dave: I noticed that you characterize it as a disease, and I know that AA has done that as well. As a psychologist, I'm aware that there have been other models sort of competing with the disease model, and I think psychology in general has tried to resist things getting over-medicalized. Can you talk a little bit about that? I think other models . . . might be an educational model . . . I don't know what the competing models are, but maybe you can speak to that and tell us why you feel so strongly that it fits the disease as the right model for speaking about addiction?

Dr. Carl: I'm really glad you asked that

question. There are 13 chapters in my book and the first three are related to this issue. Scientists should never be dogmatic, and I try not to be dogmatic. But frankly I think that science has now shown, and some of the evidence is in, that some drinkers as I just described (some but not all) have the disease of alcoholism, which we now call alcohol addiction. There are other names, which we'll cover in just a moment, but they're all based upon diagnostic procedures that are laid out in the DSM, now issue edition five (DSM-5). *The Diagnostic and Statistical Manual of Mental Disorders* has been used by psychiatrists, counsellors, qualified assessment professionals, for a number of years, and it is the bible along with the ICD, the *International Classification of Diseases* published by the World Health Organization, for diagnostic ways.

Being able to label something as a disease starts out with diagnosis. Now we have diagnostic procedures, diagnostic criteria in the DSM-5, that allows us to say this person has an alcohol use disorder, and there are 11 criteria, and everyone who has an alcohol use disorder does not have alcohol addiction, it's only the far end, the severe end, which is six or more criteria, that determines whether that's the case.

I think it's about time we stopped arguing about this, and I'm not the only one. Philosophically it's okay to argue, but frankly I think that a lot of people who are looking at thinking this is not a disease are looking at the majority of drinkers who don't have the disease. And so they tend to characterize those people as bad, having personality problems, making bad choices, and that's all true, but they're saying that because they don't deserve the same heavy duty treatment as people with severe alcohol use disorder, aka alcohol addiction, which used to be called alcohol dependence in the previous edition of the DSM (DSM-4). Here is where we get into trouble, and we can continue to argue, but we are all arguing about different parts of the elephant.

Dr. Dave: What's the difference between dependence and addiction—you're making a distinction there?

Dr. Carl: Yeah, they are essentially the same. In the DSM-4, I don't know how many of your listeners or your viewers are aware of it or have studied the DSM, but the earlier edition of the *Diagnostic and Statistical Manual*, the DSM-4, characterized two categories of drug overuse, one was called drug *abuse*, also called substance or chemical *abuse* versus substance chemical or drug *dependence*. And this dependence is known mostly by physicians as withdrawal. But chemical dependence is not the same as withdrawal, which is also called physical dependence. That's an old pharmacological teaching that everybody including physicians know about: when you take a drug over a long period of time, then you withdraw, you go through withdrawal symptoms, which is essentially a rebound from what the drug's earlier pharmacological effect was. So, if you're talking about

a depressant drug like alcohol, and you withdraw, you get hyper-excitability symptoms that include seizures, anxiety, and so forth. That's physical dependence.

The reason that the DSM-5 came up and dropped the name dependence is that too many people were getting confused between *chemical* dependence as defined by DSM-4 and *physical* dependence. In fact, there's an old-time thinking that said that the physicians just couldn't understand the difference and that's why they started to withdraw—at some period in medicine there was a time when physicians were withholding powerful pain medications from terminal cancer patients and terminal AIDS patients, for fear of addicting them, even though they were only going to live for another year or so. It got to be that ridiculous, and then people said, "Wait a minute, you're not addicting them just because they go through withdrawal; but withdrawal is not addiction. Don't worry about addicting them, you can give them all you want and only a certain percentage of them will need treatment for the continued use of the drug. Most people withdraw and they never want the drug again."

Dr. Dave: Let's talk about the opioid addiction since that is so forward in the news right now and on everybody's mind. This is really, really serious. We're finding dead people lying on the streets and emergency services using Narcan [naloxone] to try to bring them back. Let's talk about that. But, getting back to alcohol, alcohol is legal and socially sanctioned on the one hand and, as you say, most people can handle it, but not everybody. That very difficult end of alcohol has cost a lot of money and a lot of physical issues and problems and so on. So now we've got the opioid crisis, maybe you can contrast and compare?

The reason that the DSM-5 dropped the name dependence is that too many people were getting confused between chemical dependence as defined by DSM-4 and physical dependence.

Dr. Carl: Yeah, it's not just as simple as legal versus illegal, because of course many opioids are legal as prescribed. It's the overuse by people who really shouldn't be using these outside the medical prescribing regimen that start to get a lot of people into trouble. And it's not an easy answer, so let me see if I can break it down as simply as I can as I try to be the educator I want to be.

There are people who get opioids legally through their positions, through prescription, and they may take them for

a short period of time, they may take them for a long period of time, depending upon the condition. For example, if you have a leg fracture, and you go into emergency and the pain is just unbearable, so they give you an opioid to calm down the pain. Well, generally in about two, three, four, five weeks or so, that leg will begin to heal and you can back off the opioids.

One of the big problems has been to get physicians more involved in this and to try to get them educated about addiction so they can help control the drug crisis, too.

I have a colleague who had knee surgery, and he came back and he was just kind of laid up with his leg in a cast watching television for several weeks. At the end of four weeks I said, "Are you still taking opioids?" And he said, "Yeah." He said, "I'm taking one a day—I used to take three." And he said, "I'm trying to take myself off of them." And I said, "It sounds like you're being pretty successful!" And he said, "Yeah." And he says, "I can do it—I just have to supplement it a little with a Tylenol here or there." And he really didn't want to use the opioids because for whatever reason he wasn't connecting with the opioids. And then two weeks later, he was totally off the opioids. Now that's the way it should go.

A lot of people will have back surgery and they use these drugs chronically even before the back surgery and after the back surgery. And then for whatever reason, they continue using them, and they'll continue to go back and get their medications refilled, and the physician will say, "As long as you're still having pain, that's fine." And let's all agree that there are some physicians who really don't know much about addiction and opioids—because this is not a course in medical school, it's not a course in my college of pharmacy, it's individual lectures here and there. And so consequently many medical schools have half an hour on drug addiction; other medical schools will have maybe two or three hours. One of the big problems has been to get physicians more involved in this and to try to get them educated about addiction so they can help control the drug crisis, too. And many of the medical schools are taking that on; it's a really big deal right now because there are so many deaths, and they don't like to see overdoses either.

Most of the overdoses come from people who are taking these drugs chronically over many, many years, and months and years, and then they get to: "Well, the drug is not doing for me anymore." Because opioids cause a fantastic amount of tolerance, and once you get the tolerance you want more to get the same effect you did the first time, and if you're either

dependent—I'm going to say, *severe use disorde*r, that's the new terminology—if you have a severe use disorder, then you're going to continue to want to take more drugs and you'll graduate to heroin, Fentanyl, or something stronger. And now you start to get into the overdose possibilities.

One of the things that an opioid addict just never seems to learn is that if you try to get off the drug, and you're off the drug for two weeks, you don't go back to the same dose you were using two weeks ago, because your tolerance has disappeared and all of a sudden the dose that you were taking two weeks ago is now an overdose. That's where we get many of the overdoses, from this chronic use of opioids and then heroin.

Dr. Dave: Let's talk about what goes on in the brain, because in the case of alcohol you have these people who are clearly severely addicted. You said we still don't fully understand intoxication . . . we know that there are receptors in the brain that are set to respond to certain chemical compounds like a lock and key, that's the impression that I have.

Dr. Carl: Right.

Dr. Dave: So, are they extremes? You talked about the disease level of alcoholism. Is it pretty much the same phenomenon in, say, Fentanyl?

Dr. Carl: It's pretty much the same with Fentanyl because Fentanyl is an opioid-like compound, and it attaches to the same brain receptors as heroin and morphine and all the other powerful opioids. That's where it starts. By the way, let me just say, I'm not the only one that is getting ready to say let's move on. The National Institute on Drug Abuse, who funds 95% of the research on drugs in this country, their website says addiction is a medical disease. The National Institute in Alcohol Abuse and Alcoholism, their website says alcohol addiction is a brain disease. The American Medical Association had said that addiction is a disease in 1965. Now we have a newer medical organization, American Society for Addiction Medicine—6000 physicians around the country who do nothing but learn about how drugs cause addiction, and they certainly agree that this is a medical disease.

I don't think there's any threat to anybody's theory if you say this is a disease. This doesn't threaten anybody. So many people are afraid that if you call it an addiction then you are somehow letting people off for the responsibility of overusing their drugs. It may be that there's 80% of the people who use drugs that you can blame: you can say OK, that's a choice, you deserve what you get. But there is another 20% across the board, because it's different for each drug . . . there are those people who use the drugs, who become addicted, who don't deserve that type of decision.

In my book I say it very clearly. The evidence now shows us we can have it both ways. If you look at one subset of

people who overuse drugs, you can say, "Yeah, they're bad people, they shouldn't be doing that, they are totally responsible for everything that went wrong with them." Whereas there's this other group of people, which tends to be a minor group, who are addicted as a medical disease—a lot like schizophrenia, a lot like Alzheimer's, a lot like Parkinson's disease—where a chemical has gone wrong in the brain and now they can't stop using the drug. It is truly an out-of-control drug use situation. However, these people are still responsible for the havoc that they cause to their families and in their neighborhood. If they kill somebody when they're under the influence of a drug, they're responsible for taking the consequences for that. They're not responsible for having gotten the disease in the first place. You can say that maybe they shouldn't have used opioids, but some people don't have a choice; there are a lot of people who need opioids for pain control.

Dr. Dave: One of the things you write a lot about in the book is stigma, and I got the impression that you see stigma as a really big problem that is bound up in this whole addiction discussion.

Dr. Carl: Exactly! You've hit the nail on the head! In my book, I try to cover psychological aspects, social aspects, and everything else. And so that's why I say, "Let's leave the discussion and the philosophical back and forth about whether this is disease or not to the philosophers." In my view, for that particular portion of the over-users who can be diagnosed, and we can tell they have the disease, let's treat them as if they have a disease like any other disease. So, it's all about stigma.

If we don't believe that it's a medical disease, there's going to continue to be stigma against all drinkers and against all those people who are called addicts. I don't think that being a cellphone addict carries the same amount of stigma as being an opioid addict. Just ask the people in mental health. As a psychologist, mental health is a huge stigma as well, and this is a big uphill battle that we all have to climb together, because people who are drug addicted also have mental disorders as well as physical and medical disorders. We need to treat the whole person.

I love the work that's been going on since 2000 where we have a lot of brain-imaging studies, and they're now starting to show that when you go through cognitive behavioral therapy, for example, the brain function actually changes when people report their anxiety is going away. Their brain function is changing in step with those changes, and that's tending now to bring the psychologist and the neurobiologist together. They're saying, "Aha, we can see the changes that are caused by talk therapy, we can see them chemically, and that's the bridge to these disciplines." I'm old enough to remember when we didn't agree with each other. We argued with each other all time. It's okay if you're in college to argue, but if

you spread that argument to the general public, then all of a sudden you don't get enough funding for research, you don't get enough for treatment, you don't get enough for education, you don't get enough funding for prevention.

Dr. Dave: You speak about addiction as a chronic, medical, brain disease, and you spoke about how we diagnose the disease of addiction—maybe you can talk some more about that. In the book you talk about the addictive personality. That's the notion that if you have an addictive personality, if you happen to be cursed with that personality, then you're going to get addicted to something. Even if you manage to even get off that something, you'll probably get addicted to something else because you have an addictive personality. Give us your thoughts about that.

Dr. Carl: Sure. I'm going to have to wander a little bit away from the science because to me this is something that's very confusing for a lot of people. Psychologists tend to think of the addictive personality differently from a pharmacologist like me. To a psychologist—you said it best—that if you get addicted to one thing, you can get addicted to other things. As a pharmacologist, I look at an addictive personality as well, first, is there a progressive effect? For example, if you start out with smoking . . . are you more likely to go to marijuana . . . are you more likely to go to alcohol . . . are you more likely to go to harder drugs like opioids and central nervous system stimulants and so forth? That "gateway theory" has never been proven in science. There have been articles written about it, and most of them are equivocal: they either balance out each other or they come to a conclusion about which we're not exactly sure.

Whenever somebody says, "What do think of this addictive personality?" I first ask them the question back, "What do you mean by that, because I can't answer the question until you define what you mean?"

There is no scientific conclusion we can draw from that. But whenever somebody says, "What do think of this addictive personality?" I first ask them the question back, "What do you mean by that, because I can't answer the question until you define what you mean?" And that's one of the problems—there are so many different meanings to "addictive personality".

Around the recovering community, the addictive personality is where you like every different thing. You get an adrenalin

rush to different drugs or jumping off of high heights in a kite. Different things like that. That's an addictive personality to many of the people in recovery. I don't see that. I think it's just a person who has a personality that likes to do a lot of different things. Why call that an addiction?

That kind of brings me back to a point that I want to make sure I make. Because of the stigma, which you asked me about before, and because of this question, the way I try to handle that in my book is based on an idea from a colleague. I describe it this way. Let's call the drug addictions the big 'A' addictions. We have 25 years of scientific and genetic experience primarily in the neurobiological areas and so we can say, "Okay, those are the big ones that are serious." Nobody smiles when they say I'm a cocaine addict or I'm a heroin addict. I also describe a lot of other people in my book who have what we can call the little 'a' addictions, which is what the media like to focus on, or your cookie addictions—a lot of people smile when they have that type of an addiction—and so you can't compare the two. We're never going to get rid of the word addiction, and because of the various meanings, we can argue forever about what addiction is, but we may be arguing about apples and oranges, as the saying goes.

I'm not expecting the medical community to pick up this idea of big 'A' addictions and little 'a' addictions, but it's a wonderful way in my book to let people know that we really don't have a lot of research on the little 'a' addictions at all.

Dr. Dave: Are you including in the little 'a' addictions, video game addiction? Sex addiction? [Dr. Carl: Yes.] . . . Those are examples?

Dr. Carl: Yes.

Dr. Dave: I guess there's a fuzzy grey area here, because everything we do has . . . something is going on in the brain, and in the case of the big 'A' addictions, we know maybe more about what's going on in the brain. I'm under the impression, and I'm a real amateur here, but I'm under the impression that there is some brain science on some of these little 'a' addictions that would suggest that they in fact qualify for being thought of as addictive?

Dr. Carl: Okay, here we go back to stigma again. What I like to do is point out again what the American Psychiatric Association has made very clear in their latest edition of DSM, which is DSM-5. Those activities that you're talking about that are not associated with drugs are best called compulsive or impulse control disorders. And so eating in the DSM-5—eating disorders, obesity, anorexia, and so forth—have their own category. Exercise is not in the addiction category with gambling. Gambling is a unique situation where we do seem to have brain imaging studies, and even this is controversial. I was on the committee who made this decision as to whether we have enough brain-imaging studies to

indicate that gambling produces changes in the same brain area as drugs so that it can be called an addiction—but that's the only one. For Internet and even for caffeine, those are in an Appendix in DSM-5 of research to be completed; the "not enough research" category.

Dr. Dave: It sounds like a lot of this is not necessarily ruled out, but we need more research.

Dr. Carl: A number of people believe that there is enough research to show that compulsive Internet behavior would fall into the area of addiction, but then I go back to that same question: Why do we have to call it an addiction? Why did we really have to call excessive lingerie shopping an addiction? It belittles the problems that are going on with the drug problems that we know so much about. And certainly, if somebody wants to call laziness an addiction, which I have seen, why don't you prove it to me that it's not just about those people who are compulsively lazy? Isn't that a difference? I know there's some mental illnesses stigma associated with that, but let's not call it an addiction until we have the research to back it up.

Dr. Dave: Okay. I would guess that the intent when people call something like excessive computer use or video game use an addiction is the sense that there is something that needs attention.

Dr. Carl: Absolutely. There are some people, and this is a way of making things really, really blown out of control, I think. How many mothers are scared to death that their kids have screen addiction? Why don't we just say maybe they need a little more discipline? Maybe they need a little bit more parenting? Maybe they need a few more boundaries in their life? Maybe their parents should spend a little more attention with these? I'm not throwing it all on the parents, but I think you see where I'm coming from. Environmental variables can affect whether people will overuse video screens or exercise too much or things like that. There are a lot of environmental factors that are involved in that too, but only a certain percentage of them will eventually have to be described as in trouble, which we can then say, OK, they've got a compulsive behavior, and for other people it's just part of their personality. It's what we've spent our whole history and science trying to say. Where does normalcy stop? Where does pathology begin?

Dr. Dave: You talk about genetics and epigenetics in your book. To what extent does one's parents and genetic factors have influence over the things that we've talking about?

Dr. Carl: My book starts off really easy—let me mention this now before I forget to say it: this book is not only for professionals, it's designed for the general public, too. I really had the target audience of counsellors, mental health counsellors and chemical dependency counsellors, when I wrote in 2007, and lo and behold, it's being used now in the health professional schools as a

textbook! I didn't even expect it would be a textbook, but it's apparently readable enough and complete enough and resourceful enough because it has over 300 references that people can look it up and check out whether they believe what I'm saying, and if they do, then that can help them teach other people. And that's a whole purpose of the book, to spread the information that we have and the science that we have to other people—not for me to make a judgement, but to present the science so that they can look at both sides of it.

up to 60% of all the cases of alcohol addiction, properly diagnosed, are due to genetic heritability, which means vulnerability passed down from one generation to another.

That's why the book is designed in a way that they can easily read. The genetics chapter is illustrative of this because it starts out very basic—what is a gene? And you get the old DNA, RNA stuff, and then it moves progressively through what we know about the different methods of studying genetics; the adoption studies, the family studies, the twin studies, and so forth. It turns out that we have the most information in the alcohol field. The alcohol field has always had its own funding through the NIAAA (National Institute on Alcohol Abuse and Alcoholism). There were a number of geneticists who were really interested in the genetics of alcoholism, and so that's where it grew. And that genetics has been growing over the last 25 or 30 years in the alcohol field.

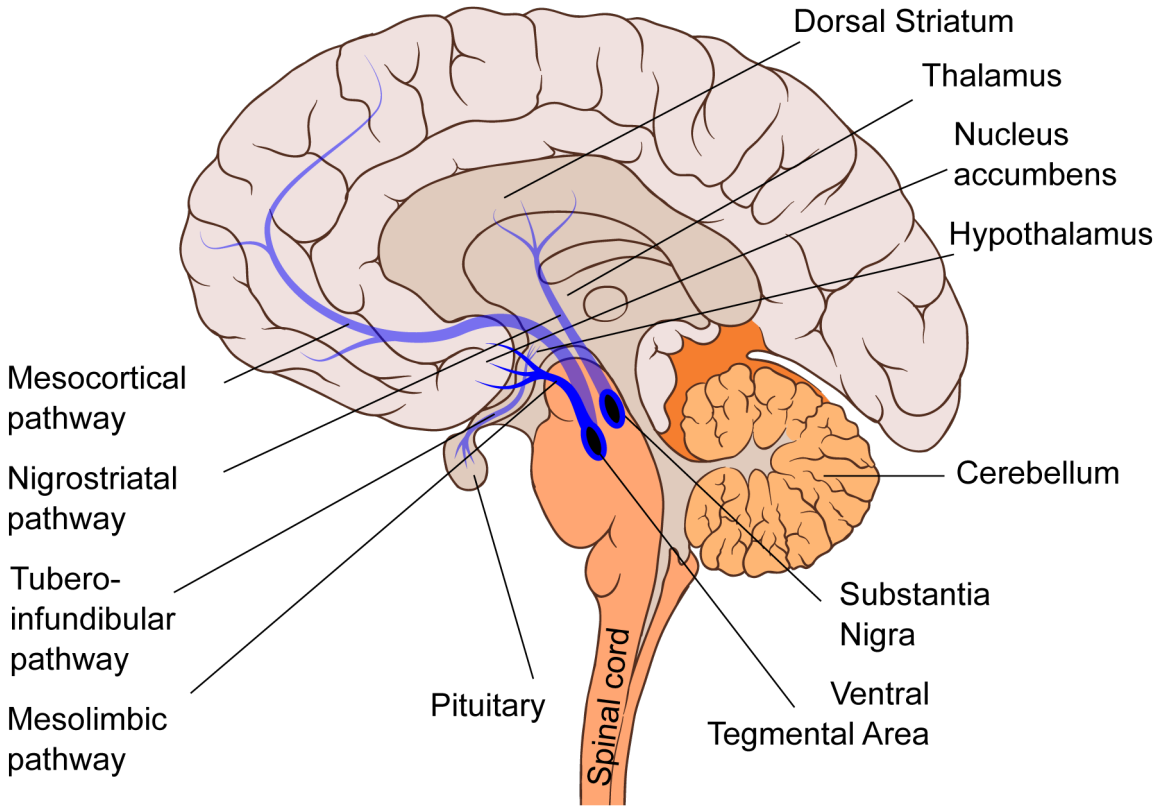
Not much is known about the genetics of other drugs compared to alcohol, so in many ways, the alcohol field is setting the standard for coming to what, hopefully, will be different conclusions, but may not be different conclusions. The conclusion in the alcohol field now is that up to 60% of all the cases of alcohol addiction, properly diagnosed, are due to genetic heritability, which means vulnerability passed down from one generation to another. It's also known now that it is polygenetic; it's not just a single gene, it's maybe 17 to 20 genes, when I talk to my genetics colleagues, one of whom has had a particular contribution to my book by checking out my science references and so forth, and he happens to be the head of the genetic department at NIAAA.

Dr. Dave: When you say polygenetic, that might mean that I could have a perfect storm of 20 genes that are pushing me in the direction of being an alcoholic. Is it a quantity issue—or what if I only have one gene as opposed to 20? [*Laughs*]

Dr. Carl: That's a great question! The easy conclusion is, yeah, the more of those genes that you have, the more likely you are to get the disease. But, of course, you have to drink alcohol first and you aren't going to get the disease if you don't drink any alcohol. Some families won't allow it; some families' kids say they're not interested; for some kids, the parents have brought them up in a very . . . I don't like to say the word strict, but maybe that's the wrong word because this might be a good outcome.

My friend John is a good example. He has four children and he taught his children from as early as they could listen that their whole family background was littered with people who have died from alcoholism—as far back as you can count the tombstones, John likes to say. He has two boys and two girls. The two boys and two girls grew up with the same message. The two girls got into trouble with alcohol, the two boys did not. And so half of them took the message—didn't have anything to do with gender . . . it just happened to be that two of them got the message and two of them didn't. When they tried alcohol, they didn't necessarily become alcohol dependent, but they did go on to have some other psychological issues.

I'm fudging a little bit on this; it's not quite as simple as that, but that's



The dopaminergic mesolimbic pathway in the brain, running from the Ventral Tegmental Area to the Nucleus Accumbens. Image: Wikipedia, https://en.wikipedia.org/wiki/Mesolimbic_pathway

essentially the story that John has told me and tells audiences when we go out . . . when we used to go out and give talks together. The big deal here is that some people can grow up in an alcoholic family and never get the disease, either because they didn't get enough genes, or the genes that they did get were not triggered by something in the environment. That's the epigenetic factors.

We now know that genes want to produce proteins and in order to form proteins, they have to turn on. There are some things in the environment that will cause those genes to turn on or to turn off. Those things could be . . . a harmful childhood . . . or co-occuring illness like depression, bipolar, ADHD, something like that. It could also be other factors like poisons, toxins in the environment that would affect those gene expressions to be able to turn on or turn off those proteins.

And then we'd find that there's the cause in the brain—that's the pathology, when those genes or enough drinking or drugging affects the chemistry of the brain in a certain brain area. Your audience will know it's the pleasure pathway or the reward pathway; scientists know it as the mesolimbic dopamine system, and other structures of the brain. When something goes wrong in that brain structure, now we have an inability to control the use of the drug, which is the primary symptom of the disease.

Dr. Dave: I'm here in California where we have first legalized medical marijuana and now recreational marijuana. Does your scientific expertise cause you to lean one way or another in relation to what continues to be a controversial and stigmatized set of circumstances?

Dr. Carl: I think that when people say that marijuana is not addicting, it's a myth. All the evidence points to the fact—this is anecdotal evidence and scientific evidence. Anecdotal evidence comes from the fact that marijuana addicts seek out treatment and they go into inpatient treatment and pay lots and lots of money to get off of marijuana. That tells me that there's a problem there. The epidemiology studies of which there have been some, mostly in the 1990s, tell us that about 9% of people who use marijuana at some time in their lives will develop a disease of marijuana addiction, now called severe marijuana use disorder or cannabis use disorder, so about 9%.

We see them in treatment, and a lot of adolescents say, "No, marijuana is not addicting, I can smoke it all day and I don't have any problems." Well, first of all, they're going through a lot of changes in their lives and it could that their brain is not being impacted by the marijuana the same way as other people's might be; or it could be impacted even more, which is what the research is starting to tell us. Marijuana used during adolescence can be particularly dangerous—that's what we hear most scientists or clinicians say.

I think we need to be careful here. For

sure, as I'm a pharmacologist I know that marijuana is not as toxic as alcohol or nicotine. We have no known human lethal dose for marijuana. You can overload mice and rats with it and find out a lethal dose, but no one has ever died from marijuana toxicity. They might die from being high and walking in front of an 18-wheeler, but that's not what we're talking about.

Dr. Dave: We should talk about the future of addiction and something you write about. What do you see on the horizon?

Dr. Carl: I like to be an optimist, and I like to think that we're going to be able to, through a reduction in stigma with substance use disorders, find out much more than we know right now: particularly in the areas of genetics; particularly in the areas of the neurobiology, and finding the exact problem that goes wrong in the mesolimbic dopamine system; and particularly in the area of better treatments.

Better treatments right now include medication-assisted treatment, or MAT, which is very controversial—has methadone, buprenorphine, naltrexone, and those types of medications . . . very controversial because it tends to go against the Alcoholics Anonymous 12-step philosophy of abstinence. But even now many people in abstinence have admitted that they had medications to help them, even though it's still a great model in 12-step meetings—and I support it that once you're abstinent, you shouldn't be using any other mood-altering drugs because you don't know which one you could become addicted to, or that mood alteration might throw you back into your primary disease of alcohol addiction.

I think that's a great message because nobody would like to challenge that and try to take every drug to see if they can become addicted to it. Nevertheless, we now know that there are medications that can help people who are opioid dependent, particularly in that area of drugs. There are some people who just can't get off opioids through psychological counselling or inpatient treatment even if they have a lot of money. They go three, or four, or five, or six times to treatment and it just won't work. But medications will put them on a track where they can begin to live a more normal life. It's like a diabetic getting insulin: the insulin is not made in sufficient quantities by the pancreas of the body, so the people have to get outside insulin to be able to live comfortably.

That's what we're asking with many opioid-dependent patients. The decision has to be made by a qualified addiction-medicine physician to do this, to be able to go on methadone or buprenorphine, with less of a chance of an overdose, but more costly, unfortunately. Many people will maintain themselves for a period of time where they can go into treatment and start to wean themselves off the opioid, perhaps by substituting the drug with a 12-step philosophy or something else. It

gives them a chance to do that. If they don't have that medicine, then we know from many examples that they'll go right back on the street and get into the heroin use scene: they start to use dirty needles, transmitting HIV and hepatitis and other viruses from user to user and making it worse for themselves by injecting with dirty needles. That scene is so desperate. We want to get them out of that scene, so they can continue to get better.

There's a small percentage of those methadone and buprenorphine users who will continue to use it for the rest of their lives. People say, "That's horrible, they're going to use an addicting drug for the rest of their lives." Well, it's something like the diabetic; they need that insulin to be able to stay alive, and that's the bottom line.

We used to call that harm reduction, and I think some people still do, but it's reducing the harm to the individual and the people around them that I'm most interested in. I applaud that greatly. I applaud abstinence; I applaud harm reduction strategies; I applaud anything we can do to help people. That's why I continue to think that this is a medical disease. Actually, not think, I know. I don't think there is a medical model for addiction anymore, I think it's a medical fact.

Dr. Dave: That could be a strong ending right there, but I wanted to ask you, are there any other countries that are doing a better job handling addiction than we are?

Dr. Carl: There are countries that are trying different ways. In the United Kingdom, for example, heroin is prescribed freely to opioid addicts. I've talked to some myself, and they do well. The one I happen to remember is that she was just humming along on the same dose of heroin every day, not escalating her dose . . . but she was going to die of nicotine, unfortunately. She admitted that she couldn't stop smoking.

Some of these experiments that other countries are trying have a lot of variables that you have to sort out. We continue to hear about the Amsterdam experience, and the Belgium experience, and the Vancouver experience, where they have communities of heroin users with clean needles and free drugs and things like that. To some extent, they really work. We don't have the research to tell whether they're going to work forever, for all people. We don't have any idea how many will continue on that path of safety. Addicts are strange people. They're not bad; they're not crazy; they are not stupid; they just have a little different way of looking at things, particularly the way that they can't stop using drugs—it affects the way they think, and we have to try to deal with

that too. That's not a good strong ending because that's a downer.

Dr. Dave: Actually, your book starts out with a dedication with a real message of hope.

Dr. Carl: I don't remember what that message of hope says, but it's got to be that someday we'll be able to treat this disease. That first step would be to treat it as heavily and as aggressively as we are cancer, heart disease, and other diseases that nobody seems to argue about with respect to whether they're diseases or not. Then, like with all diseases, we hope that we can conquer this so that fewer people will get the disease in the first place, fewer people will use drugs overall, not just addicts, and somehow we can get this drug problem in the country under control.

Dr. Dave: My recollection of it was, it was very hopeful, saying hey, keep on trying. There is a solution out there for you. Don't give up hope.

Dr. Carl: And the answer has to be in research. Obviously, what I'm saying, there's an underlying need for more research because if we don't have the answers, we'll continue to argue about things.

Dr. Dave: Thank you so much for being my guest today on Shrink Rap Radio, Carl Erickson.

Dr. Carl: Thank you, Dr. Dave. It's been a real pleasure.

POSTSCRIPT

Dr. Erickson's book does have a whole chapter on the brain and its role in addiction. Unfortunately, we didn't get very far into that topic in our discussion, but I want to call your attention to it in case you're particularly interested in that topic. What really comes across to me is, despite all the knowledge about the brain, there is still a lot that we don't know about addiction. For example, I was startled by his remark that we don't understand alcohol intoxication in terms of what's going on in the brain. We only barely touched on psychedelics, but it did enforce the crying need for much more research into the possible benefits of these compounds that have been so demonized as to make legitimate research almost impossible. As I noted, Dr. Erickson's book covers a lot of ground in the mere 300 pages or so. It's intended for a general audience but authoritative enough to have been adopted as a textbook in pharmacology and addictions courses. The title once again is *The Science of Addiction: From Neurobiology to Treatment* by Carlton Erickson. Be sure to get the second edition.

Finally, I mentioned being impressed by the message of hope in the book's dedication. The book is dedicated to his family, and in the closing sentences he writes:

> My hope is that you will never need the information in this book, but if drug problems or disease strike you, your children, or your friends, don't forget that help is available, and recovery is possible. Addiction is formidable but with the right help, guidance, and tenacity it can be overcome.