

Transcript of RELIEF Podcast with Catherine Bushnell

RELIEF: Hello, this is Stephani Sutherland. I'm with Relief.news, and I'm here in Boston at the World Congress on Pain, the meeting of the International Association for the Study of Pain. And today joining me is Catherine Bushnell, who's the Scientific Director of Intramural Research at NCCIH. Welcome, Catherine.

Catherine Bushnell (CB): Thank you.

RELIEF: So, the NCCIH, that's the National Center for Complementary and Integrative Health, which is part of the United States National Institutes of Health, the NIH. Can you tell us a bit about the NCCIH and what you're studying there in the area of chronic pain?

CB: Sure, I'll be happy to. NCCIH is one of the smaller centers at NIH, and it's dedicated to studying, as the name implies, complementary and integrative health issues. And one of its main focuses these days is pain and studying nonpharmacological techniques for modulating pain and for treating pain. And the intramural program at NCCIH, there is actually a campus in Bethesda, Maryland, where we have research labs that are part of NIH. And there the NCCIH intramural program is dedicated totally to the study of pain mechanisms and how non-drug treatments can work and the mechanisms that make them work.

At NCCIH, we just had a new director appointed. Her name is Helene Longevin. She's coming from Harvard University, and she is a specialist – she's probably the world's expert in how acupuncture works. And she's a renowned scientist, and she's been on the council of NCCIH for a number of years. And so we're very excited to have her come on as our new leader.

And we also just got a new clinical director in our intramural program, Magdalena Naylor, from the University of Vermont, who is a psychiatrist who is a specialist in treating chronic pain using cognitive behavioral therapy and studying how that works. So, with our new leadership at the NCCIH, I'm very excited about the work that's going to be coming out in the next bit of time.

RELIEF: Great. It sounds like some great new leadership and even more people working on this problem. So, maybe you could mention a few of the other interventions, or the types of treatments that you guys are studying. You mentioned cognitive behavioral therapy and acupuncture. Just generally what are some of the other types of therapies?

CB: Well, we're very interested in mind/body therapies, in general. NCCIH has grants for people who study natural products, but within our intramural program we really emphasize mind/body therapies. And these would be such things as yoga, and meditation, exercise. And we conduct both basic science studies using animal models, we study exercise in rats, and we send the rats to the gym every day for an hour, using rats having arthritis, and [we are] actually finding that it's very effective in treating arthritic pain.

And then we do work in human pain patients and in healthy people as well. And we use brain imaging as a way to look at what happens in their brains when we use different therapies that could be used for treating pain.

RELIEF: Great, thanks. So, let's back up and talk about pain signals a little more generally. So pain signals are really kind of a warning that damage may be done to the body. And we think about pain as a very bodily sensation. But, in fact, it's a very rich and complicated phenomenon that engages a lot of the brain. And, as you mentioned, you've been doing work, and others are doing work in animals as well as human brain imaging and in people. Could you talk a little bit about some of the brain's circuits or the networks that are active during pain, and particularly how these signals make their way from the body up to the brain.

CB: So, pain, as you say, is a very complex experience. And so there is acute pain, and there's chronic pain. And acute pain is very important. For example, if you touch a hot stove, you want to withdraw your hand, and that's a pain signal that's very important, and we use these types of pain signals all day long every day. We don't even think about it, about the things that we do. You sit in one position too long, and you start feeling uncomfortable, so you move your position. When you say you're feeling uncomfortable, it's actually pain signals going to your brain telling you that you've been sitting in one position too long. And actually, there are people that lack these signals, and they end up, even as young children, they develop arthritis because they don't move around enough. They don't get that pain signal. So that's an acute pain signal that's very important for our lives.

But then, when we have long-term damage, such as arthritis or after injuries to nerves, like, people that have diabetes, which is becoming more and more of a health problem around the world, the diabetes can cause damage to nerves in your feet. And then people develop pain in their feet and burning pain, and it really affects their lives. And after a while, you know you have diabetes; you know you have arthritis. You don't need to have this constant signal, yet it's still there. And that's when it becomes chronic, and it's not adaptive any more.

And then sometimes you even have pain after the tissue is completely healed. People that have shingles, which is something that happens if you had chickenpox when you were young, the virus resides and stays in your nerves, and later on, when you get older, it can come out as shingles, and you have these terrible sores that are very painful. But for many people, even after the sores go away, you can still have the pain. It can last for years after. So, a person can come to a doctor, they don't see anything wrong with them. And the pain is in their brain now. It's not even out in the real world, but you still feel it...it's more centralized into your brain. And this is the type of pain that, obviously, is the most disturbing to people and affects their lives and that we want to get rid of. We don't want to get rid of your ability to feel a hot stove when you touch it.

RELIEF: Right, because that's important for survival.

CB: Exactly.

RELIEF: Great. So, then maybe you could tell us a little bit about those networks in the brain that are activated with pain. There's kind of an emotional aspect, and then the aspect of identifying pain.

CB: When you think about your own pain, there is the sensation. Let's say you...pick up a pan that you were cooking on the stove, and you pick [it] up and the handle is hot. And it's burning hot, but you know that you can hold onto it. It's not going to hurt your skin if you hold onto it for a few seconds and carry it over to the sink. And so you have a burning sensation, but you don't have a strong negative emotional [reaction], because you know you have control over it. You know it's temporary. You know it's not going to hurt you. And so you have pain, but you don't have strong distress associated with the pain.

There are other types of pain, and the meaning of the pain matters a lot, where the emotional aspect is very powerful. You can have the exact same pain, let's say you have a stomachache, and you know you just ate this wonderful French meal, and it was very, very rich. And you know that you probably shouldn't have eaten it, but it was delicious, and you have a stomachache now. It hurts, but you don't suffer in the same way, because you know it's going to go away, and you know why it happened.

If you had that same pain in your stomach, and you knew you had stomach cancer, you could have a very different suffering component associated with it. So, when we go to a doctor, and we're treating, we said we have pain, really we're talking, generally, we're talking more about the suffering and not about the sensation. But in the brain, you have circuits in the brain, you have parts of the brain that tell you about how intense, how strong the actual sensation is and where it is on your body and the quality of it. Is it burning? Is it aching? And then there's other parts of your brain that tell you how much it bothers you, how distressful it is – the suffering parts.

RELIEF: So, some parts of your brain are telling you about the pain, helping you find it and identify it. And then the other parts are less logical.

CB: Right, well, yes, they're telling you how much you don't like the pain.

RELIEF: And those are separate brain circuits.

CB: Right. Correct.

RELIEF: So, that's how we understand that we get this experience of pain from information flowing up into the brain. But there's also something called, what researchers call, descending modulation, right? The brain can actually send information flowing down in the other direction and influence how we experience pain.

CB: Right, and this descending control of pain is very, very important. And it can amplify the pain, or it can dampen the pain. And just your thought processes – we now know that something as simple as if you’re focusing on the pain, if you’re paying attention to the pain, or if you’re distracted from your pain, has a huge impact, and how strong the signal is that’s going to be going up to your brain.

Your thoughts are in the top of your brain in the cortex, and they send, based on these thoughts and your attentional focus and what you’re paying attention to, they send signals, from your cortex, that go all the way down to your spinal cord, to where the information is first coming into your central nervous system. And they can either amplify or dampen that signal. So, just as the information is coming in to your brain, it can be blocked. The old term that was made in the 1960s was called “gate control.” And it does act like a gate. It either amplifies, opens up, or closes this gate. And, as I said, it can go in either way. It can increase it or decrease it.

Now, other types of psychological factors that also influence pain, actually with a different type of descending circuit, are emotions. So, if you are in a very negative emotional state, that will amplify the pain signal. And if you’re in a very positive emotional state, that will dampen the pain signal. And so these are real things that are happening in your brain. So, if a mother tells her child, well, “just don’t think about it.” It’s not that the pain is going into your brain, and you’re just ignoring it. It’s actually, when you don’t think about it, it’s actually engaging circuitry in your brain that dampens the pain signal. So, it’s a real physiological effect. It’s not just that you’re learning to ignore pain, you’re learning how to control it.

RELIEF: Wow, so your brain has the capacity to control your pain input. Interesting.

CB: Absolutely. And these circuits, furthermore – they have neurotransmitters, these substances in the brain, chemical substances, and these neurotransmitters, they are what we call endogenous. They are within the brain, but they are things like opiates and dopamine – things that make you feel good. So when you give somebody an opiate drug, you are actually artificially engaging the same circuitry in the brain that you can engage naturally through your own thought processes. But when you do it naturally, you’re only releasing the right amount of opiates, in the right part, and you don’t have any of the side effects that you would get when you give a drug. When you take an injection, or you take a pill, it’s acting all over your brain and all over your body. When you release these same substances naturally, they’re very targeted only where you need them, so you don’t have constipation, and you don’t have sedation, and you don’t have euphoria. You only have pain relief, but it’s working through this same chemical mechanism as the pain relief that you get when you take morphine.

RELIEF: So the brain is making its own chemicals that; opioid drugs are mimicking those natural chemicals.

CB: Exactly.

RELIEF: So, now that we know about that ability of the brain to dampen pain and things like the endogenous opioids in the brain, how can we tap into that knowledge and that understanding, so that we can use non-drug treatments to dampen pain more naturally?

CB: Well, this is what we're trying; this is what we are studying at NCCIH. We know, over the centuries, that techniques have evolved, such as acupuncture, such as meditation, such as yoga. We know that all these techniques can help relieve pain. So, by understanding how they work, then we can try to, in a more targeted way, engage that circuitry instead of just saying, okay, well, we know if we do yoga, yoga has an exercise component, it has a meditative component, it has a breathing component. So, we try to pick apart all these various factors to try to understand, and the more we can understand, then [people can be better able to] use these non-drug techniques...to best use them to engage the circuitry.

RELIEF: You mentioned earlier that some of the ways that pain experience can be changed is depending on where your attention is or your emotional state. Do some of these interventions work through those two pathways?

CB: I think that most of these interventions have, as part of them, both of these pathways. For example, if you're doing yoga, you are – if you like it – that's why I always say that if you're going to use these natural interventions, you should use something you like. If you really hate doing yoga, and so if you go to yoga class and you're stressed, and you're unhappy, you're probably counteracting the exercise. There's a lot of evidence that exercise is very, very good for chronic pain. But putting you in a negative emotional state will then engage that circuitry in a bad way.

RELIEF: It defeats the purpose.

CB: Exactly. So, you want something that makes you feel good. And then, as I said, the focused attention is very important, so when you are paying attention to other things and doing other things and not focusing on your pain, then that engages the attentional circuitry. And, as I said, there are other aspects, the physical aspects that, in addition to these psychological aspects, also make a big difference.

RELIEF: Let's come back for a moment to talking about the brain mak[ing] its own opioids. And, as you said, when the brain does that kind of naturally, we don't get all the side effects that we are now seeing with opioid use. But isn't it true that research has shown that those natural signals become less effective over time with chronic pain?

CB: When you give people opioids, they become less effective over time. There's no evidence that the natural signals become less effective; your brain can continue to release these endogenous opioids. Now, it is possible, and we have some evidence now that chronic pain itself can do damage to the brain. And there's evidence that the chronic pain itself can lead to changes in the ability of your brain to release opioids. And there's evidence that chronic pain itself can

change what we call the grey matter in the brain, which is where all the neurons reside; not only in chronic pain, but just aging – as you get older, you lose grey matter in the brain. And other chronic diseases, such as depression, can lead to decreasing grey matter in the brain. Chronic pain can lead to decreases in grey matter in the brain. So, then, you have less grey matter to be working with, and these are in areas that are important for this descending control. So, chronic pain itself can have this negative effect on the ability of your brain to engage in this endogenous circuitry.

RELIEF: The grey matter is changed in a number of areas in the brain with chronic pain, and it's not clear what's happening, is it? Why does it matter? Do we need that grey matter?

CB: There's not a lot of evidence that we have a lot of neuronal death. It's reversible; what we're finding is that if somebody has chronic pain for a long time, and they have less grey matter, and then they were able to treat the pain – sometimes people have back pain for many, many years, but it turns out that they are good surgical candidates. And they can do surgery and the pain goes away. Or with osteoarthritis, you can have a hip replacement, and you could have pain for many years and the pain goes away – there's good evidence now that some of these effects start reversing themselves, which is a very positive thing, that you can regain what you've lost.

But the relationship between the amount of grey matter and your cognitive abilities – there's a lot of leeway for using your brain to its maximum. There's evidence that, when you give people cognitive tests – it's not a huge effect – but the chronic pain patients don't do as well on cognitive tests. But when you can reverse that through various treatments, then things get better. So, we do need to have grey matter to function well. And, as I said, it's the regions that are most important for this control of pain that seem to be affected most in chronic pain patients.

RELIEF: So, it seems that with chronic pain over time, it is doing some sort of damage to your brain, but it's not necessarily killing your brain.

CB: Right, and it's probably not permanent. Most of the data that we're finding is that it's not permanent, it's reversible. We did a study with yoga, and these were not pain patients, they were healthy people. But again, this relationship between age and grey matter, which is very strong, and, if you plot the amount of grey matter in somebody's brain against their age you see this nice descending curve. When we did this with yoga practitioners, we found that eliminated that decrease in grey matter with age. So it had a neuroprotective effect, just engaging in yoga. And the longer you engaged in yoga, the better the effects were. So, that's in healthy people. Now, we haven't done this study in chronic pain patients, but I would imagine we could even get bigger effects in the pain patients than we got with healthy people.

RELIEF: Because they're compromised.

CB: Because they're already compromised, and so you have a bigger ability to make changes.

RELIEF: Well, that's exciting. I mean, that's concerning that the brain changes so profoundly with chronic pain, but that's good news that it may be reversible even without drugs, but with some of these practices.

CB: And one other thing about drugs is that, when you look at the effect of drugs on the brain, drugs are not good for the brain, in general. And some of these types of changes that we see with chronic pain, you just see with drug use independent of pain. So, using techniques that don't involve giving a person drugs has a lot of advantages.

RELIEF: I know that in this country in particular, in the United States and in Western society, we have this mindset of going to the doctor and having them give us something that's going to make us better. So, some people might just have the idea that non-drug treatments couldn't possibly work as well as a medication. What do you say about that?

CB: That seems to be the mindset of most Americans and Western medicine – that we have this idea that we are passive, that we are not participants in our own health. That you go to the doctor and you get a pill. And people insist they want a pill. And we need to have a change in the way we think. One thing is to understand that when you do these other treatments, they are really affecting your brain.

Many chronic pain patients haven't been believed; they go to a doctor, people can't see their pain, so they think they're just being crybabies. And so if they go to a doctor, and the doctor says, well, you know, I think that meditation or yoga or exercise would be good for you, they interpret that to mean that their pain is not real, and that the physician is just blowing them off. And I think that's why what we do now, as more and more pain clinicians are doing, is they show or they tell the patient about the real physiology that underlies these non-drug treatments – that these are real. And that the patient has some control and can really make real changes themselves. But they need to understand that it's not that the physician is just telling them that [their pain] is not real.

RELIEF: So, as we've talked about, chronic pain can have effects on the brain. And these practices can have protective effects on the brain. But really everything we do is changing our brain, isn't it?

CB: Exactly.

RELIEF: Then what would be your advice to, say, a patient who's skeptical that such a treatment could help them or maybe they have fears about it or they just don't believe it could work. What would be your advice? What would be their reasons to try?

CB: Well, I think that there's very little downside of trying these various techniques. They're out there. Unfortunately most of these things are not covered by most insurance policies, and this is

something that we're trying to change. I think NIH is behind trying to educate the insurance companies as well as the practitioners – even primary care practitioners, they don't get this training. So this is something that's evolving in the medical community and the insurance community, to understand that preventative care and non-drug care is going to save the system a lot of money.

But I think that, as an individual going to a doctor, asking the doctor about this or seeking out many of these [techniques]...you can go online if you don't have the money to go to a yoga class. You can watch a video. You can go online. You can look at many of these things. It's always better to do it under supervision, but if you can't afford that, these things are accessible, learning to meditate, simple breathing exercises have a big effect on pain.

There's so much evidence now that exercise is powerful in treating pain, but many pain patients are afraid to exercise. So talking to your doctor about, are there any limitations, [are there] any reasons why you shouldn't be exercising, and then taking small steps. Sometimes it's hard to go into a full-blown program, but just walking to your car, parking a little bit farther away from the shopping center – baby steps, they add up.

RELIEF: And then it gives people a little more control over their own treatment.

CB: Realizing that you have control over your own health is an important factor, because this is something that most of us didn't grow up believing. We thought that these were things that had to be done to us, that we couldn't engage in our own health.

RELIEF: That's pretty powerful when we realize that we actually do have that ability. And that's the other thing about some of these treatments, as you mentioned, that even if you can't get them paid for, they're for the most part pretty inexpensive and pretty available online and things like that. So even if you can't get into a supervised program, there's ways to try.

CB: Right, and there are public programs through YMCAs, and just keeping your eye out [for things that you can do] at home yourself. Or just doing very, very simple things. Everything helps.

RELIEF: Yes, but I think it's probably also important to realize that you're not going to be pain-free after you start yoga, right?

CB: Exactly. But, as my clinician friend says: you can't get rid of pain, but you can get rid of suffering. And I think it's a very important point. The pain might still be there, but you have control over the suffering.

RELIEF: Right. That's a great point. So, let's just come right back again to the brain circuitry. As we talked about earlier, there's different brain circuitry for the sensation of pain and for the

suffering or the unpleasantness. And so maybe some of these techniques are more tweaking that emotional unpleasantness.

CB: Exactly. Many of these techniques are really focused on the suffering part...that same suffering circuitry is involved in other suffering in your life, as well. So, it can have very widespread implications when you are engaging in these activities that help the suffering circuitry in your brain.

RELIEF: Is there anything else that you want to add about these treatments or the research that you guys are doing?

CB: Well, one thing is, if anyone wants to go on to the NCCIH website, there's a lot of information on the website about all different types of non-drug treatments. It tells you about the evidence, it tells you about how to get access to them. I think it's a very, very good site for people to look at.

RELIEF: Thank you so much for joining me today. I really appreciate it.

CB: Thank you.