

Treating Trauma Master Series

The Neurobiology of Trauma – What’s Going On In the Brain When Someone Experiences Trauma?

the Main Session with
Ruth Buczynski, PhD; Dan Siegel, MD; Bessel van der Kolk, MD; Pat
Ogden, PhD; Stephen Porges, PhD; and Ruth Lanius, MD, PhD

National Institute for the Clinical
Application of Behavioral Medicine





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The Neurobiology of Trauma – What’s Going On In the Brain When Someone Experiences Trauma?

How Trauma Creates “Overload” in the Brain

“The simplest way of defining trauma is that it's an experience we have that overwhelms our capacity to cope.”

Dr. Siegel: The simplest way of defining trauma is that it's an experience we have that overwhelms our capacity to cope.

Dr. Buczynski: That was Dr. Dan Siegel. Dan is a clinical professor of psychiatry at the UCLA School of Medicine, and founding co-director of the Mindful Awareness Research Center.

And he’s just skillfully summarized the painful experience of trauma.

But *why* does it overwhelm our capacity to cope? What specifically happens in the brain that sets us up for this kind of overload?

Dr. van der Kolk: Fundamentally, every part of the brain, more or less, is affected by trauma. The right brain lights up more. The left brain is shut down more. The back of the brain is more hyperactive. The front of the brain becomes less active.

The connections between different parts of the brain get messed up. What happens is that the brain gets frozen in a state of paralysis or of hyper-alertness, and that involves multiple brain structures.

“Fundamentally, every part of the brain is affected by trauma.”

Dr. Buczynski: You just heard Dr. Bessel van der Kolk, the world’s leading expert in the treatment of trauma. And as he said – trauma doesn’t discriminate when it comes to the way it takes over the brain. And this factor is key to understanding why trauma controls our clients’ lives.

So now, take a moment to think about what makes trauma so powerful. In other words, what *is* it about an intense experience that makes it so damaging?

Now, compare that to this next idea of what creates the single most powerful aspect of trauma.

Dr. van der Kolk: Inescapability – the inability to change things around, the feeling of paralysis. Paralysis is

central. Like, "Oh, my god, there's nothing I can do. I'm done for. This is it." It's a feeling of total helplessness.

Dr. Buczynski: These feelings can get ramped up when a client is missing one important element – the resources to deal with them.

How a Stressful Situation Can Become Traumatizing

Dr. Siegel: An experience that's traumatizing for one person may not be traumatizing to another. I think that's really what the research is telling us – that we have to understand what this situation means for this particular individual to see whether the potential for it to be traumatizing turns into it being *actually* traumatizing.

So, people can have different contexts where something that would be traumatizing for you wouldn't be traumatizing for me.

For example, if I were a race car driver, I'd be used to doing figure eights and being in those horrible situations where they literally cross over as fast as they can and they're constantly getting hit and flipped over. And that's what I do for a living, right?

So then if I was driving and my car got hit on a highway and I flipped over, I'm used to knowing what to do, because it's my profession.

Whereas, if you were driving and that were to happen, of course it would be traumatizing. How do you cope with the idea that an oil tanker has flipped your car over and over and over again?

So, that can overwhelm you. You don't know what to do, you feel helpless. In this case, it's a life-threatening situation. It's different from anything you've ever experienced before, and in that sense, it overwhelms your ability to cope.

Dr. Buczynski: So, is there anything that might help someone keep from feeling overwhelmed? What *would* need to happen for the brain to be able to cope with the situation?

Now, Dan is quick to remind us that there's still so much we don't know about the brain.

But he *will* say this . . .

Dr. Siegel: For the brain to cope with the situation, it needs to take in stimuli that are coming in from the outside world. Then allow the vision of what's going on, the hearing of what's going on, the smell, the taste, the touch.

The five senses, along with what's going on in the sixth sense, the body – all of that input is basically energy and information flow through the nervous system. And then the nervous system has to take it and do something with it.

Dr. Buczynski: So to pick back up with Dan’s analogy, the energy and information flow of a car accident is totally familiar to someone who’s a race car driver . . . the screeching of tires, the spinning or flipping of the car – even the reflex to protect the head or to not tense up upon impact.

Having this kind of familiarity allows for the person’s different systems of sensory input to stay coordinated. It allows for their emotional response to stay balanced. Dan calls that “integration.”

The flip side, of course, is that for the average person – so, someone who is NOT a race car driver – the thought of all that input (the screeching, the spinning, the flipping, and so on) – well, Dan says that would simply overwhelm their capacity to encode those things into memory.

It comes down to having the ability to cope with incoming stimuli.

Okay, so now let’s look further at what’s happening when we’re under stress.

Now of course that requires looking back at the brain. But we also need to look at the hormonal response to stress and to trauma.

The Hormonal Response to Trauma and How it Affects Brain Function

Dr. Siegel: Stress means something significant is happening, and it triggers the release of cortisol. A cortisol-releasing hormone is released from the brain and cortisol is actually going out throughout the system.

“Stress means something significant is happening, and it triggers the release of cortisol.”

So, you've got ACTH – adrenal cortical tropic hormone – coming out. Inside the kidneys, you're having adrenaline being released. Cortisol is being secreted, and it's affecting the brain in the brain itself. But that's going into the body, it's affecting metabolism. It's a really good thing.

Dr. Buczynski: Now people often think of cortisol as the enemy, but that isn’t always the case.

It’s important to note that cortisol is actually what we need to mobilize. It’s what helps you get up in the morning. So when we’re facing a threat, it’s cortisol that revs up our metabolism so that we become more alert, more energized, and ready to go.

But when it comes to what’s happening to the brain during the stress response, cortisol is only one piece of the puzzle . . .

“When we’re facing a threat, it’s cortisol that revs up our metabolism so that we become more alert, more energized, and ready to go.”

Dr. Siegel: But now, I’m also secreting things from my kidneys. Above my kidneys, the adrenal glands, like adrenaline. So, ad is above and renal is the kidneys. So, above my kidneys, I’m now secreting these

substances that will have a very different effect on my brain than cortisol.

“During trauma, cortisol and adrenaline have a direct impact on brain function.”

Dr. Buczynski: Now that’s really important, because this is the set-up for the trauma experience.

During trauma, cortisol and adrenaline have a direct impact on brain function. Here’s what happens . . .

Dr. Siegel: Cortisol will actually shut off the way the hippocampus functions, but adrenaline will increase the way the amygdala functions. So, adrenaline is going to increase the laying down of certain kinds of memories. But cortisol will decrease the integration of those memories because the hippocampus has receptors on it that respond to cortisol and shut it down.

Dr. Buczynski: So, you’ve got two hormones being released, and each one has a very different effect on the brain.

Dr. Siegel: If it’s sustained for long periods of time, cortisol can be toxic to the way the brain functions and grows, whereas adrenaline is going to increase the laying down of emotional memory.

“Adrenaline is going to increase the laying down of certain kinds of memories. But cortisol will decrease the integration of those memories.”

Dr. Buczynski: Now that we’ve got a sense of how hormones impact the brain and the body during trauma, let’s take things from a different angle.

You see, the body has this amazing built-in response mechanism that stretches back to very early in our evolution – and that’s the fight or flight response.

We’ll also get into the third response – the freeze response.

But for right now, let’s get a sense of what’s going on in the brain as it gears up the body to fight or flee in the face of trauma.

How Three Specific Brain Areas Prime the Fight-Flight Response

Dr. Lanius: The first thing that happens in the brain is that the person orients to the predator, whatever the predator may be, and examines how close the predator is and how likely the predator is to affect the individual.

This happens in the brain at the level of the superior colliculus which is deep in the brain stem. That really helps us to orient and figure out where the predator is.

“When it comes to facing down any kind of threat, the brain stem is our first line of defense.”

Dr. Buczynski: So when it comes to facing down any kind of threat, the brain stem is our first line of defense.

It’s what sets off the really quick, protective responses that can help us during trauma, when we don’t have time to think about it. Thinking happens at a higher level of the brain, and it’s too slow for an emergency response.

Dr. Lanius: I think what's really important to realize about the brain stem is that you have direct connections from the back part of the eye, the retina, to the brain stem. So, if you see something, even if you're not aware of it, that can be transmitted to the brain stem immediately, that information.

You have to act, you have to be ready the millisecond you're threatened. The organism has to be ready to defend itself. So, I think this is why very primitive structures in the brain stem are critical in these fast, defensive responses.

Let’s say you see something and you may not be aware of it, but the retina in your eye has already transmitted it to the brain stem to an area called the superior colliculus which is right next to this area called the periaqueductal gray that's involved in defensive responses.

Dr. Buczynski: That area known as the periaqueductal gray plays a crucial role in how our clients relate to the world.

Dr. van der Kolk: The periaqueductal gray — which I like to call the cockroach part of our brain — is the most primitive danger-detection part of the brain. And it’s always lit up when you're a traumatized person.

“The periaqueductal gray is the most primitive danger-detection part of the brain. And it’s always lit up when you're a traumatized person.”

And how it lights up specifically determines whether you have a more hyperactive or a more dissociative response. But basically, on the most elementary level of your survival brain, you are set to always be alert for danger and bad things happening.

“The freeze response is one more way the nervous system protects us in the face of threat.”

Dr. Buczynski: This area primes the nervous system to fight or flee. But there’s one more response we’ve yet to address — and that’s the freeze response. The freeze response is one more way the nervous system

protects us in the face of threat.

Why the Midbrain Holds the Key to Mediating a Client’s Freeze Response

Dr. Lanius: So, the next adaptive step is a freezing response. This is feigning death — the person actually can't move, the muscles are in a frozen state. Now, we don't just have that sympathetic, fight/flight activation.

We also have what's called parasympathetic activation. The parasympathetic nervous system which is sort of the break to the fight/flight nervous system that kind of breaks it all.

So, we get equal activation of both these nervous systems when the person freezes. This is again mediated by the periaqueductal gray in the mid-brain.

This part of the brain actually mediates freezing responses. Again, that connects to muscles and to high parts of the brain to get this more rest or the break nervous system online. Then, we know if this is not enough to get the predator to move away, then the person shuts down completely.

Dr. Buczynski: So heart rate drops, respiratory rate drops — people can even stop breathing.

In this state, people’s muscles become limp and their metabolism shuts down.

What’s also happening during the freeze response is that endorphins are released. This is important because

it helps the person to temporarily enter a state of no pain.

Dr. Lanius: When someone is experiencing horrific trauma, this is an adaptive state to be in because you don't feel pain, you're no longer aware of your surroundings, and you shut down.

“When someone is experiencing horrific trauma, this is an adaptive state to be in because you don't feel pain and you shut down.”

How Trauma Can Damage Three Specific Brain Networks

Dr. Buczynski: So now, let’s narrow our focus even more and hone in on three specific brain networks – the default mode network, the salience network, and the executive network.

Trauma’s impact on each of them can have dire implications for our clients.

Dr. Lanius: For example, **the default mode network** really helps us process self-relevant information. It helps us to know what we're feeling inside.

“**The default mode network** really helps us process self-relevant information. It helps us to know what we're feeling inside.”

It also helps us to process our own memories and to think about the future. When we think about our traumatized clients, all three of these functions are often very impaired.

Then, we know **the salience network** helps us to figure out what's most important in our environment to respond to. This network is also very much affected by trauma.

Dr. Buczynski: For people who have been traumatized, there’s so much in the environment that feels threatening.

So for them, trying to figure out the most important or threatening thing to pay attention to can feel virtually impossible.

Dr. Lanius: Then there's also a brain network called **the central executive network**. This is the network involved in helping us plan, helping us think, and engaging in concentration, and focused attention – which of course is very much affected by trauma as we know.

And we now have some findings showing that, especially symptoms of dissociation, so zoning out, not being

able to be in the present really affects the functioning of that central executive network, our ability to focus, our ability to plan.

I think makes a lot of sense clinically that if you're zoned out, if you're not able to be in the present, you can't engage in sustained attention, your short term memory will be affected, your ability to plan will be affected.

Dr. Buczynski: Not only that, but symptoms of dissociation also impact the brain’s executive network – symptoms like zoning out, and not being able to stay in the present.

Now when *that* happens, short term memory can be affected as well.

Last but not least, when trauma affects the central executive network, it can keep our clients trapped by taking away their ability to problem-solve.

Now, staying with dissociation . . . Some studies suggest that peritraumatic dissociation – that’s when people

dissociate at the time the trauma occurs – is the biggest risk factor for developing post-traumatic stress disorder.

So, why would this be?

Well, Dan Siegel has a hunch. But first, we should lay some groundwork – because a big part of the answer has to do with the link between dissociation and disorganized attachment.

In addition, we also need to look at how dissociation occurs, and why it also might set someone up to be more likely to develop PTSD.

“Some studies suggest that peritraumatic dissociation is the biggest risk factor for developing post-traumatic stress disorder.”

“Developmental attachment research has shown that disorganized attachment is at least one of the precursors to people experiencing dysfunctional forms of dissociation.”

Why Dissociation Can Increase the Likelihood of Developing PTSD After Trauma

Dr. Siegel: Developmental attachment research has shown that disorganized attachment is at least one of the precursors to people experiencing dysfunctional forms of dissociation.

Dissociation is a process that most human beings (probably 85 percent) have. So it's not bad – it’s just what

we have. It's the ability to get absorbed in something and then exclude other things.

So there's the normative kind of dissociation, but pathological dissociation is different. It seems to build on normative dissociation and then fragment our ability to have a continuity of consciousness.

So, remember from the studies, 20% of people who experience a really harsh event will develop PTSD. 80% won't – which is interesting because that's a number similar to the number of people with disorganized attachment.

It may be a coincidence or it may be the source of their dissociation that makes them at risk.

So let's just assume that the hypothesis that's been proposed is true. Why would that be true?

Well, I think what happens is when you have stimuli coming at you from an experience, you need to take it and place it within all sorts of aspects of your nervous system – and dissociation fragments that ability.

Literally, I believe, the mechanism of dissociation is that the hippocampus is blocked from processing things. For example, cortisol can do that, but even divided attention can do that.

Dr. Buczynski: So here’s essentially what happens when someone experiences that kind of fragmentation of

“With dissociation, the sense of self is profoundly assaulted. Dissociation itself becomes traumatizing.”

memory . . . When someone is unable to integrate memory – in other words, when we’re not able to take the separate pieces and put them together in an explicit form – well, that can wreak havoc on a person’s internal sense of coherence.

Dr. Siegel: With dissociation, the sense of self is profoundly assaulted. Dissociation itself becomes traumatizing. Because if you can't rely on

your own experiences, then your own sense of self is itself a cause of being overwhelmed by things.

I think this is why the contemporary research on attachment shows that even if you've had secure attachment with a caregiver, but at times are frightened by them, you have equally difficult outcomes as someone who's actually not had that secure attachment.

So dissociation may be the mechanism. We don't know why that is, but certainly disorganized attachment by itself, with or without a

“The mechanism of dissociation is that the hippocampus is blocked from processing things.”

“In the face of trauma, dissociation may often be the response when disorganized attachment is part of the equation.”

Impaired integration is one of the hallmarks of a traumatized brain.

background of security, is actually pretty devastating to a person's coherent development.

Now if that's the source of a person's vulnerability, and if that person has a “potentially overwhelming event,” dissociation will be the response and impaired integration will be the outcome.

Dr. Buczynski: So, in the face of trauma, dissociation may often be the response when disorganized attachment is part of the equation.

And the outcome of a dissociative response will be impaired integration. So let’s take a closer look now at integration.

Impaired integration is one of the hallmarks of a traumatized brain.

This matters because, when integration in the brain is impaired, it disrupts our ability to balance the nervous system.

Dr. Porges: Our nervous system evolved to both support reactions to challenges that were acute and then to have recoveries that support health, growth, and restoration.

We link that through evolution with our ability to coregulate and socialize with other people.

Dr. Buczynski: So that’s how it *should* work – we face a challenging situation, but we are able to recover in a healthy way.

Our system is balanced and our brains are primed to integrate the many stimuli we encounter.

We know, however, that this is often not the case. When stress is chronic or we constantly relive trauma, we can struggle to bounce back.

“An unbalanced nervous system blocks our capacity for flexible, adaptive, stable functioning.”

Dr. Porges: Basically, the nervous system is adjusting to those demands without the normal periods of recovery and rejuvenation.

Dr. Buczynski: An unbalanced nervous system blocks our capacity for flexible, adaptive, *stable* functioning.

And remember – according to Dan Siegel, all of this starts to go haywire in the first place when brain integration becomes impaired.

How Developmental Trauma Disrupts Brain Integration (and Its Effect on Our Clients’ Lives)

Dr. Siegel: So, therefore, if that's basically what we know from all the different research studies done on

“It's a reasonable statement to say the purpose of trauma therapy is to create more integration in your client's brain.”

trauma and the brain, and if you think of therapy as a way you change the brain, it's a reasonable statement to say the purpose of trauma therapy is to create more integration in your client's brain.

Brain integration is a term that refers, of course, to the brain – which is an organ in your head that's deeply interconnected with the whole body and the social world.

The word *integration* literally means the linkage of differentiated parts. When integration is impaired, what you would see in the assessment would be a lot of chaos or rigidity – those are signs of impaired integration.

Developmental trauma can block growth in any number of areas, such as the prefrontal cortex that links the cortex, the limbic area, the brain stem, the body proper, and the social world together.

In addition, the development of the corpus callosum (which links the differentiated left and right brain) can get impaired.

You can also have impairment in the hippocampus (in the limbic area) that takes these separated areas of implicit memory and links them together. The connectome can also be affected.

“When integration is impaired, what you would see in the assessment would be a lot of chaos or rigidity – those are signs of impaired integration.”

The research shows that developmental trauma, trauma early in life, blocks the growth of this integrative brain.

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In terms of functioning you would see that as a person who lacks emotional balance. They can't think clearly under stress. They

have difficulty having mutually rewarding relationships. They can't just sit quietly by themselves. If you offer to do a body scan they may have a panic attack when they are focused on their body.

Dr. Buczynski: We’re going to be talking about brain integration throughout this series. And here, we’re going to look at two types.

There’s vertical integration, in which we’re trying to make sure the three levels of the brain are unified. Those three parts are:

The primitive parts of the brain or the nervous system; the emotional parts of the brain; and of course, the thinking parts of the brain.

Now there are some experts who have recently questioned the validity of this three-part model of the brain.

We’ve looked into this, and I’ve also talked to a few colleagues, and so here’s what I would say . . .

While the “triune brain” model is starting to be considered perhaps, overly simplistic, it still can be a

“Working with thoughts, emotions, and the body can be key for helping clients facilitate vertical integration.”

generally useful way to think about the functioning of each of these three brain regions.

But getting back to brain integration . . .

In addition to vertical integration, there’s also left-right integration, in which we’re trying to harmonize the two hemispheres of the brain.

Now we’re going to look at both of these types of integration, but we’ll begin with vertical integration – because when trauma disrupts or breaks connections between the primitive, emotional, and thinking areas of the client’s brain, we need ways to help them repair that.

One way to do it is by working with three things in concert . . .

How to Help Clients Repair Two Types of Brain Integration After Trauma

Dr. Ogden: We work with what I think of as three levels of information processing – which goes along with the three levels of the brain.

“When trauma disrupts or breaks connections between the primitive, emotional, and thinking areas of the client’s brain, we need ways to help them repair that.”

We work with cognitions and belief systems that are formed after trauma, which involves the cortex. We also have to work with the emotions, especially how to regulate those trauma-related emotions, like rage and terror – that has to do with the limbic system.

Then, we also have to work with the body because that's where trauma impacts.

Dr. Buczynski: It’s working with those three levels of information processing – thoughts, emotions, and the body – that can be key for helping clients facilitate vertical integration.

Now let’s move on to left-right integration.

Dr. Ogden: We also have to work with the left-right and the implicit self that's held in the right hemisphere. So we work with what isn't conscious, what isn't fully in our awareness.

“One of the main ways we work with the unconscious is to be aware of how it's reflected and sustained through posture or movement patterns and physical expressions.”

But as Wilhelm Reich said, in the body is the manifestation of the unconscious. So that's a natural access valve toward accessing the implicit self.

One of the main ways we work with the unconscious is to be aware of how it's reflected and sustained through posture or movement patterns, physical expressions, etc.

For example, someone might be in a tight posture after trauma. We see this a lot with veterans. Their whole system is prepared to fight.

But they're often not even consciously aware of it, and they go back to their families and their children, and

“The first order of business is that you've got to form a relationship with the client. You've got to elicit their social engagement system.”

they have these rage attacks because the body is all rewired to predispose them to lash out.

Dr. Buczynski: So Pat looks at how the client’s body is reflecting and sustaining the difficulties that trauma leaves behind.

The ultimate goal is to help the client come into what Pat calls the window of calmness.

Dr. Ogden: But the first order of business is that you've got to form a relationship with the client. You've got to elicit their social engagement system because without that, you can't do anything.

That will help the client feel safe and trusting when their social engagement system is connecting with yours – and that has to sustain throughout therapy.

Then through that, you can start to access the dysregulation. Bring it into the therapy hour. Stimulate it somehow — not in a huge way, but enough so that you can then help the person integrate.

How to Prevent Dissociation and Rewire a Client’s Reaction to Trauma

Dr. Ogden: I can tell you about working with a veteran. He had explosive rage attacks. He never hurt anybody, because he said he could almost feel it coming, and so he would isolate himself. But he would destroy rooms and furniture and put his fist through the wall.

There was a point in therapy where he felt this rage just surging up through his body. And he said, "It feels explosive." So he was feeling exactly what he felt when he had those rage attacks.

This is a very important element of therapy, I think. We always want to bring a piece of that symptom into the present moment experience of the therapy hour because then we can work with it as it's happening.

Dr. Buczynski: With this particular client, Pat focused on sensory awareness. She asked the client what was going on for him when he remembered the combat, when he remembered all the people who died.

As the client experienced those memories, she brought his attention to his body.

And he felt a surge of rage . . .

Dr. Ogden: So I said to him, let's stay with that surging, and tell me exactly what's going on. He felt it rising up in his body, and he felt this tremendous urge to lash out.

“If you can get a client to be mindful, that engages the observing part of the brain.”

This has to do with brain integration because if you can get a client to be mindful, that engages the observing part of the brain. So for this client, I asked him over and over to tell me exactly what he was experiencing, to observe it with mindfulness and describe it to me.

He said he felt it surging up. He wanted to lash out, and I placed a pillow here, and I said, "Just begin to make that motion, but stay right with me and report to me what it feels like. Report the tension. Report the sensation."

When you do that, it prevents that reaction, that subcortical explosion that he had experienced so many times. So his brain started to feel the rage and execute that action — what Pierre Janet would call an act of triumph. But his cortex was online.

Dr. Buczynski: So why did this keep Pat’s client from going into an explosion?

Dr. Ogden: Because you're enlisting mindfulness, which keeps the frontal lobes online. So as I'm asking him questions and he's reporting to me, that keeps the brain integrating rather than him dissociating into the subcortical brain.

Another very important thing is that it keeps the social engagement system online. He is not alone with this like when he could feel the rage and destroy a room. He's in relationship with me. We're socially engaged.

So both of those factors, in addition to working with the body to complete that action, were critical in his resolution of the trauma.

Dr. Buczynski: After that session with her, Pat’s client was able to talk about combat without feeling

dysregulated for the first time.

“There are four ways you can affect the brain: the brain's synaptic connections; the neurons that died away; the myelin; and the epigenetic controls.”

Pat believes her client felt the effects of a more integrated brain through their work together – and she credits the combination of working with mindfulness and the body, as well as working with his thoughts and his beliefs, for bringing that about.

So as we move on, I’d like to give you one more thing to think about when it comes to mindfulness and presence and brain change.

I think you’ll find this really powerful – because, to quote Dan Siegel, “your mind can change your molecules.”

Epigenetics and Trauma – How Trauma Affects Gene Expression

Dr. Siegel: There are four ways you can affect the brain. You can affect the brain's synaptic connections which are probably affected throughout the lifespan. You can affect neurons that died away. You can affect

myelin, and you can affect the epigenetic controls.

Dr. Buczynski: Now epigenetics – let’s unpack that a bit.

We used to think that you were born with a certain number of genes and DNA and that this was fixed - that’s just what you had and that was your destiny.

Now, you *are* born with a certain number of genes of course – but that’s not the end of the story.

Genes can be turned on and off throughout life. That’s why therapists are so important. For that matter, it’s also why parents, teachers, and pastors – all of us, really – are so important.

“When we’re talking epigenetics, we’re very much talking about people’s ability to move beyond just what they’ve inherited through DNA.”

Any person can make a difference in a child’s epigenetic development.

So when we’re talking epigenetics, we’re very much talking about people’s ability to move beyond just what they’ve inherited through DNA.

“Preliminary studies have identified a big game-changer when it comes to preventing inflammatory diseases.

It’s about what we acquire during our own lifetime, and also the changes in genes that we pass on to our children.

Dr. Siegel: It’s a little complicated to tease it all apart – but the bottom line is, you affect not just synapses, neurons, and myelin, but also the epigenetic regulations that

determine how genes are expressed in the brain.

Here’s the bottom line – epigenetic impacts of trauma appear to involve alterations in parts of the genome that would otherwise be preventing inflammation. So, many of the disorders of stress are disorders of inflammation.

Dr. Buczynski: Now here’s where things start to get really interesting – because preliminary studies have identified a big game-changer when it comes to preventing inflammatory diseases.

It’s something we can easily do every day – in fact, maybe you and some of your clients already do it. I’m talking about mindfulness.

How Trauma Can Affect the Body’s Vulnerability to Inflammatory Disease

Dr. Siegel: Let’s look at mindfulness training. Some preliminary studies – like David Cresswell’s control study comparing relaxation to mindfulness – show that only with the mindfulness do you get actual changes in the epigenetic regulation of regions of your genome that will help you prevent inflammatory diseases.

We're talking about things like certain forms of diabetes, certain forms of cancer even. Some people are even thinking of Alzheimer's disease and Parkinson's disease – also inflammation, of course, and heart disease.

Inflammation is a huge thing even when you look at the biome – the composition of living organisms, yeast and other fungi, and bacteria in your intestines. These things all affect your inflammatory state.

Inflammation may be the common mechanism that leads to these problems.

The brain may participate in a big way in altering your state. After all, if mindfulness corrects epigenetics, that

“The brain may participate in a big way in altering your state. If mindfulness corrects epigenetics, that helps decrease your likelihood of getting inflammatory diseases.”

helps decrease your likelihood of getting inflammatory diseases.

Then you can imagine stress, and trauma being one, would make it more likely so you're going to have these inflammatory diseases. So, that's probably why Felitti found what Felitti found in the ACE study.

Dr. Buczynski: So let’s consider for a moment what Vincent Felitti actually found in the Adverse Childhood Experiences (ACE) study – because that was a landmark study.

Number one, he found that adverse childhood experiences are unfortunately common.

Number two, adverse childhood experiences often occur in clusters. And number three, adverse childhood experiences can contribute to high risk health behaviors in adulthood.

“The higher your client’s number of adverse childhood experiences, the higher their likelihood of engaging in addictive or destructive behaviors.”

In fact, the higher your client’s number of adverse childhood experiences, the higher their likelihood of engaging in addictive or destructive behaviors.

Not only that, but a high number of ACEs also correlates with a higher likelihood of experiencing depression, heart disease, cancer, or a shortened lifespan.

So it makes sense to talk about the ACE study when we’re talking, like Dan was, about how experiencing stress and trauma increases the likelihood of us experiencing inflammatory diseases.

Okay, so let’s go back to what Dan was saying about epigenetics – he mentioned mindfulness as a way of “correcting” epigenetics.

Now mindfulness is one thing that can cause epigenetic changes – but of course, it’s not the only thing.

Telomeres, Telomerase, and Their Effect on Epigenetic Changes

Dr. Buczynski: Recent research tells us that epigenetic changes are often affected by the length of our telomeres.

“Recent research tells us that epigenetic changes are often affected by the length of our telomeres.”

So what’s a telomere? Well, here’s one way to think about it—

Dr. Siegel: For your cells to stay healthy, your chromosomes (long lengths of DNA) have to unwind and make copies of themselves and then get themselves rewound again.

So, think about a shoelace with a cap on it. Telomeres are the cap on the twisted set of DNA, double helix DNA, that keeps it intact. Let’s say, just for number’s sake, you have about a hundred of them. They’re not genes, but they’re protectors of the genes. So they’re like a cap on a shoelace.

As we age, the number of our telomeres becomes fewer and fewer. If we have stress, the number of telomeres decreases.

At some point, the number is so low that when the cell divides and tries to put itself back together in these two new cells that are made, there aren’t enough telomeres to hold the genetic material

“Having long telomeres means that you have a lot of these gene-protecting units.”

intact.

So, they're not functioning as genes, but their function is to protect the genes. Once that no longer happens,

“Telomerase will repair a shortened set of telomeres, and telomerase will also maintain it – telomerase is good.”

your cells get sick and die, and you get sick and die.

Dr. Buczynski: So, an important thing to note here is that long telomeres are what we want.

Having long telomeres means that you have a lot of these gene-protecting units contained in the cap of the shoelace, to borrow Dan’s

analogy – and yes, it is possible to repair and lengthen shortened telomeres . . .

Dr. Siegel: You can increase the length of the cap with telomerase. In biology, we say *-ase* for an enzyme. So, it's telomere-ase, but it's pronounced *telomerase*.

So, telomerase will repair a shortened set of telomeres, and telomerase will also maintain it – telomerase is good.

You want to talk about optimal levels of telomerase because actually having too much telomerase can lead to serious problems. Too little telomerase can also lead to problems.

One Way to Help Clients Optimize Telomerase to Create Integration and Influence Epigenetics

Dr. Buczynski: So how can we achieve optimal levels of telomerase in order to increase the length of our telomeres?

Well, Dan says one of the best predictors of optimizing telomerase is *what you do with your mind*.

Dr. Siegel: So what do you do with your mind that does that? Something called "presence." Being aware of what's happening *as it's happening* is the best predictor of optimal telomerase levels.

“One of the best predictors of optimizing telomerase is *what you do with your mind*.”

Basically, what we believe presence does, is that it creates this integrated state of energy and information flow of one's self in one's body and brain and in connection with

other people.

“We now know what you do with your mind and what you do with your relationships changes the molecules of health. It literally changes enzymes.”

So the social world and the somatic world are all part of this energy and information field which becomes integrated through mental presence.

Within integration, you actually alter epigenetic controls – that’s what the research shows. You optimize telomerase levels, so you're changing an enzyme.

We now know what you do with your mind and what you do with your relationships changes the molecules of health. It literally changes enzymes. It literally improves your telomeres. It literally optimizes the non-DNA histones and methyl groups that are helping to prevent inflammatory disease.

If you would have told me 15 years ago that “one day we'll be quoting the science that says 'Your mind is changing your molecules,'" I would have said, "Well, probably it does, but gosh, we'll never know that." We now know it for sure.

Your mind is not just your brain. Your mind is both your whole body and your relational world, and yet they have this self-reinforcing loop by which you can create your own havoc.

“People with severe trauma are some of the most challenging to work with, but they're also some of the most rewarding people.”

But the great news about that is that you can work with the professional (and we as professionals can work with people) to say, "You can actually change the way you live your life."

I know people with severe trauma are some of the most challenging to work with, but they're also some of the most rewarding people.

For example, dissociation is a curable condition – and I hardly ever use that word *curable*. But I've worked

“What a privilege it is to be alive at this moment, to help people facilitate this deep set of integrated processes in their lives.”

with enough people now to know, you can actually work to change these non-integrated states that continually create chaos and rigidity in a person's life.

You can help them so that they'll optimize telomerase, they'll change epigenetic controls. They'll improve cardiovascular function, and

they’ll help their immune system function well.

These are all proven outcomes of when you become more present. So their relational world is going to become more rewarding, and that's fantastic. What a privilege it is to be alive at this moment, to help people facilitate this deep set of integrated processes in their lives.

Dr. Buczynski: What Dan said really touched me – and to paraphrase him just a bit . . . what a privilege it is to do the work that we do, right at this moment in time.



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About NICABM . . .

Ruth Buczynski, PhD has been combining her commitment to mind/body medicine with a savvy



business model since 1989. As the founder and president of the *National Institute for the Clinical Application of Behavioral Medicine*, she’s been a leader in bringing innovative training and professional development programs to thousands of health and mental health care practitioners throughout the world.

Ruth has successfully sponsored distance-learning programs, teleseminars, and annual conferences for over 20 years. Now she’s expanded into the ‘cloud,’ where she’s developed intelligent and thoughtfully researched webinars that continue to grow exponentially.

The National Institute for the Clinical Application of Behavioral Medicine is a pioneer and leader in the field of mind-body-spirit medicine. As a provider of continuing education for health and mental health care professionals for over 20 years, NICABM is at the forefront of developing and delivering programs with "take home" ideas, immediately adaptable for practitioners to use with their patients.

