**Can trauma have genetic effects across generations?**

The Truth and Reconciliation Commission's report on residential schools in Canada laid out the neglect and abuse aboriginal children and youth were put through. [Studies](http://www.ncbi.nlm.nih.gov/pubmed/24832930) have shown that trauma might have an affect not only the person experiencing the trauma, but also [subsequent generations](http://www.scientificamerican.com/article/descendants-of-holocaust-survivors-have-altered-stress-hormones/) via their DNA. Brent speaks with [Amy Bombay](http://www.dal.ca/faculty/healthprofessions/news-events/news/2014/05/21/meet_amy_bombay.html), assistant professor of psychiatry at Dalhousie University, on the possible implications of the field of epigenetics for First Nations people.

*This conversation has been edited for length and clarity.*

**How exactly could a traumatic experience change a person's DNA?**

Well this is something that we really only uncovered in the past ten to fifteen years through the study of epigenetics, which is basically the study of how environmental factors and experience can alter how genes are expressed without altering the underlying DNA sequence.

**So it's not the DNA code itself that's being affected, it's something else?**

That's right. We're all born with our DNA and we used to think that wasn't changeable and it's not. But what we know now is that experience can make certain kinds of these DNA "tags", which is the unscientific way to talk about it, that can tag onto our DNA. Those little tags can basically turn the gene on or off. And so while the same gene is still there, it could be not functioning or functioning differently and therefore the functional aspects and roles of that DNA are different.

**So why would your body do this? What's the evolutionary advantage?**

I think it really depends on the situation. Just to give you an example, the research on the long term effects of the Holocaust might help explain this. We know those who experienced chronic stress, they tend to show lower levels of the stress hormone cortisol, which helps our body return to normal after trauma. Those who have things like post-traumatic stress disorder, they have these low levels of cortisol and so it's not completely clear why this is the case in survivors. But Rachel Yehuda's team recently found that these survivors seem to be making lower levels of an enzyme that breaks down this cortisol. So this could be considered to be an adaptation to keep more free cortisol in the bodies of these people who are being starved, which would allow their livers and kidneys to maximize their stores of glucose and all of these other things that would actually help them in response to prolonged starvation and other types of stress. But that same response is not going to be adaptive for the next generation who are trying to recover in a normal environment.

**That seems to me to be the challenging part of this idea. If someone's body is responding to an environmental stress then how could that get passed along to the next generation when the DNA code itself is not altered?**

So it's not always the case that that's going to happen. But, if it so happens that whatever experience happened happened to influence DNA that is passed through the germ line in the egg and sperm, that's when it's possible that these epigenetic modifications can be transmitted transgenerationally.

**How settled do you think the science is on this, do you believe that the science is settled?**

Absolutely. We know this is a phenomenon. We know that epigenetics exist. We know that exists in a number of different species and there is now evidence that this also happens in humans. But what we don't know is the extent to which it is involved in specific diseases.

**Is there any way to know though? Do researchers know that what they're observing is a result of a genetic component and not simply the legacy of profound psychological damage?**

It's really impossible to separate those two things. They all interact with each other and are intertwined: the psychological, physiological, and social factors, particularly when we're talking about this cycle over generations. So, absolutely there are other pathways by which trauma is transmitted and the physiological and epigenetic pathways are just one.

**Your grandparents and your uncle went through the residential school system. Is that what led you to this research?**

It is. My father grew up in the reserve, but he moved to Ottawa to work for the government and so I grew up in Ottawa. Although we didn't really talk about residential schools growing up, it was when I was in high school that my mom suggested that I should look into this issue and so I did my own kind of research and paper on it. That's when I was shocked to find that this is part of Canadian history and influenced my own family.

**Seven generations of First Nations people went through the residential schools. If the science is right, if trauma can be passed down, could there be a cumulative effect? Could it be even more severe because we're talking about seven generations not one?**

Absolutely. So we know that across the lifespan, these epigenetic modifications can accumulate. If it does pass through the germ line and into the next generation, absolutely that same marker can be passed on and those same implications of that marker can also be passed on. We compared those whose families had not been affected by residential schools to those who had only one generation who attended, so the parent or a grandparent. We compared those who had two previous generations who attended, a parent and a grandparent. And we could see the cumulative effects; the more generations in your family who attended, the greater at risk you were for psychological distress.

*We could see the cumulative effects; the more generations in your family who attended, the greater at risk you were for psychological distress*- Amy Bombay, Assistant Psychiatry Professor from Dalhousie University

**Is there a dark side to this? Are you worried that this research could lead some to draw the conclusion that First Nations people are irreparably damaged?**

The good news is that these epigenetic markers can not only have negative effects, which is what we've kind of been focusing on, but they can also be protective. And not only do negative experiences result in negative outcomes, but positive experiences can also influence the expression of genes to express more protective genes.

**What are your hopes for this research? What is the best case about how this could help First Nations people?**

When I was doing my graduate studies, I had come across a lot of qualitative research, personal accounts, and books that talked about these transgenerational effects. What I found when it came to talking to regular people about this issue, their common response was, "Oh those Aboriginal people, they just need to get over their problems. Why can't they just assimilate? Why can't they just get their act together? We're giving them all of these special privileges," which is a whole other issue. So it's really to fight what's a misunderstanding and an unawareness of the long history of colonization in Canada. And to people who say, "Oh just get over it." This is showing empirically through research that that's not that simple. And that we need to invest in our Aboriginal population and invest in their healing because it took seven generations to get here it's going to take a number of generations to heal as well.

http://www.cbc.ca/radio/day6/episode-236-transgender-parenting-trauma-and-genetics-bobby-baun-gun-lobbyists-vs-bill-c-51-more-1.3098757/can-trauma-have-genetic-effects-across-generations-1.3098819