A Surprising Family Legacy: the Molecular Scars of Trauma

Research suggests trauma leaves a biological imprint that can be passed down through generations.

By Stacey Colino

If you think the trauma of a grandparent’s experience with the Holocaust or a parent’s wartime combat service or flight as a refugee from a war-torn country ended with them, you may be sorely mistaken. A growing field of research, called epigenetics and the intergenerational transmission of stress effects, suggests the descendants of trauma survivors have a biological memory of the hardship their relatives endured – namely, through alterations in certain genes and levels of circulating stress hormones.

In a study published in a September 2016 issue of Biological Psychiatry, researchers from the Icahn School of Medicine at Mount Sinai, New York City, measured methylation, a chemical process, within the FKBP5 gene in Holocaust survivors, their adult offspring and a control group of parents and adult children who were not in the Holocaust. The researchers found that the Holocaust survivors and their adult children had alterations in various sites within the FKBP5 gene, which plays a role in regulating immune function, compared to the control group.

"There is evidence that epigenetic changes that are made through stress or adversity can have long-lasting effects that may impact your stress system or sex cells," explains Rachel Yehuda, a professor of psychiatry and neuroscience at the Icahn School of Medicine at Mount Sinai. "This can create a different environment for the next generation, but it may not be the identical effect as the parents experienced."

Previously, these researchers, led by Yehuda, found that Holocaust survivors have lower levels of cortisol (a stress hormone) compared to their Jewish peers who did not directly experience the Holocaust. (It may seem counter-intuitive but reduced cortisol levels have been linked to increased vulnerability to post-traumatic stress disorder, or PTSD.) A follow-up study found that many descendants of Holocaust survivors, like their parents, also had low levels of cortisol, especially if their mothers suffered from PTSD. Similarly, a 2005 study found that pregnant women who were directly exposed to the World Trade Center collapse on 9/11 and who developed PTSD as a result have lower cortisol levels and so do their babies, compared to mothers without PTSD and their babies.

Believe it or not, from an evolutionary perspective, these transgenerational effects may be important for survival. "They might prepare subsequent generations for similar conditions because, for example, the stress hormone axis may be already prepared to encounter these environmental conditions," explains Dr. Torsten Klengel, a psychiatrist and research scientist at McLean Hospital, which is affiliated with Harvard Medical School, in Belmont, Massachusetts. "But if you
don’t encounter these conditions, the stress hormone system remains highly active, which can lead to dysregulation of the HPA [the hypothalamic-pituitary-adrenal] axis and could trigger psychiatric disorders and stress-related disorders’ such as anxiety and depression. In other words, being in a continuous state of hyper-alertness means your body’s fight-or-flight response is constantly revving high and releasing adrenaline and cortisol, which could be harmful to your body and mind.

Uncovering the Mysterious Pathways

Researchers in this area are quick to point out that there are still many unknowns behind this transgenerational transmission. "We’re just starting to elucidate potential molecular mechanisms behind this," Klengel explains. "Some of these effects occur in utero [while a woman is pregnant]; others may occur through alterations in germ cells, sperm and oocytes. There are potentially multiple molecular mechanisms involved." This type of research is very difficult to do in humans because multiple generations are needed; animal studies are easier to conduct because the environmental conditions can be better controlled, researchers say.

Researchers speculate that similar epigenetic changes may occur among survivors of other severe traumas – from revolutions, massacres and terrorist attacks to slavery, famine and torture. How severe a trauma needs to be for these transgenerational effects to occur isn’t understood. The threshold may depend on a person’s individual sensitivity and resilience, personal experiences, genetic factors and cultural factors, Yehuda says.

But it’s important to realize that the effects aren’t necessarily negative. "You’re more sensitive, not necessarily damaged," Yehuda explains. "If you have a parent who has experienced trauma, this may make you more resilient in some ways and more vulnerable in others. When you inherit the effects of trauma, you also may inherit a sensitivity that alerts you to signs of danger earlier and allows you to respond positively in ways that are powerful and effective."

She adds: "We don’t want people to think that if something bad happened to your parent, you’re doomed. We’re dealing with a dynamic biology and we have healing and restorative capacities. We can transform these experiences because our biology helps us adapt. You can get to a good place from a bad place."

Handling a Legacy of Trauma

As research in this area continues, the hope is that learning more about the potential transgenerational effects of trauma will have important implications for the prevention of mental health issues and for their treatment if they do occur. In the meantime, "if you know there’s a history of trauma in your family and you have a predisposition to react to stress, avoiding triggers may be key to protecting you from developing anxiety or depression," Klengel says. Leading a healthy, balanced lifestyle that incorporates good stress-management skills also can help in this respect, experts say.

There are also ways you can investigate whether these biological hand-me-down effects may be occurring in your own family. "When traumas remain unresolved in a family or the healing is incomplete, we often see aspects of the original trauma being repeated in subsequent generations," says Mark Wolynn, director of the Family Constellation Institute in San Francisco and author of "It Didn’t Start With You: How Inherited Family Trauma Shapes Who We Are and How to End the Cycle." "This often occurs when people hit a milestone, age or stage in life. It’s almost like there’s an ancestral alarm clock that starts ringing inside them." If, for example, one of your grandparents died in a horrific attack at age 40, you might find yourself experiencing intense stress and anxiety around the same age.

If you have free-floating anxiety or angst that can’t be traced to a particular source, it’s wise to do some detective work. "If you’re struggling in some way and it’s not clear why, shake your family tree to find out what family secrets have been
hidden," Wolynn suggests. Ask your parents and grandparents, as well as your aunts and uncles, questions about struggles and traumatic events your relatives have encountered. "Then, talk about these events with your loved ones," Wolynn advises.

To protect yourself from experiencing aftershocks from the family trauma, look for emotionally charged words that express your worst fear related to it, Wolynn advises. Then try to create a healing sentence that's the flip side of that: If your greatest fear is that you will lose everything the way your grandparents did in the Great Depression, your healing sentence might be, "It was my grandparents who lost everything. I can live a different life." This is a technique that's often used in therapy, Wolynn says, and it can help put the past in its proper place so that you can move forward with your life feeling strong.