

**Attachment-Focused Psychotherapy & Epigenetics:**  
**What your grandparents past on.**

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Is it possible for the experiences of your parents, grandparents, and great grandparents to have effects on you, your children, your grandchildren and beyond? The answer is yes! But how is that possible? Is it nature and genetics or is it psychology and nurture? Is it bad genetics and biology or bad parenting? Turns out it is both!

This article will summarize what we know about epigenetics and the implications of that for Attachment-Focused Treatment. Your life experiences and those of your parents, grandparents, and great grandparents directly affect your genes and resulting behavior.

A bit of biology now. Chromosomes are composed of genes which are composed of long strands of DNA. DNA is wound around spools (histones) and how tightly the spools are wound determines how the gene is expressed. If the DNA is wound tightly the gene will have little or no expression. If the DNA is wound more loosely, then the gene and associated proteins will be expressed in large quantities. When a methyl group or acetyl group becomes attached to the DNA that changes the activity of the gene. Attachment of a methyl group tightens to thread of DNA wrapping around the histone spool. This makes it harder for the gene to produce the protein it codes. When an acetyl group becomes attached to a gene the thread of DNA is more loosely wrapped around the histone spool resulting in greater gene expression. Diet, chemicals, and various experiences including childhood maltreatment, drug abuse, and severe stress can cause methyl groups to become attached to genes. These epigenetic changes can be passed down from parent to child and on to grand and great-grand children.

Szyf & Meaney, two researchers at McGill in behavioral epigenetics, suggest that traumatic experiences in our past and ancestry leave molecular markers on our DNA. Szyf & Meany found that maternal care causes changes in DNA methylation. In a series of famous experiments using rats that were either highly attentive or highly inattentive, described in their 2004 article in Science, they found that in the hippocampus region (essential for the regulation of stress response), pups of inattentive mothers had highly methylated genes regulating the production of glucocorticoid receptors, which regulate sensitivity to stress hormones. Pups of the conscientious mothers had unmethylated genes for glucocorticoid receptors in the hippocampus. More methylation results in less transcription. So, the methylation of the genes in the pups of inattentive mothers reduced the number of glucocorticoid receptors from being transcribed in the

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pup's hippocampus. This means that those pups had an over-active stress response system and were generally more nervous and fearful.

*Whereas a nurturing environment can predispose a rodent to be calmer in adulthood and raise a nurturing family of its own, an adverse environment can have the opposite effect. There's evidence that this effect, too, may involve epigenetic changes. Last year, researchers led by Tania Roth and J. David Sweatt of the University of Alabama, Birmingham, helped show this by building on earlier work showing that rat mothers denied access to the materials needed to make a proper nest become anxious and spend less time nurturing their young. Pups raised by these stressed-out rat moms exhibited increased methylation of the gene for BDNF, a neural growth factor, in the brain's prefrontal cortex, they reported in the 1 May 2009 issue of Biological Psychiatry. In addition, this methylation pattern, which would tend to reduce the amount of BDNF produced, was passed on to the subsequent generation. (Miller, 2010)*

This suggests that Jews whose great-grandparents were in concentration camps, Chinese whose grandparents lived through the ravages of the Cultural Revolution, young immigrants from Africa whose parents survived brutal civil wars and genocidal massacres, and adults who grew up with alcoholic or abusive parents, all carry with them more than just memories...our experiences and those of our forebears are never gone, even if they have been forgotten. They become a part of us, a molecular residue on our genetic scaffolding. The DNA remains the same, but the psychological and behavioral tendencies are inherited. You might have inherited not just your grandparent's eye color and freckles, but also their predisposition toward depression caused by the neglect they suffered as infants and young children. On the other hand, if your parent or grandparent, who was born to a maltreating family, was adopted at an early age by a nurturing, supportive, and loving family, then they and you will be privy to an epigenetic boost; strengths and resiliencies are also passed on.

Sackler Program for Epigenetics and Psychobiology at McGill University found that childhood abuse amongst suicide victims was associated with a distinct epigenetic mark on the DNA. The discovery represents a huge step forward for epigenetics—the study of how environmental factors change gene expression—and holds the promise of better understanding suicide and, perhaps, new treatments. team used a cohort of 36 brain samples. One third were from suicide subjects who were known to have been abused in childhood, one third from suicides with no known abuse in their childhoods, and one third from a control group. The researchers discovered that those suicides who had suffered abuse as children bore specific epigenetic methylation characteristics absent on specific DNA sites that were in the other two groups. Significantly, those marks were shown to influence the hypothalamic-pituitary-adrenal (HPA) function. The HPA axis is a critical feature of the stress response. It is managed by a set of genes expressed in the hippocampus, including one that was epigenetically marked by the experience of childhood abuse. Abnormal HPA activity in response to stress is in turn strongly linked to suicidal action. They found excess emthylation of the genes in the suicide brains' hippocampus, a region critical for memory acquisition and for the regulation of the stress response.

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In a landmark study, Szyf looked at the blood samples of forty men all born in 1958, who were either very poor or very rich at some point in their lives. Genes were more than twice as likely to show methylation changes based on family income during early childhood. Timing matters! Early experiences have more impact on the developing brain and on genetic expression than later experiences. Yu and colleagues (Yu, et. al., 2012) compared blood samples of 14 children raised in Russian orphanages with 14 other Russian children being raised by their birth parents. The research team found markedly greater methylation in the institutionalized children's genes, particularly those influential in neural communication, brain development, and brain functioning. " The findings suggest that patterns of differential methylation seen in nonhuman species with altered maternal care are also characteristic of children who experience early maternal separation," (p. 143). Elena Grigorenko at Yale, one of the study's authors stated, "Our study shows that the early stress of separation from a biological parent impacts long-term programming of genome function. This might explain why adopted children may be particularly vulnerable to harsh parenting in terms of their physical and mental health. Parenting adopted children might require much more nurturing care to reverse these changes in genome regulation."

One clear implication of this research is that the Attachment-Facilitating Parenting associated with Attachment-Focused Psychotherapy can be instrumental in demethylating important genes and, therefore, "resetting" the stress response system to be within a more normal range. It is clear that harsh parenting methods, methods grounded in power and control, methods that are shaming, blaming, and critical only serve to reinforce negative expectations and the unresponsive stress-response system's reset mechanism. Parenting methods that are grounded in a focus on relationship and connections of an emotionally meaningful and joyful nature may reset the stress response system by its epigenetic effects.

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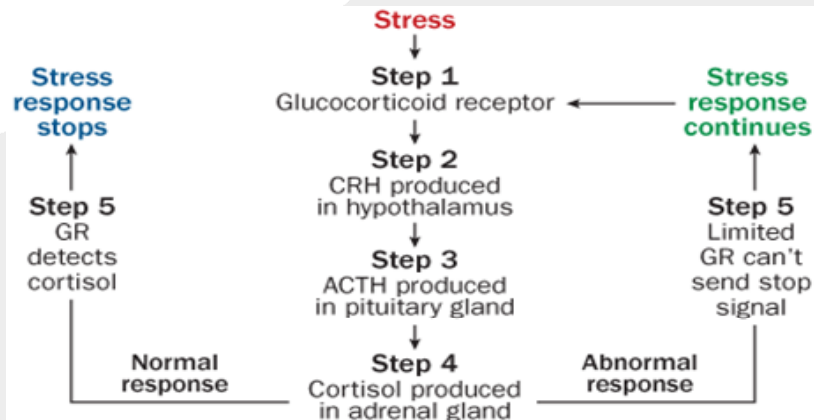
The following three slides are from my Workshop: Learning & Survival Brain: Effects of Maltreatment on Development.

### Gene & Protein Altering Effects of Adverse Childhood Experiences

- Epigenetics: Experiences modify chemical tags (Methyl groups) that affix to a gene and modify its expression.
- 5-HTT: a protein that takes up serotonin. DNA region controlling activity of gene for 5-HTT has more methyl tags in abused children than others.
- The gene controlling Glucocorticoid receptor, which “decides” when the body’s stress system has produced enough of the stress-signaling hormone (cortisol) and helps turn off that system is less active in adults who have adverse childhood experiences.

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### Stress Response System: Effects of Early Maltreatment



Cottrell, E., et al, Frontiers in Behavioral Neuroscience. 3, 2009.

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### Relationship between adverse childhood experiences and lifetime risk of attempting suicide

Adverse experience category		Percent attempting suicide
Emotional abuse	No	2.5
	Yes	14.3
Physical abuse	No	2.2
	Yes	7.8
Sexual abuse	No	2.4
	Yes	9.1
Battered mother	No	3.1
	Yes	9.0
Substance abuse in home	No	2.6
	Yes	7.0
Mentally ill household member	No	2.6
	Yes	9.6
Parents separated/divorced	No	3.0
	Yes	6.6

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