AIMS For a better birth...

Nature and nurture: a brief look at epigenetics and transgenerational trauma.

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Image source

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Epigenetics is a fairly new science, but not a newly observed phenomenon. It studies the way in which information can be passed from one generation to the next over and above the genetic blueprint inherited from our ancestors. It is a process that may have been recognised in the biblical reference to “visiting the iniquity of the fathers upon the sons to the third and fourth generation” (Numbers 14:18), and echoed by Shakespeare in The Merchant of Venice, "The sins of the father are to be laid upon the children" (Act 3, scene 5).

Iniquity (wrongdoing, unethical behaviour, violence of any kind that results in, or is experienced as, trauma), whether one is the perpetrator or the victim, leaves its mark. This mark can be passed to the children through the way in which a traumatised parent nurtures their child. The attitudes and behaviours of traumatised parents, the conditions they endure, and the stories they share, create a family environment that shapes the attitudes and behaviours of their child in a way that may be carried into adulthood and passed on - even to the third and fourth generation. This is referred to as intergenerational or transgenerational trauma (the passage of emotional pain from one generation to the next),[1] eloquently summed up by Philip Larkin in his poem, 'This Be the Verse'[2]:

This Be the Verse

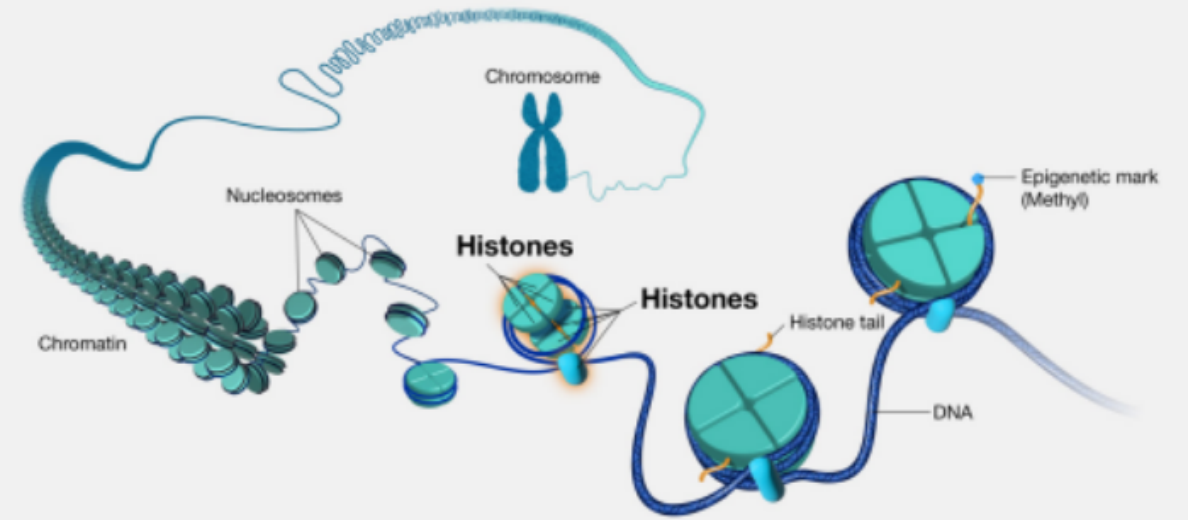
They fuck you up, your mum and dad.
They may not mean to, but they do.
They fill you with the faults they had
And add some extra, just for you.

But they were fucked up in their turn
By fools in old-style hats and coats,
Who half the time were soppy-stern
And half at one another's throats.

Man hands on misery to man.
It deepens like a coastal shelf.
Get out as early as you can,
And don't have any kids yourself.

Being filled with the faults of our parents and grandparents (faults often born from painful experiences) may also be explained through epigenetics. The epigenome ('epi' being the Greek word for over or above and 'genome' being the entire set of DNA instructions found in a cell.)[3] is a collection of chemical compounds that attach to and overlay (cover) the DNA sequence in order to direct gene expression.[4] Epigenetic marks do not alter the DNA sequence but instead they are like 'on and off' switches or 'open and closed' signs that allow or silence individual gene activity. Some have likened the DNA sequence to the words of a Shakespeare play that remain the same in every performance, and the epigenome to the director's notes that modify the expression of each performance.

If you are not quite sure where this is happening in your body, it is happening in every cell. As a general rule, the nucleus of every cell contains 23 pairs of chromosomes. One pair from each parent. The chromosomes each consist of one two-stranded (double helix) molecule of DNA that contains the genetic code unique to every individual (the genome). This strand of DNA is about six feet in length but it winds itself around little 'spools' made of eight histone proteins that magically (don't ask me how) allow the strand to pack itself into a miniscule space. Each 'spool', wrapped in its loop of DNA, is called a nucleosome. Together the nucleosomes look like tiny beads on a fine thread. This 'thread of beads' coils (or condenses) into a thicker strand called a chromatin, and this single chromatin further condenses itself to form a single chromosome. The chemical compounds that form the epigenome are attached to the histones and to the DNA itself in a number of ways, the most notable of which isDNA methylation.



These chemical markers can be acquired through environmental factors (nurture) or, though still controversially, may even be inherited (nature).

Nurture for an individual begins in the womb. The ways in which the child's development is affected by his intrauterine and early childhood experiences are referred to as environmental factors. For example, maternal stress in pregnancy affects the intrauterine environment and is known to affect the baby's development.[5] Intermittent mild to moderate stress, otherwise known as 'normal life', appears to advance the baby's neural development and in doing so, better prepares the baby for normal life. Severe and/or chronic stress, on the other hand, is associated with higher risks for adverse perinatal outcomes and long-term adverse effects on offspring. Maternal trauma, expressed as anxiety, depression or PTSD postnatally, can also be transmitted to the baby. It affects the maternal-infant bond, which has consequences for the child's future development.[6, 7] That this early and often forgotten unhappiness can come back to haunt a person in their adult life has been referred to as 'the ghosts in the nursery'.[8]

As well as the psychological effects of trauma affecting the way a baby is nurtured before and after birth, the physical effects may also be passed on. For example, we can assume that when a woman is pregnant during a period of famine her baby's physical development is likely to be adversely affected,[9] but now there is growing evidence that epigenetics can modify the baby's gene expression enabling the mother's lived experience to be passed to her child as a form of natural inherited memory.[10] The baby's body holds the memory that famine is possible and has been 'programmed' accordingly.

It was always believed that DNA methylation is completely erased from the genes that a new baby inherits from each parent, but apparently, this is not always the case. Epigenetic changes associated with a preconception trauma in parents (including the assault upon the body from smoking, alcohol or medication) may overlay the DNA in the gametes (the eggs and sperm) and continue to direct gene expression in a future baby, even when environmental stressors no longer exist.[11, 12, 13] For example, it had long been observed that the children of fathers who smoked before they (the children) were conceived, have an increased risk of experiencing asthma, low lung function and obesity. This is particularly true if the fathers smoked during puberty, but it wasn't understood why. Recently, research

has shown that the father's earlier smoking is associated with methylation of blood DNA in his offspring,[14] the 'instruction' for which must have been carried epigenetically in his sperm.

Continuing with the famine example, when women are pregnant during times of famine, their offspring have a higher likelihood of being overweight and experiencing reduced glucose tolerance later in life - with effects also noted in the grandchildren.[15] The famine-exposed babies appear to have had a gene epigenetically 'turned on' that enabled them to adapt to a resource-poor environment, but after birth, when times turned out to be good and food plentiful, they gained weight very easily and experienced higher rates of obesity and diabetes. This is known as the 'thrifty-phenotype theory'.[16] Studies have also shown that when times continue to be hard and food scarce, this epigenetic modification improves the well being of a person as they are better adapted to the situation.[17] Overall though, early exposure to famine conditions seems to impair immunity. One example of this is where prenatal and early-life exposure to the Great Chinese Famine (1958-1962) increased the risk of tuberculosis in adulthood across two generations.[18]

Other examples of intergenerational trauma that have been studied include those arising from slavery, the holocaust, forced migration, and violent colonisation with the displacement and marginalisation of indigenous people.[19] A more recent collective trauma is that of the Covid-19 pandemic. The AIMS Helpline witnessed the sometimes harrowing experiences of women who were pregnant and gave birth during this time.[20] This is not to mention the many thousands of women each year, in the UK alone, who develop PTSD after their experience of perinatal trauma.[21]

Research suggests that epigenetics may also be critical in various diseases, from cardiovascular disease and cancer to neurodevelopmental and neurodegenerative disorders,[22] as well as a tendency to aggressive and dysfunctional behaviours.[23] If genes can be epigenetically 'turned on' in a way that may harm future generations, is it possible to create conditions or treatments that 'turn them off' again and allow healing from the inherited trauma or from chronic disease? Modern medicine is developing epigenetic interventions, one example are new drugs for treating cancer that aim to 'turn back on' genes that suppress cancer tumours,[24] however, these interventions are being developed with great caution because of the potential risks associated with them, including unintended consequences like adverse drug reactions, developmental abnormalities, and cancer itself.[21]

Homeopathy may offer another approach to epigenetic treatment. Before our understanding of germ theory and long before our knowledge of epigenetics, Hahnemann, the founder of homoeopathy, observed that the effects of an acute disease can remain in the body even after treatment and that those effects can be present in future generations who have not been exposed to the acute illness (inherited miasms); this trans-generational effect manifested in the form of 'disease predispositions'. He called these effects 'miasms', miasma being Greek for pollute, taint or stain.[25] Two promising studies have shown some success with homoeopathic treatment in apparently modulating 'tainted' gene expression over and above the placebo effect.[26] Practitioners of integrative medicine, an approach that combines complementary and alternative approaches with allopathic approaches (drugs and surgery), are also interested in this field and offer evidence that their work may modify the 'epigenetic landscape' in a

positive way as well.[27]

Returning to 'the ghosts in the nursery', in 1975, Selma Fraiberg, an American child psychoanalyst, wrote about intergenerational trauma using this evocative metaphor:[8]

> "In every nursery there are ghosts. They are the visitors from the unremembered past of the parents, the uninvited guests at the christening. Under favorable circumstances, these unfriendly and unbidden spirits are banished from the nursery and return to their subterranean dwelling place. Even among families where the love bonds are stable and strong, the intruders from the parental past may break through the magic circle in an unguarded moment, and a parent and his child may find themselves reenacting a moment or a scene from another time with another set of characters. In still other families there may be more troublesome events in the nursery caused by intruders from the past. There are, it appears, a number of transient ghosts who take up residence in the nursery on a selective basis. Ghosts who have established their residence privileges for three or more generations may not, in fact, be identified as representatives of the parental past."

Forty years after her death, Fraiberg and her work with children experiencing the effects of intergenerational trauma, are still highly regarded. She features in the Shalvi/Hyman Encyclopedia of Jewish Women, along with a bibliography of her work,[28] and her life's work has recently been written about in the Journal of Psychoanalytic Social Work.[29] More recent studies confirm that of both positive and negative parenting behaviour can, consciously and unconsciously, cross generations,[30] but to what extent this is a baton passed from parent to child as Philip Larkin describes, or whether in part, the epigenome is the subterranean dwelling place where the ghosts of our ancestors wait to haunt us, is undecided.

Either way, thirty years after Fraiberg's ghosts, 'the angels in the nursery' have been written about too.[31] The authors (Alicia F. Lieberman et al) argue that:

> "Uncovering angels as growth-promoting forces in the lives of traumatized parents is as vital to the work of psychotherapy as is the interpretation and exorcizing of ghosts. Using clinical case material, we demonstrate the ways in which early benevolent experiences with caregivers can protect against even overwhelming trauma, and examine the reemergence of these benevolent figures in consciousness as an instrument of therapeutic change."

Supporting Liebernab's hopes for psychotherapy, some early and tentative research suggests that it (psychotherapy) may have a positive effect on the epigenetic mechanisms associated with the stress response. However, these epigenetic changes were only observed in patients with early trauma.[32]

The potential effects on the epigenome of babies born to mothers who experienced perinatal trauma has not yet been studied. This invites the thought that prevention would be better than cure - the thought at

the very heart of our work at AIMS in campaigning for improvements in the maternity services. An emerging policy of trauma-informed health care recognises that patients may come to healthcare with a previous history of trauma. The approach seeks to prevent re-traumatisation by understanding, building trust and supporting choice.[33] However, discussions about trauma-informed care often overlook the fact that the previous trauma may have been the result of iatrogenic harm; harm caused by medical treatment - including the trauma caused from obstetric violence.[34]

As a result of her personal experience, one health practitioner in the States, Chrystal L. Lewis, has developed the BITTEN model of trauma-informed care,[35, 36] with the B standing for 'Betrayal history by health-related institutions'. This refreshing recognition, that healthcare may have been the first trauma, is vital if the healthcare system, including maternity care, is to improve. The iniquity of non-consensual maternity care traumatises all involved, with ill effects that are surely becoming a collective transgenerational trauma - reflected in the growing climate of fear around birth.

As a grandmother and great grandmother, I weep when I hear story after story of events attending a birth that can only be described as cruelty, neglect or unwitting ignorance. This is not a trauma we want to pass to our daughters and granddaughters if there is anything at all that can be done.

Author Bio: Alex Smith is the editor of the AIMS journal and volunteers on the AIMS helpline.

The AIMS campaign for physiology-informed maternity services position paper.[37]

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