Maternal epigenetics and pregnancy control in healthcare

DR ILKE TURKMENDAG NEWCASTLE LAW SCHOOL, NEWCASTLE UNIVERSITY FUSE 2025



Protection of vulnerable groups

"appropriate attention should be given to prevention of the initiation of drinking among children and adolescents, prevention of drinking among pregnant women and women of childbearing age, and protection of people from pressures to drink, especially in societies with high levels of alcohol consumption where heavy drinkers are encouraged to drink even more."

(World Health Organization 2021: 17)





Maternal effects in epigenetics

Maternal impression – the notion that the thoughts, behaviours, emotions and experiences of a pregnant woman could 'imprint' on her offspring – "has stubbornly crossed different cultural and medical frameworks from ancient and early modern biology into the early twentieth century". (Meloni and Muller, 2018).

But such 'notions' are now 'backed by' findings from transgenerational epigenetics, a subcategory of epigenetics.

Maternal epigenetics: This is the maternal effects, 'the causal influence of maternal phenotype or genotype on offspring phenotype' (Wolf and Wade 2009), independently of the offspring's genotypes (Ho, 2014).

Responsibilisation of mothers

Eg alcohol intake before conception and during pregnancy, poor prenatal diet, prenatal exposure to domestic violence or maternal distress.

Caesarean delivery, and recently junk food consumption during pregnancy are all linked to epigenetic changes which may cause health problems in the offspring (See Valdez 2018; Geraghty et al 2015; Radkte et al 2011; Cao-Lei et al 2016; Almgren et al 2014)

Epigenetics studies also focus on how maternal stress increases the risk of offspring having a wide range of adverse outcomes (eg emotional problems, symptoms of attention deficit hyperactivity disorder, or impaired cognitive development (Glover 2014)).

Recently, it was reported that pregnant mother's diet influences future child's taste and odor preferences (Forestell 2024)





uring pregnancy and the effects of fetal prog baby and child



earch... Find

The pregnancy The Mother's Wellbeing What can help

Stress in Pregnancy

In the womb

Fetal Programming

Fetal Development

Baby and Child

Insights from the past

Insights from the Past

The Science

Evolution

Baby and Child

Charlie's story

This is a story about Charlie

Charlie, age 19 years, is just leaving prison. He has been convicted of stealing. He is also often aggressive. He generally behaves badly, and most people would think he was responsible for his crimes and deserves to be punished.

Begin Before Birth What happens in the womb can last a lifetime

But let's look at his story.

His mother was very stressed while she was pregnant, had no support from her family or friends and her partner did not want the child.

Charlie was a very difficult baby, often crying and hard to soothe. His mother became depressed. She was not able to give him love, warmth or encouragement. His father treated him harshly.



 Father, family & friends
 He did badly at school, was slow at learning, showed readily distracted attention, and often broke the rules. He was often excluded and then started to truant.

In his early teens he turned to crime.

How should we think about this?

His mother's stress while she was pregnant could have caused him to be a difficult baby and hard to soothe. It could also have led him, as he got a little older, to show signs of ADHD and being hard to control.

180228223551/http://www.beginbeforebirth.org/wp-content/uploads/2011/06/Hoodie2.jpg" in a new tab with him. and show him affection. His mother's

The Begin Before Birth foundation is no longer in operation and the website at their former domain is no longer operated by alegitimate entity. A short section of this presentation was re-recorded to remove a screenshot of the website now at their old domain, and remove references to this domain. The screenshot has been replaced with one from an archival copy of the site. Source: http://web.archive.org/web/20180519034529/https://beginbeforebirth.org/



What happens in the womb...

'Begin Before Birth' Foundation's website underlines that "what happens in the womb can last a lifetime." The website hosts a video about an individual named Charlie who has committed criminal offenses. <u>https://www.youtube.com/watch?v=LxXLHptOiEo&t=2s</u>

'More than a million children in the UK have neurodevelopmental disorders of the sort that have been found to be associated with prenatal stress, anxiety, and depression.' (Vivette Glover, Psychobiologist at Imperial College London, cited in Royal Society of Medicine, 'Experts underline importance of reducing stress in pregnancy', Published 02 February 2023)

"[p]renatal anxiety or depression may contribute 10–15% of the attributable load for emotional and behavioural outcomes" (Glover 2014: 25).

A new scientific review concluded that what a pregnant mother eats already has lasting effects on the yet-unborn child's taste preferences.

STUDY

Pregnant mother's diet influences future child's taste preferences, new study finds

Review: > Annu Rev Nutr. 2024 May 9. doi: 10.1146/annurev-nutr. 121222-101404. Online ahead of print.
Doess Maternal Diet Influence Future Infant Taste and Odor
Preferences? A Critical Analysis
Catherine A Forestell ¹

 \bigcirc 4 950 \bigcirc 74 \bigtriangledown 200

000

ces? A Critical Analysis

Currently, the social norm is that smoking and drinking during pregnancy make you a bad mother.

Giveaway by Fuisello... Inoid

menno.henselmans 🧇

Yet gaining lots of weight - far more than necessary for a healthy pregnancy - and **eating unhealthy foods are socially very accepted,** sometimes even encouraged.

♡ 4,859 74 200

.

concluded that what a pregnant mother eats... more

menno.henselmans A new scientific review





...

 ${\color{black}{\frown}}$

This begs the question of how acceptable it should be for pregnant women to eat **junk food,** as this will predispose the child to like those foods and probably not healthy whole foods.



♡ 4,859 Q 74 ♥ 200

 \Box

menno.henselmans A new scientific review concluded that what a pregnant mother eats... more

0 0 0 0 0 0

View all comments

Source: Menno Henselmans – Instagram & Facebook-18 August2024



Policing the womb

The pregnant body is considered a closed system, a microenvironment for foetal development

Although these suggestions and interventions based on research findings are well intended, they may also stigmatise or even criminalise certain kind of behavior, (even before the conception) to protect the foetus.

In the legal process, the social understanding of the normative values around parentage holds a big value.

Claims associated with epigenetics may influence public notions of maternal responsibility towards future generations and raise novel challenges for law, particularly for transgenerational justice. As Karpin argues, 'women may be constituted as hostile or as potentially hostile "environments" for future people',

'it is not hard to imagine a solution in the form of more regulatory and social constraints on women'

Robison notes if 'connections between present actions and future consequences can be established scientifically via epigenetics, a tidal wave of legal claims would potentially arise of children against parents, grandchildren against grandparents, and so on, introducing unprecedented and far-reaching legal and political complications into the mix'.

Eg, Criminal Injuries Compensation Authority on behalf of the child suffering from foetal alcohol syndrome disorders against heavy drinking mother during pregnancy; Cases relating to diethylstilbesterol (DES) in the US.

Epigenetics and the law

Conclusion

- Scientific findings in epigenetics and maternal environment are too preliminary to provide a solid evidence in courts.

- Even if the evidence is 'good science' it will almost impossible to isolate the epigenetic mechanisms from the social context. As held in Stallman v. Youngquist, the relationship between a pregnant woman and her developing foetus was 'unlike the relationship between any plaintiff and defendant'.

-Gender biases play a big role in our understanding of moral responsibility.

-While the findings from epigenetics research can generate useful insights to enhance people's lives by tackling with social inequality, they may also bring an undesirable effect of discriminating and stigmatising certain group of people.

References

World Health Organization. Maternal, newborn, child and adolescent health and ageing: Data portal. 2021; available at https://www.who.int/data/maternal-newborn-child-adolescent-ageing/indicator-explorer-new/mca/women-of-reproductive-age-(15-49-years)-population-(thousands) (last accessed 14 July 2021).

Jensen, TK, Gottschau, M, Madsen, JO, Andersson, AM, Lassen, TH, Skakkebæk, NE, et al. Habitual alcohol consumption associated with reduced semen quality and changes in reproductive hormones; a cross-sectional study among 1221 young Danish men. Reproductive medicine 2014;4(9):e005462.

Zhou, Q, Song, L, Chen, J, Wang, Q, Shen, H, Zhang, S and Li, X. Association of preconception paternal alcohol consumption with increased fetal birth defect risk. JAMA Paediatrics 2021;175(7):742-743.

Meloni, M, and Müller, R. Transgenerational epigenetic inheritance and social responsibility: Perspectives from the social sciences. Environmental Epigenetics, 2018;4(2):dvy019, 3.

Geraghty, A, Lindsay, K, Alberdi, G, McAuliffe F and Gibney E. Nutrition during pregnancy impacts offspring's epigenetic status–evidence from human and animal studies. Nutrition and Metabolic Insights 2015;8(Suppl 1):41-47.

Radtke, KM, Ruf, M, Gunter, HM, Dohrmann K, Schauer M, Meyer, A and Elbert, T. Transgenerational impact of intimate partner violence on methylation in the promoter of the glucocorticoid receptor. Translational Psychiatry 2011;1(e21):1-6; also, Cao-Lei, L, Laplante, DP and King, S. Prenatal Maternal Stress and Epigenetics: Review of the Human Research. Current Molecular Biology Reports 2016;2:16-25.

Almgren, M, Schlinzig, T, Gomez-Cabrero, D, Gunnar, A, Sundin M, Johansson, S, et al. Cesarean delivery and hematopoietic stem cell epigenetics in the newborn infant: Implications for future health? American Journal of Obstetrics and Gynecology 2014;211(5):502.e1-502.e8.

Beginbeforebirth.org. Charlie's Story can also be found at: https://www.youtube.com/watch?v=LxXLHptOiEo (accessed 07 July 2021).

Jabbar, S, Chastain, L, Gangisetty O, Cabrera MA, Sochacki K and Sarkar D. Preconception alcohol increases offspring vulnerability to stress. Neuropsychopharmacology 2016;41(11):2782-2793.

References

McGowan PO, Szyf M, 'The Epigenetics of Social Adversity in Early Life: Implications for Mental Health Outcomes' (2010) 39 Neurobiology of Disease 66

Richardson S, 'Maternal Bodies in the Postgenomic Order: Gender and the Explanatory Landscape of Epigenetics' in S Richardson and H Stevens (eds), *Postgenomics: Perspectives on Biology after the Genome* (Duke University Press 2015)

Karpin I, 'Vulnerability and the Intergenerational Transmission of Psychosocial Harm' (2018) 67 Emory Law Journal 1115

Robison S, Epigenetic and Public Policy: The Tangled Web of Science and Politics (Praeger 2018)

Rothstein MA, Cai Y and Marchant GE, 'The Ghost in Our Genes: Legal and Ethical Implications of Epigenetics' (2009) 19 Health Matrix 1

Doci F and Others, 'Epigenetics and Law: The Quest for Justice' in M Crawford (ed), *Epigenetics in Society*(Emerging Scholars Press 2015) 261

Fentiman L. Blaming Mothers: American Law and the Risks to Children's Health (NYU Press 2017) 7