Journal of Clinical Epigenetics
ISSN: 2472-1158

Open access Short Communication

Functioning of Reproductive Epigenetics

Alexander Pushkin*

Department of Clinical Epigenetics, University of Leuven, Belgium

INTRODUCTION

Environmental Endocrine Disruptors (EEDs) pose a serious threat to human health by interfering with the normal functioning of the reproductive system. In men, EED not only affects spermatogenesis and quality, but it also affects spermatogenesis and can ultimately reduce fertility. In women, EED affects uterine development and the level of expression of reproductive-related genes, and can ultimately affect female fertility and normal fetal development. There are many putative mechanisms by which can induce reproductive toxicity, and many studies have shown the involvement of epigenetics.

DESCRIPTION

Manipulating the embryo is a necessary step in Assisted Reproductive Technology (ART). Therefore, it is necessary to evaluate the safety of ART and study its long-term effects, including lipid metabolism, on progeny requiring ART. By extending the ART rabbit model to examine the long-term results of lipid metabolism in offspring, changes in liver DNA methylation in ART offspring in the F3 generation of embryo exposure (multiple ovulation, vitrification, embryo transfer) discovered. Through adult liver metabolomics and proteomics, we identified changes primarily associated with lipid metabolism (e.g., polyunsaturated fatty acids, steroids, steroid hormones). We also found that DNA methylation analysis is associated with changes in lipid metabolism and apoptotic genes. Nonetheless, these differences did not appear to change general health. Therefore, our results suggest that ART is likely to play a role in embryonic epigenetic events associated with changes in liver homeostasis in adulthood.

Epigenetic inheritance is another piece of the non-genetic inheritance puzzle, but the prevalence, source, persistence, and phenotypic results of hereditary epigenetic traits in all categories are unknown. It remains as it is. We systematically reviewed more than 500 studies over the last five years to identify trends in the frequency of epigenetic inheritance due to differences in reproductive mode and germline development. Genetic, intrinsic (eg, disease) and extrinsic (eg, environmental) factors have been identified as causes of epigenetic inheritance with phenotypic and adaptive effects that depend on the predictability of the environment.

The field of nanotechnology has enabled increased exposure to nanoparticles (NPs) in the male reproductive system. Certain nanoparticles have been reported to adversely affect male germ cells and somatic cells. Germ cells are a bridge between generations and are responsible for transmitting genetic and epigenetic information to future generations. Many NPs can adversely affect male germ cells and somatic cells, ultimately affecting fertility and the ability to produce healthy offspring. These effects are related to NP composition, modification, concentration, aggregation, and route of administration. Nanoparticles can have serious toxic effects on the male reproductive system after crossing the blood-testis barrier and eventually damaging sperm.

CONCLUSION

Male fertility rates have shown a gradual decline over the last few decades. There is growing concern about male reproductive dysfunction caused by exposure to environmental pollutants, but the underlying molecular mechanism is not yet well understood. Epigenetic modifications play an important role in the biological response to external stressors. Therefore, this review describes the role of epigenetic modifications in male reproductive toxicity induced by environmental pollutants, with a particular focus on DNA methylation, histone modifications, and miRNAs. The available literature shows that environmental pollutants directly cause or can cause oxidative stress and DNA damage, leading to genetic dysregulation, mitochondrial dysfunction, and consequent male reproductive toxicity. It suggests that it causes a lot of changes [1-4].

Received:	01-June-2022	**Manuscript No:**	IPJCE-22-13949
Editor assigned:	03-June-2022	**PreQC No:**	IPJCE-22-13949(PQ)
Reviewed:	17-June-2022	**QC No:**	IPJCE-22-13949
Revised:	22-June-2022	**Manuscript No:**	IPJCE-22-13949(R)
Published:	29-June-2022	**DOI:**	10.21767/2472-1158.22.8.30

Corresponding author Alexander Pushkin, Department of Clinical Epigenetics, University of Leuven, Belgium, E-mail: pushkin974@gmail.com

Citation Pushkin A (2022) Functioning of Reproductive Epigenetics. J Clin Epigen. 8.30.

ACKNOWLEDGEMENT

None

CONFLICTS OF INTERESTS

The authors declare that they have no conflict of interest.

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