**2020 Glyphosate Epigenetics Summary**

**December 2020**

**Publication**

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Epigenome-wide association study for glyphosate induced transgenerational sperm DNA methylation and histone retention epigenetic biomarkers for disease

Published online: 09 Dec 2020. https://doi.org/10.1080/15592294.2020.1853319

**Summary**

The herbicide glyphosate has been shown to promote the epigenetic transgenerational inheritance of pathology and disease in subsequent great-grand offspring (F3 generation). This generational toxicology suggests the impacts of environmental exposures need to assess subsequent generations. The current study was designed to identify epigenetic biomarkers for glyphosate-induced transgenerational diseases using an epigenome-wide association study (EWAS). Following transient glyphosate exposure of gestating female rats (F0 generation), during the developmental period of gonadal sex determination, the subsequent transgenerational F3 generation, with no direct exposure, were aged to 1 year and animals with specific pathologies identified. The pathologies investigated included prostate disease, kidney disease, obesity, and presence of multiple disease. The sperm were collected from the glyphosate lineage males with only an individual disease and used to identify specific differential DNA methylation regions (DMRs) and the differential histone retention sites (DHRs) associated with that pathology. Unique signatures of DMRs and DHRs for each pathology were identified for the specific diseases. Interestingly, at a lower statistical threshold overlapping sets of DMRs and DHRs were identified that were common for all the pathologies. This is one of the first observations that sperm histone retention can potentially act as a biomarker for specific diseases. The DMR and DHR associated genes were identified and correlated with known pathology specific-associated genes. Observations indicate transgenerational epigenetic biomarkers of disease pathology can be identified in the sperm that appear to assess disease susceptibility. These biomarkers suggest epigenetic diagnostics could potentially be used to facilitate preventative medicine.