TO WHAT EXTENT AGROCHEMICALS EXPOURE AFFECTS MALE GONADS?

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Introduction

Agriculture practices are recognized sources of pollutants and, according to Horrigan et al. (2012), the most significant anthropogenic activities that greatly affect both environment and human health.
Health effects of agrochemicals exposure on male reproduction are an issue of considerable concern in environmental, occupational and reproductive toxicology (Perry, 2008; Mehrpour et al., 2014), as the testicle is considered one of the most vulnerable organs to agrochemicals (Oliva et al., 2001).
As in Portugal, and in many other countries around the world, agricultural activities are carried out by men, it is important to evaluate the effects of exposure to agrochemicals on male gonads. Thus, the main objective of this study was to clarify the link between different agricultural practices and male fertility.

Methods

The study was conducted in S. Miguel Island (Azores, Portugal), in farms located in the same geological complex, ensuring the same bedrock and pedological conditions. The selected study sites correspond to representative farms subjected to different agricultural practices (conventional and organic); a forest reserve of centennial Japanese cedar (*Cryptomeria japonica*), with no historical records or evidence of farming activity was also included as reference site. Twelve male adult (age estimated by dry crystalline lens mass) and sexually mature wild mice, *Mus musculus,* naturally occurring in these 3 sites, were used as bioindicators for observable effects of testicular damage on a set of histological and cellular parameters. Both testicles were processed for histology, and one set of slides was used for morphometric measurements and for the evaluation of the damage in the seminiferous tubules, and another set was prepared for TUNEL assay to assess the number of apoptotic cells. The liver from each specimen was processed for metal analysis by mass spectrometry with inductively coupled plasma.

Results

Results showed that mice living in farms where conventional agricultural practices are common have a tendency to bioaccumulate greater Pb hepatic loads, while mice exposed to organic agricultural practices tend to bioaccumulate greater Cd loads. Mice chronically exposed to conventional farming environments showed severe alterations in the seminiferous tubules: disorganization of the germinal epithelium, frequent detachment of spermatogonia from the basement membrane, macrovacuolization, reduction of spermatozoa, and a higher number of apoptotic DNA-fragmented cells mainly occurring in spermatogonia and spermatocytes.

Conclusion

The considered testicular damage biomarkers indicated the suppression of testicular function that ultimately may lead to male fertility impairment. These results also demonstrate that *M. musculus* is a suitable bioindicator for male fertility biomonitoring in farming environments, where collected information can be useful for a weight-of-evidence approach in risk assessment decisions.

References

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