

Effects of the pesticide Lindane on granulosa cell ultrastructure

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The excessive exposure to pesticides in the Aral Sea area was correlated to the increased reproductive pathologies in those regions [1]. One of the principal chemical employed was the gamma-hexachlorocyclohexane herbicide Lindane (L), a persistent organochlorine that may induces alterations in granulosa cell (GCs) survival [2, 3]. However, a comprehensive experimental study on the L-induced dose-effect morphological alterations, has not yet addressed. Therefore, we studied by means of transmission and scanning electron microscopy, the morphological changes of mouse GCs, matured in vitro with increasing concentrations of L [4-6].

GCs showed several dose-dependent changes, in respect to controls. In particular, we observed significant reduction of GC microvilli and decrease of cytoplasmic processes between adjacent GCs. In addition, peripheral aggregation of chromatin under the nuclear membrane, extensive plasma membrane blebbing, abundant GC remnants and cellular debris were also present. Mitochondria, endoplasmic reticula and Golgi apparatuses did not show significant changes. In conclusion, our results showed a dose-dependent toxicity of L on GCs, associated to morphological signs of apoptosis. Alterations of GCs may be associated to impaired oocyte competence and sterility [7].

References

- [1] Ataniyazova O et al. (2001) Continuing progressive deterioration of the environment in the Aral Sea Region: disastrous effects on mother and child health. *Acta Paediatr* 90:589-91.
- [2] Li R, Mather JP. Lindane, an inhibitor of gap junction formation, abolishes oocyte directed follicle organizing activity in vitro. *Endocrinology* 138:4477-80.
- [3] Picard A et al. (2003) Effect of organochlorine pesticides on maturation of starfish and mouse oocytes. *Toxicol Sci* 73:141-8.
- [4] Rossi G et al (2006) Mancozeb adversely affects meiotic spindle organization and fertilization in mouse oocytes. *Reprod Toxicol* 22:51-5.
- [5] Palmerini MG et al (2014) Ultrastructure of Immature and Mature Human Oocytes after Cryotop Vitrification. *J Reprod Dev* 60:411-20.
- [6] Martelli A et al. (2009). Blood vessel remodeling in pig ovarian follicles during the periovulatory period: an immunohistochemistry and SEM-corrosion casting study. *Reprod Biol Endocrinol* 7:72.
- [7] Kidder GM, Vanderhyden BC (2010). Bidirectional communication between oocytes and follicle cells: ensuring oocyte developmental competence. *Can J Physiol Pharmacol* 88:399-413.

Keywords

Lindane; sterility; granulosa cells; ultrastructure; mouse.