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Abstract

Neonicotinoids: Agrochemicals with Toxic Impact on Reproductive Functions in Males †

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In general, agrochemicals are compounds used to control weeds and diseases in crops during many agronomic practices, and they have become an essential tool in crop protection [1]. Neonicotinoid pesticides are highly effective against some destructive crop pests, and their occurrence in aquatic ecosystems could represent a relevant risk. Acetamiprid N-[(6-chloropyridin-3-yl)methyl]-N′-cyano-N-methylethanimidamide and thiacloprid (2Z)-3-[(6-chloro-3-pyridinyl)methyl]-1,3-thiazolidin-2-ylidenecyanamide) are especially frequently used agrochemicals, with a wide spectrum of efficacy [2]. Currently, exact knowledge about the impact of neonicotinoid exposure on the reproductive system is limited as well as inconsistent. The scientific environment does not provide a relevant background for solving this problem. The objective of our in vitro study was to examine the potential effect of selected neonicotinoids on mouse Sertoli cells. TM4 cells were treated with experimental doses of acetamiprid (10 to 500 µM) and thiacloprid (7.8 to 500 µM) for 48 hours of exposure. Metabolic activity and cell membrane integrity were examined to determine the potential toxicity. The results of an alamarblue assay revealed that higher experimental doses of acetamiprid (200–500 µM) significantly ($p < 0.0001$) decreased the metabolic activity of exposed TM4 Sertoli cells. A similar tendency was confirmed after thiacloprid exposure when significant ($p < 0.0001$) cytotoxicity started from 125 to 500 µM. The cell membrane integrity, evaluated via a CFDA-AM assay, showed a significant ($p < 0.01$) decrease at 250 or 300 µM followed by significant ($p < 0.001$; $p < 0.0001$) inhibition at 350 and 500 µM of acetamiprid. In the case of thiacloprid, the presented parameter was significantly ($p < 0.01$) inhibited at 125 and 250 µM, while the highest concentrations, 300 and 500 µM, caused significant changes ($p < 0.001$; $p < 0.0001$). Considerably more detailed and systematic research on thiacloprid toxicology is definitely required for a better understanding of the risks associated with reproductive health.

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