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Investigating the potential of Nigella sativa and thymoquinone in salvaging the embryo from effects of toxic paternal exposure to cyclophosphamide

(Article)

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Abstract

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Background: Exposure to cyclophosphamide (CPA) for cancer treatment results in over-production of reactive oxygen species causes oxidative stress thus affecting the DNA in male germ cell inducing sperm defects. Our goal is to assess the potential effects of Nigella sativa extract (NSE) and thymoquinone (TQ) on sperm and embryo quality following fertlization of sperm produced from germ cells which have been exposed to the damaging alkylating effects of CPA. Methods: Thirty male ICR mice were divided into six groups; (I) Vehicle-treated control (normal saline), (II) CPA-only, (III) TQ-only, (IV) NSE-only, (V) CPA followed by TQ and (VI) CPA followed by NSE. Treatment with 200mg/kg CPA and 10mg/kg of both NSE and TQ were given by intraperitoneal injection. Animals were sacrificed at 33 days by cervical dislocation and sperm from caudal epididymis were taken for analysis and in vitro fertilization (IVF) with eggs from untreated female. Fertilization rates and embryo development were monitored for 5 days. The result were analysed by using SPSS 16.Results: TQ and NSE supplementation to CPA-exposed male mice have no significant effect ($p > 0.05$) on the total number of sperm if compared to CPA-only exposed mice. NSE and TQ supplementation have been shown to have significant effect ($p < 0.05$) on the percentage of motile sperm as well as the number of abnormal sperm. Four types of abnormalities of the sperm were found which includes folded sperm, amorphous, banana-like and the head lacking of the usual hook. Finally, the embryo quality shows a significant improvement by the supplementation of TQ and NSE to CPA-exposed male mice ($p < 0.05$). Conclusion: Overall, both NSE and TQ have indicated chemopreventive potential against the cytotoxicity of cyclophosphamide on the reproductive capacity and fertility.

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