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Dietary Inclusion of Black Seed Flour Inhibits Reproductive Alterations via Signal Transduction by Depleting Ectoenzyme, Adenosine Deaminase and Acetylcholine Sterase Activities in Rats Intoxicated with Mixed Environmental Metals

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Abstract: Free-radical scavenging mechanism may limit the clinical application of male reproductive therapies if additional biochemical targets are not provided. Hence, this study investigates the effects of dietary supplementation from black seed flour (D-BSF) on ectonucleotidases (NTPDase and 5'-nucleotidase), adenosine deaminase (ADA) and acetylcholinesterase (AChE) activities including malonaldehyde (MDA) content in testicular cells of rats exposed to Elewi odo municipal auto-battery recycling leachate (EOMABRL). The animals were divided into six groups (n = 8): normal control rats; normal rats treated with 10 % and 20 % D-BSF; rat exposed to intraperitoneal 1 ml of mixed metals (EOMABRL); exposed rats to 1 ml of EOMABRL treated with 10 % and 20 %, D-BSF, respectively; for 14 days. The proximate composition of D-BSF indicated moisture content (8.78 %), protein (23.96 %), fat (38.84 %), ash (3.84 %) and carbohydrate (24.49 %). Additionally, analysis of dietary elements from D-BSF revealed phosphorus (690 mg/100 g), calcium (530 mg/100 g), magnesium (60 mg/100 g), potassium (330 mg/100 g), sodium (13.44 mg/100 g), manganese (2.66 mg/100 g), iron (4.55 mg/100 g) and zinc (5.10 mg/100 g). Furthermore, *in vivo* study revealed that 1 ml of EOMABRL upsurge the testicular MDA content following the exposure. Moreover, the hydrolysis of ATP, ADP and AMP nucleotides as well as ADA and AChE activities were amplified in leachate-exposed rats' testes relative to the control. Conversely, the treatment with D-BSF inhibited the upsurge. We concluded that some possible mechanisms by which D-BSF elicit spermatogenesis could be through inhibition of testicular lipid peroxidation, nucleotides hydrolysis and modulation of purinergic metabolizing enzymes.