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Effect of Dietary Organic Zinc Supplementation on Immunocompetance and Reproductive Performance in Rats

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Abstract : The zinc (Zn) is the second most abundant trace element in mammals and birds, forming structural component of over 300 enzymes, playing an important role in anti-oxidant defense, immune response and reproduction. Organic trace minerals are more readily absorbed from the digestive tract and more biologically available compared with its inorganic salt. Thus, the present study was undertaken on 60 adult female Sprague Dawley rats (275±2.04 g) for experimental duration of 12 weeks to investigate the effect of dietary Zn supplementation from various organic sources on immunity, reproduction, oxidative defense mechanism and blood biochemical profile. The rats were randomly allotted to 30 replicates (2 per replicate) which were in turn randomly allotted to 5 dietary treatments varying in Zn source i.e., one inorganic source (Zn carbonate) and 4 organic sources (Zn-proteinate, Zn-propionate, Zn-amino acid complex and Zn-methionine) so as to supply NRC recommended Zn concentration (12 ppm Zn). Supplementation of organic Zn had no effect on various haematological and serum biochemical constituents compared to inorganic Zn fed rats. The TBARS and protein carbonyls concentration in liver indicative of oxidative stress was comparable between various organic and inorganic groups. The glutathione reductase activity in haemolysate ($P<0.05$) and reduced glutathione concentration in liver ($P<0.01$) was higher when fed organic Zn and RBC catalase activity was higher ($P<0.01$) on Zn methionine compared to other organic sources tested and the inorganic source. The humoral immune response assessed as antibody titres against sheep RBC was higher ($P<0.05$) when fed organic sources of zinc compared to inorganic source. The cell mediated immune response expressed as delayed type hypersensitivity reaction was higher ($P<0.05$) in rats fed Zn propionate with no effect of other organic Zn sources. The serum progesterone concentration was higher ($P<0.05$) in rats fed organic Zn sources compared to inorganic zinc. The data on ovarian folliculogenesis indicated that organic Zn supplementation increased ($P<0.05$) the number of graafian follicles and corpus luteum with no effect on primary, secondary and tertiary follicle number. The study indicated that rats fed organic sources of Zn had higher antioxidant enzyme activities, immune response and serum progesterone concentration with higher number of mature follicles. Though the effect of feeding various organic sources were comparable, rats fed zinc methionine had higher antioxidant activity and cell mediated immune response was higher in rats on Zn propionate.

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