EFFECT OF ZINC SUPPLEMENTATION ON SERUM LEVELS OF CERTAIN ENZYMES IN PIGS

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ABSTRACT

An experiment was conducted to study the effect of zinc supplementation on the activities of certain serum enzymes-alkaline phosphatase (ALP), CuZn superoxide dismutase (CuZnSOD), ceruloplasmin, SGOT and SGPT in pigs. Twenty four crossbred (Hampshire X Assam Local) pigs, 4 months of age were randomly divided into 3 groups (n=8 in each). Control (C) animals were offered basal diet supplemented with AAUVETMIN (Strategic Mineral Mixer) containing 100ppm elemental zinc (NRC requirement). Treatment 1 (T1) pigs were given Calcium Carbonate @1.5 % on DM basis to induce zinc deficiency in addition to the diet offered to control group. Pigs of Treatment 2 (T2) group were offered the same basal diet but supplemented with AAUVETMIN containing 500ppm elemental zinc. The serum ALP and CuZnSOD activity decreased significantly (P<0.01) in T1 group from day 15 (18.49 ± 0.51 KAU/100 ml and 29.67 ± 0.68U/mgHb) of treatment but increased significantly (P<0.01) in T2 group from day 15 (20.39 ± 0.58 KAU/100 ml and 32.32 ± 1.09 U/mgHb) till day 120 (28.91 ± 0.27 KAU/100 ml and 53.32 ± 0.95 U/mgHb) respectively. Serum levels of ceruloplasmin ranged between 85.15 ± 1.86 µg/100 ml and 87.11 ± 1.35 µg/100 ml but did not differ significantly. SGOT and SGPT concentration increased significantly (P<0.01) from day 75 onwards but no alteration was observed in T2 group.

Key words: Zinc, Supplementation, Enzyme, Pig, Serum.

Many changes have taken place in the swine industry during the last few years which have a bearing on mineral nutrition in swine. First of all, the pig has remarkable efficiency to convert dietary amino acids and energy towards formation of lean body tissues. This necessarily demands a reappraisal of the dietary requirement of the pig for various aspects like skeletal needs (Calcium, Phosphorus and Vitamin D), electrolyte needs (K, Na, Cl) and the need of metabolic inorganic cofactors (Trace elements). Secondly, the general practice of confinement rearing has placed a greater constraint on swine nutritionists to provide all of the required elements in the diets beside the supplemental source from pasture. The third major change which has been affecting mineral nutrition of pig is the general adoption of all plant swine diets lacking in many of the essential inorganic elements. These have to be supplemented in biologically available forms to potentiate the desired level of bodily functions to achieve growth and other productive performances. Zinc is little different from some other well known minerals having identifiable functions familiar to us, such as calcium for bone strength and iron for healthy red blood cells etc. However, the zinc has no single clear function, instead performs a number of important biochemical functions in the body. This is due to the fact that because the zinc is an essential component of around 300 enzymes that are involved in a range of biochemical functions within the body. The genesis of the concept of zinc supplementation had come from the fact that zinc is not widely stored in the body, so the diet should have a continuous supply and at the same time there is area specific

1NRC on Yak, Dirang, Arunachal Pradesh. 2 NRC on Pig, Rani, Guwahati. 3 AICRP on Pigs, AAU, Khanapara.
deficiency of specific mineral in the soils of many parts of India. Therefore the present experiment was undertaken to study the effect of supplementation of higher dose of zinc on certain serum enzyme activity.

A total of twenty four numbers healthy and uniform sized crossbred (Hampshire × Assam Local) pigs, 4 months of age were divided in to three groups (n=8) viz. Control, T₁ and T₂. Control group animals were given basal diet supplemented with AAUVETMIN (strategic mineral mixture) containing 100 ppm (as per NRC requirement) of elemental zinc. T₁ group animals were given the basal diet supplemented with AAUVETMIN containing 100 ppm (as per NRC requirement) of elemental zinc and additional calcium carbonate @ 1.5% of DM of diet to induce zinc deficiency. T₂ group animals was given the same basal diet supplemented with AAUVETMIN containing 500 ppm of elemental zinc. The animals were fed with the corresponding diet for a period of four months. Blood samples were collected from anterior venacava at 15 days interval from the day of starting the experiment up to 120 days. Then an amount of the whole blood was used for estimation of CuZn Superoxide dismutase following the method Madesh and Balasubramanian (1998). The rest of the blood was used for separation of serum for estimation of different blood enzymes- alkaline phosphatase (ALP), ceruloplasmin, SGOT and SGPT within 24 hours. Estimation of ALP was estimated by described by Kind and King (1954), SGOT and SGPT were done was done following the method described by Reitman and Frankel (1957) by using commercial kits. Ceruloplasmin estimation was done by the method described by Colombo and Richterich (1964). Results obtained was analyzed using standard statistical methods (Snedecor and Cochran, 1994) analysis of variance followed by post hoc comparison test employing Graph pad prism 4.01 software (Graph pad software, San Diego, USA).

The serum ALP and CuZnSOD activity decreased significantly (P<0.01) in T₁ group from day 15 (18.49 ± 0.51 KAU/100 ml and 29.67 ± 0.68U/mgHb) of treatment but increased significantly (P<0.01) in T₂ group from day 15 (20.39 ± 0.58 51KAU/100ml and 32.32 ± 1.09 U/mgHb) till day 120 (28.91 ± 0.27 KAU/100ml and 53.32 ± 0.95 U/mgHb) respectively. The lowest alkaline phosphates activities in T group support the earlier findings (Luecke et al., 1957; Miller et al., 1965; Prasad et al., 1969) that zinc deficient pig had a lower alkaline phosphatase activity. In the present experiment, it was observed that CuZn superoxide dismutase activity increased along with the days of the experimental period both in Control and T₂ groups. Higher CuZn superoxide dismutase activities in T₂ group that was observed following higher dietary zinc concentration were in agreement with the earlier reports in rat (Ming et al., 2007; Dimitrova et al., 2008) in rhesus macaques (Olin et al., 1995) in goats (Chhabra and Arora, 1993). Serum levels of ceruloplasmin ranged between 85.15±1.86µg/100ml and 87.11 ± 1.35 µg/100ml but did not differ significantly among the different treatment groups. SGOT and SGPT concentration increased significantly (P<0.01) in T₂ group from day 30 (47.14 ± 1.09 U/L and 43.02 ± 1.50U/L) and day 45 (50.59 ± 1.27 U/L and 44.33 ± 1.62 U/L) respectively. The SGPT concentration in T₁ group decreased significantly (P<0.01) from day 75 (41.35 ± 0.29 U/L) onwards but no alteration was observed in T₁ group. The SGOT concentration in T₂ group decreased significantly (P<0.01) from day 75 (41.35 ± 0.29 U/L) onwards but no alteration was observed in T₁ group. The SGOT concentration increased significant (P<0.01) in T₂ group from day 30 up to day 120 of the treatment period. However, non significant higher SGOT values along with advancement of treatment periods was recorded for Control and T₁ groups. The present finding in respect of higher SGOT concentration in T₂ group is in agreement with the earlier finding of Daghash and Mousa (1999) who observed higher SGOT activity in buffalo calves supplemented with higher level of zinc. However, Mandal et al. (2008) observed that there was no change in SGOT activity in calves supplemented with zinc.

REFERENCE


