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Effect of Zinc Supplementation on Serum Biochemistry in Dairy Calves

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INTRODUCTION

Zinc is essential for maintaining health and immunity. They are involved in growth, production and reproduction essential for life, in particular for growth and development. Zinc is a component of metalloenzymes such as copper-zinc superoxide dismutase, carbonic anhydrase, alcohol dehydrogenase, carboxypeptidase, alkaline phosphatase, and RNA polymerase, which affects carbohydrate, protein, lipid, and nucleic acid metabolism [1]. Trace elements are important for functioning of a number of enzymes and proteins which are involved in many physiological, biochemical and metabolic processes. The NRC-recommended level for Zn is 40 ppm in the total diet. Zn should be fed at 40 to 60 ppm in the total diet to maintain an optimal immune system. Zn is inorganic minerals which cannot be converted from other consumed, therefore to be available in fed. Zn deficiencies will delay sexual maturity and may also cause fetal abnormalities. Zn is essential for improving health so mineral supplementation needs to be studied. This study was performed to determine whether zinc supplementation of the diet on serum biochemistry in dairy calves

MATERIALS AND METHODS

This research was carried out at dairy farm in Citapen Ciawi Bogor, and at Laboratory Clinical Pathology of Department Clinical, Reproduction and Pathology, Faculty of Veterinary Medicine – Bogor Agriculture Institute. Six calves were divided equally into two groups (control, and group 1). The dietary, environmental, and husbandry factors were similar in all groups. Zinc 120 ppm was added to concentrate of group 1. No zinc sulfate was added to the diet of the control group. Blood samples were collected from the jugular vein before Zn supplementation (Pre Zn) and the third months after supplementation (Post Zn). Blood was collected without anticoagulant and then put it in a vacutainer or serum tube for more than 30 mins. Then the tube was centrifuged at 3000rpm for 5 mins and the serum was collected. If the serum is not analyzed immediately, the serum should be stored at –20°C. Measurement of serum was using spectrophotometer. Parameters that examined were including alkaline phosphatase (ALP), aspartate transaminase (AST), total protein (TP, globulin (Glb), and albumin (Alb).

RESULTS AND DISCUSSION

Serum biochemistry is a blood test that provides an overview of many of the body's functions. The serum biochemistry profile measures a variety of chemicals and enzymes in the blood to provide very general information about the status of organ health and function. ALP (alkaline phosphatase), AST (aspartate aminotransferase) and protein serum values can help to evaluate information about the liver function. The liver plays important roles. It stores energy from food, makes proteins, and helps remove toxins. The liver function panel is a blood test to check how well the liver is working. This test used to evaluate the liver for injury, infection, or inflammation. ALP levels in serum rise with large bile duct obstruction, intrahepatic cholestasis, or infiltrative diseases of the liver. AST support enzyme leakage resulting from increased cell membrane permeability associated with hepatocellular damage. Albumin is a protein made specifically by the liver. Results of research can be seen in Table 1.

Table 1. The average of serum biochemistry at pre and post Zn supplementation for two groups

Treatment	Parameters	Pre Zn	Post Zn
Control	ALP	170±39 ^{ab}	132±26 ^{a}
	AST	59±5 ^{a}	57±9 ^{a}
	TP	7.80±0.40 ^{bc}	7.20±0.20 ^{ab}
	Albumin	3.67±0.16 ^{ab}	3.90±0.07 ^{bc}
	Globulin	4.13±0.49 ^{cd}	3.3±0.06 ^{abc}
Zn 120 ppm	ALP	200±74 ^{bc}	187±62 ^{ab}
	AST	57±12 ^{a}	60±13 ^{a}
	TP	7.27±0.50 ^{ab}	7.00±0.20 ^{a}
	Albumin	3.58±0.01 ^{ab}	3.76±0.13 ^{bc}
	Globulin	3.75±0.50 ^{bcd}	3.24±0.25 ^{abc}

^{a,b} shows no significant difference between different superscript letters for the same rows (P>0.05)

Statistical analysis indicated that no significant differences were observed among groups for AST, ALP and protein parameters. The concentration of ALP, AST, TP, Glb, and Alb were in a normal range. The result showed that ALP and AST were fluctuated before and after treatment. ALP is found in the liver, bones, intestines, kidneys, and other organs. When the liver is injured or inflamed, levels of AST in the blood usually rise. Total protein and globulin decreased while albumin increased at the end of the observation. There was no significant differences were observed for all parameters. El-Hendy *et al.* [2] reported that in two test groups fed with insufficient zinc diet, globulin and total protein were significantly lower than controls but serum albumin was elevated in those rats fed with the lowest Zn level. Daghash and Mousa [3] reported significant increase of total protein and total globulin in buffalo calves after Zn supplementation over 180 days but albumin did not change significantly. Therefore, the results obtained that no negative effects of high Zn supplementation in feed on serum biochemical parameters.

CONCLUSION

Supplementation of Zn showed that no negative effects on biochemical parameters. The concentration of alkaline phosphatase (ALP), aspartate transaminase (AST), total protein (TP), globulin (Glb), and albumin (Alb) were in a normal range, so supplementation Zn 120 ppm were safe for health in calves.

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P-21 Identification of Avian Influenza Virus Subtype H5N1 Clade 2.3.2.1 from Duck as a Candidate Vaccine to Chicken 104
Suwarno, Nanik Sianita Widjaja, Jola Rahmahani

P-22 Profiles of Red Bood Cell and White Blood Cell of Rat Snake (*Ptyas korros*) 106
Aryani S Satyaningtijas, Hera Maheshwari, Wahyu Aji Al Amin, Fajar S. Nur Hardiansyah

P-23 Distribution of Lysozyme Producing Cells in the Sheep Salivary Glands: Immuno-histochemical Study 109
I Ketut Mudite Adnyane, Wahono Esthi Prasetyaningtyas, Adi Winarto

P-24 Antimicrobial Effectivity of *Mikania micrantha* Leaves Extract Against Penicillin Resistant Positive Gram Bacteria 110
RH Gumelar Yoga Tantra, Usamah Afiff, Siti Sa'diah

P-25 The Potency of Ghrelin and Neuropeptide Y Protein as Materials for Energy Balance Regulate Feed Efficiency of Broiler Chicken 113
Nove Hidajati, Romziah Sidik, Ratna Damayanti

P-26 Proteins Signal Tranducers and Activators Transcription (STAT) 5a and 5b as a Candidate Growth Promoter on Broiler Chicken 115
Anwa Ma'ruf, Kuncoro Puguh S.

P-27 Motion Mode Ultrasonography of Rabbit's Heart during Long-Term Anesthesia 117
Septiana Eka Sari, Rr. Soesatyoratih, Devi Paramitha, Sitaria Siallagan, Deni Noviana

P-28 Effect of Zinc Supplementation on Serum Biochemistry in Dairy Calves 119
Sus Derthi Widhyari, Anita Esfandiari, Agus Wijaya, Retno Wulansari, Setyo Widodo, Leni Maylina

P-29 The Prevalence of Reproductive Disorder on Beef Cattle 121
Surya Agus Prihatno, Sri Gustari, Agung Budiyanto, Erif Maha Nugraha S, Woro Danur Wendo, Dwi Cahyo Budi Setyawan

P-30 Effect of pH on the Stability of Anti Avian Influenza H5N1 IgG from Colostrum of Cows Vaccinated by H5N1 123
Anita Esfandiari, Fajar Kawitan, Sri Murtini, Sus Derthi Widhyari

P-31 The Effect of Pepsin and Trypsin Enzym on Anti H5N1 IgG Titer of Colostrum from Bovine Vaccinated with H5N1 Vaccine 126
Sri Murtini, Fitri Amalia, Anita Esfandiari, Sus Derthi Widhyari

P-32 Erythrocyte Profile of Three Breed Bulls at Balai Inseminasi Buatan, Lembang, West Java 128
Intan Pandini Restu Mukti, Chusnul Choliq, Leni Maylina

P-33 Ecosystems, Aquaculture and Potential Vulnerability to Schistosomes and Food-Borne Trematodes in Fresh Water Wetlands, Myanmar 130
Khin Thet Wai, Kay Thwe Han, Tin-Oo, Aung Ye Naung Win, Su Latt Tun Myint

P-34 Development and Optimization of Indirect ELISA for Detection of Human Antibody against Schistosoma japonicum 131
Fadjar Satrija, DG Noor Syamimi binti Daud, Samarang, Sri Murtini

P-35 Analysis of Community Knowledge and Behaviour to Cysticercosis/ Taeniosis in Kama Village at Jayawijaya Region, Papua 134
Olimince Asso, Inriyanti Assa

P-36 Observation on Temperature of Pork Cooked with Traditional Burning Stones (Bakar Batu) Cooking Technique of Jayawijaya Regency, Papua Province, Indonesia 135
Inriyanti Assa, Fadjar Satrija, Denny Widaya Lukman, Nyoman Sadra Dharmawan

P-37 Cysticercosis in Wild Boar and Domestic Pig in Way Kanan District, Lampung Province, Indonesia 137
Heri Yulianto, Fadjar Satrija, Denny Widaya Lukman, Mirnawati Sudarwanto

P-38 Trichinellosis Prevalence in Pigs in Kupang City, East Nusa Tenggara Province 139
Andrijanto Hauferson Angi, Fadjar Satrija, Denny Widaya Lukman, Mirnawati Sudarwanto, Etih Sudarnika