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Effect of nutritional supplementation on haematological profile of neonatal pig during pre-weaning period

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Abstract
The present study was conducted to know the effect of bovine colostrum based nutritional supplementation to Neonatal Pig on haematological profile during pre-weaning period. A total of 72 number of Large White Yorkshire nursing piglets were utilized. Animals were randomly assigned into 4 equal groups; Group 1 (Control), Group 2, 3 and 4. Weaning was done on day 28. The nutritional supplement containing bovine colostrum, egg yolk, probiotic, zinc oxide, chelated iron, dextrose powder etc. was fed orally twice daily with a gap of 6 hours up to 7 days to the piglet @ 2 ,4, 6 ml/kg body wt./piglet of group 2,3,4 respectively. The control group was not fed any nutritional supplementation. Blood samples of piglets were analysed for Haemoglobin, Packed Cell Volume (PCV), White blood cell (WBC) and Red bold cell (RBC) at 7th, 14th, & 28th day of experiment. The mean±SE of haematological parameters in pre-weaning piglets were in normal ranged in group 2, 3, 4 and control group and significance difference were observed in WBC level on day 14 of pre-weaning. However, overall haematological level at 28th day was in normal range which indicates that supplementation of nutritional supplement during pre-weaning stage did not influence the haematological parameters in pre-weaning pigs.

Keywords: Neonatal pig, nutritional supplementation, haematology, pre-weaning period

Introduction
Among the various livestock species, pig is one of the most important meat producing animals around the world [1]. Growth and survivability of young pigs during pre-weaning period is very crucial for any pig farm. Feeding of young pig is one of the important factors affecting growth and survivability of young pigs [2, 3]. Different techniques and managemental practices were developed in the last few decades to improve the efficiency of pig production system. Many studies have conducted to see the impact of supplementation of bovine colostrum, egg yolk immunoglobins, zinc oxide, probiotics, iron, dextrose powder etc. in weaned pigs. However, there is scanty of information on effect of supplementation of these ingredients in a blended form on performance of neonatal pigs. High mortality rate of neonatal piglets (Within 7 days postpartum), higher incidence of diarrhoea and poor growth during pre and post weaning periods are the major concern in pig husbandry [4]. Prime factors that might be responsible of neonatal mortality are low body energy reserves, poor birth weight, low intake of immunoglobulin immediately after birth and lack of required microclimatic condition for neonates [5] which trigger many haematological changes and further predisposing the piglet to pathogenic organisms [6]. Therefore, continuous monitoring of the health of the pigs becomes crucial. Blood biochemical parameters are routinely used to assess the health of the animals [7]. Efforts are being made to supply extra source of nutrients like bovine colostrum, egg yolk protein, zinc oxide, iron etc. to the neonatal pig especially during the crucial few days of their life.
In view of the above, the present study was planned to compare the health status of young pigs in terms of haematological analysis during pre-weaning period, which were fed the Nutritional supplement.

Materials and Methods
Experimental animals
The study was carried out in the pig units of the livestock farm complex, department of livestock production and management, college of veterinary sciences & Animal Husbandry,

Central Agricultural University, Selesih, Aizawl, Mizoram, India. For the purpose of the present study, 72 number of Large White Yorkshire nursing piglets were utilized. Considering the body weights, all the new born piglets in a litter (litter size 8) were categorized into four groups viz.T_1 (treatment 1), T_2 (treatment 2), T_3 (treatment 3) and C (control) so that each group consist of at least two piglet in a litter. Similarly, new born piglets of eight litters were assigned to T_1, T_2, T_3 and C groups, so that there would be a minimum of 18 numbers of new born piglets per group and have equal average birth weight for all the four groups. The piglets were reared with their dam in the farrowing pen up to weaning (28 days of age), wherein piglets were allowed to suckle mother's colostrum/milk at free choice during the entire study period. Creep area with brooding facility was created inside the farrowing pen to maintain required temperature for the young piglets.

Feeding

The blend of nutritional supplement containing bovine colostrum, egg yolk, probiotic, zinc oxide, chelated iron, dextrose powder etc. was fed orally to the piglet as per the treatment group. Pre-starter rations [8] incorporating conventional feed ingredients along with skim milk powder was provided to the nursing piglets from 10th day of age up to weaning. The nutritional supplement containing bovine colostrum, egg yolk, probiotic, zinc oxide, chelated iron, dextrose powder etc. was fed orally twice daily with a gap of 6 hours up to 7 days to the piglet @ 2 ,4, 6 ml/kg body wt./piglet of T_1, T_2 and T_3 respectively. The control group was not fed any nutritional supplementation.

Collection of blood samples

Blood samples were collected in vacutainers with anticoagulants (EDTA) from the anterior vena cava (Fig.1) by using 5 ml disposable syringes from all pigs under study on at 7th, 14th & 28th day of the experiment. The sample bottle was shaken gently to mix up the blood with the EDTA to prevent clotting. Blood samples of piglets were analysed for important blood haematological parameters like Haemoglobin, Packed Cell Volume (PCV), White blood cell (WBC) and Red blood cell (RBC) by automated blood analyzer.

Data was analysed statistically as per the methods described by Snedecor and Cochran [9].

Fig 1: Collection of blood sample in the piglets

Results and Discussion

The mean ± SE of haematological parameters namely Haemoglobin (Hb), White blood cell (WBC) and Red blood cell (RBC) and Packed Cell Volume (PCV) have been presented in the Table 1.

The blood haemoglobin levels (g %) in pigs at day 7, 14 and 28 ranged from 10.09±0.75 to 12.99±1.32 in treatment group and 9.84±0.62 to 12.85±1.88 in Control group. However, the differences observed were not significant between the treatment and control group. The recorded haemoglobin levels were in the range reported in earlier studies [10, 11, 12]. The differences observed in haemoglobin levels of pigs during different periods within the treatment groups were non-significant. Non-significant differences for Haemoglobin (Hb) were also reported by Boudry *et al*. after daily oral supplementation of 0, 1 or 5 g of colostrum for three weeks in weaning piglets [13]. However Li *et al*. reported that dietary supplementation of ferrous chelate in neonatal piglet's results in significantly increased (P<0.05) Hb concentration in blood during pre-weaning period [14].

The WBC levels (x10^3 cells/µl) in pigs at day 7, 14, and 28 ranged from 7.63±1.13 to 17.13±4.14 in treatment and 6.60±0.97 to 12.37±2.15 in Control group. The blood WBC level of treatment and control groups resembled with the earlier report [11]. Statistical analysis revealed non-significant differences in WBC levels between different treatment and control groups. However at day 14 there was significantly (P<0.05) higher WBC in between T_2 & C and T_3 & C groups, which might be due to supplementation of Bovine colostrum. Significantly higher white blood cell (WBC) count in piglets on day 21 was reported in earlier studies [13], where weaned piglets were given daily oral supplementation of colostrum for three weeks. Besides, in weaned pigs higher WBC count after dietary supplementation of both probiotics (*Lactobacillus acidophilus* & *Pediococcus acidilactici*) was also reported in earlier studies in weaned pigs [15].

Table 1: Mean (± SE) of haematological parameters of LWY piglets under different treatment and control groups

Parameters	Age (days)	Treatment-1 (T_1)	Treatment -2 (T_2)	Treatment -3 (T_3)	Control (C)	F Value
Haemoglobin (g%)	7	12.40±2.59	12.31±1.47	12.99±1.32	12.85±1.88	0.03^{NS}
	14	10.09±0.75	10.73±1.11	12.71±1.09	9.84±0.62	2.01 ^{NS}
	28	10.81±0.57	11.44±0.67	11.16±0.64	11.09±0.52	0.18 ^{NS}
WBC ($x10^3$ cells/µl)	7	7.63±1.13	13.13±2.41	13.81±1.45	12.37±2.15	2.27 ^{NS}
	14	9.51±0.64^{ab}	10.99±1.73^{b}	11.19±1.24^{b}	6.60±0.97^{a}	3.05*
	28	10.27±0.88	17.13±4.14	11.93±0.93	10.34±0.87	2.14 ^{NS}
RBC ($x10^6$ cells/µl)	7	5.56±1.01	5.86±0.67	6.47±0.51	6.13±0.87	0.24 ^{NS}
	14	5.86±0.67	5.33±0.46	5.62±0.32	4.94±0.31	0.73 ^{NS}
	28	5.61±0.26	5.88±0.40	5.86±0.30	5.24±0.48	0.65 ^{NS}
PCV (%)	7	47.64±9.46	47.14±4.69	51.91±4.54	50.10±6.45	0.11 ^{NS}
	14	39.91±2.49	41.90±3.84	43.71±2.28	38.57±2.59	0.62 ^{NS}
	28	42.80±1.22	44.24±2.22	43.57±1.22	38.16±3.60	1.45 ^{NS}

*Significant (P<0.05), and ^{NS} Non Significant, Note: Means bearing at least one common superscript in each row do not differ significantly

The mean ± SE of RBC levels ($x10^6$ cells/µl) in pigs at day 7, 14, and 28 ranged from 5.33±0.46 to 6.47±0.51 in treatment and 4.94±0.31 to 6.13±0.87 in Control group. Statistical analysis revealed non-significant differences in RBC levels between different treatment and control groups which indicates that the nutritional supplement of neonatal piglet did not influence the RBC levels in pigs. Similar findings were reported in earlier studies who performed experiment on weaning pigs after supplementation of bovine colostrum for three weeks [13]. However Dowarah *et al*. reported that dietary supplementation of both probiotics (*Lactobacillus acidophilus* & *Pediococcus acidilactici*) causes higher concentration of the total Red blood cell (RBC) count (P<0.05) in weaned pigs [15].

The mean ± SE of PCV levels (%) in pigs at day 7, 14, and 28 ranged from 39.91±2.49 to 51.91±4.54 in treatment and 38.16±3.60 to 50.10±6.45 in Control group. Statistical analysis revealed non-significant differences in PCV levels between different treatment and control groups which indicates that the nutritional supplement of neonatal piglet did not influence the PCV levels in pigs. Similarly non-significant differences for PCV were reported in earlier studies who performed experiment on weaning pigs after supplementation of bovine colostrum for three weeks [13]. The present finding was in agreement with the earlier reports [11, 16, 17].

Conclusion

Hence, it can be concluded that Oral nutritional supplementation containing bovine colostrums, egg yolk, probiotics, dextrose, zinc oxide and chelated iron during neonatal period (Birth to day 7) at the dose rate of 2 or 4 or 6 ml/kg body weight twice daily didn't have adverse effect on Haematological parameters of young pigs during pre-weaning period (Birth to 28 days of age).

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