



Influence of iron and copper supplementation to advanced pregnant sows on the haematological parameters of their piglets

A S SIROHI¹, M SINGLA², S S NAGRA³ and R JINDAL⁴

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab 141 004 India

Received: 14 October 2010; Accepted: 16 April 2011

Key words: Anaemia, Copper supplementation, Haematology, Iron supplementation, Piglet

Piglets in the modern husbandry practices are born with very low iron reserves and become anaemic if additional iron is not provided parenterally or orally. The young pig uses its own iron reserves along with the iron supplied through mother's milk to meet its iron need but these supplies are normally inadequate. Iron is an integral constituent of haemoglobin while copper is essential for its formation and iron transport (Nazifi *et al.* 2005). The efforts have been made to raise the level of iron in piglets through different means and the most successful results have been obtained with intramuscular injection of iron-dextran in newly born piglets. The present study was carried out to evaluate the effects of supplementation of these elements in advanced pregnant sows on the haematology of their offsprings.

The study was conducted at Pig Farm of the University, Ludhiana. Three Large White Yorkshire sows (first to third parity) were selected randomly and kept individually with litters in farrowing pens having concrete flooring. They were

managed on similar pattern except iron and copper supplementation. The control sow (T₀) was supplemented neither for iron nor for copper. One injection (1500 mg elemental iron) of iron-dextran was administered on 110th day of gestation in T₁ sow, while 3 injections of iron dextran (500 mg elemental iron each) on 106th, 109th, and 112th day of gestation to the T₂ sow. In addition, T₂ sow was supplemented with 2.4 g copper (II) sulphate, pentahydrate through concentrate feed daily for 7 days prior to farrowing. The blood samples were collected in EDTA vials aseptically from cephalic vein on 5th and 8th day of age for estimation of haemoglobin (Hb) and total erythrocyte count (TEC) from 5 piglets, selected randomly from each sow.

All the piglets were injected intramuscularly with 100 mg iron as iron-dextran on the ninth day of age. The data obtained were subjected to analysis as per Snedecor and Cochran (1994).

Haematological investigations revealed that average

Table 1. Mean haemoglobin (Hb) and total erythrocyte count (TEC) in piglets born from the sow supplemented with iron and copper during advanced pregnancy

Parameter	Age (day)	T ₀ (control)	T ₁ (iron supplementation)	T ₂ (iron and copper supplementation)
Hb (g/dl)	5 th	9.00±0.30 ^b	9.56±0.34 ^{ab}	10.16±0.26 ^a
	8 th	8.16±0.38 ^b	9.52±0.33 ^b	10.72±0.34 ^a
TEC (× 10 ⁶ /cu mm)	5 th	3.63±0.40 ^{ab}	3.19±0.24 ^b	4.70±0.41 ^a
	8 th	2.93±0.20 ^b	3.42±0.19 ^b	4.74±0.30 ^a

Means bearing different superscripts within a row differ significantly (P<0.01).

Present address: ¹Senior Scientist, Division of livestock Production systems and Range Management, Central Arid zone Research Institute, Jodhpur 342 003 (e mail: ajaysirohi31@rediffmail.com).

²Assistant Animal Scientist (e mail: mandeep.bank@gmail.com), ³Professor (e mail: snagra52@rediffmail.com), Department of Livestock Production Management; ⁴Professor (e mail: rajeshjindal@gadvasu.in), Department of Veterinary Physiology and Biochemistry.

haemoglobin concentration was higher (P<0.01) in T₂ piglets than that of T₀ at fifth and at eighth day of age (Table 1). On the eighth day of age, Hb concentration was significantly higher in T₂ than T₁. According to Radostits *et al.* (2007) piglets at birth had Hb levels of 9.0–10.0 g/dl. A physiological fall to 4.0–5.0 g/dl occurred in all the pigs, the lowest levels occurring at eighth to tenth day of life. Decrease in Hb concentration during first week of life in T₀ piglets was

attributed to the increase in circulatory fluid and dilution of blood Hb concentration in growing piglets (Peters and Mahan 2008). Average Hb concentration of T₂ piglets was within the physiological limits (reference range 10.0 to 16.0 g/dl). Since, iron and copper both are essential in the synthesis of Hb for developing foeti and after birth, the provision of these elements to advanced pregnant dam helped in maintaining normal values in piglets.

Total erythrocyte count which could be a better index of iron status than Hb (Hannan 1971) was also significantly higher in T₂ piglets at both stages. The reports of various studies conducted to increase Hb and RBCs in piglets through feeding of iron and/ or copper in pregnant sows have contradictory results. Giving oral or injectable iron or copper to sows will not increase piglet stores at birth nor will increase colostrums and milk iron sufficiently to prevent anaemia in neonatal pigs (Kahn 2005). Feeding sow a diet supplemented with 2000 mg iron/kg of diet will satisfactorily prevent iron-deficiency anaemia in the piglets (Gleed and Sansom 1982). The trend in change of Hb and TEC was similar up to eighth day of age in newborn piglets.

The higher Hb and TEC values indicated that the copper supplementation is essential along with iron for maintaining their normal physiological levels and longer survival rate of RBCs. From this study, it was concluded that supplementation of iron and copper during last week of gestation is beneficial for maintaining normal Hb levels and TEC in newborn piglets. This may help in delaying first injection of iron-dextran till the ninth day of age to reduce stress on new born piglets.

SUMMARY

Three Large White Yorkshire sows (first to third parity) were selected randomly and managed on similar pattern except iron and copper supplementation. The control sow (T₀) was supplemented neither for iron nor for copper. One injection of iron-dextran was administered on 110th day of gestation in T₁ sow, while 3 injections of iron dextran on 106th, 109th, and 112th day of gestation to the T₂ sow. In addition, T₂ sow was supplemented with 2.4 g copper

sulphate, pentahydrate through concentrate feed daily for 7 days prior to farrowing. Hb concentration was higher in T₂ piglets in comparison to the piglets of other treatments. The Hb level in T₁ and T₂ was normal but it progressively decreased in T₀ up to eighth day of age. TEC was also higher in T₂ piglets on same age basis. The trend in change of Hb and TEC was similar up to eighth day of age. It was concluded that supplementation of iron and copper during last week of gestation was beneficial for maintaining normal haemoglobin levels and total erythrocyte counts in new born piglets.

ACKNOWLEDGEMENT

Authors thank the staff of the Haematology laboratory of department of Veterinary Physiology and Biochemistry for examination. We also acknowledge the assistance of Mr Ashok Kumar for maintaining the animals.

REFERENCES

- Gleed P T and Sansom B F. 1982. Effects of feeding lactating sows an iron-rich diet on piglet haematology and growth rates. *Veterinary Record* **111**: 136–39.
- Hannan J. 1971. Recent advances in our knowledge of iron deficiency anaemia in piglets. *Veterinary Record* **88**: 181–90.
- Kahn C M. 2005. Management and nutrition. *The Merck Veterinary Manual*. 9th edn. Pp 1895. Merck and Co. INC. Whitehouse station.
- Nazifi S, Rowghani E and Nikoosafat Z. 2005. Studies on the relationship between haemoglobin, copper, ceruloplasmin, iron, and superoxide dismutase activity in blood of Iranian fat-tailed sheep. *Comparative Clinical Pathology* **14**: 114–17.
- Peters J C and Mahan D C. 2008. Effects of neonatal iron status, iron injections at birth, and weaning in young pigs from sows fed either organic or inorganic trace minerals. *Journal of Animal Science* **86**: 2261–69.
- Radostits O M, Gay C C, Hinchcliff K W and Constable P D. 2007. Diseases associated with deficiencies of mineral nutrients. *Veterinary Medicine- A text book of the Diseases of Cattle, Horses, Sheep, Pigs and Goats*. 10th edn pp 1698-1770. Saunders, Elsevier, Philadelphia.
- Snedecor G W and Cochran W G. 1994. *Statistical Methods*. Iowa State University Press, Ames, Oxford and IBH, New Delhi.