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## Hematological and Serum Biochemical Profile of Apparently Healthy Haryana Cattle Heifers in Northern India

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**Abstract:** The 'Haryana' breed of cattle has been proved to be highly adaptable to harsh climatic conditions and resistant to common diseases prevalent in India. In this study, the normal reference values of hematological and serum proteins and other blood biochemical parameters were determined in the heifers of Haryana breed maintained at Instructional livestock farm complex, DUVASU, Mathura, India. A total of twenty four animals were used in this study. Blood was taken aseptically from all the animals and transported to laboratory for hematological and biochemical analysis. The hematological parameters (Hemoglobin, total erythrocyte count, total leukocyte count, packed cell volume) and biochemical parameters (Total protein, total albumin, albumin globulin ratio, urea, creatinine, calcium, phosphorous, calcium phosphorous ratio, AST, ALT) values were statistically analyzed, mean and standard deviations were calculated and set as reference values. This study reported hematological and serum biochemical values which could serve as baseline information for comparison in conditions of nutrient deficiency, physiological and health status of Haryana cattle heifers in India.

**Key words:** Hematological, biochemical parameters, haryana, cattle heifer

### INTRODUCTION

Recently, there is an increasing interest in indigenous breeds of animals for increasing their efficiency in harsh climatic conditions all over the world (Porter, 1991). Many of the indigenous breeds of cattle in India are giving way to the exotic and cross-bred animals. This has led to a situation, where exotic breeds like Holstein Friesian, Jersey and their cross-breds are predominant in Northern part of India, while the indigenous breeds like Haryana and Sahiwal have been reduced to small herds. Haryana breed of cattle is mainly Indian zebu, white or light grey colored, with short horns either horizontal or somewhat longer and curved in bullocks. They are dual-purpose cattle, good milkers and excellent in fast road transport and ploughing work. They are native of Rohtak, Karnal, Hissar, Gurgaon districts of Haryana; Union Territory of Delhi and Meerut, Bulandshahar, Mathura and Aligarah districts of West Uttar Pradesh in Indo-Gangetic plains of India (Jaiswal, 1979). They are medium heavy type (310 and 430 kg) for an average cow and average bull, respectively (Mason, 1996). Milk yield may be up

to 4500 kg of milk per lactation for a well reared cow. Haryana breed getting degraded genetically due to crossing with exotic germplasm. As a result India is losing most of Indigenous breeds like Haryana cattle.

Most of Northern India's grazing area is subject to decline day by day, periodic drought, seasonal dry periods, low-nutrition winter grazing, common livestock diseases (Foot-and-mouth disease, Hemorrhagic septicemia, brucellosis etc.) and other major environment related stress. However, various studies have proved that indigenous cattle like Haryana breed are able to survive in such environmental conditions in comparison to exotic breeds. Now-a-days people including the animal farmers are realizing that in spite of low productivity of indigenous breeds; they have the potential for higher yields provided better management conditions and selective breeding rather than cross-breeding from exotic ones. The importance of determining the haematological and biochemical indices of domestic animals have been well documented and acknowledged (Opara *et al.*, 2006). Hematological and biochemical values of blood can provide baseline valuable information and help in realistic

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evaluation of management practice, nutritional and physiological status of animal and diagnosis of health condition (Osman and Al-Busadah, 2003; Radostits *et al.*, 2006; Jezek *et al.*, 2006; Mir *et al.*, 2008). There is dearth of literature on the hematological and serum biochemical values of the Haryana cattle heifers in northern region of India. To the best of our knowledge, this seems to be the first report of normal hemato-biochemical indices of Haryana cattle heifers in Northern India. This study will therefore will document their hematological and biochemical reference values.

**MATERIALS AND METHODS**

**Animals:** In the present study, a total of twenty four Haryana cattle heifers (approximately 1 year of age) were selected from the herd maintained at Instructional livestock farm complex, DUVASU, Mathura. All the animals were fed the diet as per the recommendations of NRC (2001). On clinical examination, all the animals were approximately healthy and not suffering from any disease or malnutrition.

**Sample collection:** Blood samples were collected aseptically in duplicate from the jugular vein using the vacutainer (BD bioscience). Approximately, 3 mL blood was collected in heparinized vacutainer for haematological studies, while another 7 mL was collected in plain vacutainer. Sample in plain vacutainer was allowed to clot at room temperature for 3 h of collection. Serum samples were separated following the centrifugation at 3000 g for 5 min and stored at -20°C for biochemical studies.

**Sample analysis:** Blood with anticoagulant were used for hematological analysis. For the determination of hematological analysis viz., hemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC), Differential Leukocyte Count (DLC), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC) standard method as described by Feldman *et al.* (2000) was used. Serum concentration of total protein, total albumin, urea, creatinine, Alanine Amino Transferase (ALT), Aspartate Amino Transferase (AST), calcium, phosphorous, magnesium were analyzed by auto-analyzer (Mindray) using the commercial kits provided by Span diagnostic, India. Globulin concentration was determined by the difference between total protein and albumin.

**Statistical analysis:** All the statistical analysis viz. means and standard deviations were performed as per the method given by Snecacor and Cochran (1980).

**RESULTS AND DISCUSSION**

The present article describes the blood composition of the relatively genetically pure indigenous Haryana cattle heifers in northern part of India. The mean and standard deviation of hematological (Hb, PCV, TEC, TLC, DLC, MCV, MCH, MCHC) and biochemical (total protein, albumin, globulin, albumin globulin ratio, urea, creatinine, Alanine Amino Transferase (ALT), Aspartate Amino Transferase (AST), calcium, phosphorous, calcium phosphorous ratio, magnesium) parameters in blood of Haryana cattle heifers in India are given in Table 1.

Metabolic, health, nutritional and physiological status of animal can be detected by analysis and monitoring the blood and other body fluids by the use of clinical pathology and chemistry procedures (Rowlands *et al.*, 1975; Bogin, 1994; Kaneko *et al.*, 1997). Definition of pathologic values is defined as values that deviate from the normal references values (Kaneko *et al.*, 1997) which require the establishment of normal reference values. However, the interpretation of results obtained by the laboratory analysis depends on the reference values of each and every animal species in various geographical and environmental conditions. Since the animals used in the present study were approximately healthy and did not show any clinical signs or pathological conditions, hence can be considered as

Table 1: Average (±SE) hematological and biochemical values of Haryana cattle heifers in India

Parameters	Mean
<b>Hematological values</b>	
PCV (%)	35.17±1.249
Hemoglobin (g dL <sup>-1</sup> )	10.36±0.298
RBCs, ×10 <sup>6</sup> (μL)	7.15±0.660
MCV (fl)	49.18±1.260
MCH (pg)	14.49±0.790
MCHC (%)	29.46±0.960
Total WBCs, × 10 <sup>3</sup> (μL)	8.59±6.220
<b>Percentage distribution of leukocytes</b>	
Neutrophils (%)	51.24±3.760
Lymphocytes (%)	33.14±1.960
Eosinophils (%)	6.94±0.430
Monocytes (%)	7.96±0.580
Basophils (%)	1.06±0.230
<b>Serum biochemical values</b>	
Calcium (g dL <sup>-1</sup> )	7.61±0.090
Phosphorous (g dL <sup>-1</sup> )	6.09±0.140
Calcium: Phosphorous ratio	1.24±0.080
Magnesium	2.68±0.050
Urea (g dL <sup>-1</sup> )	34.26±0.900
Creatinine (g dL <sup>-1</sup> )	0.93±0.030
Total protein (g dL <sup>-1</sup> )	5.34±0.100
Albumin (g dL <sup>-1</sup> )	3.58±0.040
Globulin (g dL <sup>-1</sup> )	1.94±0.310
Albumin globulin ratio	1.85±0.040
Cholesterol (g dL <sup>-1</sup> )	148.54±5.380
ALT	29.58±1.080
AST	66.63±2.380

healthy and the hematological and biochemical profile of these animals can serve as reference values for future use of animals of Haryana breed in India having similar climatic and environmental conditions.

### CONCLUSION

The findings of this study may serve as reference values in which alterations due to metabolic, nutrient deficiency, physiological and health status can be compared for diagnostic and therapeutic purpose in heifers of Haryana cattle breed, which is unique cattle breed adapted to existing climatic, nutritional, environmental and pathological exposures.

### REFERENCES

- Bogin, E., 1994. Handbook for Veterinary Clinical Chemistry. Kodak Publications, USA.
- Feldman, B.F., J.G. Zinkl and N.C. Jain, 2000. Schalm's Veterinary Hematology. Lippincott Williams and Wilkins. USA.
- Jaiswal, P.L., 1979. Characteristics of Cattle and Buffalo Breeds in India. Indian Council of Agricultural Research, New Delhi, India.
- Jezek, J., M. Klopcic and M. Klinkon, 2006. Influence of age on biochemical parameters in calves. Bull. Vet. Inst. Pulawy, 50: 211-214.
- Kaneko, J.J., J.W. Harvey and M.L. Bruss, 1997. Clinical Biochemistry of Domestic Animals. 5th Edn., Academic Press, New York, ISBN-13: 978-0123963055, pp: 932.
- Mason, I.L., 1996. A World Dictionary of Livestock Breeds, Types and Varieties. 4th Edn., CAB International, Wallingford, UK., Pages: 273.
- Mir, M.R., Z.A. Pampori, S. Iqbal, J.I.A. Bhat, M.A. Pal and M.A. Kimani, 2008. Hemato-biochemical indices of crossbred cows during different stages of pregnancy. Int. J. Dairy. Sci., 3: 154-159.
- NRC, 2001. Nutrient Requirements of Dairy Cattle. 7th Edn., National Academies Press, Washington, DC., USA., ISBN: 0309069971, Pages: 381.
- Opara, M.N., K.A. Ike and I.C. Okoli, 2006. Haematology and Plasma Biochemistry of the Wild Adult African Grasscutter (*Thryonomys swinderianus*, Temminck). J. Am. Sci., 2: 17-22.
- Osman, T.E.A. and K.A. Al-Busadah, 2003. Normal concentrations of twenty serum biochemical parameters of she-camels, cows and ewes in Saudi Arabia. Pak. J. Biol. Sci., 6: 1253-1256.
- Porter, V., 1991. Cattle: A Handbook to the Breeds of the World. A and C Black, London, UK.
- Radostits, O.M., C.C. Gay, K.W. Hinchcliff and P.D. Constable, 2006. Veterinary Medicine. 10th Edn., Elsevier Science Ltd., USA.
- Rowlands, G.J., R. Manston, R.M. Pockock and S.M. Dews, 1975. Relationship between stage of lactation and pregnancy and blood composition in herds of dairy cows and the influence of seasonal changes in management on these relationships. J. Dairy Res., 42: 349-362.
- Sneecor, G.W. and W.G. Cochran, 1980. Statistical Methods. Oxford and IBH Publishing Co., Calcutta.