

## CYTOMORPHOLOGICAL STUDIES ON BLOOD CELLS OF SHEEP

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### ABSTRACT

The present study was conducted on ten normal healthy sheep for cytomorphological studies on blood cells. The erythrocytes were non nucleated round in shape and measured  $4.1\pm 0.27\ \mu$  in size. The neutrophils were roughly round in outline and were  $11.2\pm 0.24\ \mu$  in size. The eosinophils were round in shape and were  $14.5\pm 0.26\ \mu$  in size. The cytoplasm contained numerous large size pink granules which were distributed throughout the cytoplasm. The basophils were roughly round in shape and were  $13.6\pm 0.14\ \mu$  in size. The nucleus was indented and placed eccentrically. The cytoplasm was having numerous large violet to purple granules. The small sized lymphocytes were  $8.6\pm 0.27\ \mu$  in size while the medium sized lymphocytes were  $11.8\pm 0.10\ \mu$  in size. The large sized lymphocytes were  $14.9\pm 0.27\ \mu$  in size. The monocytes were the largest in size and measured  $16.2\pm 0.29\ \mu$  in size.

**Key words:** Cytomorphology, blood cells, sheep

The blood examination is performed routinely to assess general health and diagnosis of diseases. It also assesses the body's ability to respond to a hematological insult and monitor the cause of certain disease. Accurate identification of the cells and localization of various enzymes is of great importance in understanding body response to any kind of stress.

### MATERIALS AND METHODS

Ten normal healthy sheep reared at the College of Veterinary Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar were selected to study the cytomorphological characters of different blood cells. Blood was aseptically collected from jugular vein of sheep in a test tube containing EDTA as an anticoagulant (Proescher, 1951). The blood films were stained with May Grunwald Giemsa (MGG) stain for cytomorphological studies (Bover, 1964).

### RESULTS AND DISCUSSION

The erythrocytes of sheep were non nucleated, round in shape and were  $4.1\pm 0.27\ \mu$  in size. The cells stained paler in the center and comparatively darker at the periphery (Figs. 1-6), when stained with MGG stain. Menaka and Singh (2006) also observed that goat erythrocytes had a pale central area. It had been reported that sheep erythrocytes were biconcave lens

like with a mean diameter of  $4.5\ \mu$  (Coles, 1980; Huda *et al.*, 2000). Singh (2000) reported that the erythrocytes of buffalo calves were non-nucleated, circular in outline and were like biconcave disks.

The neutrophils were roughly round in outline and were  $11.2\pm 0.24\ \mu$  in size. The nucleus was lobed having 2 to 7 lobes that varied in size and arrangement. The chromatin material was distributed in the form of light and dark patches. Generally the lightly stained chromatin was placed centrally. The cytoplasm was laden with fine granules that stained light pinkish with MGG (Fig. 1). Brown (1987) reported lobed nucleus in a mature neutrophil with incomplete nuclear constrictions. The nuclear chromatin was dense clumped and plaqued. Singh (2000) observed in buffalo calves that the neutrophils were round in shape and measured  $13.25\pm 0.77\ \mu$ . The nucleus had 2 to 4 lobes of unequal size. The cytoplasm had uniformly distributed fine dust like particles showing poor affinity with MGG. Similarly, Menaka and Singh (2006) reported in goat that nucleus of neutrophils had 3 to 6 lobes of unequal size and were arranged in different fashion.

The eosinophils were round in shape and were  $14.5\pm 0.26\ \mu$  in size. The nucleus was lobed having 2 to 4 lobes of varying size and arrangement. The deeply stained chromatin material was distributed towards the periphery. The cytoplasm contained numerous large size granules that stained pink with MGG and were distributed throughout the cytoplasm (Fig. 2). Dellmann and Eurell (1998) reported that the eosinophils in sheep, goat, cows and pigs had numerous uniform,

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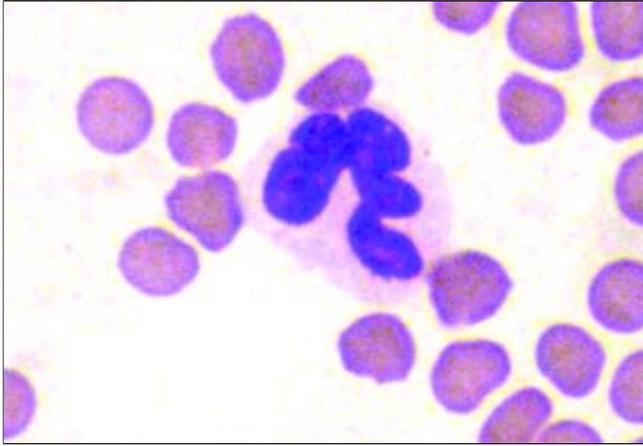


Fig 1. Photomicrograph of blood smear showing neutrophil with light pinkish fine granules. (x 100)

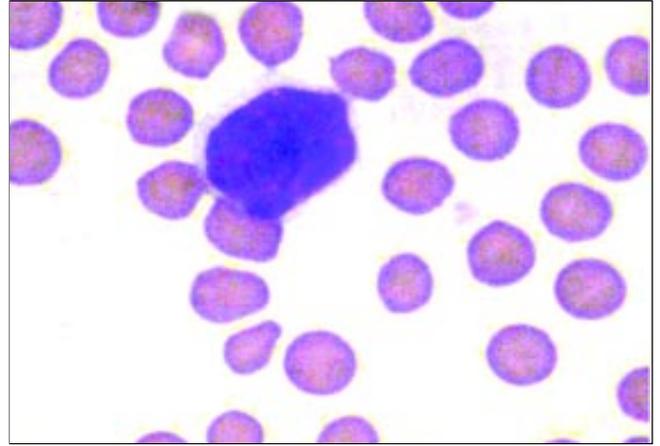


Fig 4. Photomicrograph of blood smear showing small sized lymphocyte having large nucleus surrounded by a thin rim of cytoplasmic fine granules. (x 100)

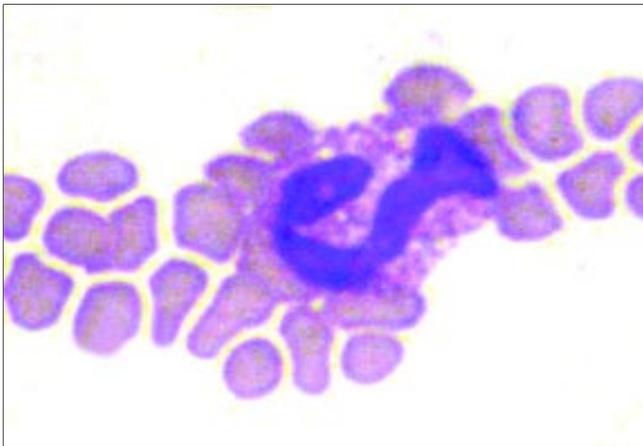


Fig 2. Photomicrograph of blood smear showing eosinophil with larger pinkish granules. (x 100)

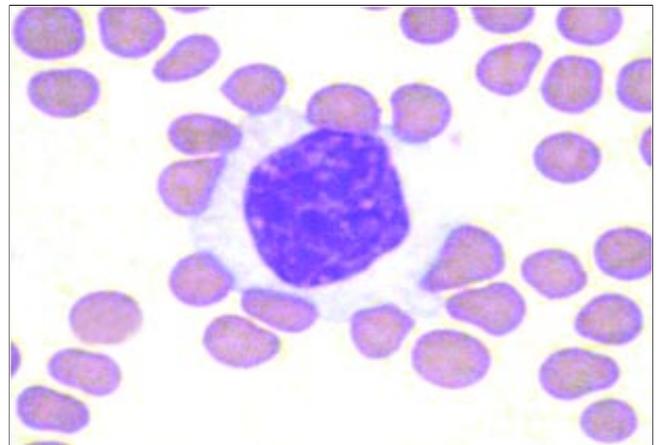


Fig 5. Photomicrograph of blood smear showing large sized lymphocyte. (x 100)

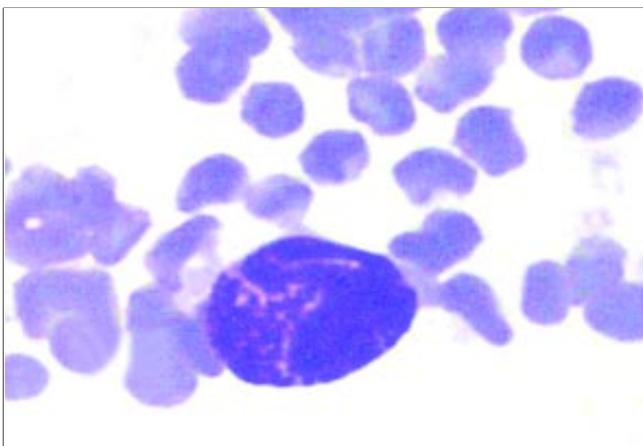


Fig 3. Photomicrograph of blood smear showing basophil with violet to purple granules. (x 100)

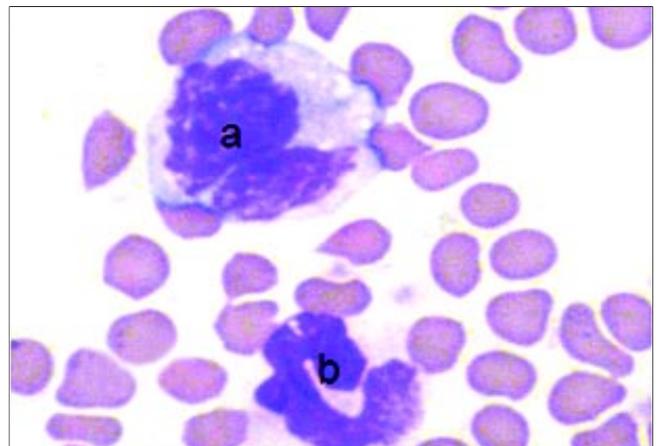


Fig 6. Photomicrograph of blood smear showing monocyte (a) and neutrophil (b). (x 100)

spherical granules and stained bright orange. Eurell and Frappier (2006) stated that eosinophils in sheep, goat, cow and pig had less intensely stained smaller granules. Menaka and Singh (2006) reported that eosinophil cytoplasm in goat was laden with coarse rounded strongly acidophilic granules occupying whole of cytoplasm.

The basophils were roughly round in shape and were  $13.6 \pm 0.14 \mu$  in size. The nucleus was indented and placed eccentrically. The nucleus had predominance of darkly stained chromatin material. The lightly stained chromatin in the form of few patches was distributed in the darkly stained chromatin material. The cytoplasm had numerous large granules obscuring the nucleus. The basophilic granules showed metachromatic properties and stained violet to purple in color (Fig. 3). Jain (1986) reported that the ovine basophils had variable number of dark granules. Singh (2000) stated that the basophilic granules stained reddish violet in color in buffalo calves. Feldman *et al.* (2000) reported that the basophils of sheep, cattle and goat contained numerous, small intensely blue-staining granules which sometimes masked the nucleus. Menaka and Singh (2006) observed that goat basophils' cytoplasm was fully laden with coarse granules which were large, numerous, strongly basophilic and distributed throughout the cytoplasm.

The lymphocytes were round in shape and were of three sizes i.e. small, medium and large. The small sized lymphocytes were  $8.6 \pm 0.27 \mu$  and had a large nucleus surrounded by a thin rim of cytoplasm. The nuclear chromatin was comparatively dense (Fig. 4). The medium sized lymphocytes were  $11.8 \pm 0.10 \mu$  and had comparatively more amount of cytoplasm which stained light bluish in color. The large sized lymphocytes were  $14.9 \pm 0.27 \mu$  in size and had large amount of cytoplasm that stained bluish and these were less in population (Fig. 5). The large lymphocytes had eccentrically or centrally placed nucleus with indentation as reported by Menaka and Singh (2006) in goat. Singh *et al.* (1997) in camel described small and large lymphocytes, which measured  $5.43 \pm 0.76 \mu$  and  $7.21 \pm 0.90 \mu$  in size, respectively. The nucleus of small lymphocytes was uniformly dark whereas the nucleus of large lymphocytes stained less intensely with MGG. Lymphocytes in buffalo calves were round in shape and were of three types depending upon their size (Singh, 2000). The small and large lymphocytes measured  $9.00 \pm 0.46 \mu$  and  $11.25 \pm 0.45 \mu$ , respectively. The nucleus

of large lymphocytes was either eccentrically or centrally placed. The nuclear chromatin of small lymphocytes was densely packed and stained more intensely as compared to large lymphocytes. Few large lymphocytes had small granules in the cytoplasm. Eurell and Frappier (2006) stated that small lymphocytes were  $6.9 \mu$  in diameter, whereas large lymphocytes measured up to  $15 \mu$  in diameter.

The monocytes were round in shape and largest in size and measured  $16.2 \pm 0.29 \mu$  in size. The nucleus was indented and eccentrically placed. The light and darkly stained chromatin was in the form of intermingled patches. The cytoplasm was foamy in appearance due to the presence of large number of vacuoles and stained bluish in color (Fig. 6). Singh (2000) observed that monocytes were round in shape in buffalo calves. The cytoplasm was abundant, stained grey blue and was foamy in appearance. Menaka and Singh (2006) reported that goat monocytes were round in shape and cytoplasm had ground-glass appearance as several vacuoles were observed in the cytoplasm. The nucleus was round or oval in shape and placed eccentrically or in the center of cell.

## REFERENCES

- Bover, G.F. (1964). Atlas of Blood Cytology, Cytomorphology, Cytochemistry and Cytogenetics. (1<sup>st</sup> edn.), Ediciones Toray SA, Barcelona. pp. 5-51.
- Brown, E.M. (1987). Blood and Bone Marrow. Textbook of Veterinary Histology. (eds.), Dellmann, H.D. and Brown, E.M. Lea and Febiger, Philadelphia. pp. 71-99.
- Coles, E.H. (1980). Veterinary Clinical Pathology. (3<sup>rd</sup> edn.), W.B. Saunders, Co., Philadelphia, p. 562.
- Dellmann, H. D. and Eurell, J. (1998). Textbook of Veterinary Histology. (5<sup>th</sup> edn.), Williams and Wilkins, U.S.A.
- Eurell J.A. and Frappier B.L. (2006). Textbook of Veterinary Histology. (6<sup>th</sup> edn.), Blackwell Pub., U.S.A. pp. 61-66.
- Feldman B.F. (2000). Schalm's Veterinary Haematology (5<sup>th</sup> edn.), Lippincott Williams and Wilkins. pp. 1057-1084.
- Huda, M.S., Aboul-Ela, M.B., Yousef, M.K. and Nawal, A. Ahmed (2000). Comparative erythrocytes morphology in camels, sheep and goats during feed and water deprivation. *J. Camel Prac. Res.* 7: 15-28.
- Jain, N.C. (1986). Schalm's Veterinary Haematology. (4<sup>th</sup> edn.), Lea and Febiger, Philadelphia.
- Menaka R. and Singh I. (2006). Cytomorphological studies on the blood cells of goat. *Indian Vet. J.* 83: 68-71.
- Proescher, F. (1951). Anticoagulant properties of ethylene bis-iminodiacetic acid. *Proc. Soc. Exp. Biol. Med.* 76: 619.
- Singh, G., Singh, Y. and Nagpal, S.K. (1997). Cytomorphological studies on the blood cells of camel (*Camelus dromedarius*). *Indian J. Anim. Sci.* 67: 499-500.
- Singh, I. (2000). Light and ultrastructural studies on the blood cells of normal and dexamethasone treated buffalo calves. Ph.D. thesis, CCS HAU, Hisar.