Histological study of granulocytic series in the bone marrow of adult goat (*Caprus Hircus*)

Yahia Dahash Hamdi,[a] Alzubaidi KA,[b] Siraj M Al-Kafagy[b]

[a]Department of Anatomy, Histology and Embryology, College of Veterinary Medicine, University of Al-Fallujah, Al-Anbar, Iraq.
[b]Department of Anatomy, Histology and Embryology, College of Veterinary Medicine, University of Al-Qasim Green, Babylon, Iraq.
Correspondence to Yahia Dahash Hamdi (email: yahia83mwr@yahoo.com).
(*Submitted: 7 June 2016 – Revised version received: 10 July 2016 – Accepted: 14 July 2016 – Published online: 26 September 2016*)

Objectives The aim of this research is to identify and evaluate the cellular granulocytic series of bone marrow in goat that aids to diagnose bone marrow from a variety of clinical disorders in the field of medicine.
Methods Five adult goats were used in this research. These animals are obtained from the Animal's Field in the College of Veterinary Medicine, University of Al-Fallujah.
Results The first indication of the granulocytic series begins from Myeloblast, which possesses eccentric, round or oval nucleus that surrounded by a rim of cytoplasm. The smaller nucleus leads to identify the Promyelocyte. The cytoplasm of Promyelocyte is very light. Definitive granulations appear within the cytoplasm of Myelocyte, which has round to oval nucleus. The elongation of the nucleus indicates the Metamyelocyte. This cell shows the neutrophilic, eosinophilic and basophilic Metamyelocyte. A large segment of a circle or twisted nucleus represent the Band cell. The last stage of granulocytic series is the segmented cell, which is illustrated by segmented neutrophil, eosinophils, and basophils.
Conclusion The developmental process of granulocytopioesis series of bone marrow in goat encompasses a lineage of successive morphological alterations involves nuclear and cytoplasmic changes as well as granule transformation resulting in the production of granulocytes.
Keywords developmental process, granulocytic series, bone marrow, adult goat *Caprus Hircus*

Introduction

The granulocytic sequence in the active bone marrow is confined to the selected areas of bones, such as the flat bones of the head, pelvis, ribs, vertebral bodies, and the ends shift of the long bones. Indeed, the blood cells also produced in the spleen and liver of the fetus.[1,2] In adult, the normal marrow consists of hematopoietic precursors of erythrocytes, granulocyte, some lymphocytes, plasma cells, and few scattered precursor of platelets.[3,4] Generally, hematopoiesis is a complex process in which pluripotent stem cells differentiate and evolves into committed progenitor cells. They in turn proliferate into mature functional blood cells such as erythrocyte, megakaryocytes, monocytes, neutrophils, esinophils, basophiles, T- as well as B- lymphocytes. Thus, hematopoiesis takes place within the bone marrow stromal microenvironment.[5,6]

Materials and Methods

Five adult goats were used in this research. These animals were obtained from the Animal's Field in the College of Veterinary Medicine, University of Al-Anbar. The adult goat weight (23–28) kg. These animals are supplied by ruminates diet supplement with vitamin C. The goats are maintained in a pathogen-free environment and femurs are chosen for bone marrow aspiration and biopsy. The great advantage is that serial examinations showing distinct qualitative differentiation of marrow cells may be obtained from femoral bone. Each goat was anesthetized with a mixture of Xylazine hydrochloride 0.1 mg/kg B.W. and Ketamine hydrochloride 4 mg/kg B.W. intramuscularly.[7] The hind limb was shaved and prepared aseptically with providone iodine. A small incision is made through the skin to facilitate the entering of the needle. The tip of the needle was pushed through the head of the femur until it reaches the shaft of femur. Special syringe is applied to obtain bone marrow aspiration. Syringe is then withdrawn and the marrow expelled onto glass slides. Marrow then spreads between the slide and the resultant smear are rapidly air dried.[8] All smears were stained with Giemsa stain.[9]

Results and Discussions

The granulocytic events or myeloid series begin with the formation of Myeloblast (Fig. 1) which is the first precursor cells formed by uni-potent stem cell that has the capacity to give rise to all the granulocytic cell types. Myoblast is an oval cell; the cytoplasm is pale, light blue green in color and form a complete collar around the nucleus. The round or oval nucleus in which chromatin is evenly distributed and may form a velvety texture to the nucleus. The promylocyte or progranulocyte possess light cytoplasm and had a slightly smaller nucleus (Fig. 2). Small nucleoli may be present and its chromatin forms a meshwork. The Myelocyte can be recognized as neutrophilic, esinophilic, and basophilic Myelocyte (Fig. 3–5). The Myelocyte has a round to oval nucleus. At this stage, the neutrophilic and esinophilic Myelocytes have all the granules or very distinct, but the basophilic Myelocyte has only a few dark purple specific granules. Regardless of cell type, the granule tends to accumulate near one side of the nucleus. The Metamyelocytes are smaller cells; the nuclei tend to be elongated and show a definitive indentation with the absence of nucleoli. The arrangement of the nuclear chromatin appears coarse, with definite clumping. The cytoplasm of Metamyelocytes shows a few granules (Fig. 6). Band cells or stab cells are characterized by neutral cytoplasm

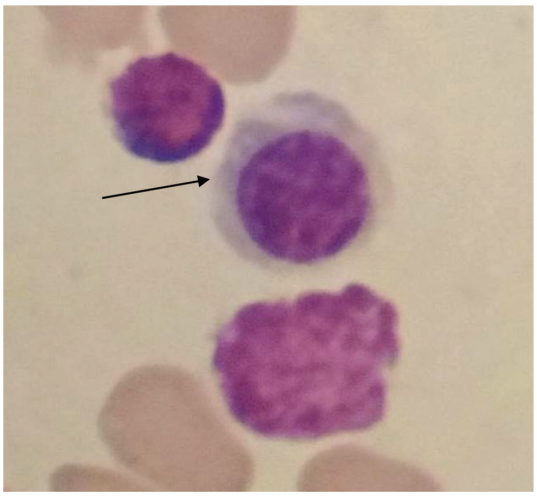

Fig. 1 **Myeloblast (arrow). ×100 Giemsa stain.**

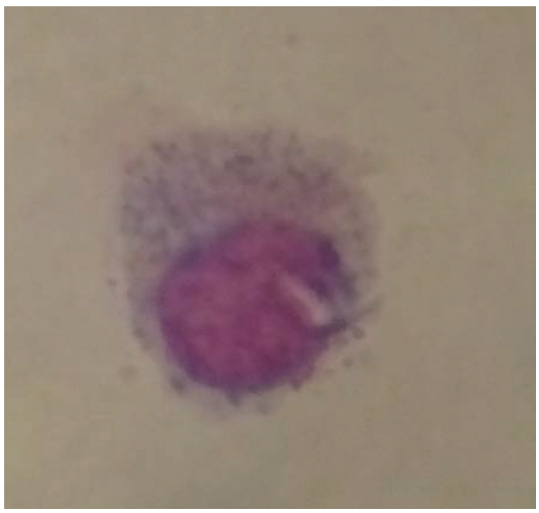

Fig. 2 **Promylocyte. ×100 Giemsa stain.**

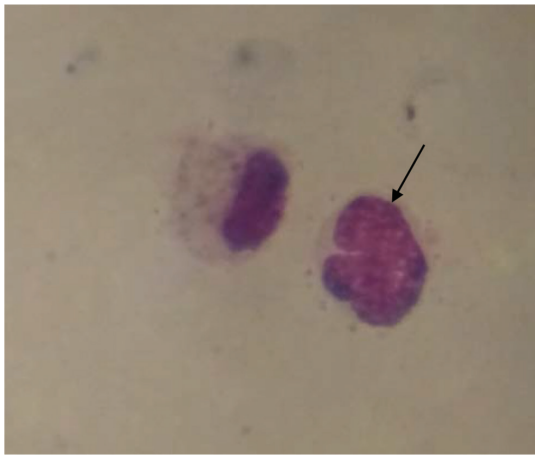

Fig. 3 **Neutrophilic Myelocyte (arrow). ×100 Giemsa stain.**

containing many granules and appear in the form of neutrophilic, basophilic, and eosinophilic band cells. The cytoplasmic granules course and clumped. Their nuclei appear rod shape, kidney-bean shape or in the form of "C" shape of band cell neutrophils (Fig. 7). Band cell can be identified by their own segmented nuclei (Fig. 8). These results were in

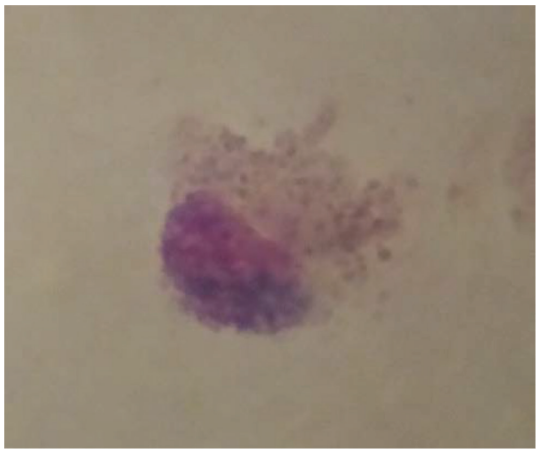

Fig. 4 **Eosinophilic Myelocyte. ×100 Giemsa stain.**

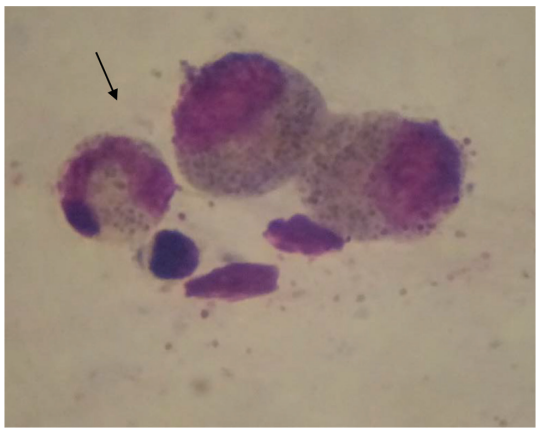

Fig. 5 **Basophilic Myelocyte (arrow). ×100 Giemsa stain.**

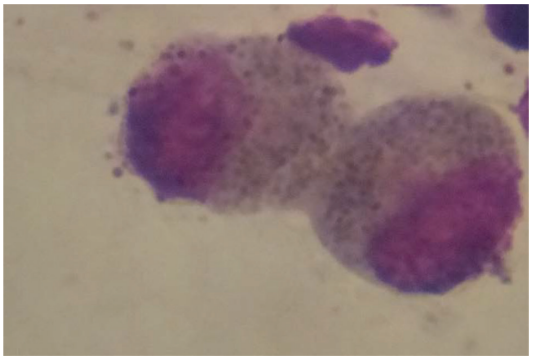

Fig. 6 **Metamyelocytes. ×100 Giemsa stain.**

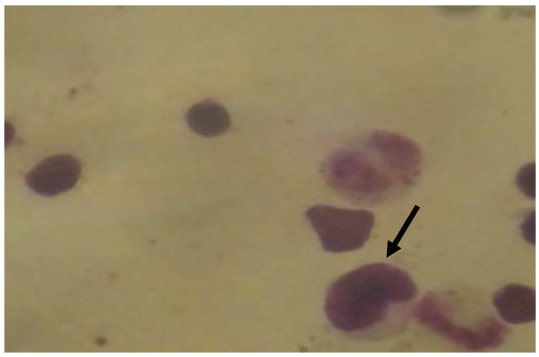

Fig. 7 **Neutrophilic band cell (arrow). ×100 Giemsa stain.**

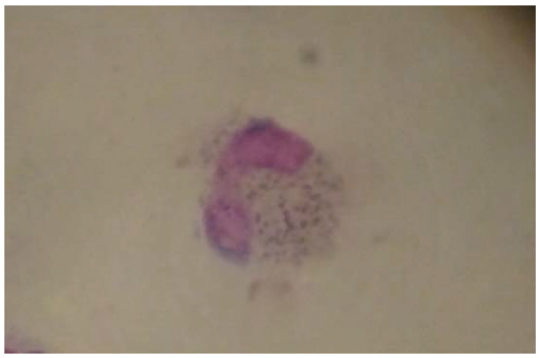

Fig. 8 **Band cell basiophilic. ×100 Giemsa stain.**

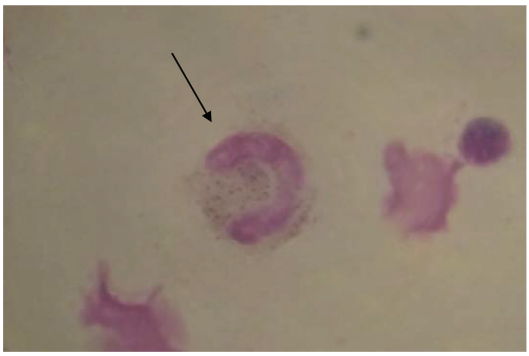

Fig. 9 **Esinophilic band cell (arrow). ×100 Giemsa stain.**

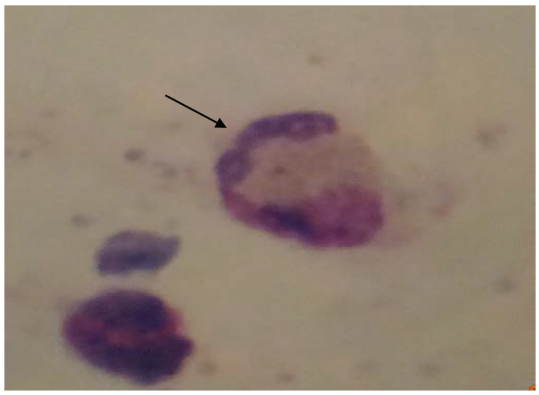

Fig. 10 **Neutrophil (arrow). ×100 Giemsa stain.**

agreement with the previous result.[10] Eosinophilia granules are found in the cytoplasm of eosinophilic band cells (Fig. 9). Their nuclei have two segments or in the form of horseshoes. This result coincides with published report.[11] The segmented cell showed the form of the three granulocytic series, and it

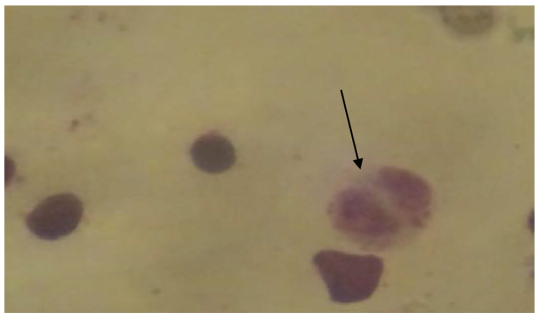

Fig. 11 **Eosinophil (arrow). ×100 Giemsa stain.**

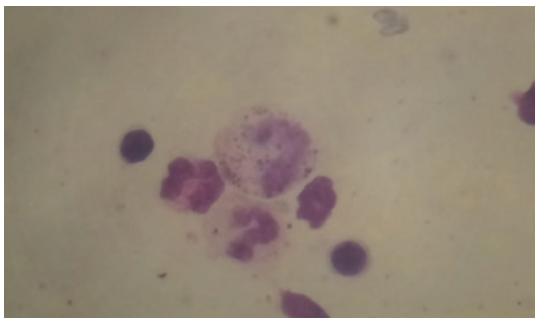

Fig. 12 **Basophil (arrow). ×100 Giemsa stain.**

represented the last stage of myeloid cell maturation the neutrophil has a segmented nucleus, possess three to five nuclear lobes joined by short chromatin filaments (Fig. 10). The multilobulated nucleus shows a densely packed chromatin. The eosinophilic segmented cells possess two nuclear lobes (Fig. 11). The nucleus of basophilic-segmented cell may appear as S-shape or consists of multiple lobes (Fig. 12). These marked results in this research were compatible with[12] and with.[13] Medical researcher[14] registered that the granulocyte undergo many stages in the granulocytic event but they did not mention the segmented cells in their events.

Conclusion

The developmental process of granulocytopioesis series of bone marrow in goat encompasses lineage of successive morphological alterations involves nuclear and cytoplasmic changes as well as granule transformation resulting in the production of granulocytes. The earliest recognizable progenitor of this granulocytic series were the myeloblast. The daughter cells of myeloblasts were the promylocytes, followed by myelocytes, metamyelocytes, band cells and segmented cells. ■

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