HISTOLOGICAL STUDY OF ERYTHROID LINEAGE IN THE BONE MARROW OF LOCAL ADULT GOAT *(Caprus Hircus*)

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ABSTRACT

This study was conducted to investigate the normal maturation process of erythriod lineage in bone marrow of adult Iraqi goat. Five healthy adult male goats aged 26-34 months were chosen for this study. A simple technique used for obtaining marrow from goats, employs sedation xylazine hydrochloride 0.1 mg/kg body weight. Skin incision was made over the iliac crest. Marrow was aspirated with a syringe and smears were made directly. Erythropoiesis in the bone marrow of an adult goat included a successive morphological alteration resulting in production of erythrocytes. The lineage of erythroid of bone marrow of adult goat comprises; Rubriblast , Prorubricytes, Rubricytes, Metarubricytes, and Reticulocyte. The final cellular lineage of the erythropoiesis bone marrow of the goat was the formation of non-nucleated erythrocytes.

Key words: Erythroid, Bone Marrow, Goat.

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دراسة نسجيه لحوادث تكون الخلايا الحمر لنقي العظم في الماعز البالغ المحلي (*Caprus Hircus*)

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المستخلص

اجريت هذه الدراسة لمعرفة المراحل الطبيعية لتكون الخلايا الحمر في نقي عظم الماعز العراقي البالغ . خمسة من ذكور الماعز المحلي البالغ استعملت لهذة الدراسة وكانت خالية من اي مرض. تقنية الحصول على نخاع العظم من الماعز، وذلك باعطاء الحيوان زيلازين هيدروكلوريد 0.1 ملغم/ كغم من وزن الجسم ثم إجراء شق الجلد على الفور فوق الحرقفة. وتم سحب النخاع بواسطة محقنة ويتم إجراء مسحات النخاع مباشرة .تشمل حوادث تكون الخلايا الحمر لنقي العظم في الماعز المحلي البالغ سلسلة متعاقبة من التغيرات الشكلية التي تؤدي إلى إنتاج الخلايا الحمر. تشمل هذه الحوادث المتعاقبة لتكون الأورمات الحمر: تتكون الوحدة التشريحية لانتاج الحمر من الاورمات الحمراء الاورمة الحمراء القعدة، الاورمة الحمراء متعددة الالوان، الاورمة الحمراء السوية، الاورمة الحمراء الشبكية. المرحلة الاخيرة لحوادث تكون الخلايا الحمر لنقي العظم في الماعز هو تكون خلية حمراء عديمة النواه.

الكلمات المفتاحية:- الكريات الحمر، نقي العظم، الماعز.

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INTRODUCTION

Bone marrow is a soft tissue, which occupies the medullary cavity of the long bones; the larger haversian canals and all spaces between the trabeculae of spongy bone. It consists of a delicate reticular connective tissue in the meshes of which lie various kinds of cells (12). Two varieties of marrow are identified ; red marrow and yellow marrow. Red marrow is the only type found in fetal and young bones. Yellow marrow consists mainly of fat cells. With an adequate stimulus, yellow marrow may assume the character of red marrow and play an effective role in this process of blood development (9). Therefore, the bone marrow is the most important organ comprises various cellular elements of the hematopoietic tissue. Bone marrow histology has remained a matter of hematologist, anatomic, and clinical pathologist (1). The object of the present study was to learn the normal maturation process of erythroid lineage in adult goat. This study was planned due to scant information concerning goat bone marrow and these aids in diagnosis of hematopoietic system diseases

MATERILAS AND METHODS

Five healthy adult male goats aged 26-34 months with weight 24-33 kg. were chosen for this study. The goats belong to College of Veterinary Medicine. Physical examinations of goats were done before performing bone marrow aspiration. All clinical parameters were within normal limits and none of these animals were subjected bone marrow aspirations before. The hair was clipped, shaved and the skin of each goat was aseptically prepared using iodine and alcohol. Before the procedure, each goat was sedated with xylazine hydrochloride 0.1mg/kg B.W (13). A small skin incision was made immediately over the iliac crest. This incision should be made to facilitate entry of the biopsy needle. The biopsy needle was inserted perpendicularly into the skin incision and entered with gentle force and rotary to – and – fro motion into the bone. Slightly suction was applied to the syringe and was discontinued as soon as marrow appeared in the syringe. No anticoagulant was used in the syringe, and smear was prepared within few seconds after bone marrow aspiration because marrow clot rapidly. The marrow was put onto glass slides and smeared between another glass slide. These samples were stained with Giemsa stain and Wright stain (6). Photographs of examining slides were carried out with an optic microscope, which was supplied with a digital camera with resolution power of two mega pixels. Closely packed or damaged cells were avoided in this examination

RESULT AND DISCUSSION

Erythropoiesis was the proliferation and progressive differentiation of hematopoietic stem cells into hemoglobinzed red blood cells. Therefore, it was necessary to identify the bony structure for the intention of describing the hematopoietic tissue. Trabecular bone comprises the basic structural units of haemopoiesis, (Fig.1). The trabeculae, arterioles, and venules form the structural framework around which granulopoiesis develops. Erythropoiesis and Megakaryopoiesis occur in opposition to the fine, branching sinusoids. This information was also supported by Travlos (12) and Kuter et al., (9). The bone marrow stroma consists of a heterogeneous mixture of adipocytes, fibroblast, and macrophage – like cells together with a complex extracellular matrix (Fig.2). Indeed, the trabecular and the vascular architecture of medullary bone provides the basic framework, nutritional supply, and waste removal system for haemopoiesis, but specialized support of the self – renewal and differentiation of haemopoietic precursor were provided by bone marrow stroma. This is compatible with Bonnet (2), Darr and Benvensity (4) whom they observed that the reticulin, binding proteins, including fibronectin and haemonectin, and proteoglycans together with adipocytes, fibroblast, and macrophage – like cells from the marrow stroma. Based on morphological characteristics, the stages of erythropoiesis in the bone marrow of gout included; rubriblasts, prorubricytes, rubricytes, metarubricytes, reticulocytes, and mature red blood cells. Rubriblast (Proerythroblast, Pronormoblast) was the earliest precursor of the erythriod cells. Rubriblast (Fig.3) was a large cell with the deeply basophilic cytoplasm; a rounded, centrally located nucleus; finely granulated but deeply staining nuclear chromatin; and one or

more prominents stainined nucleoli. Rubriblasts undergo a series of different steps that result in a progressive decrease in cell size, a gradual increase in cytoplasmic hemoglobin concentration, and gradual condensation of nuclear chromatin. This in agreement with view of Kaushansky (8) and Wojchowski et al., (14). The prorubricyte (basophilic erythroblast, basophilic normoblasts) was similar to rubriblast except it does not contain a nucleolus. Prorubricyte possess more abundant cytoplasm than that of rubriblast. These cells have round nuclei contain slightly more coarse chromatin (Fig.4). This identification was also mentioned by Dellman and Carithers (5). Subsequent stage was called Rubricyte (polychromatophilic erythroblast, polchromatophilic normoblast), which was smaller than prorubricyte (Fig.4). Rubricyte cytoplasm stains blue to blue-pink. Rubricyte have smaller nuclei with very coarse chromatin. This result was in agreement with Chasis and Mohandas (3). The most mature cells of erythroid series were the Metarubricytes (Orthrochromatotic erythroblast, Orthrochromatotic normoblast) whose cytoplasm stained red-orange. These cells still contain small dark and dense nuclei (Fig.5). This was in contrast to Travassoli and Crosby(11) whom reported that basophilia of the cytoplasm of the metarubricyte was decreased and the amount of hemoglobin increased and in this case the cytoplasm stained acidophilus, reticulocytes (polychromatophilic erythrocyte, diffusely basiophilic erythrocyte), they contain cytoplasm stained light blue or gray in color (Fig.6). Reticulocytes were large nucleated cells. This was in accordance with Noble et al. (10) whom also declared that nuclear expulsion from reticulocytes was associated with changes in intermediate filament and microtubules that result in the rearrangement of the membrane cytoskeleton. Extruded nuclei were rapidly ingested by bone marrow macrophages. The stress reticulocyte were released from the bone marrow during times of erythropoietic stress and these cells were larger and less mature than normal reticulocytes. This description of cells are in agreement with finding of Jain (7).

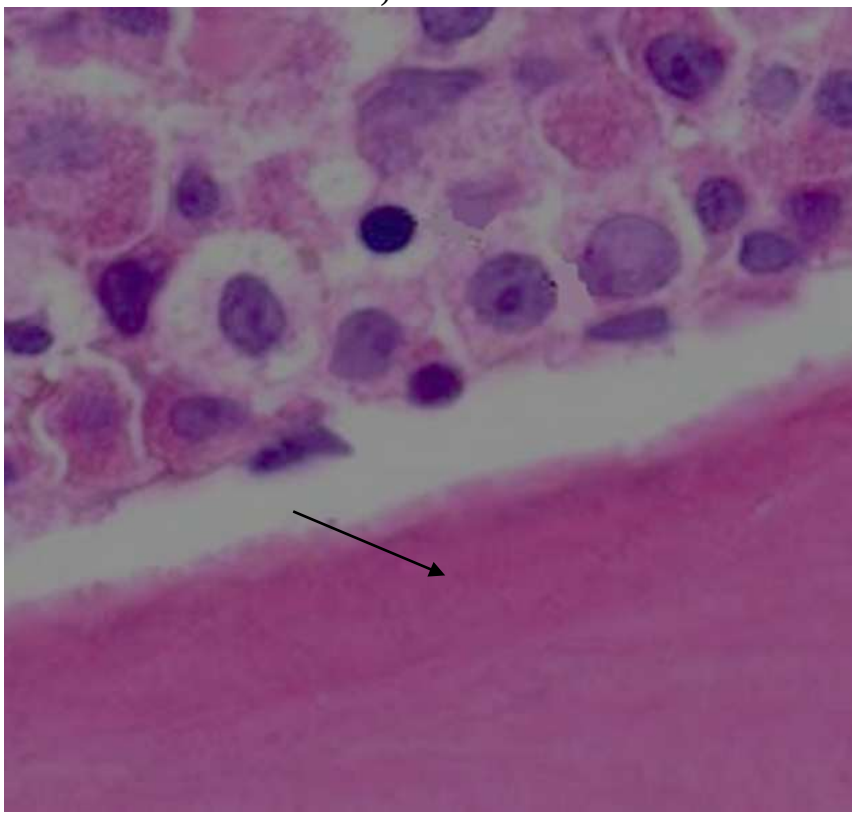

Fig.1 shows bone trabecula (arrow). Wright stain X100

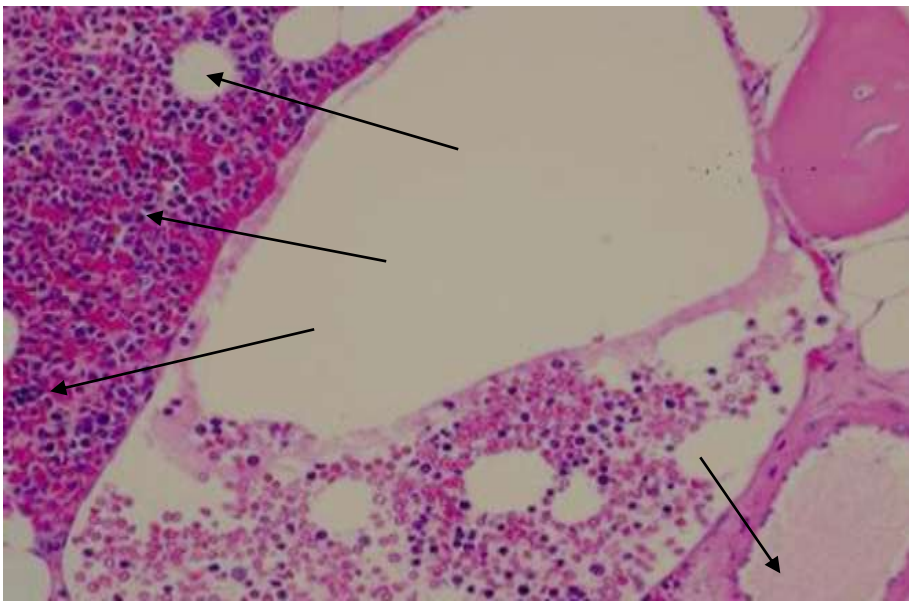

Fig.2 shows a- adipocyte b-sinsoid c-hematopoitic cell and d-macrophage. Wright stain X100

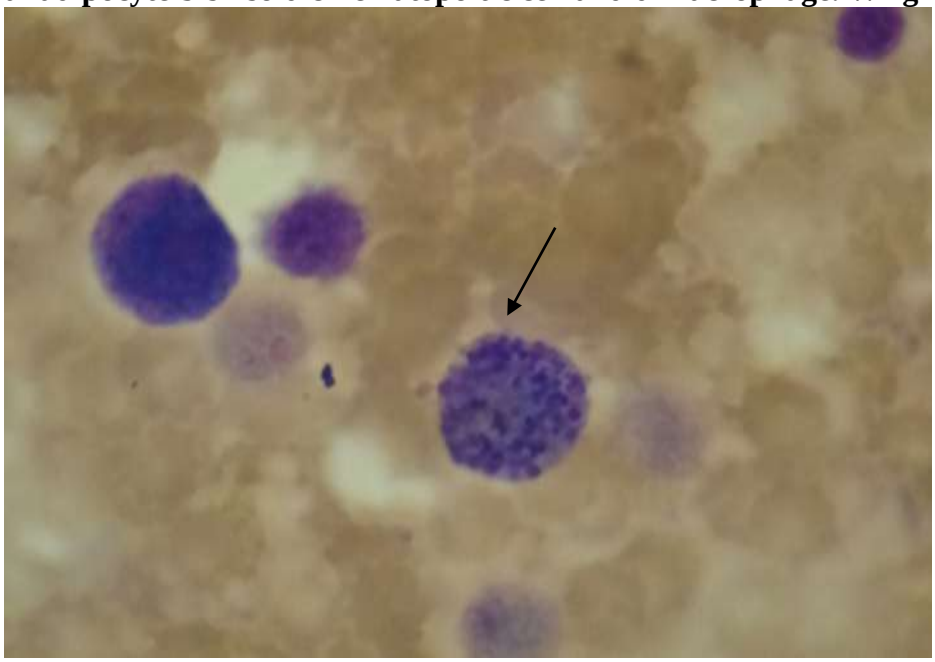

Fig.3 shows Rubriblast (arrow). Giemsa Stain X100

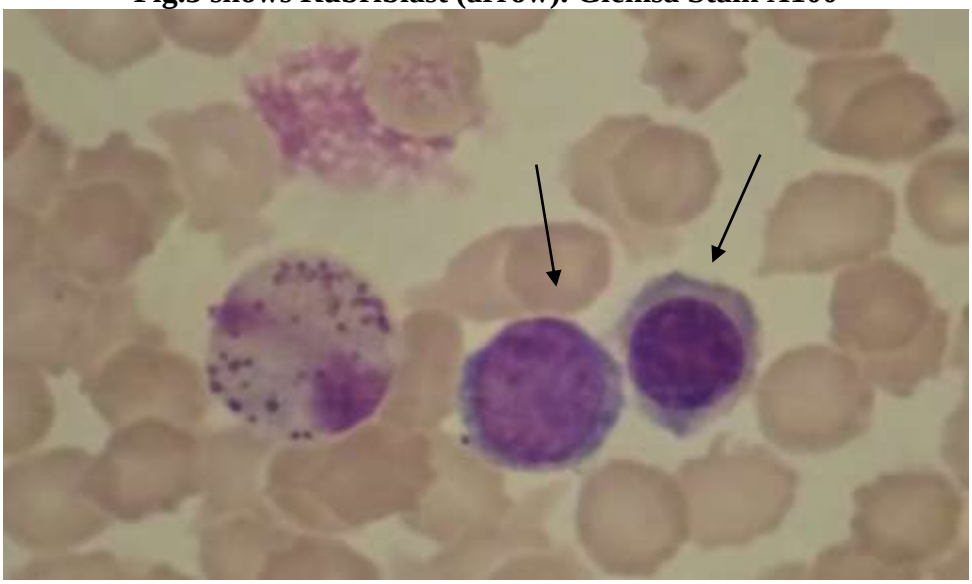

Fig.4 shows a- Prorubricytes . b- basophilic rubricytes. Giemsa Stain X100

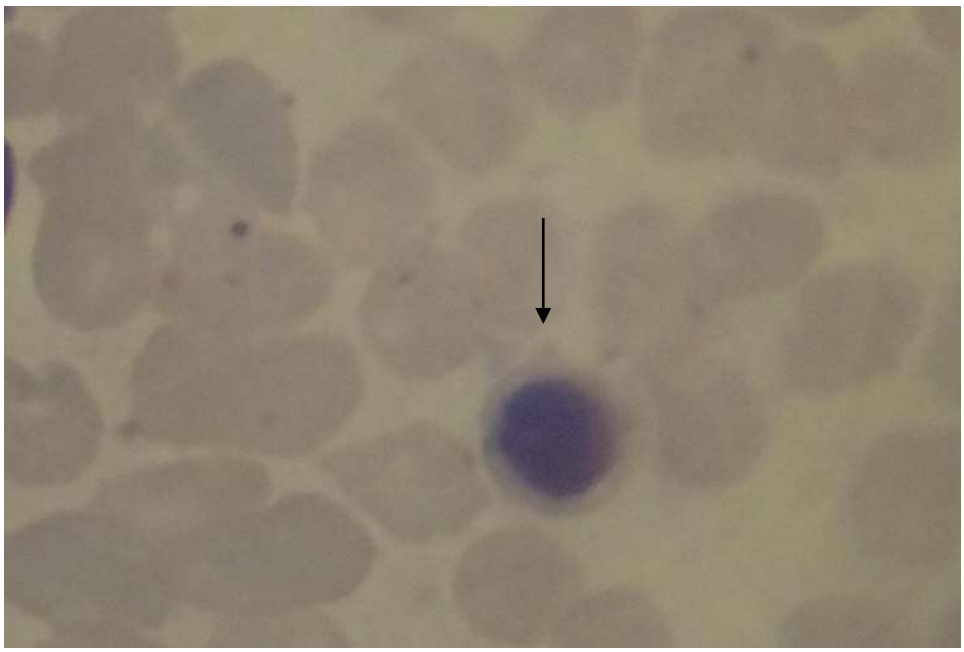

Fig.5 shows Metarubricytes (arrow). Giemsa stain X100

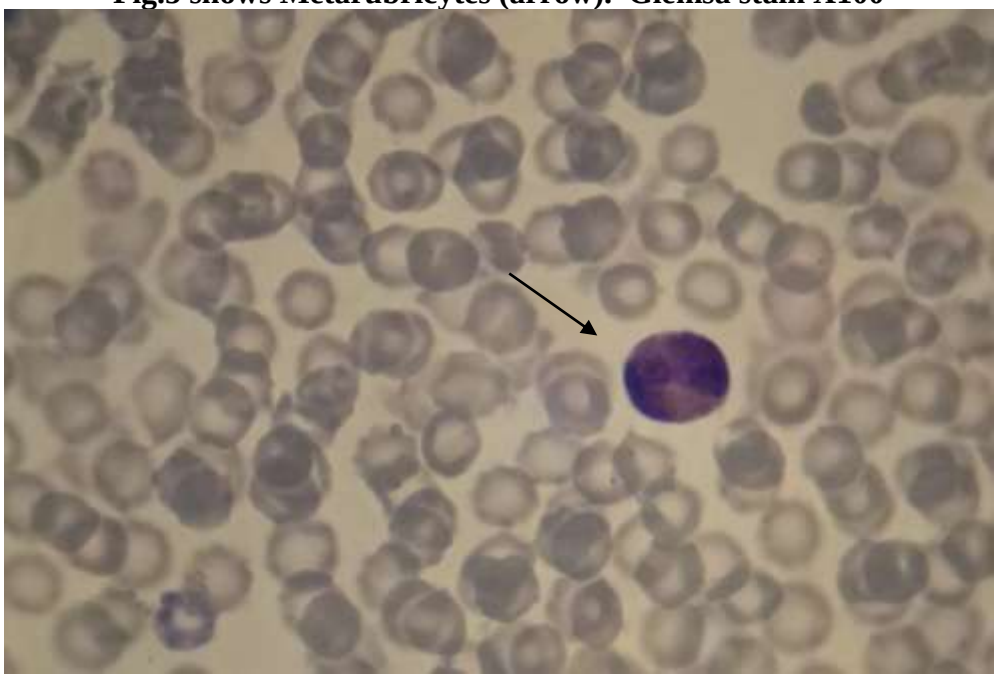

Fig.6 shows Reticulocyte. Giemsa stain X100

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