Morphometry and Comparison of blood samples in sheep and goat

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Abstract

Ten blood samples were collected from jugular vein of healthy sheep and goats. These are normal physiological condition and good nutritional status in Salah Al-Deen Governorate (Balad, Samaraa, Alalam). After complete collection of anti coagulated samples transfer immediately in to laboratory for evaluation of red blood cell number, haemoglobin concentration and red blood cell diameter, by using hemolyzer. For examination of haemoglobin concentration. Haemocytometer used to examine red blood cell count and microscope supported with camera used to measure red blood cell diameter. After complete evaluation of these, the results showed the diameter of sheep red blood cells larger than goat are about 1.98um diameter large than goat and sheep contain large amount of haemoglobin than goat approximately 23.2mg/dl Hb. Sheep more than in goat and goat has large number of red blood cell than sheep. In comparison with normal physiological activity such as respiratory rate which more in goat 90 breath/min, and less in sheep 75 breath/min. The results showed small diameter of red cells and low concentration of haemoglobin in goat. For this reason require to make respiratory rate high than sheep to maintained sufficient amount of gas exchange. The present study was designed to demonstrate the morphometric and histological comparison of the blood samples between the sheep and goat.

Keyword: Morphometry, Comparison, blood, sheep, goat.
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قياسات شكلية ومقارنة لعينات الدم في الأغنام والماعز

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الخلاصة

عشر عينات من الدم قد تم أخذها من الوريد الوداجي لأغنام وماعز سليمة وبصحة جيدة والحالة الفسلجية والتغذية أيضا جيدة حيث تم أخذها من محافظة صلاح الدين (بلد، سامراء، العلم) العينات المأخوذة وضعت مع مضاد التخثر ثم نقلها إلى المختبر لتقييم أعداد كريات الدم الحمراء، تركيز الهيموغلوبين وأقطار كريات الدم الحمراء واستخدم في ذلك جهاز حل الدم لفحص تركيز الهيموغلوبين. استخدم جهاز العد الخلوي الدموي لبيان أعداد كريات الدم الحمراء واستخدم المجهر المثبت عليه الكاميرا لقياس أقطار كريات الدم الحمراء. بعد إجراء التقييم الكامل لهذه القياسات بينت هذه النتائج ان أقطار كريات الدم الحمراء في الأغنام اكبر مما في الماعز واحتوت على هيموغلوبين اكثر حيث بلغت 1.98 مايكروميتر وكمية الهيموغلوبين 23.2 ميليغرام لكل 100 مل هيموغلوبين. في الماعز كريات الدم الحمراء كانت اكثر عددا واقل قطرا مما في الأغنام وهذا يدل على ان النشاط الفسلجي الطبيعي كمعدل التنفس اكثر في الماعز

مما في الأغنام حيث بلغ 90 شهيق لكل دقيقة بينما في الأغنام بلغ 75 لكل دقيقة. بينت النتائج بشكل عام ان أقطار كريات الدم الحمراء وتركيزها للهيموغلوبين اقل في الماعز لهذا السبب تطلب زيادة معدل التنفس اعلى مما في الأغنام للحفاظ على معدل وافي من التبادل الغازي.

الكلمات المفتاحية: قياسات شكلية والنسيجية، الدم، الأغنام، الماعز.

Introduction

Erythrocytes or red blood cells (RBCs) provide the body organs with oxygen transport, carbon dioxide transport, and buffering of hydrogen ions (1).The typical RBCs shape for multiple veterinary species is disc or biconcave disc (discoid) resulting in a high surface area to volume ration making the red blood cells deformable. Central pallor can be observed to variable degrees in these species on examination of a peripheral blood smear (2, 3). Ovine red blood cells are some what smallest than mammalian RBCs, has a width of 3.2-5µm and lifespan 70-150 days (4, 5), they do not aggregate or deform as readily as erythrocytes of other species (6). Caprine red blood cells are generally discoid with 2.5-3.9µm of width and lifespan of 125 days. The disc shape of the red blood cell facilitate gas exchange which is may be because more hemoglobin molecules are closer to the plasma membrane than they would be in spherical cell (5, 7). Hemoglobin is highly specialized intracellular protein responsible for transporting oxygen from tissue to the lung. Hemoglobin occupies approximately 33% of the volume of red blood cell also Golgi apparatus, centrioles and mitochondria diminishes. 60% of red blood cell volume consist of water and 40% composed of solids nearly 90% of solid material is conjugated protein composed globin and pigment hem (7, 8). Normal blood cell diameter in sheep 4.5 µm while in goat 2.5 µm. Normal red blood cell number in sheep is 10- 15 million/dl while in goat 10-18 million/dl and the normal red cell hemoglobin concentration in sheep 15 g/dl while in goat 15 g/dl (9). Thus, the purpose of the present study was to determine the red blood cell diameter, number of red cell and hemoglobin concentration in both males sheep and goat within the area of study.

Materials and Methods

Haemocytometer for counting (red blood cell) which consist of pipette and cell 33333 counting chamber 2. Micropipette, slides. Anticoagulant tubes and ethanol alcohol (to make blood film). Giemsa dye for staining the blood smears. Microscope with calibrated ocular micrometer and supported with camera to measurement of RBC diameter.

- **Blood Film Method:** Sample of blood were collected from jugular vein by disposable syringe and put in the plan tubes contained EDTA. A clean glass slides were used and a drop of blood was placed on one end of the slide this slide held in place with one hand and the end of the second glass slide was used to spread the blood drop on the first slide, 30 degree angle in front of the drop of blood. The blood smear left 5 min. for drying.
- **Method determination of RBC number:**

1. Carefully blood drawn to the 0.5 mark of pipette.
2. An isotonic solution drawn to mark 101 and mixed and then discharged in to chamber.
3. Count RBC in five squares in centre of the counting chamber and multiplied by 10.000 (10).

First five sample measured by counting haemocytometer and other five samples measured by hemolyser. Methods of haemoglobin determination are many and varied such as oxyhemoglobin method, cyanmethaeogobine method, direct matching method. Also hemolyser apparatus. The method which was choice in the determination of haemoglobin concentration is by hemolyser apparatus (10).

Results

Table (1) shows the diameter of red blood cells in sheep.

Table (1) data of sheep red blood cells diameter(µm)

Sample No.	First measure	Second m.	Third m.	average
1	5.60	6.47	5.40	5.82
2	6.40	5.20	6.44	6
3	4.17	4.13	4.30	4.2
4	4.67	5.55	5.30	5.17
5	5.20	5.55	6.13	5.62
6	4.88	4.70	5.53	5
7	5.20	4.43	5.53	4.9
8	5.20	4.17	4.53	4.3
9	6.17	5.33	6.11	5.87
10	6.32	5.47	5.88	5.89

Table (2) shows the mean values of the diameter of goat red blood cell.

Table (2) data of goat red blood cell diameter(µm)

Sample no.	Mesur1	Measure 2	Measure 3	average
1	3.90	3.17	3.	3.37
2	3.44	4.17	3.87	3.82
3	3.25	3.70	3.12	3.35
4	2.97	2.84	3.16	2.99
5	4.15	3.78	3.92	3.59
6	2.98	2.83	3.14	2.98
7	2.70	3.33	3.12	3
8	2.75	4.14	3.11	3.33
9	3.12	3.77	2.90	3.26
10	3.13	3.57	2.90	3.2

Table (3) shows the Statistic values of red cell diameter (µm) the standard deviation was 0.667284 in Sheep and 0.332507 in Goat

Name	Sheep	Goat
Number of values	10	10
Sum	52.77	33.25
Minimum	4.2	2.98
Maximum	6	3.95
Range	1.8	0.97
Mean	5.277	3.325
Median	5.395	3.295
Standard deviation	0.667284	0.332507

Statistic values of red cell diameter (µm)

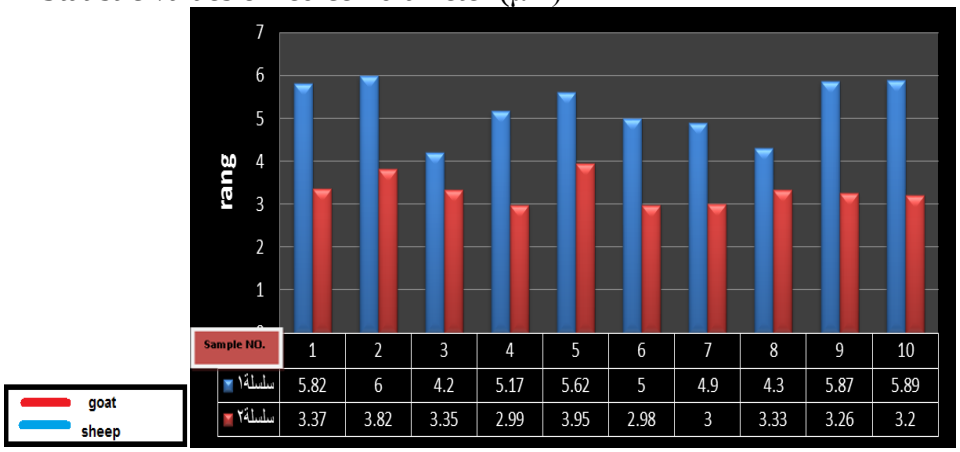

Diagram (3) Sheep and goat red cell diameter

- **Hb. Concentration**

Table (3) sheep goat haemoglobin concentration mg/dl blood

Sample no.	Sheep	Goat
1	113	90
2	122	96
3	108	103
4	115	91
5	117	88
6	126	107
7	117	91
8	121	87
9	124	97
10	111	91

Diagram (4) Sheep goat HB, compartment

Name	Sheep	Goat
Number of values	10	10
Number of missing values	0	0
Sum	1173	941
Minimum	110	87
Maximum	126	107
Range	16	20
Mean	117.3	94.1
Median	117	91
Standard deviation	4.83160889	6.59039705

Statistic values of HB (mg/dl)

- **RBC number:**

Table (4) sheep and goat red blood cell count million per/microliter

Sample no	Goat	sheep
1	17	15
2	15	13
3	18	13
4	18	15
5	17	11
6	18	15
7	16	15
8	18	12
9	15	10
10	18	11

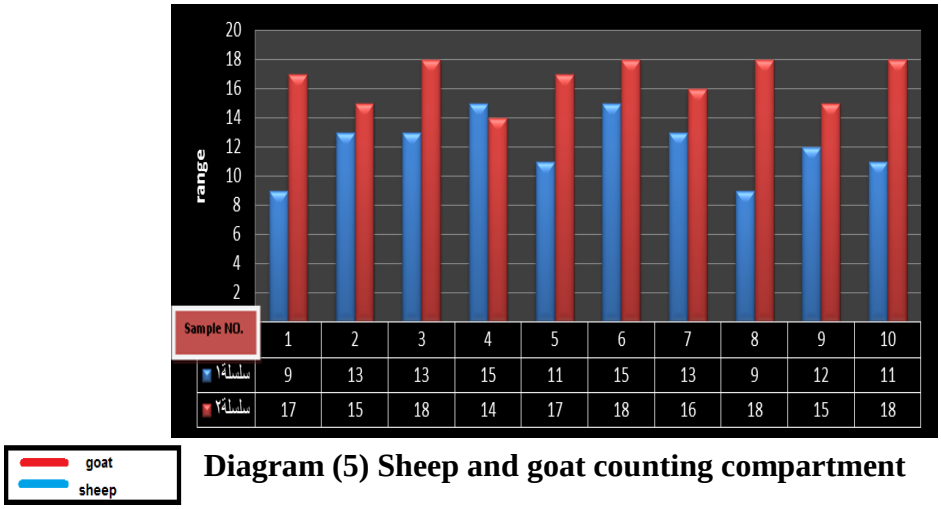

Diagram (5) Sheep and goat counting compartment

Name	Sheep	Goat
Number of values	10	10
Sum	121	166
Minimum	9	14
Maximum	15	18
Range	6	4
Mean	12.1	16.6
Median	12.5	17
Standard error	0.67412495	0.47609523
Standard deviation	2.13177026	1.50554531

Statistic value of number (10*10)

Discussion

After evaluations of all samples and the results completely obtain, these results discussed. Erythrocyte diameter of sheep appeared larger than diameter of goat erythrocyte and approximately (1.98 um), diameter of sheep larger than goat, this result is in agreement with (11, 12). So large diameter red blood cell of sheep allow it to obtain large amount of haemoglobin and this clearly appeared when obtain the result of high amount of Hb in red blood cell of sheep than goat approximately (23.2mg/dl),(13, 14), so there is a relationship between the red blood cell diameter and haemoglobin concentration present in red blood cell . the disc shape of the red blood cell facilitate gas exchange because more hemoglobin molecules are closer to the plasma membrane than they would be in spherical cell (15).

The number of red blood cell of goat appeared more than sheep per/dl of blood when count the samples (13, 16) and this data were related to small diameter of red cell of goat which took large number per/dl of blood variation of some normal physical activity in both sheep and goat that associated with haematology (diameter of red blood cell, haemoglobin concentration and cell number related to variation of this value between these animals for example respiratory rate of sheep 75 min and respiratory rate of goat 90 min (17). These variations were due to the diameter of sheep red blood cell which are larger than diameter of goat red blood cell, so thus sufficient amount of haemoglobin responsible for gas exchange in the lung in sheep rather than in goat are demand (18).

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