

**EFFECT OF AGE ON SOME PHYSICAL AND  
BIOCHEMICAL BLOOD PARAMETERS OF HOLSTEIN  
FRESIAN HEIFERS**

**تأثير العمر في بعض صفات الدم الفيزيائية والكيميائية لعجلات  
الهولشتاين- فريزيان**

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**Abstract**

This study was conducted at al-ameria research station ,ipa agriculture research center on 20 Holstein-Fresian (HF) which divided according to their age into five groups as follows; 3,5,8,10 and 12 months , The aim of the this study was to investigate the influence of age on some Blood parameters(hematological and biochemical) of young (HF) heifer in Iraq. Blood samples were collected weekly from October to December. The blood parameter studied were the hemoglobin concentration ,packed cell volume ,erythrocyte sedimentation rate ,cholesterol concentration , urea ,glutamic oxaloacetic and pyruvic transamines ,total serum protein ,albumin and globulin concentration .Data obtained from this study indicated that different age of heifer (3-12 month) were not effected significantly on the whole blood parameter studied unless the glutamin pyruviat transaminase enzyme which increased significantly for heifer aged between 5-8 month than other. Also the beta globulin concentration was significantly increase for heifer aged between 8-12 month in compared to the young heifers.

**الخلاصة**

اجريت هذه الدراسة في محطة ابحاث العامرية التابعة لمركز اباء للابحاث الزراعية (سابقا) في ابو غريب على 20 عجلة نوع هولشتاين-فريزيان تم تقسيمها الى خمسة مجاميع اعتمادا على فئاتها العمرية وكما يلي: 3,5,8,10,12 شهرا، لدراسة تأثير العمر على بعض الصفات الدموية والكيميائية لدم هذه العجلات في العراق. اخذت عينات الدم وبمعدل عينيه واحدة/عجلة اسبوعيا ولمدة شهر لدراسة صفات الدم والتي شملت تركيز الهيوكلوبين (HP) وحجم خلايا الدم المضغوطة (PCV) ومعدل ترسب الكريات الدموية (ESR) والكولسترول واليوريا والانزيمات الناقلة لمجموعة الامين وتركيز البروتين الكلي في مصل الدم. واطهرت النتائج بان العمر لم يؤثر معنويا في معظم صفات الدم الفيزيائية والكيميائية التي درست و شملت الهيوكلوبين وحجم خلايا الدم المضغوطة والكوليسترول واليوريا وانزيم الاوكساليت الناقل لمجموعة الامين ، بينما تآثر انزيم البايروفيت الناقل لمجموعة الامين معنويا يعمر العجلات فقد ارتفع تركيزه للعجلات بعمر 5-8 اشهر مقارنة ببقية العجلات ، ولم تتآثر نسبة البروتين الكلي واجزائه في مصل الدم بتقدم عمر العجلة ما عدا تركيز البيتاكلوبولين فقد ارتفع تركيزه للعجلات من عمر 8-12 شهر للعجلات الصغيرة .

## **Introduction**

Holstein Friesian is an important dairy animal in Iraq, The productivity of this animals needs improvement, and this entails an evaluation of their nutritional status. The assessment of the nutritional and health status in cattle can be made by determining certain blood metabolite concentrations (1).

The blood is essential for the survival. It is necessary for the transport oxygen, water, nutrients, electrolytes and hormones to the organs (2).

Study of hematological constituents and biochemical indicators of blood is fast method in disease diagnostic purposes (3). Moreover, They are important to evaluate the animal's metabolic status and good indicators for animal health, and in herd supervision programs (4). Studies of blood biochemistry can provide important information on the physiological status and health of mammals (5).

Several factors effect the pattern of hematological values and Variations in blood markers and plasma biochemical of animals such as feeding(6), age(7; 8), sex(9;10), breed(11;12), season (13;14;15), and the physiological status (16) such as pregnancy(17) , lactating statue (18) and stage of oestrus cycle ( 19 ).

Amid the blood biochemical parameters in the biochemical profile of an animal are glucose and cholesterol, which epitomize the energy metabolism; urea, albumin, globulin, and total protein are related to protein metabolism. Enzymes such as aspartate aminotransferase, gamma glutamyl transferase and alanine aminotransferase are important in the evaluation of body metabolism (20) .

The aim of the this study was to investigate and show the differences in haematological and biochemical parameters related with age of(HF) heifers.

## **Material and methods**

This study was conducted at al-ameria research station ,ipa agriculture research center, from October to December, heifers are well adapted to the environmental and climatic conditions of the region. twenty (HF) heifer were divided according to their age into five groups as follows; 3,5,8,10 and 12 months, All animals were in a good health and its were feeding on the alfalfa and the concentrate (6 kg/ head/ day ). Blood samples were collected weekly from October to December.

Blood samples was evacuate in the early morning from each heifer at the external jugular vein into test tubes containing EDTA, for hematological markers (PCV,ESR and hemoglobin concentration), , the Packed Cell Volume ( PCV ) was obtained by the micro-hematocrit method as described by Jain (21), while the erythrocyte sedimentation rate (ESR ) were determined by using the techniques as described by Benjamin (22). hemoglobin concentration was determined by using Sahli`s apparatus (23). Part of the blood was collected in dry test tubes for biochemical analysis. The collected blood in dry test tubes was immediately placed in in the refrigerator and left to clot for about 3 hrs,then centrifuged at 4000 rpm for 10 min , the serum was kept in tubes at the deep freeze (-20°C) until biochemical markers analysis , Serum glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) levels according to (24) cholesterol concentration (25), urea (26) and the total serum protein was measured by biuret method (27), while the fraction of protein were calculated by the electrophorsis methods(28) (Sheadon., Southern limited ,England ) at 230 volt in about 23 min with cellulose paper , the density spots of protein were measured using a desinometer (elphorgraph desinometer ,gmbh , Germany )

Statistical analysis were done by the general linear model of SAS (29) and different between means measured by the Duncon multiple range test( 30).

## **Results and discussion**

Many factor effect blood parameters(hematological and biochemical)including age, sex, and season(31;10).

Hb concentration showed variation during different age period in buffalo heifers with higher values at post-pubertal stage (6). The hemoglobin concentration was found to be higher at birth(32), but result of this study show the Hb concentration did not different significantly between different ages of heifers ,Its ranged from 8.34- 9.36 gm /dl , (Table 1). This results in agreement with previous study which found Hb concentration differences between different ages of (HF) heifer( 2) and Punganur cattle( 33) not significan .

Also the percentages of PCV for heifers have a similar values and range between 31.33% to 32.75% , the difference between all the groups was statistically non significant ,this consistent with previous reports (2) ,unlike our study , the PCV was lower during young age and it increased as age increased in buffalo heifers(6).and this disagreement may be due to different Strain and analysed methods (34;35).

Hb and PCV, both depended especially upon the red blood cell count in the blood stream , and each of these parameter were in normal range in this animals (34).

The ESR being also is the minimum and normal range for all different ages of heifers (table 1) and were  $7.00 \pm 0.00$ ,  $7.66 \pm 0.66$ ,  $6.00 \pm 0.57$  ,  $8.26 \pm 0.62$  and  $8.33 \pm 1.45$  mm westergreen pipette/ 24 hrs . for heifer aged 3,5,8,10,12 month respectively , These value did not differ statistically among different age, similar observations has been found (33) ,this result is in contrary to results reported (6) that observed age of animals affected the ESR value in buffalo heifers.

The maximum cholesterol concentration in serum of heifers was reduced for heifer at 8 month of age ( $246 \pm 36.69$  mg /dl) and the minimum for heifers at age 5 months ( $133.72 \pm 5.38$  mg/dl) and the differences between all ages were not significant ( $p > 0.05$ ) .The urea level in the blood of heifers(Table 1)show no significant differences between ages and its were range between  $25.57 \pm 7.86$  to  $36.42 \pm 4.59$  mg /dl , these findings are supported by another study (36) indicated that the level of urea were not affected significantly by the age of buffalo heifers.

Enzymatic activity in the serum of heifers as seen from table 1 shows no significant differences ( $p > 0.05$ ) for glutamic oxaloacetic transaminase between ages it were ranged 41.39-51.22 u/l , while the glutamic oxaloacetic transaminase have been increased for heifer with the progressive of age , and the minimum value for heifer at 8 month of age (  $154.31 \pm 56.75$  u/l )

Total serum protein and its fractions were listed in table (2). Although there was no significant differences in the total protein in the serum between the ages of heifer, ther was trend to rise with it's values with the increase age of heifers and it were  $6.75 \pm 0.65$ ,  $8.12 \pm 0.13$  gm/dl for heifers of 3 and 12 months of age , so Prisacaru (36) noted that total protein levels are lower in young animals than mature animals. Another study have been reborted that the total serum protein for cow ranged from  $6.56 \pm 1.32$  to  $7.55 \pm 4.60$  gm/dl (37), and this was similar to our results.

The fractions of total protein in the serum for heifers were not significant differences ( $P > 0.05$ ) between ages , unless the beta globulin which being to increase signifigantly( $P > 0.05$  ) for heifers at 12 month of age ( $21.86 \pm 4.80\%$ ).

The globulin protein have been a good indicator about the immune response for the immuno system of heifers, and the concentration of globulin were alter by the physiological states of animal like the stress ,age ,disease and production states (38). Serum albumin is a very sensitive and early nutritional indicator of protein status (39).

It can be concluded that there is trend to increase in the some parameters of the blood studied with the age like enzyme(GPT)and globulin protein in the serum.

Table1: Some chemical and biochemical properties of blood in different ages of Holstein heifers

Means with the same letter are not significantly different (  $p \leq 0.05$  ).

Age of heifers (month)	Homoglobin (gm/dl) Means $\pm$ SE	P CV (%) Means $\pm$ SE	GOT u/l Means $\pm$ SE	ESR Westergreen /mm/24 hrs Means $\pm$ SE	G PT u/l Means $\pm$ SE	Cholesterol (mg/dl) Means $\pm$ SE	Urea mg/dl Means $\pm$ SE
3	9.36 $\pm$ 0.33a	30.75 $\pm$ 1.97a	41.39 $\pm$ 4.34a	7.00 $\pm$ 0.00 a	34.36 $\pm$ 19.17 b	201.54 $\pm$ 70.86a	25.57 $\pm$ 7.86a
5	9.14 $\pm$ 0.37 a	32.33 $\pm$ 0.88a	48.92 $\pm$ 5.70a	7.66 $\pm$ 0.66 a	81.40 $\pm$ 18.19ab	133.72 $\pm$ 5.38 a	36.19 $\pm$ 9.49a
8	9.06 $\pm$ 0.54 a	31.66 $\pm$ 1.85a	51.22 $\pm$ 3.59a	6.00 $\pm$ 0.57 a	154.31 $\pm$ 56.75a	246.00 $\pm$ 36.69b	36.35 $\pm$ 0.53a
10	8.89 $\pm$ 0.33 a	32.75 $\pm$ 1.49a	48.50 $\pm$ 5.11a	8.25 $\pm$ 0.62 a	71.04 $\pm$ 22.06ab	164.46 $\pm$ 37.35a	36.37 $\pm$ 4.70a
12	8.34 $\pm$ 0.72 a	31.33 $\pm$ 1.20a	49.48 $\pm$ 4.95a	8.33 $\pm$ 1.45 a	61.35 $\pm$ 33.70ab	212.02 $\pm$ 9.18 a	36.42 $\pm$ 4.59a

Table 2: Total serum protein and its fractions in different ages of Holstein heifers

Age Of heifer (month)	Total protein (gm/dl) Means $\pm$ SE	Albumin (%) Means $\pm$ SE	Globulins % Means $\pm$ SE		
			Alpha	Beta	Gama
3	6.75 $\pm$ 0.65 a	49.5 $\pm$ 4.75 a	13.15 $\pm$ 1.56 a	11.90 $\pm$ 3.08 bc	19.77 $\pm$ 0.92 a
5	7.77 $\pm$ 0.09 a	47.36 $\pm$ 4.72 a	11.66 $\pm$ 1.59 a	10.36 $\pm$ 0.98 c	26.76 $\pm$ 3.01 a
8	8.09 $\pm$ 0.25 a	44.86 $\pm$ 2.22 a	11.70 $\pm$ 2.13 a	16.40 $\pm$ 0.88 abc	23.63 $\pm$ 4.03 a
10	8.22 $\pm$ 0.51 a	46.55 $\pm$ 1.45 a	12.80 $\pm$ 1.84 a	19.70 $\pm$ 0.92 ab	17.36 $\pm$ 3.28 a
12	8.12 $\pm$ 0.13 a	42.40 $\pm$ 1.65 a	15.43 $\pm$ 0.12 a	21.86 $\pm$ 4.80 a	15.03 $\pm$ 6.11 a

Means with the same letter are not significantly different (  $p \leq 0.05$  ).

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