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Effect of Aging on some Blood Parameters of Local Cows

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ABSTRACT

The study includes (30) local cows from Al-Alam in the east of Tikrit city, which distributed into three groups, first group included (10) cows aged (1-1.5 years), second group included (10) cows aged (5-7 years), while the third group was included (10) cows aged (10-12 years) in order to study the effects of progressing of age on some physiological parameters. The results showed that all of the (Erythrocyte RBC, Hemoglobin HB and Packed cell volume P.C.V) increased significantly ($p \leq 0.05$) in the second group in comparison with first and third group of the study and the lowest value in the third group, while platelets increased gradually and significantly with progressing in age. In addition, WBCs increased significantly in the second group in comparison with first and third group and decreased significantly in the third group while the percentage of eosinophil and neutrophils showed significant increase in the third group and the lowest in the first group, lymphocytes showed a gradual significant decreasing with increasing in age in the studied groups. Monocytes increased significantly in the second aged group but there was no significant difference between the small aged and old aged groups, basophil revealed significantly increased in the second aged group and the significantly decreased in the older aged group. In this study, it has concluded that with age-progress has a negative effect on the blood components represented by the reduction of both red blood cells and white blood cells on the Physiological criteria in the local cows.

تأثير الشيخوخة على بعض المعايير الدميّة في دم الابقار المحلية

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الخلاصة

شملت الدراسة (30) حيوان من الابقار المحلية الموجودة في منطقة العلم الواقعة في شرق تكريت بواقع ثلاث مجاميع. اذ ضمت المجموعة الاولى (10) بقرات بعمر (1–1.5) سنة، وضمت المجموعة الثانية (10) بقرات بعمر (5–7) سنة اما المجموعة الثالثة فضمت (10) بقرات بعمر (10–12) سنة. أظهرت نتائج الدراسة ان كريات الدم الحمر وخضاب الدم وحجم خلايا الدم المرصوصة ازدادت معنوياً ($p \leq 0.05$) في المجموعة الثانية مقارنة مع المجاميع الاخرى للدراسة وظهرت ادنى قيمة معنوية في المجموعة الثالثة بينما ازدادت الصفيحات الدموية ازدياداً تدريجياً معنوياً بتقدم العمر. تبين وجود زيادة معنوية في العدد الكلي لخلايا الدم البيض في المجموعة الثانية المقارنة مع مجاميع الدراسة الاخرى وانخفاضها معنويا في المجموعة الثالثة في حين سجلت الدراسة ان النسبة المئوية لخلايا العدلات والحمضات أعلى قيمة معنوية في المجموعة الثالثة واقل قيمة معنوية في المجموعة الاولى بينما الخلايا اللمفية صاحبها انخفاضاً تدريجياً معنوياً مع تقدم العمر بالمقارنة بين مجاميع الدراسة الاخرى ولوحظ ان الخلايا وحيدة النواة بأعلى قيمة معنوية في المجموعة الثانية في حين لم يلاحظ أي فرق معنوي بين المجموعتين الاخرتين ولوحظ ازدياد النسبة المئوية لخلايا القعدات معنوياً في المجموعة الثانية عند مقارنتها مع مجاميع الدراسة الاخرى وانخفاضها معنوياً في المجموعة الثالثة. استنتج من هذه الدراسة ان التقدم في العمر أثر تأثيرا سلبياً في مكونات الدم تمثلت بانخفاض كريات الدم الحمر وخلايا الدم البيض مما يؤكد ان له تأثيرا سلبيا على المعايير الفسلجية في الابقار المحلية.

Introduction:

Aging is a very complex processes that cause physiological changes in the organs and leads to the death of those organs. Accompanying aging or aging processes is a continuous accumulation of mutations in the Deoxy Ribonucleic Acid (DNA), loss of protein function and change in the general system of antioxidants, where a number of enzymes are affected by aging, which are more susceptible to diseases, especially degenerative diseases (Ozben, 2004). There are several factors that effect on aging, such as nutrition, nature of life, genetic background . Several theories have been developed to explain aging: (1) random genetic damage (Knight, 1996), (2) The theory of glycation theory (Resnick, 1998) , (3) Evolutionary processes associated with the immune system and neurotoxic system (Liew, 1986) and (4) Free radical damage theory (Harman, 1956).

The latest theory (theory of free radicals) is based on the estimation of several chemical and physiological parameters that change gradually in terms of age. The most accepted of these theories is the crash theory of free radicals that emerged in the last seventh decades and was developed by the Harman world and was widely accepted by researchers and received their attention (Harman,1956). Age-related processes and the appearance of several diseases, especially degenerative diseases, are associated with oxidative stress, which occurs with age. There is an increase in active oxygen species of internal mitochondrial origin, while the mitochondria are respirated. Active oxygen species of external origin source polluted air in the cities where they predominate, Progress in age is accompanied by changes in blood parameters, cytometry, increase in lipid peroxidation, oxidation of proteins, and change in antioxidant enzymes. (Harper *et al*., 2004).

Aims of study :

1. To know the normal physiological blood parameters associated with age in cows.
2. To explain and understand the effects of age on the laboratory values of some blood parameters to test the theory of free-radicals as one of the reasons for biological progress in aging.

Materials and Methods:

1- Animals Study:

Blood samples were collected from cows fields located in Al-Alam east of Tikrit with 30 cows distributed into three groups. The first group consisted of (10) cows with a life of (1-1.5 years). The second group consisted of (10) cows (5-7 years). The third group consisted of (10) cows aged (10-12 years).

The duration of the blood collection about one month. Blood was collected from the Jugular vein using sterile syringes (20 ml) after sterilization of the area well before blood was withdrawn. Blood was placed in test tubes containing EDTA for transfer to the laboratory and blood parameters of this study. The study period lasted from 16/11/2016 until 20/12/2016.

2- Counting Blood Standards:

Using Hematology counter to count the number of red blood cells, hemoglobin concentration, size of blood cells, number of blood platelets and total number of white blood cells was calculated. Of the differential leukocyte count using blood dyed pigments (Coles, 1986). One hundred white cells were recorded, the total number of (Neutrophils , Eosinophils , Basophils , Lymphocytes and monocyte) were recorded, and then the percentage of each species was calculated.

3. Statistical analysis:

The results were analyzed using the SPSS program for values representing the standard rate and error and analyzed the data using the ANOVA Analysis of variance One Way. The differences between the groups were determined using the Duncan multiple range test. At level of probability ($P \leq 0.05$).

Results:

The following table (1) shows significant differences (P ≤ 0.05) between the different groups in the total number of red blood cells, The highest value was found in the middle age group, followed by the small age group, while the lowest value was found in the large age group. regarding Hemoglobin concentration, the highest value was observed in the middle age group, followed by the small age group, while the lowest value was found in the large age group. While the packed cell volume showed the highest value in the group of middle ages followed by the group of small ages and showed the lowest value in the group of large ages and the number of platelets we note the highest level in the group of large ages followed by the group of middle ages while the lowest value in the group of small ages.

Table (1) The Effect of age on the total number of red blood cells, hemoglobin, packed cell volume (p.c.v), number of blood platelets of local cows.

	mean ± standard error		
Groups / Parameters	**Small ages (1-1.5)years**	**medium ages (5-7) years**	**Large ages (10-12) years**
number of red blood cells 10^6 × Microliter	8.92 ± 0.676 b	9.81 ± 0.823 a	7.63 ± 0.776 c
Hemoglobin gram / 100Milliliters	12.8 ± 0.112 b	14.4 ± 0.788 a	10.7 ± 0.211 c
P.C.V (%)	38 ± 0.964 b	43 ± 1.121 a	33 ± 0.823 c
Platelets 10^3 ×Microliter	268 ± 12.56 c	397 ± 13.832 b	545 ± 12.765 a

Number of animals per group (10) animals
Values represent the mean ± standard error
Different characters in the same row mean significant difference at a significant level (P ≤0.05).

The following table (2) shows significant differences (P ≤ 0.05) between the different groups in the total number of white blood cells, The highest value was found in the middle age group, followed by the small age group, while the lowest value was found in the large age group. As far as Neutrophils we note in our study the highest value was observed in the large age group, followed by the middle age group, while the lowest value was found in the small age group. While the Eosinophils showed the highest value in the group of large ages followed by the group of middle ages and showed the lowest value in the group of small ages. In our study we noted the highest level of Basophils in the group of middle ages followed by the group of large ages while the lowest value in the group of large ages. Regarding the Lymphocytes we recorded in this study that the highest level of it in the group of small ages followed by group of middle ages and the lowest level in the group of large ages . Also we noted the highest level of monocyte in the middle ages group and the lowest level in the large age group while the middle level was recorded in the small ages group .

Table (2) Effect of age on the total number of white blood cells of local cattle

Groups / parameters	mean ± The standard error		
	Small ages (1-1.5) years	medium ages (5-7) years	Large ages (10-12) years
white blood cells Microliter×10^6	9.95 ± 3.232 b	10.92 ± 5.887 a	8.41 ± 4.212 c
Neutrophils (%)	38.75 ± 3.623 c	43.88 ± 2.412 b	48.43 ± 3.487 a
Eosinophils (%)	4.86 ± 0.332 c	5.76 ± 0.676 b	6.96 ± 0.532 a
Basophils (%)	1.21 ± 0.012 b	1.62 ± 0.014 a	0.91 ± 0.006 c
Lymphocytes (%)	49.82 ± 2.823 a	45.73 ± 1.373 b	38.76 ± 3.765 c
monocyte (%)	2.85 ± 0.762 b	3.82 ± 0.228 a	2.72 ± 0.326 b

Number of animals per group (10) animals
Values represent the mean ± standard error
Different characters in the same row mean significant difference at a significant level (P ≤0.05)

Discussion

The progress with age has a great effect on the number of white blood cells which takes a main role in the immune system as it has observed a decrease in the number of these cells with age. These results have agreed with Targonski *et al*. (2007), who has showed that the dysfunction and disorders of the immune system with age. It is due to the length of the use of drugs and vaccines, as well as exposure to various environmental factors during the stages of life, which have adverse effects on the body, which leads to the low capacity of the immune system and the low number of white blood cells. Finkel (2005) has explained the decline in the total number of white blood cells with age on the basis that their cell membranes which are composed of lipid, fatty acids and cholesterol. These components are affected by free radicals, which increase with age leading to changes in the composition and quality of cellular membranes and then cell death and decrease in number. Amer (2015) has noted that reduced immune system capacity, especially T-lymphocyte cells, may be caused by a decrease in the zinc component, which is due to aging, plays a very important role in the immune system. Zinc is an antioxidant and works to protect the sulfydryl group in protein membranes of oxidative stress and age progression causes a decrease in the total number of white blood cells and immune response in general, due to cell suicide or programmed death cell death (PCD) or apoptosis, making the member more likely of various diseases such as cancer and other infectious diseases. Ames (2014) has observed that aging leads to a decrease in lymphocytes through the defect in the initial stages of cell formation. Hartmann *et al*.,(1996) the decline in lymphocytes because of the imbalance in the regulation of calcium within the cell that accompanies aging. In addition, the number of red blood cells decreased with age. These results were agreed with the researchers Shashikant (2015), who has explained that age lead to a decrease in glomerular filtration rate, leading to chronic diseases in the urinary system. The erythropoietin is responsible for the formation of red blood cells and hence their number. Keaney (2015) has explained that the reason for the decline in red blood cells, Hb and PCV with age is due to the fact that red blood cells are more susceptible to the effects of free radicals that increase with age because they are the main carriers of oxygen and are unable to repair itself and the presence of peroxide in the red blood cell membranes. The oxidative stress in these erythrocyte leads to the reproduction of

free radicals, which interact with the components of the cellular membranes, causing the lipid peroxidation and oxidation of proteins. The lipid peroxidation causes the breakdown of the cellular membranes of the erythrocyte. Proteins lead to the breakdown of proteins found in cytoskeleton and cell cytosole components and thus break down the number of erythrocyte. Young (2012) has showed that oxidative stress leads to a reduced level of hemoglobin through the damage caused by free radicals in the hemoglobin and leads to the formation of methemoglobin which is broken down into a group of pigments called hemichromes with the continuous production of the superoxide root that accompanies. This process leads to the continuous accumulation of broken proteins, the increase of lipid peroxide, the breakdown of membranes, increased potassium permeability across the membrane, and the lack of protein formation and stability, thus reducing the level of hemoglobin from the normal limit. Anastasios *et al.* (2007) has showed that the oxidative stress caused by age increases the number and characteristics of red blood cells by altering the permeability of the membrane and thus dissolving hemolysis, the occurrence of immune recognition of red blood cells, and oxidation increases the fragility of blood cells, the reds by smashing the proteins in them. This is the main determinative stress of the age of red blood cells. As for platelets, the results of Wagner (2013) have agreed that aging can lead to increased platelets. Calabrese (2012) has noted that age lead to anemia due to the effect of free radicals generated by oxidative stress, which attacks the blood cells. As it does not have a nucleus, it cannot repair the damage that occurs and it is deficient in the numbers of mitochondria. It has one type of superoxide dismutase (SOD1) that cannot protect against free radical attacks and therefore faces severe oxygen poisoning when compared to other tissues. In the current study, it revealed that RBCs, age-related WBCs, may be due to increased oxidative stress as a result of increased free radicals and low levels of antioxidants in the body, making the body vulnerable to free radical attacks. The results were consistent with what Ozbay and Dulger (2002) reported.

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