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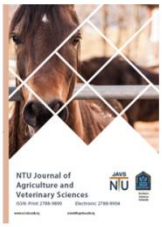

A Research Study of Blood Picture of Both Cows and Buffaloes

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A B S T R A C T

The current study was designed to evaluate the effect of sexual maturity in both male cows and buffaloes on hematological parameters. Blood samples were collected from 20 immature male cows and 20 mature males. In the same way, samples were collected from male buffaloes. The results of the statistical analysis showed a significant increase in the values of the packed cells volume (PCV) and the number of red blood cells of the sexually mature male cows compared with the immature, and a rise in the PCV, the concentration of hemoglobin and the number of red blood cells for the mature male buffaloes compared with the immature, while no effect of sexual maturity was observed on the number of white blood cells for both male cows and buffaloes. In conclusion, the age of sexual maturity in male cows and buffaloes had an effect that would raise the values of red blood cells count, PCV, and hemoglobin concentration.

Introduction

One of the primary sources of human life, and the most crucial one in life sustainability is animal production (Roland *et al*., 2014). Animal production should be given attention, developed and supported in order to assure one of life essentials as well as the economy significance it represents in terms of meeting local demands and bolstering economy beside giving employment possibilities (Roland *et al*., 2014). Blood tests are used to identify any illness, whether acute or chronic before problems occur, because blood is an early indicator of deviation from normal while in contact with animals. Animal health is mostly established by blood, as any changes to animal appearance (Agarwal *et al*.,2016). Blood tests can therefore be performed in the field or in a lab without incurring substantial costs or the need to wait a long time for the test results to be accessible because they are one of these procedures that is quick and simple (Agarwal *et al*.,2016).

Puberty is the beginning of animal's sexual existence and is the moment when a female animal can produce eggs and a male animal can produce sperm for the first time. The appearance of signs of animal estrus is one of its symptoms in females. The animal's nutritional intake, genetics and stage of development all influence when they reach puberty. Sexual maturity (maturity) is the stage in which an animal becomes capable of fertilization, pregnancy and natural childbirth, and at different ages that vary according to the animal, and that sexual maturity in cows is at the age of (11–15) months. Sexual maturity in male cows, however, is (1.5-2) years, and in females (15–18) months (Day& Nogueira, 2013), while buffaloes reach puberty at (9–18) months and maturity (3-2.5) years (Plansky and Dimitrov, 2020). The current study aims at comparing the hematological parameters between the two pre-sexual stages and the maturation of the local breeds of both cows and buffaloes.

Materials & Methods

Blood samples were taken from (20) male cows (4-18) months before maturation. Other Twenty adult males (24 months–48 months) and samples were taken from male buffaloes with the same method, where their ages ranged before maturity (7 months–30 months) and after maturity (i.e. 36 months). The animals are clinically examined before sampling to assess the clinical condition and confirm that it is free from any disease symptoms. The criteria for selecting animals were vigilance and activity, normal rectal temperature (<38 and <39.5°C), absence of dehydration, diarrhea, cough and nasal or eye secretions.

Jugular vein blood samples were drawn into tubes with an anticoagulant (EDTA). As soon as possible after collection, they were put in a cooler and kept at 4 °C in the lab and analyzed for 24 hours. The same thing were applied on buffaloes, too (coles,1986; kerr, 2002).

Blood with anticoagulant (EDTA) was used for hematology analysis. Red blood cell count was performed. Then, white blood cell count (WBC), packed cell volume (PCV%), Hemoglobin concentration (Hb g/dl), mean corpuscular hemoglobin (MCH), mean corpuscular volume (MCV); mean corpuscular hemoglobin concentration (MCHC) of the blood samples were estimated.

Statistical Analysis

All data were presented as mean ± S.E. The statistical significance was determined using SPSS at a significant value of less than 0.05($P<0.05$) version 26. The differences among groups were evaluated using an independent t-test (Steel and Torri, 1997).

Results:

The data in Table 1 indicates a significant increase ($P<0.05$) in the value of each of the packed cell volume (PCV) which counted value ($P=0.001$) and the red blood cells (RBCs) which counted value ($P=0.045$) in the group of adult cows, whereas, there were no significant differences noted in hemoglobin concentration (Hb) and leukocyte (WBCs) average value observed in the same group in comparison with a group of immature cows.

Table 1: Comparison of blood parameters in male cows before and after maturation.

Groups	Hb gm/dl	PCV %	RBC*10^6 Cells/cu.mm	WBC*10^3 Cells/cu.mm
Immature group of cows	10.49 ±0.57	34.48 ±0.90	6.33 ±0.16	5.91 ±0.32
mature group of cows	11.58 ±0.37	39.20 * ±0.97	6.79 * ±0.15	6.35 ±0.13
P value	0.119	0.001	0.045	0.207

Number of animals = 20 animals in each group
The value represents mean ± standard error.
* Indicates that there were statistical significant differences among the groups at ($P<0.05$) maturation.

The results in Table 2 showed that there were no significant differences in the MCV, MCH, and MCHC parameters in comparison between the two groups; i.e. the mature and immature cows.

Table 2: Comparison of blood indices parameters in male cows before and after maturation.

Groups	MCV Fl	MCH pg	MCHC g/dl
Immature group of cows	54.95 ±1.62	16.88 ±1.04	30.67 ±1.64
mature group of cows	57.83 ± 0.98	17.03 ± 0.40	29.44 ±0.39
P value	0.137	0.890	0.470

Number of animals = 20 animals in each group
The value represents mean ± standard error.
* Indicates that there were statistical significant differences among the groups at (P<0.05).

The influence of maturity on some hematological values in buffalos (see Table 3). The results appeared that the matured buffaloes had a significant elevation in Hb, PCV, and RBC count compared with immature male buffaloes at P values of 0.001, 0.000, and 0.005, respectively. However, there was no significant alteration (P> 0.05) in the WBC counedt in both mature and immature groups.

Table 3: A comparison of blood parameters in male buffaloes before and after maturation.

Groups	Hb gm/dl	PCV %	RBC*10^6 Cells/cu.mm	WBC*10^3 Cells/cu.mm
Immature group of buffaloes	10.44 ±0.36	29.44 ±0.99	5.63 ±0.17	5.04 ±0.20
mature group of buffaloes	12.39* ±0.41	36.30* ±0.84	6.25 * ±0.13	4.93 ±0.26
P value	0.001	0.000	0.005	0.737

Number of animals = 20 animals in each group
The value represents mean ± standard error.
* Indicates that there were statistical significant differences among the groups at (P<0.05).

As shown in Table 4, a significant elevation in MCV values in the mature buffalo group, while the results of the current study showed no significant changes in the level of MCH and MCHC values in the blood in both immature and mature buffalo groups.

Table4: A comparison on blood indices parameters in male buffaloes before and after maturation.

Groups	MCV Fl	MCH pg	MCHC g/dl
Immature group of buffaloes	52.82 ±1.81	18.77 ±0.65	35.49 ±0.78
mature group of buffaloes	58.53* ± 1.85	19.97 ± 0.81	34.01 ±0.53
P value	0.034	0.257	0.129

Number of animals = 20 animals in each group
The value represents mean ± standard error.
* Indicates that there were statistical significant differences among the groups at (P<0.05).

Discussion:

The aim of information gathering was to lay the groundwork for typical values of one sort. For instance, healthy animal samples were taken in the same nutritional, physiological and environmental conditions as sick animals (Krimer, 2011). The majority of physiological changes was true in all types and situations, and were visible in the blood measurements and standards of livestock. These variables were represented by the elements that had an impact on blood characteristics depending on the animal's age, sex, diet, body condition and reproductive status. The majority of the changes in circulation, such as; activity, temperature and humidity, obtained from earlier research were carried out over a variety of time periods (Wood and Quiroz-Rocha, 2010).

Since they were commonly employed in medical decisions as well, hematological and chemical variables were important in giving a general picture of an animal's metabolism and health status. The data from sick animals should be contrasted with the typical results from healthy animals when reaching a diagnosis. As a result, each type of animal requires a separate and appropriate comprehensive reference paragraph (Klinkon & Jezek, 2012).

The current study comprises a comparison of the hematological parameters of pre- and post-maturity for both cows and buffaloes showing a significant increase in the number of red blood cells and the percentage of packed cell volume of mature male cows compared with immature (see Table No. 1), and this result is in agreement with Mohri *et al.* (2007), as it was noted that there was a significant decrease in the value of hemoglobin concentration and the percentage of packed cell volume in calves of immature cows and also a significant increase in red blood cells, the percentage of packed cell volume and hemoglobin concentration was observed in mature male buffaloes when compared with a group of animals. This result is consistent with the results of Khadjeh and Papahn (2002). The

reason could be due to the system of feeding and raising growing calves as it has an important effect on the values of blood variables (Reece and Hotchkiss, 1987).

The effect of feeding became more pronounced after the fifth week when the intake of dry food (hay) increased, as the values of red blood cell counted, hemoglobin concentration and volume of stacked cells increased during this period. Anemia occured in calves after birth due to iron deficiency caused by eating colostrum alone (Reece and Hotchkiss 1987; Klinkon and Jezek 2012). The values of different blood parameters in calves and other young animals changed with age (Klinkon and Jezek, 2012).

White blood cells (WBCs) play an essential role in immune defense and include neutrophils, eosinophils, basophils, monocytes and lymphocytes of different types. White blood cells were produced and matured in the bone marrow and, in the case of lymphocytes, in lymphoid tissue (Webb and Latimer, 2011). They were also characterized by having different life spans. So their number can rapidly change. White blood cell count usually increased when diseases were present especially in infections and possibly when stress was present (Kraft, 1999), and no significant changes in white blood cell counts were observed in both pre-mature cows and buffaloes. Post-mature periods, as Gründer HD. (2006) observed in cows that total WBC count decreases with age; Terosky, *et al*. (1997) observed WBC fluctuation in the period from birth to age 18 months; and Knowles *et al*. (2000) observed elevated WBC count from birth to 84 days and then decreased. This is possibly due to the high concentration of cortisol as the fetal cortisol level rises during the last days of pregnancy and gradually decreases after birth for 11-20 days until it reaches an adult level. No significant differences were observed in the blood parameters represented by mean corpuscular hemoglobin (MCH), mean corpuscular volume (MCV); mean corpuscular hemoglobin concentration (MCHC), while Knowles *et al*. (2000) showed a significant decrease in these measurements in calves immediately after birth when compared with adult animals, and indicated that the reason could be that the volume of red blood cells continues to decrease after birth for the first three or four months in newborn calves. This gradual decrease in mean corpuscular volume (MCV) coincided with the disappearance of fetal hemoglobin and the replacement of hemoglobin A (Jain,1986). The persistent decrease in blood indices in this study indicates that the decrease in erythrocyte volume is concurrent with the decreased production of non-iron dependent hemoglobin

Conclusions:

Both packed cell volume and erythrocytes were increased in mature male cows compared with the immature ones. The concentration of hemoglobin, the average packed cell volume and the number of red blood cells were also increased in male buffaloes after the age of sexual maturity. Additionally, male cows' and buffaloes' white blood cells were unaffected by their sexual maturity stages.

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Reference:

[1] Aggarwal A., Singh S. V., Badrealam K. F., Renuka K. A. and Kumar A. (2016) Hematological and hormonal profile of various breeds of cattle and buffalo under varied seasons and environmental. conditions. ICAR-National Dairy Research Institute, Karnal. NDRI Publication Np, 146.

[2] Coles E. H. (1986) Veterinary Clinical pathology, 4th ed. W. B. Saunders. Co Philadelphia. London, Tornto. PP: 15-90

[3] Day M. L. and Nogueira, G. P. (2013) Management of age at puberty in beef heifers to optimize efficiency of beef production. Animal frontiers, 3(4), 6-11. DOI:10.2527/AF.2013-0027

[4] Gründer H.D. (2006) Krankheiten der Kreislauforgane und des Blutes [Diseases of the circulatory organs and of the blood]. In: Innere Medizin and Chirurgie des Rindes [Internal medicine and surgery of cattle], ed.Dirksen G, Gründer HD, Stöber M, 5th ed., pp. 159–270. Parey, Berlin, Germany. In German.

[5] Jain N.C. (1986) Schalm's Veterinary Hematology, Fourth ed. Lea and Febiger, Philadelphia.

[6] Kerr M.G. (2008) Veterinary laboratory medicine: Clinical biochemistry and hematology. John Wiley & Sons.

[7] Khadjeh G. H. and Papahn A. A. (2014) Some haematological parameters in the Iranian (Khuzestan native) buffalo.

[8] Klinkon M. and Ježek J. (2012) Values of blood variables in calves. A Bird's-Eye View

of Veterinary Medicine, 301-320. DOI: 10.5772/32100.

[9] Knowles T.G., Edwards J.E., Bazeley K.J., Brown S.N., Butterworth A. and Warriss P.D. (2000) Changes in the blood biochemical and hematological profile of neonatal calves with age. Veterinary Record 147, 593–598 Changes in the blood biochemical and hematological profile of neonatal calves with age. Veterinary Record 147, 593–598. doi:10.1136/vr.147.21.593.

[10] Kraft, W. (1999) Skelettmuskulatur, Knochen, Kalzium-, Phosphor-, Magnesiumstoffwechsel. In: Klinische Labordiagnostik in der Tiermedizin, W. Kraft, U.M. Dürr, (Ed.), pp. 251-258, Schattauer, ISBN 978-3794519422, Stuttgart, Germany.

[11] Krimer P.M. (2011) Generating and interpreting test results: test validity, quality control, reference values, and basic epidemiology. In: Duncan and Prasse's veterinary laboratory medicine: clinical pathology, ed. Latimer KS, 5th ed., pp. 365–382. Wiley, Chichester, UK.

[12] Mohri M., Sharifi K. and Eidi S. (2007) Hematology and serum biochemistry of Holstein dairy calves: Age related changes and comparison with blood composition in adults. Research in Veterinary Science, Vol.83, No.1 (August 2007), pp. 30-39, ISSN 0034-5288. Doi: 10.1016/j.rvsc.2006.10.017

[13] Plansky V. and Dimitrov D. (2020) Puberty age and body weight of the water buffalo heifers. *Tradition and Modernity in Veterinary Medicine*, *5*(1), 25-28. DOI : 10.5281/zenodo.3675083

[14] Reece W.O. and Hotchkiss D.K. (1987) Blood studies and performance among calves reared by different methods. Journal of Dairy Science, Vol.70, No.8 (August 1987), pp. 1601- 1611, ISSN 0022-0302. https://doi.org/10.3168/jds.S0022-0302(87)80188-1.

[15] Roland L., Drillich M. and Iwersen, M. (2014) Hematology as a diagnostic tool in bovine medicine. Journal of Veterinary Diagnostic Investigation, 26(5), 592-598. https://doi.org/10.1177/1040638714546490

[16] Steel R. G. D., Torrie J.H., Dickey D.A. (1997) Principles and procedures of statistics: A Biometrical Approach. 3rd ed. New York: McGraw-Hill Book Co.; 350-386p 10.4236/blr.2014.5424.

[17] Terosky T.L., Wilson L.L., Stull C.L. and StricklinW.R. (1997) Effects of individual housing design on special fed Holstein veal calf growth performance, hematology and carcass characteristics. Journal of Animal Science, Vol.75, No.7, pp. 1697-1703. DOI: 10.2527/1997.7571697x

[18] Webb J.L. and Latimer K.S. (2011) Leukocytes. In: Duncan and Prasse's veterinary laboratory medicine: clinical pathology, ed. Latimer KS, 5th ed., pp. 45–82. Wiley, Chichester, UK.

[19] Wood D. and Quiroz-Rocha G. (2010) Normal hematology of cattle. In: Weiss DJ, Wardrop KJ, eds. *Schalm's Veterinary Hematology*. 6th ed. Ames, IA: Wiley-Blackwell, 829–835.