

التغيرات الكيميائية في دم وسيرم دم الأبقار الحلابة والعجول البقرى والجاموس بالنسبة للتغير في درجات حرارة الجو والرطوبة النسبية

١٠٤٠ عامر ، ع ١٠٠ اسماعيل ، ط ٠٠ ح ٠٠ مصطفى

الملخص العربي

تمت دراسة تأثير التغير في درجة حرارة الجو والرطوبة النسبية على مدار فصول السنة المختلفة على المكونات الكيميائية لدم وسيرم دم الأبقار الحلابة والعجول البقرى والجاموس وقد لاحظ الباحثون :-

- ١ - سجلت كمية البروتين الكلي أعلى نسبة لها في أثناء فصل الصيف .
 - ٢ - كانت كمية النتروجين الغير بروتين واليوريا في دم الحيوانات مرتفعة في للافصل الخريف والصيف بالمقارنة بفصول السنة الأخرى .
 - ٣ - زادت كمية الكوليسترول في فصل الربيع والخريف .
- ويعتبر هذه النتائج ذات أهمية كبيرة عند تشخيص الحالة الاكلينيكية للحيوانات .

Handwritten text at the top of the page, possibly a title or header.

Handwritten text line.

Handwritten text line.

Handwritten text block, possibly a paragraph.

Handwritten text line.

Handwritten text block, possibly a paragraph.

Handwritten text line.

Handwritten text line.

BIOCHEMICAL CHANGES OF WHOLE BLOOD AND BLOOD SERUM OF LACTATING COWS, BOVINE AND BUFFALO CALVES, IN RELATION TO VARIOUS ENVIRONMENTAL TEMPERATURES AND RELATIVE HUMIDITY.

(With 4 Tables)

By

A.A. Amer*, A.A. Ismail and T.H. Moustafa.

(Received at 1/4/1976)

SUMMARY

The influence of the environmental climatic conditions during different seasons on some biochemical constituents of blood of dairy cattle, bovine and buffalo calves was studied. Total serum protein reached its maximum level during summer months.

The non-protein nitrogen and blood urea were higher during autumn and summer than other seasons.

Cholesterol content increased during spring and autumn

INTRODUCTION

The effect of climatic seasonal variations upon the biochemical constituents of blood of ruminants have been demonstrated by several investigators (TERRI *et al.*, 1946; BLINCO, 1949; DIVEN *et al.*, 1958; SETTY and RAZDAN, 1966; SINGH *et al.*, 1966; ROUSSEL *et al.*, 1971 and ROUSSEL *et al.*, 1972 .

In a previous contribution, the effect of environmental temperature and relative humidity upon some haematologic constituents were studied. Results pointed that climatic alters haemoglobin concentration and corpuscular constituents of the blood (MOUSTAFA *et al.*, 1976).

* Dept. of Veterinary Medicine and Poultry Diseases, Faculty of Vet. Med.: Assiut University.

A trial therefore, was found to be necessary in order to provide valuable informations about the seasonal variations of some biochemical constituents of ruminant's blood and blood serum as total protein, non- protein nitrogen, blood urea as well as total serum cholesterol.

MATERIAL and METHODS

Experimental work was conducted on the clinically apparently healthy animals previously examined for blood cytology (Moustafa *et al.*, 1976)

Total serum proteins were estimated by means of ABLE refractometer (MACFATE, 1972) while blood urea and non protein nitrogen was estimated according to RAITSKA (1970) Blood serum cholesterol was determined by ILCA method (LLCA, 1969) .

RESULTS and DISCUSSION

Table, I, II and III present data about the influence of seasonal temperature as well as relative humidity on some biochemical constituents of blood of dairy cattle, buffalo and bovine calves respectively .

TABLE (1).—Effect of varying climatic conditions on some biochemical constituents of blood in dairy cows.

Season	Climatic conditions		Biochemical constituents			
	Enviro. temp. °C	R.H. %	T.S.P. Gm %	N.P.N. mg %	B.U.N. mg %	T.C. mg%
Summer. . . .	26.3	41.5	7.93	25.5	14.5	237.1
Autumn. . . .	19.9	72.2	7.33	26.4	15.4	289.5
Winter	15.8	71.4	6.84	17.7	7.3	223.7
Spring	24.5	46.2	7.45	21.6	14.6	859.3
Meam	21.62	57.82	7.38	22.8	12.95	277.40

T.S.P.: Total serum proteins

B.U.N. = Blood urea nitrogen.

N.P.N. = Non-protein nitrogen.

T.C. = Total cholesterol.

TABLE 2.—Effect of varying climatic conditions on some biochemical constituents of blood in buffalo calves.

Season	Climatic conditions		Biochemical constituents			
	Enviro. temp. °C	R.H. %	T.S.P. Gm %	N.P.N. mg %	B.U.N. mg %	T.C. mg %
Summer	29.7	55.6	6.42	32.1	20.6	165.6
Autumn	27.5	60.5	5.99	32.4	21.0	172.7
Winter	15.4	68.9	4.60	23.5	12.6	163.1
Spring	26.4	42.8	4.91	27.2	16.1	181.7
Mean	24.75	56.95	5.48	28.8	17.57	170.77

T.S.P. = Total serum proteins.
N.P.N. = Non-protein nitrogen.

B.U.N. = Blood urea nitrogen.
T.C. = Total cholesterol.

TABLE III.—Effect of varying climatic conditions on some biochemical constituents of blood in bovine calves.

Season	Climatic conditions		Biochemical constituents			
	Enviro. temp. C°	R.H. %	T.S.P. Gm %	N.P.N. mg %	B.U.N. mg %	T.C. mg %
Summer	28.5	46.5	6.68	27.3	16.1	220.7
Autumn	24.1	64.7	5.81	29.9	18.5	217.4
Winter	17.3	67.2	5.20	22.8	13.9	201.5
Spring	24.9	47.9	6.21	25.5	14.6	229.1
Mean	23.79	56.57	5.97	26.37	15.77	192.42

T.S.P. = Total serum protein.
N.P.N. = Non-protein nitrogen.

B.U.N. = Blood urea nitrogen.
T.C. = Total cholesterol.

Total serum protein in all groups markedly increased as season progressed from cold to hot, to reach its maximum level during summer months (June - August). Observations of DIVEN *et al.* (1958) KAMAL (1960), SINGH *et al.* (1966) and ROUSSEL *et al.* (1972) coincide with the present results, however BLINCO (1949) reported that such high environmental temperature had no significant changes on plasma protein concentration of cattle.

Levels of non-protein nitrogen (N. P. N.) recorded its highest figures in autumn and summer than in winter and spring months. Similar results were obtained by SETTY and RAZDAN (1966).

Blood urea was found to be invariably higher during autumn and summer than in winter and spring months. Similar results were obtained by SETTY and RAZDAN (1966). Cholesterol content of blood serum increased during warm months (Spring and autumn). Lactating cows on the other hands, had relatively higher cholesterol levels during all seasons of the year when compared with other animals. These observations support the results previously recorded by SETTY and RAZDAN (1966). However, very low (141.0 and 95.73 %) levels were reported in dairy cattle by LENNON and MIXNER (1957) and PAL *et al.* (1945) respectively. The explanation of ROBINSON (1957) may support the obtained results in this report as cholesterol metabolism which have positive correlation with general steroids, tend to increase during lactation.

The overall mean values of studied biochemical values in investigated animal are presented in table IV.

TABLE IV.—The overall means of some biochemical variables of the blood during the investigation period.

Variable	Unit	Buffalo calves			Dairy cows			Bovine calves		
		Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
T.S.P. . . .	Gm %	2.84	7.91	5.48	4.81	9.41	7.38	2.84	8.82	5.97
N.P.N. . . .	mg %	16.0	41.5	28.8	16.1	34.0	22.8	15.0	38.5	26.37
B.U.N. . . .	mg %	5.6	28.5	17.57	5.7	22.4	12.95	4.7	26.6	15.77
T.C. . . .	mg %	95.0	268.0	170.77	222.5	365.0	277.40	105.0	263.0	192.42

T.S.P. = Total serum protein.

N.P.N. = Non-protein nitrogen.

B.U.N. = Blood urea nitrogen.

T.C. = Total cholesterol.

This report, together with finding concerning blood cytology (MOUSTAFA *et al.*, 1976) are definitely influenced by the environmental temperature, relative humidity, age, breed and nutrition. Such results will be helpful in the field of laboratory medicine

REFERENCES

- Blinco, C. (1949). "Environmental physiology with special reference to domestic animals. III. Influence of ambient temperature, 50-100°F on the blood composition of Jersey and Holstein cows. Plasma protein." *Mo. Agric. Exp. Sta. Res. Zool.*, 433.
- Diven, R.H.; Page, H.M.; Erwin, E.S. and Roubicek, C.B. (1958). "Effect of environmental temperature on diurnal variation of blood constituents in the bovine". *Am. J. Physiol.*, 195, 88.
- Ilea, Z. (1962). "Express method for determination of total blood serum cholesterol". *Gen. Imn. med.*, 11.
- Kamal, T.H. (1960). "Metabolic reactions during thermal accumulation (50 °F and 80 °F) and thermal stress (35 °F to 95°F) in dairy animals." Ph. D. thesis, Univ. of Missouri, U.S.A.
- Lennon, H.D. and Mixner, J.P. (1957). "Some sources of variation in total plasma cholesterol levels in dairy cattle". *J. dairy Sci.*, 40, 1424.
- MacFate, R.B. (1972). Introduction to the clinical laboratory. (the refractometer) p. 404-407. Edited by Year book Medical publisher Chicago, 3rd. edition.
- Moustafa, T.H.; Ismail, A.A. and Amer, A.A. (1976). The effect of climatic changes on haemoglobin content and corpuscular constituents of blood in cattle and buffalo (*Ass. Vet. Med. J.*, Vol. 3, No. 6).
- Pal, H.K.; Momin, S.A. and Mullick, D.N. (1945). "Studies on the composition of the blood at farm animals in India. II. Seasonal variations in the blood of dairy cattle." *Ind. J. Vet Sci.*, 15, 119.
- Raitska, U.E. (1970). "Methods of zootechnical and biochemical analysis of rations, products of metabolism and animal byproducts. U.S.S.R., Moscow, Dobrovits.
- Robinson, T.J. (1957). "Pregnancy, in the progress in the physiology of farm animals, 3, p. 793. Ed. John Hammond, Butterworth Publications, London.
- Roussel, J.D.; Koonce, K.L. and Pinero, M.A. (1972). "Relationship of blood serum protein and protein fractions to milk constituents and temperature-season". *J. Dairy Sci.*, 55, 8, 1093.
- Roussel, J.D.; Beatty, J.F.; Gholson, J.H.; Pinero, M.A. and Waters, W.H. (1971). "Effect of seasonal climatic changes on the productive traits, blood glucose, body temperature and respiration rate of lactating dairy cows". *Abstr. J. Dairy Sci.*, 54, 458.
- Setty, S.V.S. and Razdan, M.N. (1966). "Studies on the chemical composition of blood in dairy cattle. I. Cholesterol, glucose, iron and urea nitrogen during humid and winter seasons". *Ind. J. Dairy Sci.*, XIX, 2, 55.
- Singh, K.P.; Johnson, H.D. and Ragsdale, A.C. (1966). "Effect of high environmental temperature on bovine serum protein and its fractions". *Ind. J. Dairy Sci.*, 19, 137.
- Teeri, A.E.; Keener, H.A. and Marraw, K.S. (1946). "Studies on the chemical composition of calf blood". *J. Dairy Sci.*, XXIX, 10. 663.
- Author's Address :- Dr. A. A. Amar Dept. of Internal Medicine Faculty of Vet. Medicine Assiut University, Assiut, Egypt

This report, together with findings concerning blood electrolyte (MOUSEL) and relative humidity, are being influenced by the environmental temperature and nutrition. Such results will be helpful in the field of laboratory medicine.

REFERENCES

Blair, E. C. (1950). Plasma protein, with special reference to domestic animals. II. Influence of ambient temperature, 30-100°F, on the blood composition of horses and dogs. *Plasma Protein*, *MacKinnon, A. G. Ed.*, Vol. 1, pp. 1-15.

Blair, E. C., Page, H. H., Ewing, E. S., and Roubicek, C. B. (1950). Effect of environmental temperature on diurnal variation of blood constituents in the bovine. *Am. J. Physiol.*, 195, 88.

Blair, E. C. (1952). Express method for determination of total blood serum cholesterol. *Can. Jour. Med. Sci.*, 11.

Blair, E. C. (1950). Metabolic reactions during diurnal acclimatization (50°F and 80°F) and rectal temperature (37°F to 92°F) in dairy animals. Ph.D. Thesis, Univ. of Missouri, U.S.A.

Blair, E. C. and Mizner, J. P. (1957). Some sources of variation in total plasma cholesterol levels in dairy cattle. *Vet. Rec.*, 60, 1424.

Blair, E. C. (1957). Introduction to the clinical laboratory (the technician). p. 404-407. Edited by Yearbook Medical Publishers, Chicago, Ill.

Blair, E. C., Lemay, A. A., and Jones, J. A. (1957). The effect of climatic changes on hemoglobin content and coagulable constituents of blood in cattle and goats. *Can. Jour. Med. Sci.*, Vol. 3, No. 6.

Blair, E. C., Stompin, S. A., and Jullier, D. N. (1957). Studies on the composition of the blood in farm animals in India. II. Seasonal variations in the blood of dairy cattle. *Ind. J. Vet. Sci.*, 12, 119.

Blair, E. C. (1950). Methods of zootechnical and biochemical analysis of ruminants. *Products of metabolism and animal by-products*, U.S.S.R. Moscow, *Doklady Akad. Nauk S.S.S.R.*, 1950, 1097.

Blair, E. C. (1957). Pregnancy in the progress in the physiology of farm animals. J. p. 701. Ed. John Hammond, Butterworth Publications, London.

Blair, E. C., Koenig, K. I., and Pincus, S. A. (1957). Relationship of blood serum protein and protein fractions to milk constituents and temperature-season. *Dairy Sci.*, 40, 1097.

Blair, E. C., Beatty, J. E., Gibson, J. H., Pincus, S. A., and Waters, W. H. (1957). Effect of seasonal climatic changes on the productive traits, blood glucose, body temperature and respiration rate of lactating dairy cows. *Ann. N.Y. Acad. Sci.*, 458, 458.

Blair, E. C. and Ravshan, M. Z. (1956). Studies on the chemical composition of blood in dairy cattle. I. Cholesterol, glucose, iron and urea nitrogen during winter and winter seasons. *Ann. N.Y. Acad. Sci.*, XIX, 2, 32.

Blair, E. C., Johnson, H. D., and Ragsdale, A. E. (1956). Effect of high environmental temperature on bovine serum protein and its fractions. *Ann. N.Y. Acad. Sci.*, 19, 137.

Blair, E. C., Keener, H. A., and Sturkey, K. S. (1956). Studies on the chemical composition of calf blood. *Vet. Rec.*, XIX, 10, 65.

Author's Address: - Dr. A. A. Amir, Dept. of Internal Medicine, Faculty of Veterinary Medicine, Assiut University, Assiut, Egypt.

Ann. N.Y. Acad. Sci., Vol. 4, No. 7 (1957).