

THE VARIATION OF BLOOD CONSTITUENTS WITH STAGE OF LACTATION IN BEEF AND DAIRY CATTLE

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Breeds show variation in their response to climatic and environmental changes. They also differ in their physiological functions which is reflected in the variation of the blood constituents (Heyns, 1964). Although the composition of blood is relatively constant, short term as well as longer cyclic changes may occur (Smith, 1959). Blood serves as the principal transport system of the body and is associated with its physiological processes including milk production. The concentration of the constituents in milk varies with the different physiological stages of lactation. To test whether a corresponding variation in the blood constituents during lactation occur, regular blood samples over the lactation period were drawn from Afrikaner and Friesian cows and analysed for 12 constituents. These were correlated with the stage of lactation.

The experimental animals were 12 Afrikaner and 12 Friesian cows from the herds of the Glen Agricultural Institute, Bloemfontein. The management of the Afrikaner herd was essentially that of a typical ranching beef herd with no supplementary feeding. The management of the Friesian herd was that of a typical dairy herd where the cows were fed in accordance with their production. Seventeen blood samples were obtained from each cow at fortnightly intervals over a period of 32 weeks from the beginning of lactation. Samples were taken in the early morning. The following blood constituents were determined by methods described by Oser (1965). The original texts were studied and modifications applied as was suggested by later authors. Haden's modification of the Folin & Wu (1919) precipitation of whole blood was used:—

1. Creatinine in blood
Folin & Wu (1919)
2. Serum albumin
Howe (1921) and others
3. Serum globulin
Howe (1921) and others
4. Haemoglobin by means of a calibrated Fischer Electro-Hemometer.

5. Erythrocyte counts by means of a haemocytometer using a 3% sodium nitrate solution.
6. N.P.N. in blood
Folin & Wu (1919)
7. Glucose in blood
Folin & Wu (1920)
8. Serum alkaline phosphate
Fiske & Subba-Row 1925
9. Inorganic phosphorus in serum
Fiske & Subba-Row 1925
10. Calcium, sodium and potassium were determined flame photometrically (Oser, 1965).

Breeds may differ in the variation of their blood constituents during the various stages of lactation. For this reason correlation coefficients between the percentage constituents of blood and the stage of lactation were calculated (Table 1).

No definite relationship exists between the percentage constituents of blood and the stage of lactation of the Friesian cows. Only the haemoglobin fraction of the blood seems to be affected and shows a tendency to increase with advancing lactation. The blood constituents of the Afrikaner cows show a more pronounced relationship with the stage of lactation. The globulin, N.P.N., glucose, phosphorus, calcium and sodium are highly significantly ($P < 0.01$) correlated with the stage of lactation and the potassium significantly ($P < 0.05$) Globulin and potassium levels decrease with advancing lactation while the remainder of the constituents increase. It thus appears that the stage of lactation has a greater influence on the variation of blood constituents for Afrikaner cows than for Friesian cows.

To illustrate the variation of these constituents during lactation, the deviations from their mean are presented graphically in Fig. 1.

Table 1

Correlation coefficients between the stage of lactation and blood constituents of Afrikaner and Friesian cows

	Creatinine	Albumin	Globulin	Haemoglobin	Erythrocytes	N.P.N.
Afrikaner	-0,005	0,400	-0,746**	0,054	-0,108	0,660**
Friesian	-0,035	-0,332	-0,449	0,544*	0,353	-0,343
	Glucose	Alkaline phosphatase	P	Ca	Na	K
Afrikaner	0,816**	0,007	0,799**	0,711**	0,693**	-0,478*
Friesian	0,447	0,007	0,060	0,105	-0,460	-0,010

* Significant $P < 0,05$;

** Significant $P < 0,01$

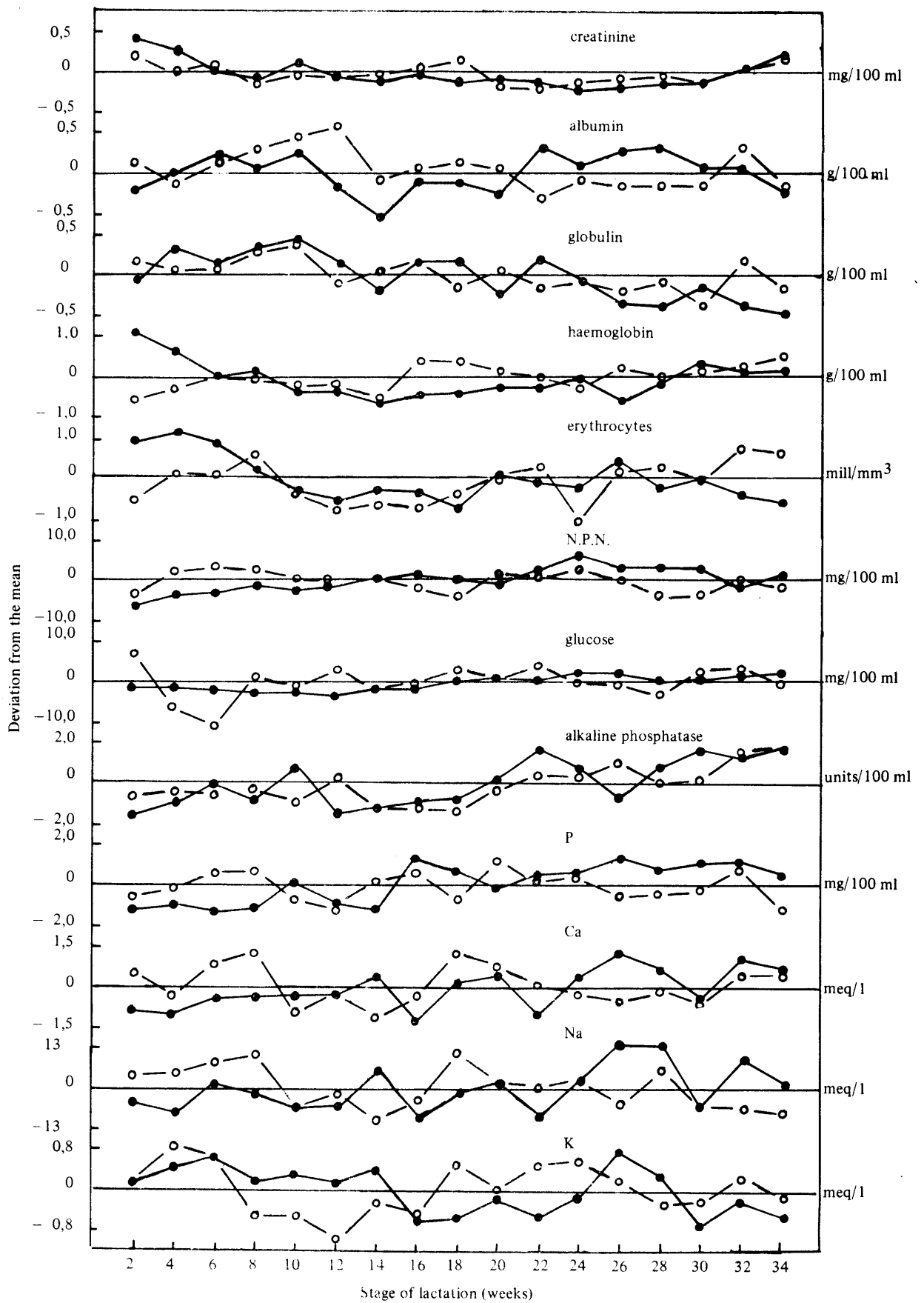


Fig. 1. — The variation of blood constituents of Afrikaner (●—●) and Friesian (○—○) cows with stage of lactation.

From Fig. 1 it can be seen that the degree of variation of each constituent from the mean is similar in both breeds. Large fluctuations in the blood composition do not occur except in the case of the glucose level of the blood of both breeds, although these fluctuations are smaller and show a more constant increase during lactation in the case of the Afrikaner than in the case of the Friesian cows. A remarkably close relationship in the variation of creatinine, globulin, erythrocytes, glucose and alkaline phosphatase was found during the different physiological stages of the lactation period in both breeds. The alkaline phosphatase concentration in the blood of both breeds showed a definite increase with advancing lactation, and the fact that the correlations with stage of lactation are not statistically significant may have been due to irregular fluctuations between sampling periods. It would thus appear that the percentage constituents of blood change with advancing

lactation, and that these changes are more consistent in the Afrikaner than in the Friesian breed.

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