COMPARATIVE BIOCHEMISTRY OF EWE SERUM DURING OESTRUS AND DIOESTRUS

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In oviparous and ovoviviparous animals, the oestrous period is accompanied by striking changes in composition of blood (Urist, Schjeide & McLean, 1958). Limited information is available, however, on changes in the composition of the blood of mammals during the reproductive cycle. The research reported in this paper concerns changes in blood plasma biochemistry during the oestrous and dioestrous phases of the cycle in the ewe.

Six mature ewes which had shown two consecutive oestrous cycles of normal duration were bled from the jugular vein on the day of oestrus. The same six animals were bled 6 days later during dioestrus. For both phases, ewes were bled at 09.00 hours before daily feeding. The blood samples were spun at 1600 g for 10 min and the serum was frozen at -20°C until it was analysed. Blood serum glucose, blood urea nitrogen (BUN), creatinine, uric acid, cholesterol, serum glutamic oxaloacetic transaminase (SGOT), lactate dehydrogenase (LDH), alkaline phosphatase (APase), inorganic phosphorus, calcium, albumin and total protein levels were determined in a Technicon Autoanalyzer SMA 18/60 model (Technicon Instruments Corporation). The haematocrit of blood samples was determined in Wintrobe haematocrit tubes.

The results of biochemical analysis of the serum are presented in Table 1. Both glucose and BUN were significantly ($P<0.01$) lower during oestrus. Uric acid and cholesterol were lower during dioestrus, but the differences between the two phases of cycle were not statistically significant. The hormonal status of the ewe changes during the oestrous cycle, blood levels of oestrogen being high during oestrus, and those of progesterone being predominant during dioestrus (Thorburn, Bassett & Smith, 1969; Scaramuzzi, Caldwell & Moor, 1970). The significantly lower levels of glucose and BUN during oestrus which were observed here may have resulted from a temporary decrease in feed intake or from changes in the metabolic status of the animal while under the influence of the high level of oestrogen.

Hervey & Hervey (1967) have shown that administration of progesterone to female rats causes an increase in body weight and a change in body composition. On the other hand, Morrison (1951) reported a decrease in the body weight of dairy heifers during oestrus. Clifton & Meyer (1956) found that injection of oestrogen depressed the appetite of rats. Preston (1968a) and Davis, Garrigus & Hinds (1969) have shown that plasma urea nitrogen (PUN) is reduced following diethylstilboestrol administration in sheep. Wynn & Doar

(1969) have reported a decrease in blood glucose in women receiving oestrogen therapy. They were unable to conclude whether this change resulted from altered rates of production and/or removal of glucose.

The enzymes, SGOT and APase, analysed in this study were elevated during dioestrus but the changes were not significant. Boyer (1961) and Birkett, Done, Neale & Posen (1966) reported a higher level of APase in the serum of women during pregnancy, when the serum progesterone level is known to be high. In another study, the serum APase level was higher in women treated with oestrogen (Curzen & Southcombe, 1970).

Inorganic phosphorus, calcium, albumin and total protein were significantly ($P < 0.01$) higher in blood serum on the day of oestrus than during dioestrus. Larson & Kendall (1957) reported an increased level of albumin and total

Table 1. Biochemical constituents of ewe serum during oestrus and dioestrus

	Phase of oestrous cycle	
	Oestrus	Dioestrus
Glucose (mg/100 ml)	54.8* $\pm$ 0.91	61.6 $\pm$ 1.58
BUN (mg/100 ml)	22.0* $\pm$ 0.97	28.5 $\pm$ 0.76
Creatinine (mg/100 ml)	0.85 $\pm$ 0.04	1.0 $\pm$ 0.07
Uric acid (mg/100 ml)	0.35 $\pm$ 0.03	0.30 $\pm$ 0.04
Cholesterol (mg/100 ml)	103.5 $\pm$ 5.38	91.0 $\pm$ 7.70
SGOT (mU/ml)	140.5 $\pm$ 6.56	155.5 $\pm$ 2.71
LDH (mU/ml)	391.6 $\pm$ 3.84	366.0 $\pm$ 13.63
APase (mU/ml)	100.0 $\pm$ 12.60	118.0 $\pm$ 4.57
Inorganic phosphorus (mg/100 ml)	4.91* $\pm$ 0.09	4.30 $\pm$ 0.09
Calcium (mg/100 ml)	12.95* $\pm$ 0.64	10.45 $\pm$ 0.13
Albumin (g/100 ml)	1.65* $\pm$ 0.04	1.45 $\pm$ 0.04
Total protein (g/100 ml)	7.55* $\pm$ 0.04	7.30 $\pm$ 0.04
Haematocrit (%)	39.1 $\pm$ 1.14	40.6 $\pm$ 1.31

Values are expressed as Mean $\pm$ S.E. There were six ewes per phase of the cycle.

* Significantly ($P < 0.01$) different from the mean dioestrous value.

protein in the blood of cows at the time of oestrus. Seal & Doe (1969) have shown that oestrogen causes an increase in total serum protein in women. They interpreted this as being a direct stimulatory effect by oestrogen on the liver which is the main source of all plasma proteins except the immunoglobins. The increased levels of phosphorus, calcium, albumin and total protein in the ewe serum during oestrus may result from increased metabolic activity while the ewe is under the influence of higher levels of oestrogen. There was no significant difference in the haematocrit when oestrous and dioestrous values were compared (Table 1). Preston (1968b) also did not find any significant difference between the haematocrit values of sheep treated with diethylstilboestrol and those of controls. The significant changes observed in certain blood serum components of the ewe during oestrus and dioestrus are probably not the result of haemodilution.

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