Maintenance of Pregnancy in Ovariectomized Ewes by Means of Progesterone

Ovariectomy may be performed in the ewe as early as the 50th day of pregnancy without resulting in abortion[1]. It has been assumed that by this stage the steroid hormones produced from extra-ovarian sources are sufficient to maintain pregnancy. This supposition is supported by the fact that progesterone has been found in the placentæ of ewes 100 days pregnant[2], and also in the adrenal venous blood of both gonadectomized rams and ewes[3]. However, little is known of the steroid hormonal requirements of the ewe during pregnancy. Foote *et al.*[4] treated ewes, ovariectomized $3\frac{1}{2}$ days after mating, with either progesterone alone or progesterone together with œstrone, and found at slaughter 25 days after mating, that almost 50 per cent of the ewes contained normal embryos.

In the course of a recent study involving egg transfer in the ewe, fertilized sheep eggs at the 8–16 cell stage were collected from donor ewes and transferred to the uterine horns of 36 recipient ewes. Both the donors and recipients were of the Welsh Mountain breed. Twenty-four of the recipients were ovariectomized at the time of transfer, 3–4 days after œstrus, and then treated with either progesterone alone at doses of 10 or 20 mgm./day, or with similar amounts of progesterone together with 5 μgm. œstradiol benzoate. The remaining 12 recipients were left entire and acted as control animals (Table 1). Of each group of 12 ewes,

Table 1

Treatment	No. of ewes	Total No. of eggs transferred	No. of Ewes lambing	No. of lambs born
Spayed Ewes				
Progesterone alone	12	42	10	17
Progesterone + œstradiol benzoate	12	42	6	8
Control Ewes				
None	12	42	10	19

6 received 5 eggs and 6,2 eggs, making a total of 42 eggs transferred to the animals in each of the 3 groups. Treatment of the spayed ewes was discontinued on the 60th day after œstrus and both control and spayed ewes were allowed to go to term.

Sixteen (67 per cent) of the 24 spayed ewes and 10 (83 per cent) of the 12 control animals afterwards lambed, producing 25 and 19 lambs respectively (Table 1). Of the 16 spayed ewes which lambed, 10 had been treated with progesterone alone and 6 with progesterone plus œstradiol benzoate. Significantly, more of the eggs transferred to ewes treated with progesterone alone developed into lambs than of those transferred to ewes treated with both hormones ($\chi^2 = 4{\cdot}61$; $P < 0{\cdot}05$). Neither the number of ewes which lambed nor the number of lambs born to the spayed ewes treated with progesterone alone differed significantly from control ewes, but significantly fewer of the eggs transferred to the spayed ewes treated with progesterone and œstradiol benzoate developed into lambs than in the control ewes ($\chi^2 = 6{\cdot}60$; $P < 0{\cdot}02$). The actual dose of progesterone administered to spayed ewes, irrespective of whether given alone or with œstradiol benzoate, had no effect upon the lambing results; of the 16 spayed ewes which lambed 8 had been treated with 10 mgm./day and 8 with 20 mgm./day progesterone. No abortions were observed in the spayed ewes after the cessation of treatment and the mean length of gestation of both control and spayed ewes was 147 days. Parturition in the spayed ewes was quite normal and the mean birth-weight of lambs born to these animals did not differ significantly from that of the control ewes.

It would seem that progesterone alone in daily dose levels of 10 or 20 mgm. is capable of maintaining pregnancy in ovariectomized ewes up to the 60th day of pregnancy. The presence of the ovaries does not seem to have any great influence on determining the length of gestation, nor do they appear to be essential for the processes of parturition.

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Effect of Vitamin D on the Respiration of Rat Oral Tissue

Little is known of the metabolic changes occurring in mammalian oral tissues. Glickman[1] determined the oxygen quotient, $Q(O_2)$, (μl. oxygen taken up per mgm. dry tissue per hr.) of normal human gingiva and found it to be $1{\cdot}6 \pm 0{\cdot}37$. In 1950[2] he reported that the $Q(O_2)$ of normal dog gingiva was $1{\cdot}3 \pm 0{\cdot}07$. Recently we have shown that a complete citric acid cycle exists in sheep gingiva, the $Q(O_2)$ for this tissue being[3] $1{\cdot}46 \pm 0{\cdot}33$. This work has been extended to include rat oral tissues in which the occurrence of a citric acid cycle has also been demonstrated[4]. The present report is concerned with the effect of vitamin D on the metabolism of rat palatal mucosa.

The tissues were taken from both normal and rachitic rats of the Wistar Institute strain. Histological examination confirmed that only the epithelium and a little sub-epithelian connective tissue was removed. Normal rats, fed on the stock diet used in this department, were taken for study when weighing about 60–80 gm. Another group was placed when weighing about 60 gm. on a modified Sherman-Pappenheimer rachitogenic[5] diet for 21 days. The diagnosis of rickets was made on radiological examination and after staining the epiphyses of the radii and ulnæ with silver nitrate[6]. Water-soluble vitamin D was prepared according to the method of Zetterström[7] and was found to be biologically active when given to rachitic rats. The $Q(O_2)$ of the palatal mucosa was determined by the direct method of Warburg, the procedure and solutions being as described by Umbreit *et al.*[8] Only a 30 per cent change in the $Q(O_2)$ as compared with controls was taken as being significant.

The basal $Q(O_2)$ values of normal and rachitic tissues showed no significant differences (Table 1). With both tissues the addition of succinate or malate produced a rise in oxygen consumption. When soluble vitamin D was added to the reaction mixture it had no effect upon the basal oxygen uptake of either type of tissue, nor upon the oxygen consumption of normal tissue in the presence of the two metabolites. However, in the case of mucosa from rachitic rats, vitamin D produced a further rise in oxygen consumption when succinate or malate was present (Table 1). The above effects were also noted when pyruvate or citrate