CIRCULATING PROGESTERONE LEVELS IN ANOESTROUS SHEEP WITH SILICONE RUBBER PROGESTERONE IMPLANTS

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Progesterone and various progestagen preparations impregnated into vaginal sponges (Robinson, Moore, Lindsay, Fletcher & Salamon, 1970; Robinson, 1970) or contained in subcutaneous silicone rubber implants (Dziuk & Cook, 1966; Falkenburg, Hulet & Kaltenbach, 1971) have been successfully used for the synchronization of oestrus in sheep. Sponges or implants are normally inserted for 10 to 20 days. Their removal at the end of this period leads to a high percentage of animals showing oestrous behaviour within 24 to 72 hr. Despite the success of this technique, little information is available on the actual levels of circulating progesterone in sheep during the treatment period. Dhindsa, Resko & Metcalfe (1973) reported on falling progesterone levels in goats despite continued administration of progesterone, either as an implant or by intramuscular injection.

In this study, ten 4/-year-old crossbred Suffolk ewes in mid-an oestrous (July) were used. All had previously lambed. Progesterone implants were made using silicone rubber tubing with an internal diameter of 3-18 mm, and an external diameter of 6-35 mm (Dow Corning, Silastic No. 601-361). The tubing was cut into 9-cm lengths, sealed at one end with silicone rubber adhesive and allowed to harden overnight. Progesterone (100 mg, Koch-Light Labs Ltd) was then dispensed into each tube and the open end was sealed with adhesive. All implants to be surgically inserted into sheep were autoclaved at 5 lb/in² for 20 min (109°C). Some implants were not autoclaved for comparisons of progesterone leakage rates in vitro.

For experiments in vivo, implants were inserted under the skin behind the front leg of each animal at least 15 min after local anaesthesia had been achieved by injecting 3 to 4 ml of 2% procaine hydrochloride (Novutox: Willows Francis Ltd, London) into the area. Implants were left in place for 10 days, during which time jugular vein blood samples were taken, and the plasma was separated and frozen at -20°C until progesterone assays were performed. Plasma progesterone was measured using a radioimmunoassay method which has been previously described (Symons, 1973).

Text-figure 1 shows the progesterone levels before, during and after the 10-
The results obtained. The leakage rate over the 10-day period did not alter significantly and in every case a saturated solution of progesterone was obtained. Heap, Symons & Watkins (1970) reported that the aqueous solubility of progesterone was 48 \( \mu \text{mol/l} \) (approx. 15 \( \mu \text{g/ml} \)). The autoclaved tubes showed a slightly higher leakage rate than did the unautoclaved tubes for the first few days. The leakage of progesterone over a 3-day period from implants removed from the experimental sheep was at a similar rate to those of all other implants.
Progesterone implants in anoestrous sheep

Table 1. The daily passage of progesterone into 100-ml vols of 0·9% saline at 37°C from silicone rubber implants

<table>
<thead>
<tr>
<th>Implant treatment</th>
<th>Days</th>
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<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Autoclaved (n = 3)</td>
<td>16·3</td>
</tr>
<tr>
<td>Unautoclaved (n = 3)</td>
<td>13·9</td>
</tr>
<tr>
<td>After 10 days in sheep (n = 6)</td>
<td>15·3 ± 1·0</td>
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Results are expressed as concentration in µg/ml. n = Number of samples. Where n = 3, results are means; where n = 6, results are means ± S.E.M.

It was concluded that the decrease in circulating levels of progesterone in the sheep while the implant was retained was due to a physiological process rather than to availability of the hormone from the implants.

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REFERENCES


Symons, A. M. (1973) Levels of oestrogen and progesterone in the plasma of the cow during the last month of pregnancy. J. Endocr. 56, 327.