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# **ELECTROMYOGRAPHIC STUDIES ON THE OVINE UTERUS**

**A THESIS PRESENTED IN PARTIAL FULFILMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
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*Li Yuemin*

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## ABSTRACT

There are many reports in the literature, using a variety of techniques, indicating that hormonally induced movements of the uterus play a major role in the reproduction process. The purpose of this study was to explore some of these phenomena by measuring electro-myographical responses from the uterus of intact and ovariectomized ewes both before and during their normal breeding season.

Six healthy non-pregnant Romney ewes of about 50 kg body weight were selected for the investigations which were carried out between September 1987 and February 1988.

Electrodes, usually in groups of three, were surgically implanted at pre-selected sites (cervix, uterine body, uterine horn, oviduct) on the reproductive tract of the ewes, leads plugged into a universal AC amplifier, and the output recorded on a four channel ink writing chart recorder.

Four of the six ewes were ovariectomized at the time of implantation of the electrodes. Indwelling silastic catheters were inserted into the external jugular veins of these ewes to enable oxytocin to be injected without disturbing the animal. All ewes were housed individually indoors in pens that allowed them to move freely during recording sessions. Recordings began about 10 days after surgery had been carried out.

The electromyographs (emgs) were described using generally accepted terms such as the presence of spikes, their amplitude, the presence of bursts and of episodes of activity, whether electrical activity was co-ordinated or unco-ordinated, and the direction of propagation of the activity. A motility index (MI) was derived as a method of measuring electrical activity of the uterus over prolonged periods of time.

During the anoestrous period in both intact and ovariectomized ewes an emg pattern of myoelectrical complexes characterised by alternating phases of co-ordinated bursts of electrical activity and quiescent periods were observed. This basic pattern of activity, and responsiveness to uterine stimulants such as oxytocin and Glandin N (a PGF<sub>2</sub> $\alpha$  analogue), was greater in the intact

ewes as compared to the ovariectomized ewes at this time. Although such a difference could be anticipated, a clear answer as to whether it is a general phenomenon, or whether seasonal differences exist, could not be determined because of the limitations in design of this study.

A distinct pattern of emg activity was also identified during different phases of the oestrous cycle in the ewe during the natural breeding season. This pattern could be mimicked by administration of the exogenous steroid hormones oestrogen and progesterone in the ovariectomized ewes. Four days after daily oestradiol-17 $\beta$  injections (50 $\mu$ g s.c.) the emgs of the ovariectomized ewes showed a marked increase in amplitude and in burst frequency and a considerably increased response to oxytocin and Glandin N. When this was followed by progesterone administration (50mg. s.c.), even with oestrogen injections continuing, inhibition of activity and reduced responsiveness to oxytocin and Glandin N was equally marked.

Withdrawal of progesterone, but with continuing oestrogen administration, resulted in a recovery from the inhibition and a response that was even greater than before the progesterone had been given. This suggests both an inhibiting and a potentiating action of progesterone on uterine electrical activity, a finding which adds some support to Csapo's classical withdrawal of the 'progesterone block' as one of the pre-requisites for initiation of normal parturition in sheep.

While oestrogen has a clear role to play as a stimulator of electrical activity it also seems capable of exhibiting a biphasic response with a period of depressed activity occurring before the positive stimulus occurs. Whether this is a function of dose or some other factor could not be established in this study. Its potentiating effect on the action of both oxytocin and Glandin N in these experiments adds further significance to the attention that should be paid to the reproductive status of the animal when clinical use is made of these substances.

The direction of propagation of action potentials recorded in these studies depended on the general level of emg activity. When this was low the direction of propagation was cervico-tubal, when high, the proportion of action potentials is in both directions from the tubal end of the uterus. A

clear understanding of such a mechanism, and its significance, must await further study.



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