THE CONCEPTION RATE OF EWES AFTER ARTIFICIAL INSEMINATION AT DIFFERENT TIMES DURING OESTRUS*

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It is generally accepted that in cattle the conception rate depends upon the time of insemination in relation to the time of ovulation, considering the unequal life-span of the gametes and the time necessary for sperm transport and capacitation (Asdell, 1955). Accordingly, practical recommendations have been put forward as to the time during oestrus when insemination will result in the optimum conception rate (Salisbury & VanDemark, 1961).

Studies made in ewes gave variable results, with the optimum time for insemination coinciding with the first half of oestrus (Sinclair, 1957; Morratt & Dun, 1960; Restall, 1963; Jones, Martin & Lapwood, 1968; Mattner & Braden, 1969), mid-oestrus (Kardymovic, Marsakova & Pavljucek, 1934; Carbonero-Bravo, 1955) or the later stages of oestrus (Anderson, 1941; Restall, 1961; Schindler, Eyal & Volcani, 1961; Steklenev, 1961).

In view of the potential importance of artificial insemination in sheep breeding, the present study was undertaken in order to obtain additional information on the relationship between the time of insemination and the conception rate.

A total of 209 mature dry Awassi ewes were inseminated during 3 consecutive years, between August and November, the season when the ewes were in full sexual activity (Amir & Volcani, 1965). The onset and duration of heat was determined by teasing with aproned rams at 4-hr intervals. A single insemination was performed on each ewe, at 08.00 hours, immediately after teasing. Thirty-one ewes were inseminated either before the onset of the expected oestrus or after the end of oestrus, and 178 ewes were inseminated over a range from '0 to 4 hr' to '36 to 40 hr' after the onset of oestrus. The teasing of the ewes during the whole period of oestrus ensured an equal frequency of contacts with rams and enabled us to relate the time of inseminations to the end of oestrus.

Semen was collected with an artificial vagina from fifteen rams in a random sequence; one ejaculate was generally used for not more than five inseminations. The semen was kept at about 30°C until insemination, which was carried out within 30 min of collection. Semen (0.1 ml) was deposited in the opening of the cervical canal. The conception rate was assessed as the rate of ewes lambing.

The conception rate was found to be rather uniform regardless of the stage of oestrus at which the ewes were inseminated (Table 1). Only inseminations

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carried out 0 to 4 hr after the onset of oestrus resulted in a lower conception rate. The conception rate of ewes inseminated either before the onset or after the end of oestrus was very low (Table 2).

The fact that a lower conception rate was obtained from inseminations carried out 0 to 4 hr after the onset of oestrus did not appear to be related to ageing of the spermatozoa, since by relating the results to the end of oestrus (Table 1), it can be seen that even a time interval of 40 hr from insemination to end of oestrus did not influence the conception rate. Since the end of oestrus

TABLE 1
RESULTS OF INSEMINATIONS CARRIED OUT AT DIFFERENT TIMES
DURING OESTRUS

Grouping in relation to onset of oestrus			Grouping in relation to end of oestrus		
Hours from onset of oestrus	No. of inseminated ewes	No. of lambings	Hours before end of oestrus	No. of inseminated ewes	No. of lambings
0 to 4	20	9	0 to 4	23	14
4 to 8	17	15	4 to 8	22	18
8 to 12	17	15	8 to 12	16	14
12 to 16	13	10	12 to 16	22	17
16 to 20	21	17	16 to 20	14	8
20 to 24	19	13	20 to 24	23	15
24 to 28	21	17	24 to 28	19	15
28 to 32	16	14	28 to 32	18	14
32 to 36	18	12	32 to 36	6	5
36 to 40	16	9	36 to 40	15	11
Total	178	131	Total	178	131

TABLE 2
RESULTS FROM INSEMINATIONS CARRIED OUT BEFORE THE ONSET OR
AFTER THE END OF OESTRUS

Grouping in relation to onset of oestrus			Grouping in relation to end of oestrus		
Hours before (–) or after (+) the onset (0 hr) of oestrus	No. of inseminated ewes	No. of lambings	Hours before (–) or after (+) the end (0 hr) of oestrus	No. of inseminated ewes	No. of lambings
–24 to –12	9	1	> –48	7	0
–12 to 0	8	2	–48 to –36	10	3
> +32	14	3	0 to +12	14	3

coincides, on the average, with ovulation (McKenzie & Terrill, 1937; Schindler & Amir, 1972), this time interval is indicative of the duration of the fertile life of the spermatozoa. Occasionally, their fertile life may be even longer, as shown by the results of the pro-oestrous inseminations (Table 2). It seems, therefore, that the lowered conception rate from inseminations early in oestrus is connected with conditions in the reproductive tract of the ewe rather than with senescence of the spermatozoa. The poor results obtained from inseminations before the

onset of oestrus are probably due both to senescence of the spermatozoa and to unfavourable conditions in the female reproductive tract.

The long survival time of ram spermatozoa in the genital tract of the ewe, (Quinlan, Maré & Roux, 1933; Dauzier & Wintenberger, 1952; Steklenev, 1961), and the short time necessary for sperm capacitation (Mattner, 1963), explain why a high conception rate can be achieved from inseminations carried out during almost all the stages of oestrus. The fact that some conceptions were obtained from inseminations after the end of oestrus, probably in late ovulating ewes (McKenzie & Terrill, 1937; Schindler & Amir, 1972), is also indicative of a short capacitation time.

The data presented were obtained using a dose containing 300 to 500×10^6 fresh spermatozoa. The results may differ when stored semen or a reduced sperm concentration is used. Under such conditions, which may influence the fertile life-span of the spermatozoa and the size of the sperm reservoir in the genital tract of the ewe (Quinlan *et al.*, 1933; Mattner, 1966), the time range for successful inseminations may be more limited.

In the present experiment, normal cycling ewes were used. When inseminations are preceded by hormonal treatment of the ewes, an optimum time for mating in relation to induced ovulation (Dziuk, 1970), or in relation to the beginning of an induced oestrus (Robinson, 1970), has been found.

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