

Hormonal Induction of Lactation in Friesian Cows and Heifers

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LACTATION was hormonally induced in 9 cows and 5 heifers which were known to have reproductive disorders. Each animal received daily subcutaneous injection of oestradiol 17-B (0.1 mg/kg body weight) and progesterone (0.25 mg/kg body weight) for 7 days. This was followed by oral treatment with reserpine (0.017 mg/kg body weight) for 5 days (days 8-12). Hand milking was initiated (day 20-23). Thereafter, all animals were machine milked twice daily.

Lactation was successfully induced in all animals and it continued for about 45 and 52 weeks, on average in cows and heifers, respectively.

Milk yield was about 72 of that obtained from contemporary herdmates. Peak lactation was reached about 56 days, on average, after commencement of lactation, with marked individual variation. Milk fat percentage was slightly higher in milk from induced lactation than in that obtained from contemporary cows and heifers which calved normally. The hormonal treatment used did not have marked effect on the reproductive performance of the animals used.

Key words : Friesian, Lactation, Induction.

Artificial induction of lactation may be economically used in commercial herds to salvage subfertile or problem breeder cows with food fenetic background.

There have been many attempts to induce lactation artificially using hormonal treatment with oestrogen alone or combined with progesterone (Erb *et al.*, 1976, Fulkerson, 1978). These schemes which usually involved long periods of hormone injection mimicking pregnancy, generally gave inconsistent and low milk yields.

Smith and Schanbacher (1973 & 1974) introduced a method combining oestrogen and progesterone treatment. Although better success was claimed using this method, milk production was below normal. Low plasma prolactin levels in some cows can limit the milk yield which is induced by steroid treatment (Erb *et al.*, 1976). Since prolactin is not available in large quantities for the hormonal induction of lactation in dairy cows, reserpine treatment which results in dramatic prolactin release (Bauman *et al.*, 1977) has been used along with steroid treatment, to induce lactation with varying degree of success (Collier *et al.*, 1977, Peel *et al.*, 1978).

The purpose of this investigation is to evaluate the success of short term hormonal treatment with oestradiol and progesterone along with reserpine for inducing lactation in cows and heifers which have failed to conceive due to various reproductive disorders.

M a t e r i a l a n d M e t h o d s

Nine cows and five heifers from the friesian herd kept at Sakha Experimental Station were used in this study. They were culled from the herd from various reproductive disorders, which included failure to conceive after repeated breeding, failure to have detectable oestrus, cervicitis or a combination of the above. At the beginning of the experiment, the cows used had been dry for at least four months.

Each of these animals received daily injection of oestradiol 17-B (0.1 mg/kg body weight) and progesterone (0.25 mg/kg body weight) for seven days. Progesterone and oestradiol 17-B were dissolved in sterile arachis oil and injected subcutaneously. In addition, on days 8 to 12 each animal received an oral dose of 0.017 mg reserpine/kg body weight/day.

Milking commenced when the mammary gland became engorged on days 20-23 of the treatment period.

All animals were hand milked for the first three days and thereafter were machine milked twice daily at 0600 and 1600 h. Milk yield of individual animals was recorded daily. Fat content was determined in milk samples taken once every two weeks throughout the lactation period. (Gerber, 1960).

All cows and heifers were housed in an open yard and were subjected to the normal feeding and management system applied on the farm. Oestrous detection was carried out, using a teaser bull, twice daily at 0700 and 1500 h for 30 min. on each occasion. Starting from day 40 following treatment animals which were seen in oestrus were inseminated using locally produced frozen semen. Ovarian examination was performed through rectal palpation once every two weeks throughout the experimental period, while pregnancy diagnosis was carried out about 50 days after the last insemination.

Results and Discussion

The use of short term hormonal treatment in the present study was successful in inducing lactation in all the treated heifers and cows. All animals had peak lactation of more than 5 kg/day which is higher than the 3 kg/day peak level used by peel *et al.* (1978) as the criterion to indicate successful lactation. Such high success is in contrast with the results of other studies (Hammond and Day, 1944 ; Smith and Schanbacher, 1973 ; Chakriyarat *et al.*, 1978) where 50-70% of the treated animals "lactated" The high rate of success in inducing lactation in the present study may be related to the use of reserpine to follow the combined oestrogen and progesterone treatment. Collier *et al.* (1977) and lembowicz *et al.* (1982) reported that the use of reserpine increased success rate of inducing lactation. This effect has been related to the role of reserpine in causing a dramatic increase in blood prolactin concentration (Bauman *et al.*, 1977 ; Collier *et al.*, 1977). Low plasma levels of prolactin in some cows can limit the milk yield which is induced by steroid treatment (Erb *et al.*, 1976 ; Collier *et al.*, 1977 ; Jordan *et al.*, 1981).

Total milk yield for the induced lactation was variable among individual animals (Table 1). This agrees with other authors who reported marked individual variation in the response of animals to hormonal treatment to induce lactation (Smith and Schanbacher, 1973 ; Collier *et al.*, 1975 ; Harness *et al.*, 1978). Almost all cows had milk yields which was substantially lower than those of normal parturient cows. Total milk yield was about 63% on average, of that produced from the cows, in their previous lactation with large individual variation (range 42-128%). (Table

TABLE 1.: Lactational performance of cows and heifers induced to lactation by combined oestradiol/progesterone/resserpine treatment.

Cow No.	No. of previous lactations	Previous lactation		35 days yield (kg)	Total yield (kg)	lactation period (day)	305-days yield (kg)	mean fat content %	% of herd mates production	% of previous lactation	Time to peak lactation (day)
		Total yield (kg)	lactation period (day)								
1	6	1340	232	-	1718	263	-	3.5	74	128	22
2	9	2380	457	1744	3003	291	-	3.6	67	42	74
3	8	2290	273	-	1169	354	1072	3.8	65	51	15
4	6	1836	262	-	886	284	-	3.7	38	48	34
5	6	3587	315	3566	2109	403	1791	3.5	92	59	84
6	9	1644	302	-	1077	298	-	3.4	71	66	56
7	7	2209	267	-	928	218	-	3.5	60	42	80
8	3	839	216	-	611	263	-	3.4	44	53	42
9	6	4081	331	4015	2521	352	2420	3.4	109	61	68
10	-	-	-	-	2426	375	2134	3.5	86	-	16
11	-	-	-	-	966	295	-	3.6	34	-	111
12	-	-	-	-	3706	450	3053	3.1	127	-	34
13	-	-	-	-	2958	422	2689	3.4	104	-	76
14	-	-	-	-	1194	288	-	3.4	42	-	74

1). Part of the low production in the induced lactation of these cows, however, may be related to their age since almost all cows used had six lactations or more prior to the induced one. Milk yield from induced lactation in cows was about 69% of that produced by their herd mates of the same parity. This was however higher in heifers (79%) giving an overall average value of 72% in all animals used (Table 1). The figures obtained in the present study support those reported by other workers who found that induced lactation yield was substantially less than that of normal lactation. Fulkerson (1978) reported that milk yield induced lactation in heifers was 65% of that following normal pregnancy, while a lower value of 44% was reported by Harness *et al.* (1978). Others reported that cows which were induced to lactate produced about 51 to 76% of the milk yield in their previous lactation (Smith and Schanbacher, 1973; (Chakriyarat *et al.*, 1978; Lembowicz *et al.*, 1982).

The pattern of changes in milk yield in the present study is similar to that reported by other authors. Peak milk yield was achieved after 56 ± 7.8 days from the commencement of lactation. In some individuals however peak lactation was either achieved earlier (2nd-3rd week of lactation) or later (16th week). The average time to peak lactation is similar to that reported by Collier *et al.* (1975), Chakriyarat *et al.* (1978) and Harness *et al.* (1978).

Fat percentage in milk from induced cows and heifers was slightly higher than that produced after normal parturition of their herd mates. This agrees with what has been reported by other authors (Smith and Schanbacher, 1978; Fulkerson, 1978) such a difference is difficult to explain and deserves detailed investigation.

The hormonal treatment used in this study did not result in marked changes in the reproductive performance of the animal used (Table 2). For all animals the interval from the induction of lactation to the detection of first oestrus was long (mean 113 ± 22.6 days). Following their first oestrus, only four out of 11 which were inseminated conceived with an average number of 2.7 inseminations per conception. These results contrast with those of Collier *et al.* (1975) who found that the beneficial effect on conception of steroid-induced lactation extended to 50% of the animals. On the other hand, no cases of ovarian cysts were observed

in the present experiment following treatment, which is contrary to a high incidence of cystic ovaries reported by Harness *et al.* (1978) and Lembowicz *et al.* (1982). The variable effect of hormonal treatments to induce lactation in dairy cows soon their reproductive performance found in different studies may be related to variation in the initial reproductive status of the animals or to multiple differences in the treatments used.

TABLE 2. Reproductive performance of cows and heifers prior to and after hormonal induction of lactation.

Cow No.	Age (Yr)	Prior to treatment		After treatment		
		No. of unsuccessful inseminations	Possible causes of reproductive failure	Days to first	No. of services	Reproductive performance
1	9	3	cervicitis	66	2	open (cycling)
2	8	6	cervicitis	174	22	open (cycling)
3	10	8	unknown	124	3	pregnant
4	11	4	cervicitis	26	2	open (cycling)
5	9.5	5	metritis	41	3	open (cycling)
6	13	3	unknown	26	3	open (cycling)
7	10	3	cervicitis	264	4	pregnant
8	6	3	cervicitis	34	3	cycling (open)
9	9.5	7	unknown	—	—	not cycling
10	4	12	cervicitis	36	2	open (cycling)
11	4	—	abortion	212	2	pregnant
12	3.5	11	metritis	184	—	culled
13	3	12	cervicitis	176	2	open (cycling)
14	2.5	not cycling	unknown	110	2	pregnant

In conclusion, the results of the present investigation indicate the success of using short term treatment with progesterone and oestrogen followed by reserpine in inducing lactation in cows which would be normally culled for reproductive disorders. It should be emphasized however that apart from a few individual animals lactation yields are likely to be less than those obtained in lactations following pregnancy.

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احداث الحليب هرمونيا فى ابقار وعجلان الفريزيان

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مصر .

تم احداث الحليب فى ٩ ابقار وعشر عجلات بهما عيوب تناسلية .
اعطى لكل حيوان حقنة تحت الجلد يوميا من مادة الاستراديول
(١ر. ملليجرام/كيلو جرام وزن حى) وكذلك حقنة البروجستيرون
(٢٥ر. ملليجرام/كيلو جرام وزن حى) لمدة سبعة ايام . ثم تبع ذلك
اعطاء الحيوانات مادة الريفيربين عن طريق الفم (١٧ر. ملليجرام/كيلو
جرام وزن حى) لمدة خمسة ايام (يوم ٨ الى يوم ١٢) .

تم حليب هذه الحيوانات يدويا (يوم ٢٠ الى ٢٣) ثم استخدم
الحليب الالى مرتين يوميا . ولقد نجح حليب هذه الابقار جميعها واستمر
الحليب الى حوالى ٤٥ الى ٥٢ اسبوعا فى كل من الابقار والعجلات على
التوالى . كان انتاج اللبن حوالى ٧٢ ٪ من متوسط انتاج الحيوانات
المباشرة وصل اقصى انتاج للبن بعد ٥٦ يوما فى المتوسط .

وكان هناك ارتفاع بسيط فى نسبة الدهن فى الحيوانات الماملة من
الاخرى التى ولدت ولادة طبيعية .

لم تسبب الماملة اى تغير فى السلوك التناسلى لهذه الحيوانات .