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INDUCTION OF GESTATION DURING LACTATION IN THE SOW

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SUMMARY

The moment of injection of PMSG during lactation and the size of the suckled litter at the time of treatment modify to a large extent the level of induced births : it increases if the mother suckles few piglets and when the injection of PMSG is administered late in lactation.

If one wishes to induce a gestation early in the lactation period (around the 16th day) some of the piglets must be removed from the mother before PMSG injection. Under these conditions, 76.4 p. 100 of the sows come into oestrus between the 3rd and 7th days after hormone treatment, they ovulate. The fertility approaches that produced after an abrupt weaning 3 to 5 weeks after parturition.

Throughout lactation in the sow, oestrous cycles are usually suspended, no ovulation occurs, and the ovary is in a resting phase (PALMER *et al.*, 1965 ; LAUDERDALE *et al.*, 1965). The absence of follicular stimulation would originate from a lack of FSH release. The FSH hypophyseal content is elevated at end of lactation. But also LH synthesis can be stopped. The pituitary level of this hormone remains low during the period of lactation (CRIGHTON and LAMMING, 1969 ; LAUDERDALE *et al.*, 1965 ; MELAMPY *et al.*, 1966) ; no hormonal assay in blood has confirmed these hypothesis.

Nevertheless, in a certain number of cases, it has been possible to induce a gestation during lactation by the use of PMSG. The results were variable, especially when attempts were made to induce gestation early after parturition (CRIGHTON, 1968 ; 1970 ; HEITMANN and COLE, 1956 ; EPSTEIN and KADMON, 1969 ; MARTINAT *et al.*, 1972, 1974).

Different factors are likely to modify the farrowing rate and the litter size after induced oestrus with PMSG during lactation in the sow. We have tried to elucidate the role of some factors (time of PMSG injection, size of the suckled litter at the time of treatment).

EXPERIMENTAL METHODS

Large White, Pietrain and cross-bred sows received an intramuscular injection of 2 000IU PMSG on the 16th, 18th, 25th or 32 nd day of lactation (L_0 : day of parturition).

The piglets were not separated from the mothers during the period of lactation when the females underwent PMSG treatment at L_{18}, L_{25} and L_{32}. The number of piglets at the time of injection was not noted for all sows treated at L_{18}, L_{25} and L_{32}.

On the other hand, for half the sows treated at L_{16}, a reduced number of 1 to 5 piglets was left with the mother from the 10th day of lactation ; the rest of the litter was reared artificially.

Oestrous detection was carried out twice daily from the day after PMSG injection.

Females in oestrus were inseminated twice on the first and second days of oestrus with 4×10^9 spermatozoa. In the sows treated on the 32 nd day of lactation, and in some of those treated at L_{18}, artificial insemination was carried out systematically on the 4th and 5th days after PMSG. A coelioscopic examination of the ovaries was performed, during the ten days following insemination, on some of the sows treated at L_{16}, L_{18} and L_{25}. Weaning was at a fixed date, either 21 or 31 days after PMSG.

RESULTS

1. — *Appearance of oestrus*

Respectively, 33.3, 57.0 and 74.2 p. 100 of sows treated at the 16th (suckling more than 6 piglets), 18th and 25th days of their lactation came into oestrus between the 3rd and 7th days after injection of PMSG — the maximum number on the 4th and 5th days : 45.8 p. 100 if the hormone was injected at L_{18} ; 61.4 p. 100 if PMSG was injected on the 25th day of lactation (table 1). Thus, the response, is better when the treatment is given later in lactation ($P < 0.01$). No detection of oestrus was possible for the hormone treatment carried out at L_{32}.

TABLE I

Oestrus response after PMSG injection (2 000 IU)
L_0 = day of farrowing

Day of PMSG injection during lactation	No. of treated sows	Interval between PMSG injection and oestrus (days)				
		3	4	5	6 + 7	Total
L_{16}	21 (1)	1	2	2	2	7 (33.3)
	17 (2)	6	5	2	—	13 (76.4)
L_{18}	205	5	61	33	18	117 (57.0)
L_{25}	140	8	59	27	10	104 (74.2)

(1) Sows suckling more than 6 piglets.

(2) 1-5 piglets left with the sow from the 10th day of lactation.

( ) Percentages calculated in comparison with the number of sows treated.

In addition, the induction of oestrus seems to depend on the size of the suckled litter at the time of treatment. If litter size is increased from 5 to 10, the percentage of sows in oestrus decreases : at L_{18}, it decreases from 77.3 to 46.8 p. 100 ($P < 0.05$). This diminution is similarly noted for treatments at L_{16} ($P < 0.05$) and L_{25} (NS) (table 3). On the other hand, if only 1 to 5 piglets are left with the mother from the 10th dayof lactation, the same proportion of sows come in oestrus, after an injection of PMSG at L_{16}, L_{18} and L_{25} and are 76.4, 77.3, 58.3 p. 100 respectively.

2. — *Ovulation* (table 2)

A coelioscopic examination of the ovaries was performed ten days after the injection of PMSG. A low percentage of females in oestrus are ovulating, whatever the time of PMSG injection. In fact, among the sows in oestrus after a PMSG treatment at L_{16} (suckling more than 6 piglets), L_{18} and L_{25}, only 71.4, 41.6 and 75.0 p. 100 of these had corpora lutea on both ovaries. The ovulation rate varied between 19.8 and 24.2. The frequency of silent ovulations is higher at L_{16} (10.0 p. 100) than at L_{18} (3.2 p. 100) ; none was noted at L_{25}.

If the size of the suckled litter is diminished, the proportion of sows showing induced oestrus and ovulating after PMSG injection at L_{16} is around 100 p. 100 ; the mean number of corpora lutea per female is 27.8 in this case.

TABLE 2

Influence of the PMSG injection (2 000 IU) *on the rate of ovulated sows*
(coelioscopic ovarian examination)
L_0 = day of farrowing

Day of PMSG injection during lactation	Sows in oestrus				Sows without oestrus		
	With ovulation			Without ovulation	Total	With ovulation	Without ovulation
	Total	Only C. L.	C. L. and cystic follicles				
L_{16}	7 (1)	5 (23.2)	—	3	13 (1)	2	11
	11 (2)	11 (27.8)	—	—	4 (2)	2	2
L_{18}	12	5 (19.8)	3	4	19	1	18
L_{25}	28	21 (24.2)	3	4	9	—	9

(1) Sows suckling more than 6 piglets.
(2) 1-5 piglets left with the sow from the 10th day of lactation.
( ) Mean No. of corpora lutea per sow.

3. — *Farrowing rate and prolificity* (obtained after induced oestrus)

The time of PMSG injection during lactation modifies significantly the farrowing rate : 19.0 p. 100 and 25.4 p. 100 of sows treated at L_{16} (suckling more than 6 piglets) and L_{18} give birth, against 34.1 and 45.8 p. 100 in the case of injection 7 or 14 days later (table 3).

The size of the suckled litter at the time of PMSG injection is also related to the fertility : at L_{18}, if the number of suckled piglets increases from 5 to 10 the farrowing rate decreases from 63.6 to 22.6 p. 100 ($P < 0.01$). This decrease under the influence of litter size is also observed for the treatment at L_{16} as for that at L_{25} (NS). The time of treatment does not appear to have an influence on the prolificity. The mean litter size are for the four treatments respectively : 9.2, 11.1, 10.3, 9.9 piglets per sow after systematic AI at the induced oestrus (table 3).

TABLE 3

Influence of the number of suckled piglets on the pregnancy rate of treated osws
L_0 = day of farrowing

No. of suckled piglets	Day of PMSG injection during lactation															
	L_{16} (1)				L_{18}				L_{25}				L_{32} (2)			
	Studied parameters															
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1-5	17	13	11 (64.7)	9.9	22	17	14 (63.6)	10.3	12	7	5 (41.7)	12.4				
6-9	12	4	4 (33.3)	9.2	93	52	17 (18.3)	12.2	53	42	22 (47.5)	9.9				
10-15	9	3	—	—	62	29	14 (22.6)	10.8	58	31	15 (25.9)	8.8				
Total					177	98	45 (25.4)	11.1	123	80	42 (34.1)	10.3	107	—	49 (45.8)	9.9

Studied parameters { 1 = No. of treated sows, 2 = No. of induced oestrus, 3 = No. of pregnant sows, 4 = Litter size (average of dead and live piglets at birth).

( ) Percentages calculated in comparison with the number of treated sows.

(1) For half the treated sows, a reduced number of 1 to 5 piglets was left with the mother from the 10th day of lactation.

(2) The number of piglets at time of injection was not noted.

For the females treated at L_{16}, if the piglets are removed from the mother at 10 days of lactation, the farrowing rate increases significantly (64.7 p. 100) in comparison with that calculated when the females keep all their piglets (more than 6 in this case) during the whole lactation period (19.0 p. 100). Prolificity does not differ between treatments.

DISCUSSION

It is possible to induce oestrus and ovulation in lactating sows by a single injection of PMSG (2 000 IU) carried out on the 16th, 18th, 25th or 32nd day after parturition. However, the ovarian response is dependant on the time of injection of PMSG and on the size of the suckled litter at this time.

It appears difficult to induce gestation early enough in lactation when the sow suckles more than 6 piglets. In fact, an examination of the ovaries 10 days after artificial insemination has shown that the proportion of sows which ovulate is low in sows treated at $L_{\prime 16}$ and $L_{\prime 18}$.

This could explain in part, the variability of results quoted in the literature (ALLEN and *al.*, 1957 ; CRIGHTON, 1968 ; 1970 *a* ; 1970 *b* ; KUDLAC, 1962 ; EPSTEIN and KADMON, 1969 ; MARTINAT and *al.*, 1972 ; 1974) since few authors have taken account of the parameters indicated above.

However, if the size of the suckled litter is controlled by removing some of the piglets from the 10th day of lactation, the percentage of pregnant sows after injection of PMSG at $L_{\prime 16}$ is little different from that found after immediate weaning.

ROWLINSON and BRYANT (1974) have shown that, under natural conditions (without hormone treatment and without control of the size of the suckled litter), the grouping at 3 weeks of lactation until weaning (6 weeks) of 3 to 8 sows with their litters in the same covered yard provokes an oestrus and a gestation during lactation in 98.2 p. 100 of animals. However, the appearance of oestrus is spred over a period of 10 days, on average, after the grouping.

Why then, could one not envisage to leave 3 or 4 piglets with the mother until ten days of lactation, to re-group the sows with their piglets after an injection of 2 000 IU of PMSG, weaning taking place at a fixed date?

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RÉSUMÉ

INDUCTION DE LA GESTATION PENDANT LA LACTATION CHEZ LA TRUIE

L'injection de 2 000 IU de PMSG permet d'induire l'œstrus et l'ovulation chez la truie allaitante. Mais la réponse de l'ovaire dépend du moment de l'injection de PMSG et de la taille de la portée allaitée.

Pour induire une gestation très tôt au cours de la lactation (vers le 16e jour) il faut enlever une partie des porcelets à la mère avant l'injection de PMSG. S'il ne reste que 1-5 porcelets, 76,4 p. 100 des truies entrent en œstrus 3 à 7 jours après l'injection et ovulent. La fertilité est comparable à celle des truies sevrées 3 à 5 semaines après parturition.

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