

## THE MANAGEMENT OF REPRODUCTION IN SOW GROUPS WITH TIME-ORIENTATED INSEMINATION TO REDUCE SEASONAL PERFORMANCE VARIATIONS

U. Hühn, M. Wähner

### Summary

At the beginning of the eighties in East Germany more than 85% of sows were artificially inseminated. The simultaneous insemination of weaning sows after a suckling period of 4 or 5 weeks in a short time is of great importance in large herds with group weaning systems. The onset of follicle growth and the beginning of oestrous in sows is stimulated by a PMSG-application. This step (measure) is qualified for increasing the amount of ovulating follicles. The synchronisation of oestrous is an important condition to stabilize and increase the litter size of sows after a short suckling period. Exactly 24 hours post weaning sows receive the PMSG-injection. It is necessary to note the number of the litter for doses of PMSG. Primiparous sows receive 1000 IU PMSG, pluriparous sows receive 800 IU PMSG.

For stimulation of ovulation in sows hCG is used. In healthy sows under good feeding and housing conditions it protects the synchronisation of the beginning of ovulations to a large degree.

The length of the previous suckling period is important for the distance between PMSG- and hCG-injection. For sows with a 5-week suckling period it will be 56 to 58 hours and for sows with a 4-week suckling period it will be 72 hours.

The reproduction performance variations in quarters are an important yearly problem, especially in large stocks of sows. They exist for all synchronized biotechnical efforts in large stocks with consequence performance degree. Reducing these reproduction performance variations is the main aim of biotechnical treatments for oestrous controlling in sows.

In the first investigations the synthetic Gn-RH analogue to Gonavet<sup>R</sup> (Veyx-Pharma) is suited for these aims. In contrast to gonadotrophin hCG the Gn-RH is active in the hypothalamus-hypophysis system. It controls synthesis and the release of gonadotrophins in adenohypophysis (see picture 1). External and internal stimulating factors influence the control of Gn-RH synthesis very much, such as environmental stimuli like the light rhythm of day and night.

Therefore supplementary exogenous injection of this hormone could promote a higher stability in growth and maturing of follicles (Wähner, 1989).

Paper presented at 46th Annual Meeting of the EAAP, 4. - 7. September 1995 in Prague.

U. Hühn, Hybridschweinezuchtverband Nord-Ost, Neubrandenburg, Germany; M. Wähner, Fachhochschule Anhalt, Fachbereich Landwirtschaft, Ökologische, Landespflege, Bernburg, Germany

The aim of these investigations are the following:

- The use of Gonavet<sup>R</sup> for stimulation of ovulation in sows and comparison of reproduction performance to sows which received 500 IU hCG.
- Testing the seasonal reproduction performance variations in sows which received Gonadotrophin or Gn-RH Analoge for stimulation of ovulation.

### *Introduction*

At the beginning of the eighties in East Germany more than 85% of sows were artificially inseminated. The simultaneous insemination of weaning sows after a suckling period of 4 or 5 weeks in a short time is of great importance in large herds with group weaning systems.

The onset of folliclegrowth and the beginning of oestrous in sows is stimulated by a PMSG-application. This step (measure) is qualified for increasing the amount of ovulating follicles. The synchronisation of oestrous is an important condition to stabilize and increase the litter size of sows after a short suckling period.

Exactly 24 hours post weaning sows receive the PMSG-injection. It is necessary to note the number of the litter for doses of PMSG. Primiparous sows receive 1000 IU PMSG, pluriparous sows receive 800 IU PMSG:

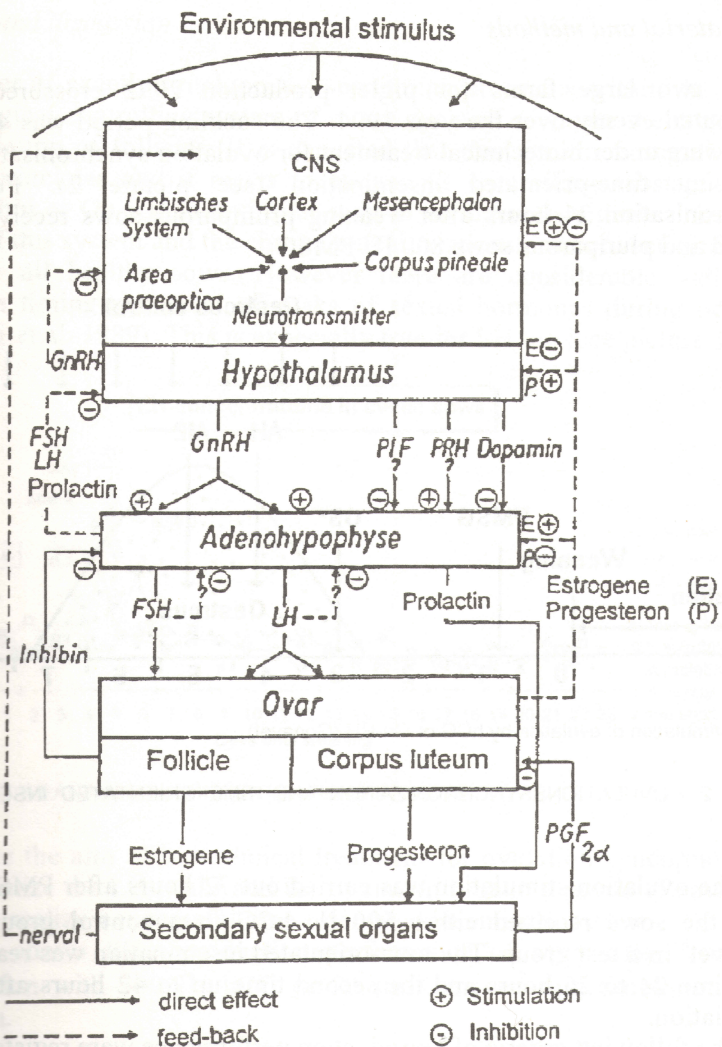
For stimulation of ovulation in sows hCG is used. In healthy sows under good feeding and housing conditions it protects the synchronisation of the beginning of ovulations to a large degree.

The length of the previous suckling period is important for the distance between PMSG-and hCG-injection. For sows with a 5-week suckling period it will be 56 to 58 hours and for sows with a 4-week suckling period it will be 72 hours.

The reproduction performance variations in quarters are an important yearly problem, especially in large stocks of sows. They exist for all synchronized biotechnical efforts in large stocks with consequence performance degree (Wähner, 1989), Reducing these reproduction performance variations is the main aim of biotechnical treatments for oestrous controlling in sows.

In the first investigations the synthetic Gn-RH analogue to Gonavet<sup>R</sup> (Veyx-Pharma) is suited for these aims. In contrast to gonadotrophin hCG the Gn-RH is active in the hypothalamus-hypophysis system. It controls synthesis and the release of gonadotrophins in adenohypophysis (see picture1). External and internal stimulating factors influence the control of Gn-RH synthesis very much, such as environmental stimuli like the light rythm of day and night. (Döcke, 1994).

Therefore supplementary exogenous injection of this hormone could promote a higher stability in growth and maturing of follicles (Wähner, 1989).



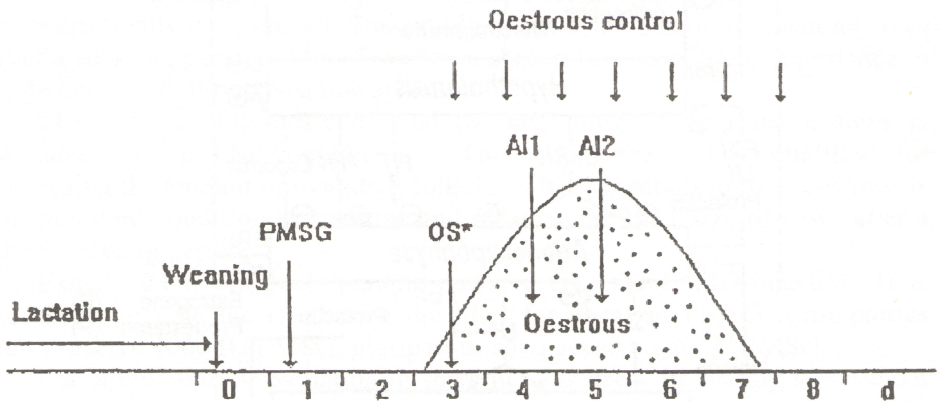
Picture 1 - NEUROHORMONAL CONTROL OF REPRODUCTION IN FEMALE ANIMALS (DÖCKE, 1994)

The aim of these investigations are the following:

- The use of Gonavet<sup>®</sup> for stimulation of ovulation in sows and comparison of reproduction performance to sows which received 500 IU hCG.
- Testing the seasonal reproduction performance variations in sows which received Gonadotrophin or Gn-RH Analoge for stimulation of ovulation.

### Material and methods

In two large farms for piglet production 2992 crossbred sows are distributed evenly over the year 1994. The suckling period was 4 weeks. All sows were under biotechnical treatment for ovulation synchronisation with the following time-orientated insemination (see picture 2). For oestrous synchronisation 24 hours after weaning primiparous sows received 1000 IU PMSG and pluriparous sows 800 IU PMSG:



\* OS: Stimulation of ovulation by hCG or Gn-RH (Gonavet)

Picture 2 - OVULATIONSSYNCHRONIZATION AND TIME ORIENTATED INSEMINATION OF SOWS

The ovulation stimulation was carried out 72 hours after PMSG-injection. Here the sows received either 500 IU hCG in a control group of 50 µg Gonavet<sup>R</sup> in a test group. The time-orientated insemination was realised for the first time 24 to 26 hours and the second time up to 42 hours after ovulation stimulation.

The following criteria of reproduction performance were registered:

- share of pregnancy sows after first insemination (FI)
- litter size, total and living born piglets
- reproduction index "living born piglets per 100 first inseminations" by means of the following formula:

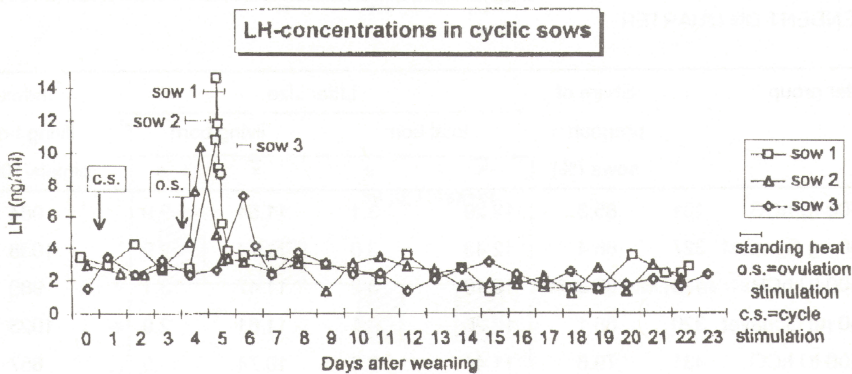
$$\text{living born piglets per 100 FI} = \text{Share of pregnancy sows} \times \text{litter size}^*$$

For the statistical calculation the computer programme SPSS was used.

\* the mean of living born piglets in group

*Results and discussion*

The order of exactly synchronised secretorian processes within the neuro-endocrinological controlling system of ovary cycle of sows are the conditions for the ovulation of follicles. It is expected that this system is regulated by cybernetic principles and it reacts to exogenous controlling substances like Gonadotrophin or Gn-RH in a similar way to endogenous signals. The basic principles of this system and the chronological relationships between hormones is valid for all healthy sows. However there are considerable individual variations in timing and level of peaks of sexual hormones during oestrous period (Glei et al. 1989). This is expecially true for LH too (see picture 3).



Picture 3 - POST WEANING LH - CONCENTRATIONS IN SOWS

Therefore the aim of biotechnical treatment for ovulation synchronisation is to synchronize the LH peaks and the ovulation time in a group of sows in a short time to realize a successful time-orientated insemination after.

Table 1 shows the reproduction performance of sows after ovulation synchronisation with 500 IU hCG or 50 µg Gonavet<sup>R</sup> and time-orientated insemination.

Table 1. - REPRODUCTION PERFORMANCE OF SOWS AFTER SYNCHRONISATION OF OVULATION WITH 500 IU HCG OR µG GONAVET<sup>R</sup> AND TIME-ORIENTATED INSEMINATION

Group	n	Share of pregnancy sows (%)	Litter size				Index living born piglets/100 FI
			total born		living born		
			$\bar{x}$	s	$\bar{x}$	s	
500 IU hCG	1683	82.5	12.07	3.3	11.37	3.1	938
50 µg Gonavet <sup>R</sup>	1309	86.7*	12.26*	3.2	11.57*	3.0	1003*

There were significant differences between the groups in favour of the Gonavet<sup>R</sup> treatment, concerned the share of pregnancy sows, the litter size and the index "living born piglets per 100 first inseminations (FI)"

These results give cause to detailed analysis of reproduction performance of sows dependent on quarter, when the insemination took place.

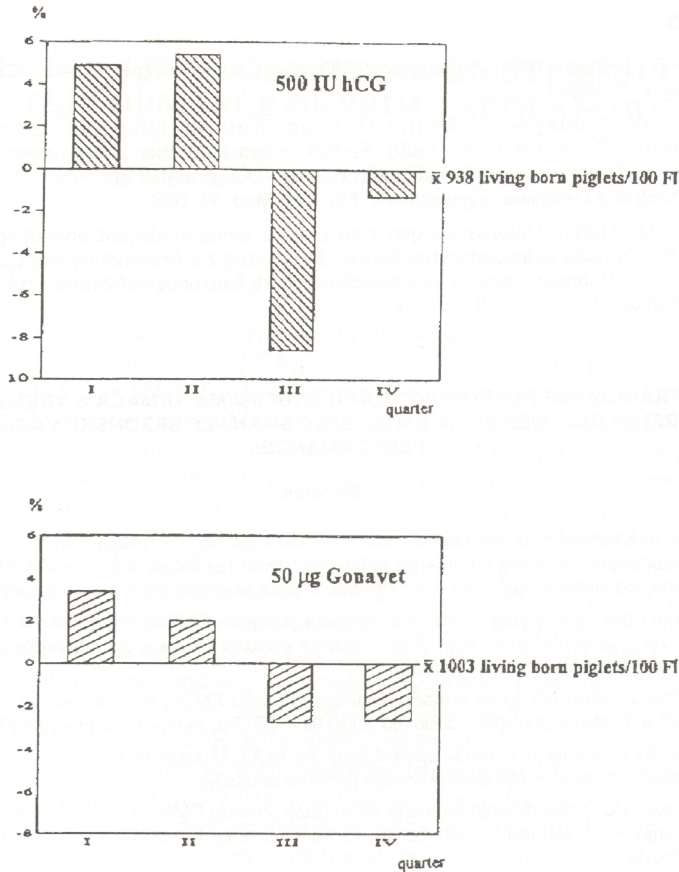
Table 2 shows the constant superiority in reproduction performance of sows with ovulation stimulation by Gonavet<sup>R</sup>. In the 4<sup>th</sup> quarters the litter size of sows with Gn-RH analoge was lower than from control group.

Table 2. - REPRODUCTION PERFORMANCE OF SOWS AFTER SYNCHRONISATION OF OVULATION WITH 500 IU hCG OR 50 µg GONAVET<sup>R</sup> AND TIME-ORIENTATED INSEMINATION DEPENDENT ON QUARTER

Quarter group	n	Share of pregnancy sows (%)	Litter size				Index living born piglets/100 FI
			total born		living born		
			$\bar{x}$	s	$\bar{x}$	s	
I 500 IU hCG	401	85.3	12.29	3.1	11.54	2.9	984
50 µg Gonavet	327	88.4	12.43	3.0	11.74	2.9	1038
II 500 IU hCH	414	86.2	12.16	3.2	11.47	3.1	989
50 µg Gonavet	320	88.1	12.26	3.1	11.61	2.9	1023
III 500 IU hCG	431	79.8	11.44	3.6	10.74	3.5	857
50 µg Gonavet	337	85.8	12.11	3.3	11.38	3.1	986
IV 500 IU hCG	437	78.9	12.41	3.2	11.74	3.0	926
50 µg Gonavet	325	84.6	12.24	3.4	11.55	3.2	977

But the share of pregnancy sows was significantly higher than in the control group. Therefore the index "living born piglets per 100 first inseminations" was also significant higher than from sows with 500 IU hCG treatment for ovulations stimulation.

The reproduction performance variation related to the middle of the year in the two treatment groups is very interesting (see picture 4). In the group "50 µg Gonavet<sup>R</sup>" there was a significant higher level than in group "500 IU hCG" but in three of four quarters there was a lower seasonal performance variation than in the control group. Especially in summer time, the hot temperatures in quarter III are a well-known fact for reproduction problems, the treatment with Gn-RH analoge for stimulation of ovulation has a significant stabilizing effect on reproduction performance in large stocks of sows.



Picture 4 - PERFORMANCE VARIATIONS IN QUARTERS FROM SOWS AFTER STIMULATION OF OVULATION BY 500 IU hCG OR 50 µg GONAVET<sup>R</sup>

### Conclusions

- Gh-RH analoge Gonavet<sup>R</sup> is effective for stimulation of ovulation in sows after a short suckling period to realize a time-orientated insemination.
- Sows with stimulation of ovulation with Gn-RH analoge Gonavet<sup>R</sup> realize a significantly higher reproduction performance in the year than sows with hCG-treatment.
- Gn-RH analoge Gonavet<sup>R</sup> is suitable to reduce seasonal variations of reproduction performance in sows. Especially in summer time Gonavet<sup>R</sup> has a stabilizing effect for it in contrast to 500 IU treatment.

## REFERENCES

1. Döcke, F. (editor) (1994): Veterinärmedizinische Endokrinologie. 3. Aufl. Gustav Fischer Verlag, Jena - Stuttgart
2. Geil, M., W. Schlegel, T. Müller-Dittman, Kathrin Titzmann, Ellen Leistner, M. Wähner, D. Schwarze (1989): Einfluß unterschiedlicher Dosierungen von Gonavet "Berlin-Chemie<sup>®</sup>" zur Ovulationsstimulation bei Jungsauen auf die präovulatorische Ausschüttung des Luteinisierungshormons. Mh. Vet.-Med. 44, 566.
3. Wähner, M. (1989): Untersuchungen zum Einsatz eines analogen Gonadotropin-Releasing-hormons zur Ovulationsstimulation bei Sauen - Ein Beitrag zur Anwendung von Gonavet "Berlin-Chemie<sup>®</sup>" in Rahmen des biotechnischen Fortpflanzungsverfahrens der Ovulations-synchronisation. Habil. - Schrift, Leipzig

## UPRAVLJANJE REPRODUKCIJOM U SKUPINAMA KRMAČA S VREMENSKI USMJERENIM OSJEMENJIVANJEM DA BI SE SMANJILE SEZONSKE VARIJACIJE PERFORMANCE

### Sažetak

Početak osamdesetih u Istočnoj Njemačkoj više od 85% krmača umjetno je oplodeno. Istovremena inseminacija krmača za vrijeme odbijanja nakon razdoblja dojenja od 4 do 5 tjedana, u kratkom vremenu, od velike je važnosti u velikim stadima sa skupnim sistemom odbijanja.

Rast folikula i početak estrusa u krmača stimulira primjena PMSG. Taj se korak (mjera) smatra razlogom za povećanje ovulacije folikula. Sinkronizacija estrusa važna je za stabiliziranje i povećanje veličive legla nakon kratkog razdoblja dojenja.

Točno 24 sata nakon odbijanja krmače dobivaju injekciju PMSG-a. Potrebno je znati broj legla radi doza PMSG-a. Krmače primipare dobivaju 1000 IU PMSG-a, pluripare dobivaju 800 IU PMSG-a.

Za stimulaciju ovulacije u krmača upotrebljava se hCG. U zdravih krmača s dobrim uvjetima hranidbe i smještaja to uvelike štiti sinkronizaciju početka ovulacije.

Dužina ranijeg razdoblja dojenja važna je za razmak između PMSG i hCG injekcije. Za krmače s razdobljem dojenja od 5 tjedana iznositi će 56 do 58 sati, a za krmače s razdobljem dojenja od 4 tjedna bit će 72 sata.

Variranje performance reprodukcije važan je godišnji problem, naročito u velikim skupinama krmača. Ono postoji u svim sinkroniziranim nastojanjima u velikim skupinama s posljedičnim stupnjem performance (Wahner, 1989). Smanjenjem ovog variranja performance reprodukcije glavni je cilj biotehničkih postupaka za kontroliranje estrusa u krmača.

U prvim istraživanjima sintetski Gn-RH analogan Gonavetu<sup>®</sup> (Veyx-Pharma) odgovara u te svrhe. Za razliku od gonadotropina hCG, Gn-RH je aktivan u sustavu hipotalamus-hipofiza. Kontrolira sintezu i oslobađanje gonadotropina u adenohipofizi. Vanjski i unutarnji stimulativni čimbenici znatno utječu na kontrolu sinteze Gn-RH kao što je svjetlosni ritam dana i noći (Döcke, 1994).

Stoga dodatna egzogena injekcija ovog hormona može pridonijeti većoj stabilnosti folikula rasta i sazrijevanja (Wahner, 1989).

Cilj ovih istraživanja je sljedeće:

- Primjena Gonavera<sup>®</sup> za poticanje ovulacije u krmača i usporedba performance u reprodukciji krmače koje su dobile 50 IU hCG.

- Testiranje varijacije performance sezonske reprodukcije u krmača koje su dobile gonadotropin ili Gn-RH analog za poticanje ovulacije.

Primljeno: 15. 2. 1997.