

STIMULATION OF CONCEPTION IN COWS BY CHORIONIC GONADOTROPIN AND SYNTHETIC GONADOTROPIN-RELEASING HORMONE ADMINISTRATION

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Abstract

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Effect of HCG and gonadotropin-releasing hormone (Gn-RH) administration on the conception rate in 792 cows in large-scale units was investigated. A total of 431 cows were treated with 1500 IU (93 head) or 3000 IU (203 head) of HCG, or 5 µg nonapeptide Gn-RH (46 head), 10 µg nonapeptide Gn-RH (63 head) or with 50 µg of dekapeptide Gn-RH (26 head). A group of 361 simultaneously inseminated cows served as control.

In all treated groups a conception rate by 3.29 to 24.41 % higher was obtained as compared to the controls. The best results were found after treatment with 10 µg of nonapeptide Gn-RH at the second and first insemination (71.42 % and 62.16 %, respectively) and with 3000 IU of HCG at the second and first insemination (67.64 % and 67.44 %, respectively).

Stimulation of conception in sows with HCG or Gn-RH seems to be another tool in the improvement of reproductive performance of cows in large-scale production units.

Cattle, insemination, conception rate, reproductive performance.

A rather low conception rate of cows in large-scale units results, for the most part, from frequent disturbances of ovulation and incorrect timing of artificial insemination. The fact that the immediate cause of a delayed or even absent ovulation in cattle is above all a low plasma level of luteinizing hormone (LH) offers a possibility of substitution therapy with preparations containing LH or hypothalamic gonadotropin-releasing hormone (Gn-RH). Production of synthetic Gn-RH and a good market supply of HCG have promoted a number of workers to study the effects of a single application of such substances on the conception rate improvement in breeding cows.

A conception rate by 19.6 % higher as against the controls was achieved in cows by i.m. administration of 500 IU of Gonabion (HCG) given in the time interval of 24 hours before up to 24 hours after insemination (Knoblauch 1975). Similar results have been reported by Simon (1977).

A beneficial effect of Gn-RH treatment in cows with delayed ovulation and higher conception rates in artificially inseminated cows were reported by Sali and Delfanti (1976) and Yamauchi et al. (1979). Improved conception rate by 13.1 % as against controls was found in 197 German Red Pied cows treated with 100 or 250 µg of Gn-RH (Ehlers 1977). The effect of treatment in cows once or several times unsuccessfully inseminated accounted for 19 % in animals treated with 100 µg and 23 % in those treated with 250 µg of Gn-RH as against the controls. In these, a positive correlation was found between the insemination interval length and conception rate whereas in cows treated with Gn-RH substantially smaller differences occurred. Similar data presented Goldbeck (1976).

Stimulating results of treatment with HCG and Gn-RH (Kudláč et al. 1980) have lead us to study in more detail the timing and time-related stimulation of ovulation in cows as affected by hormonal treatment aimed at improved reproductive performance.

Table 1

Conception rate in cows treated prior to insemination with various doses of HCG as compared to the controls

Treatment	No. of animals	Average age (years)	Average insemination interval (days)	Interval from parturition to treatment (days)	Conceived at exp. insemination		Difference in % conception in treated cows
					head	%	
HCG (Praedyn Spofa) 3000 I.U. i/m prior to 1st insemination	86	4.53	70.62	70.62	58	67.44	+ 14.50
Control 1st insemination	51	4.67	64.44	64.44	27	52.94	
HCG (Praedyn Spofa) 1500 I.U. i/m prior to 1st insemination	33	not evaluated			21	63.63	+ 4.26
Control 1st insemination	32	not evaluated			19	59.37	
HCG (Praedyn Spofa) 3000 I.U. i/m prior to 2nd insemination	68	3.94	62.77	109.74	46	67.64	+ 8.55
Control 2nd insemination	66	4.37	61.77	115.41	39	59.09	
HCG (Praedyn Spofa) 1500 I.U. prior to 2nd insemination	30	not evaluated			16	53.53	+ 3.33
Control 2nd insemination	34	not evaluated			17	50.00	
HCG (Praedyn Spofa) 3000 I.U. prior to 3rd and further insemination	49	4.66	62.75	153.91	30	61.22	+ 13.40
Control 3rd and further insemination	46	3.87	63.68	175.12	22	47.82	
HCG (Praedyn Spofa) 1500 I.U. prior to 3rd and further insemination	30	not evaluated			14	46.46	+ 1.50
Control 3rd and further insemination	31	not evaluated			14	45.16	

Materials and Methods

The experiments were carried out on several farms with similar husbandry systems and performance of the animals. A total of 792 cows were employed. The animals were divided in groups according to the number of inseminations performed and according to the treatment. Only cows showing a normal heat and physiological status of the reproductive organs were included in the study. At first, second, third or a further insemination a single i.m. injection of the respective preparation was given to 431 cows as follows: 93 cows were treated with 1500 IU of HCG (Praedyn Spofa), 203 were treated with 3000 IU of HCG (Praedyn Spofa), 46 cows were given Gn-RH at a dose of 5 μ g of nonapeptide LHRF (Lutal forte Hoechst), 63 were given the same drug at a dose of 10 μ g, and 26 cows were treated with Gn-RH at a dose of 50 μ g (dekapeptide LHRF — Lutal Hoechst). A group of simultaneously inseminated cows served as a control of the treatment effect. In both treated and control groups, detailed records were kept on the estrus character, reproduction parameters and performance of the animals. The external symptoms of estrus, at which time the cows were examined, were mostly marked with a usual amount and quality of mucus. In several cows less pronounced symptoms of estrus were seen with changes in the amount and consistency of the cervical mucus. The cows were usually inseminated once, at average intervals from parturition to treatment at first insemination accounting for 60.50 to 70.62 days, at second insemination 108.60 to 109.74 days, at third or following insemination 153.91 to 299.62 days.

Results

The results of the present study are encouraging in that higher conception rates were reached in all treated groups of cows with any of the above mentioned preparations as against the controls (Table 1). A high conception rate was found in cows treated with 3000 IU of HCG prior to the second and first insemination (67.64 % and 67.44 %, respectively), representing an improvement of 8.55 % and 14.5 % as against the controls. Worse results were obtained in cows treated prior to the third insemination although in this group, too, an improvement of 13.4 % as against the controls was found. Less improvement of the conception rate was obtained after treatment with 1500 IU of HCG (1.5 % and 4.26 %, respectively).

Similar results were observed in cows treated with Gn-RH (synthetic nonapeptide or dekapeptide) as indicated in Table 2. The highest conception rate was found in animals treated with higher doses of nonapeptide Gn-RH, particularly at the second and first insemination (71.42 % and 62.16 %, respectively) with a remarkable improvement as against the controls. A less pronounced effect was found in cows treated with 50 μ g of dekapeptide Gn-RH. In this group only 50 % of cows conceived.

In Table 3 the results of experimental application of HCG and Gn-RH are summarized. Evaluation of the results irrespective of the sequence of insemination revealed the highest conception rate after treatment with 3000 IU of HCG and 10 μ g of nonapeptide Gn-RH (66.0 % and 60.31 %, respectively). The greatest differences as against the controls were found after treatment with the above-mentioned drug (16.08 % and 24.41 %). Improvement of the conception rate in all treated groups averaged 11.44 % as against the controls.

In Table 4, the relationship between the insemination sequence and conception rate is documented. These data clearly show the highest conception rate in cows treated prior to the first and second insemination (63.72 % and 63.63 %, respectively), surpassing that of the control animals after simultaneous insemination by 13.4 % and 10.91 %. Cows treated prior to the third and following insemination had a conception rate by 8.04 % higher than the respective control animals. Nevertheless, their conception rate was still by 10.89 % and 10.80 % lower than that of cows treated before the first and second insemination.

Table 2
Conception rate in cows treated prior to insemination with various doses of Gn-RH
as compared to the controls

Treatment	No. of animals	Average age (years)	Average insemination interval (days)	Interval from parturition to treatment (days)	Conceived at exp. insemination		Difference in % conception in treated cows
					head	%	
Nonapeptide Gn-RH i/m 5 μ g prior to 1st insemination	33	3.21	61.24	61.24	22	66.66	+25.00
Control 1st insemination	24	3.63	53.90	53.90	10	41.66	
Nonapeptide Gn-RH i/m 10 μ g prior to 1st insemination	37	5.13	65.94	65.94	23	62.16	+15.11
Control 1st insemination	34	5.08	63.81	63.81	16	47.05	
Dekapeptide Gn-RH i/m 50 μ g prior to 1st insemination	26	4.44	60.50	60.50	13	50.00	+7.15
Control 1st insemination	14	4.67	53.71	53.71	6	42.85	
Nonapeptide Gn-RH i/m 5 μ g prior to 2nd insemination	5	2.75	64.20	108.60	3	60.00	+40.00
Control 2nd insemination	5	4.20	56.00	90.20	1	20.00	
Nonapeptide Gn-RH i/m 10 μ g prior to 2nd insemination	7	5.71	60.85	108.71	5	71.42	+51.42
Control 2nd insemination	5	5.20	59.60	101.00	1	20.00	
Nonapeptide Gn-RH i/m 5 μ g prior to 3rd insemination	8	3.12	74.75	299.62	2	25.00	+8.34
Control 3rd and further insemination	6	4.41	52.00	161.33	1	16.66	
Nonapeptide Gn-RH i/m 10 μ g prior to 3rd and further ins.	19	5.36	57.94	164.50	10	52.63	+6.48
Control 3rd and further insemination	13	4.73	78.61	169.46	6	46.15	

Table 3
Stimulatory effect of HCG and Gn-RH administration on the conception rate of cows

Treatment	Total No. treated	Conceived at exp. insemination %	Total No. conceived at experim. insemination	No. of control animals	Conceived insemination (control cows)	Total No. conceived at exp. insemination (control cows)	Difference in % conception in treated cows
HCG 1500 I.U. i/m (Praedyn Spofa)	93	63.63 53.53 46.66	54.83	97	59.37 50.00 45.16	51.54	+3.29
HCG 3000 I.U. i/m	203	67.44 67.64 61.22	66.00	163	52.94 59.09 47.82	53.98	+12.02
nonapeptide Gn-RH 5 µg i/m (Lural forte Hoechst)	46	66.66 60.60 25.00	58.69	35	41.66 20.00 16.66	34.28	+24.41
nonapeptide Gn-RH 10 µg i/m (Lural forte Hoechst)	63	62.16 71.42 52.63	60.31	52	47.05 20.00 46.15	44.23	+16.08
decapeptide Gn-RH 50 µg i/m (Lural Hoechst)	26	50.00	50.00	14	42.85	42.85	+7.15
Total	431	61.02	61.02	361	49.58	49.58	+11.44

Table 4

Sequence of inseminations as related to the conception rate of cows treated with HCG and Gn-RH

No. of insemination	Treated cows		Control cows		Difference in % conception in treated cows	Difference in % conception in cows after 1st and 2nd-3rd insemination
	No.	conceived	No.	conceived		
First	215	137 = 63.72	155	78 = 50.32	+13.40	—
Second	110	70 = 63.63	110	58 = 52.72	+10.91	—0.09
Third and further	106	56 = 52.83	96	43 = 44.79	+8.04	—10.89
Total	431	263 = 61.02	361	179 = 49.58	6 + 11.44	

Discussion

A favourable effect of administration of luteinizing substances (HCG and Gn-RH) on the conception rate in cows is demonstrated by the present results. This effect lies in fortification of the LH level in the blood and its substitution in cows likely to have a delayed or absent ovulation. Thus an increased LH level provides a timely maturation of the follicle and ovulation followed by development of a functional corpus luteum able to maintain pregnancy.

Our results further demonstrated the effect of the sequence of inseminations; the highest conception rate was found in cows treated prior to the first and second insemination. A similar trend was observed in control cows, too. Slight differences in conception rates of cows treated at first and second insemination can be explained by the fact that with prolonged postpartum period (up to 90–100 days) the conception rate tends to increase anyway (Salisbury and Van Demark 1961). A lower conception rate in cows after the third and further inseminations is undoubtedly related to possible pathological conditions of the reproductive organs and disturbances of the cycle.

The results were also influenced by the dose of the preparation used for treatment. Best results were obtained with 3000 IU of HCG and 10 μ g of nonapeptide Gn-RH.

Stimulace koncepce krav choriovým gonadotropinem a syntetickým Gn-RH

U 792 krav ve velkochovech byl zkoumán vliv intramuskulární aplikace HCG a Gn-RH před provedením inseminace na úroveň zabřezávání. 431 krav bylo před první, druhou, třetí, popřípadě další inseminací ošetřeno 1 500 nebo 3 000 j. HCG, 5 μ g nebo 10 μ g nonapeptidu Gn-RH, 50 μ g dekapeptidu Gn-RH. Jako kontrola bylo hodnoceno 361 paralelně inseminovaných krav.

Ve všech skupinách ošetřených krav byla dosažena lepší úroveň zabřezávání než u kontrol a to o 3,29–24,41 %. Nejlepší koncepce byla zjištěna při použití 10 μ g nonapeptidu Gn-RH při druhé a první inseminaci (71,42 % a 62,16 %) a 3000 j. HCG při druhé a první inseminaci (67,64 % a 67,44 %).

Stimulace koncepce krav HCG nebo Gn-RH představuje jednu z dalších možností zlepšení výsledků reprodukce ve velkochovech.

Стимуляция зачатия коров хориальным гонадотропином и синтетическим Gn-RH

У 792 коров скотоводческих ферм проводились исследования влияния внутримышечного применения HCG и Gn-RH перед проведением искусственного осеменения до уровня забеременения. 431 корова подавали перед первым, вторым, третьим или последующими искусственными осеменениями 1500 или 3000 единиц HCG, 5 ng или 10 ng нонапептида Gn-RH, 50 ng декапептида Gn-RH. В качестве контрольной группы проводилась оценка 361 параллельно осемененной коровы.

У всех групп коров было достигнуто лучшего уровня забеременения чем у контрольной группы, а именно на 3,29—24,41 %. Самое лучшее зачатие было установлено при применении 10 ng нонапептида Gn-RH при втором и первом осеменениях (71,42 % и 62,16 %) и 3000 единиц HCG при второй и первой осеменениях (67,64 % и 67,44 %).

Стимуляция зачатия коров HCG или Gn-RH представляет собою одну из возможностей улучшения результатов репродукции в скотоводстве.

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