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EFFECT OF CHANGE OF CAGE 2 DAYS BEFORE ARTIFICIAL INSEMINATION ON REPRODUCTIVE PERFORMANCE OF RABBIT DOES *

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ABSTRACT : During 6 months, 1552 artificial inseminations (AI) were carried out to compare three different techniques to induce oestrous in rabbit females. The first method consisted of transferring the female and its litter if any to another cage 2 days before AI (biostimulated group), the other two were based on hormonal treatments: does were either treated with 20 IU PMSG 72 hours before AI or a combination of 16 IU PMSG and 8 IU hCG (0.2 ml i.m.) injected 48 hours before AI. A control group of does was not treated. Results showed that the different treatments and the physiological status of females statistically influenced fertility and the number of born alive, but not the number of stillborn, mortality and weight of young 2 days post parturition. PMSG and the PMSG + hCG resulted in a significant ($P<0.05$) increased fertility rate compared to the control, in nulliparous and lactating non-nulliparous does respectively (76.9 *vs* 66.2% and 83.1 *vs* 61.8 %) Change of cage increased ($P<0.05$) fertility rate in pluriparous does (lactating and non lactating) compared to the control (75.8 *vs* 61.8% and 67.5 *vs* 53.6%). The results demonstrated that a fertility rate, comparable with hormonal induced oestrus could be obtained by a change of cage in pluriparous does. However, this bio-stimulation method is time consuming and difficult to manage in large rabbit farms.

RESUME : Effet du changement de cage sur les performances de reproduction des lapines.
Afin de comparer 3 techniques différentes d'induction de l'oestrus chez la lapine, 1552 inséminations artificielles ont été effectuées pendant 6 mois. La première méthode consiste à transférer la lapine dans une autre cage deux jours avant l'insémination artificielle (groupe biostimulé), les deux autres comportent des traitements hormonaux : les lapines ont reçu soit 20 U.I. de PMSG 72 heures avant l'I.A., soit une combinaison de 16 U.I. de PMSG plus 8 U.I. d'hCG (0,2 ml i.m.) en injection 48 heures avant l'I.A.. Les lapines du groupe témoin n'ont reçu aucun traitement. Les résultats montrent que les différents traitements et le statut physiologique des femelles influencent significativement la fertilité et le nombre de lapereaux nés vivants mais pas le nombre de lapereaux mort-nés, ni la mortalité, ni le poids des lapereaux à l'âge de 2 jours. Comparés au groupe témoin, les traitements PMSG et PMSG + hCG augmentent significativement ($P<0.05$) le taux de fertilité des nullipares et des multipares allaitantes (76,9 vs 66,2% et 83,1 et 61,8 % respectivement). Comparé au groupe témoin, le changement de cage augmentes le taux de fertilité ($P<0.05$) des lapines pluripares allaitantes et non allaitantes (75,8 vs 61,8 et 67,5 vs 63,6 % respectivement). Les résultats montrent qu'un taux de fertilité comparable à celui obtenu par induction hormonale de l'oestrus peut être obtenu par un changement de cage des lapines pluripares. Cependant la méthode par bio-stimulation nécessite plus de temps et est plus difficile à mettre en oeuvre dans les grandes unités de production.

INTRODUCTION

Modern rabbit farms use a semi-intensive reproductive rhythm (AI 11d *post partum*). However, the receptivity of does is reduced during lactation and fertility rate is low, especially in lactating non receptive does. (THEAU-CLÉMENT and ROUSTAN, 1992). In order to solve the poor fertility observed after AI of these does, the systematic use of gonadotrophin hormones is widespread in rabbit farms. In view of the increasing sensitivity for animal welfare, such treatments are now under discussion also by the E.U. Committee for Animal Protection. Furthermore, meat residues of pharmacological treatments, hormones and additives are badly accepted by the consumers and the maintain of a "natural" meat image is of increasing interest. The administration of gonadotrophins in dosages not balanced to the physiological condition of the does, can cause fertility problems (MAERTENS and LUZI, 1995).

Alternative methods like lighting programs, controlled lactation by mother-litter separation, and doe manipulation have been used to synchronise oestrous in place of hormone treatments (MIRABITO *et al.*, 1994). The usefulness of the so called "bio-stimulation" methods have already been demonstrated since long time in nulliparous does (LEFEBVRE and MORET, 1978).

The purpose of this experiment was to compare, under farm conditions, the efficacy of the change (bio-stimulation) of cage method with two different hormonal protocols (PMSG and PMSG+hCG) in increasing the fertility.

MATERIAL AND METHODS

The trial, which lasted for 6 months, was carried out on an industrial rabbit farm in the north-west of Italy. The

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Table 1 : Reproductive performance of the does according to the treatments

	Change of cage	PMSG	PMSG + hCG	Control
Number of AI	99	95	100	90
Fertility rate (%)	66.70 ± 0.10 b	76.91 ± 0.10 a	63.21 ± 0.10 b	66.23 ± 0.10 b
Nb of born alive	7.27 ± 0.52 b	8.97 ± 0.57 a	7.75 ± 0.63 b	7.63 ± 0.44 b
Nb of stillborn	0.97 ± 0.21	0.63 ± 0.23	0.42 ± 0.26	0.82 ± 0.18
Mortality at 2d (Nb)	0.49 ± 0.13	0.40 ± 0.15	0.08 ± 0.16	0.45 ± 0.11
Litter weight at 2d (g)	574 ± 45	589 ± 36	603 ± 39	600 ± 42
Nb of weaned	6.75 ± 0.43	7.56 ± 0.47	7.47 ± 0.55	7.22 ± 0.36

Mean values with different small letters, in the same row, showed a statistical significance of P<0.05.

rabbitry was naturally ventilated and heated during the winter months, with temperature ranging between 12°C and 24°C. The daily light schedule was 16L:8D or all the animals. The 600 commercial hybrids does were individually housed in "flat-deck" cages (60x43x33 cm) and fed *ad libitum* the same commercial feed. Litters were weaned when 32 days old.

Thirty males were used for the artificial insemination technique. Semen was collected early in the morning using a glass artificial vagina and diluted 1:10 with a commercial extender. Only the samples of good quality (PIZZI *et al.*, 1995) were pooled and analysed by a contrast-phase microscope (200x). The females were inseminated every 42 days utilising a single use glass pipette. If the AI was not fertile, does were re-inseminated 21 days later. Does (150/group) were homogeneously distributed over the 4 experimental groups according to their physiological status : nulliparous, lactating and non lactating does. For lactating and non-lactating does, the non nulliparous ones re-inseminated 21 days after an infertile AI at 11 days *post partum*, were considered as "non-lactating". They were definitely assigned to one of the following groups: the biostimulation group, in which the females and nest-boxes were transferred to another cages 48 hours before AI; the PMSG group which was given 20 IU PMSG 72 hours before AI, the PMSG + hCG (16 IU and 8 IU, respectively) group which was injected 48 hours before AI and the control group. PMSG was injected 72 hours before the AI because this was the usual procedure in the farm.

The following parameters were recorded: the physiological status of the female at each insemination, fertility rate, the number of rabbits born alive, the number of stillborn, the mortality of young 2 days *post partum*, the number weaned and the weight of the litter at 2 days of age.

The data were analysed using a linear analysis of variance (GLM) with least square means method (SAS/STAT, 1992) which considered as fixed effects the experimental treatment and physiological state of the females, the nested effect between physiological state and treatment and the number of born alive expressed in classes.

RESULTS

The analysis revealed significant effects of the physiological status on both fertility rate and litter size. For this reason the results (least square means, standard error and relative statistical significance) are presented separately in Tables 1 to 3 for each physiological status.

In nulliparous does, PMSG significantly (P<0.05)

Table 2 : Reproductive performance in lactating pluriparous does

	Change of cage	PMSG	PMSG + hCG	Control
Number of AI	158	165	170	155
Fertility rate (%)	75.75 ± 0.08 b	66.00 ± 0.03 c	83.07 ± 0.06 a	61.78 ± 0.03 c
Nb of born alive	9.80 ± 0.62 a	9.08 ± 0.22 a	8.05 ± 0.42 b	9.77 ± 0.24 a
Nb of stillborn	0.48 ± 0.25	0.55 ± 0.09	0.35 ± 0.17	0.49 ± 0.10
Mortality at 2d (Nb)	0.28 ± 0.16	0.33 ± 0.06	0.02 ± 0.11	0.38 ± 0.06
Litter weight at 2d (g)	590 ± 63	665 ± 20	685 ± 48	596 ± 21
Nb of weaned	8.40 ± 0.71	8.10 ± 0.22	7.26 ± 0.43	8.04 ± 0.22

Mean values with different small letters, in the same row, showed a statistical significance of P<0.05.

Table 3 : Reproductive performance of the non lactating does

	Change of cage	PMSG	PMSG+hCG	Control
Number of AI	135	120	140	125
Fertility rate (%)	67.50 ± 0.07 a	58.91 ± 0.04 b	69.29 ± 0.08 a	53.57 ± 0.09 b
Nb of alive born	9.57 ± 0.48 a	8.98 ± 0.36 b	7.74 ± 0.60 c	8.46 ± 0.80 b
Nb of stillborn	0.52 ± 0.19	0.50 ± 0.14	0.78 ± 0.24	0.87 ± 0.32
Mortality at 2d (Nb)	0.50 ± 0.12	0.10 ± 0.09	0.15 ± 0.15	0.20 ± 0.20
Litter weight at 2d (g)	692 ± 28	625 ± 30	719 ± 30	663 ± 126
Nb of weaned	7.38 ± 0.37	7.73 ± 0.28	7.55 ± 0.43	8.28 ± 0.60

Mean values with different small letters, in the same row, showed a statistical significance of $P<0.05$.

increased the fertility rate (76.9%) compared to controls (66.2%) and change of cage (66.7%), while the combined hormonal treatment had the lowest fertility rate (63.2%). A similar effect was observed for the litter size (Table 1). No significant effects between treatments, probably due to the too small number of AI, were found on the other parameters of litter performance (Table 1).

In lactating does, large differences in fertility rate were observed (Table 2). Control does showed a fertility rate of only 61.8%, while change of cage and dual hormone combination resulted in a significant ($P< 0.05$) increased fertility rate (83.1% and 75.8%, respectively). By contrast, the PMSG treatment failed to increase fertility (66.0%). Also, the number of born alive was significantly lower ($P<0.05$) in does treated with the two hormones combination (Table 2).

In non-lactating does (Table 3) an increased ($P<0.05$) fertility rate was observed in the PMSG+hCG and change of cage groups when compared to the control (69.3%, 67.5% and 53.6%, respectively). The positive effect of the cage transfer on fertility rate was also reflected in a significant ($P<0.05$) increase in litter size compared to the other experimental groups (9.6 *vs* 7.7 to 9.0).

As for nulliparous and lactating does, treatments did not have a significant effect on the number of stillborn, early young mortality, litter weight or number of young weaned (Table 3).

The overall model showed a statistically significant effect ($P<0.05$) of the physiological status of the doe both for litter size and weaned young but not for the weight of the litter when corrected for the litter size.

DISCUSSION

The positive effect of 20 IU PMSG (72 h before AI) on fertility rate and litter size was only evident in nulliparous does. The combination PMSG+hCG, 48h before AI, was very efficient in improving fertility rate both in lactating and non lactating does, thus confirming the results obtained by DAVOUST *et al.*, (1994). The results of our experiment illustrate that the response to hormonal oestrus induction on fertility rate is not always outspoken as those reported in the review of MAERTENS *et al.* (1995) or CASTELLINI (1995).

The effect of cage transfer on the fertility rate was effective in does which have kindled once or more, but not in nulliparous ones. Also, the highest litter size was observed in non-nulliparous does who were submitted to a cage transfer. These does are probably stimulated much easier by an environmental modification like the change of cage similarly to what has been found in nulliparous does (LEFEVRE and MORET, 1976; REBOLLAR *et al.*, 1995). For non lactating does a cage transfer can easily be performed in a rabbitry using modern management techniques. However, from an operative point of view, such a transfer to another cage of lactating does with their litter in it's nest-box is not only time consuming, but difficult to organise in large rabbit farms. Although the results were encouraging, further efforts to find alternative bio-stimulation methods for synchronising oestrus in lactating does should be done.

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