

"BIOSTIMULATION METHODS" FOR BREEDING RABBIT DOES : SYNTHESIS OF THE FIRST RESULTS

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ABSTRACT : In this short synthesis the authors tried to drive some conclusions from 4 studies on breeding rabbit does biostimulation, conducted within the International Rabbit Reproduction Group (IRRG). The aim of these biostimulations was the improvement of does' fertility after artificial insemination (AI). All experiments were conducted according a 42 days reproduction rhythm. The trial of flushing, i.e. momentary improvement of the energy balance of does 4 days before AI, failed to improve fertility. The main reason was the low palatability of the experimental diet : the daily energy intake was lower than with control diet. Transfer of does to another cage, 2 days before AI, can

improve fertility of adults does, but in opposition with literature, was inefficient in nulliparous does. However this technique is difficult to manage in large commercial rabbitries. Efficiency of biostimulation through separation of mother from her litter for a short period depends of the timing and duration of the stimulus. A 36 to 48 hours separation just before AI may improve fertility by 7 to 30 points ; but kits' weaning weight is reduced by 5% to 10%. Finally, further experiments are needed to know the practical interest of a long term utilisation of such biostimulations, and to know the physiological mechanism.

RESUME : Méthodes de Biostimulation chez la lapine reproductrice. Synthèse des premiers résultats

Dans ce bref article de synthèse, les auteurs tentent de tirer les enseignements de 4 études portant sur la "biostimulation" de la reproduction chez la lapine, études conduites dans le cadre du Groupe International sur la Reproduction (IRRG). Les différentes biostimulations étudiées avaient toutes pour objectif de favoriser la fertilité de lapines inséminées artificiellement dans le cadre d'une conduite en bandes selon un rythme à 42 jours. L'essai de flushing par distribution d'un aliment plus concentré n'a pas donné les résultats espérés en raison d'une sous-consommation relative de l'aliment expérimental initialement destiné à stimuler l'ingestion énergétique des femelles. Un simple changement de cage des lapines pendant les

2 jours précédant l'IA permet d'améliorer significativement la fertilité (+14 points), sauf pour les femelles nullipares. Toutefois, cette technique est difficile à appliquer dans des élevages commerciaux. Enfin, la biostimulation de la reproduction par séparation de la mère et de sa portée donne des résultats dépendants de la durée et du moment de la séparation par rapport à l'IA. Une séparation de 36 à 48 heures juste avant l'IA permet d'accroître la fertilité des lapines de 7 à 30 points, mais elle réduit d'environ 5% à 10% le poids des lapereaux au sevrage. De nouvelles expérimentations sont nécessaires pour valider l'efficacité de ces biostimulations à long terme et élucider le mécanisme de leur action.

INTRODUCTION

One of the aims of the International Rabbit Reproduction Group (IRRG.) is to study and develop the so-called "biostimulation methods" in order to improve sexual receptivity of lactating does, and consequently their productivity on rabbit farms (BOITI, 1998, THEAU-CLÉMENT *et al.*, 1998). They are intended as a real alternative to hormonally induced oestrus. In this issue of World Rabbit Science, four papers report three "biostimulation methods". Before insemination, a flushing, a change of cage or a temporary mother-litter separation were applied to stimulate the does. We will briefly discuss the results and the future research perspectives for this field.

Experimental design

The experiments were performed carefully in large commercial rabbitries or in experimental research farms over the whole reproductive life of does. The two types of experiment provide complementary information. Each group, treated before insemination,

was compared with a non stimulated group of does and sometimes with a second control group of does previously treated with 20 IU of Pregnant Mare Serum Gonadotrophin. The effects of the methods applied were studied in relation to the physiological status of the does at the moment of insemination. All the experiments used artificial insemination as a routine technique. A 42 day reproductive rhythm was followed and quite large numbers of observations were made (> 200 inseminations per group). If cross-fostering was used, only inter-group adoptions were performed.

Biostimulation methods tested

1. Flushing

Flushing aims to increase the does' feeding (energy) level before insemination. With lactating does, MAERTENS (1998), performed a 4 day flushing with a high-energy diet before insemination. However this failed to improve sexual receptivity, fertility or litter size, in comparison with the control group (-1.2 %, -12.2 % and -0.5 alive born, respectively). The author attributed these results to the low palatability of the experimental diet. The daily energy

intake during the flushing period was lower than in the control group (-0.15 MJ ME/day). Although these first results are not encouraging, new experiments should be done to counterbalance the energy deficit of does during lactation and to improve their reproductive performance.

2. Change of cage

LEFÈVRE and MORET (1976) and REBOLLAR *et al.* (1995) concluded that a change of cage can improve the fertility of nulliparous does. LUZI and CRIMELLA (1998) transferred does (and their litter when lactating) to another cage 2 days before insemination. The fertility rate in non-nulliparous does (whatever their lactating status) was increased compared to the control group (+ 14 %). But in contrast with earlier published results, this method had no effect on nulliparous does. Moreover, this biostimulation method is time consuming and difficult to manage in large rabbit farms.

3. Temporary mother-litter separation

For this type of biostimulation, different authors used different timing and duration of stimulus:

♦ 24 hours, 3 days before insemination

CASTELLINI *et al.* (1998) compared two different techniques of mother-litter separation lasting 24 hours. The separation was performed 3 days before insemination by closing the nest-box or by a change of cage (which implies a mother-litter separation in addition to a modification of the does' micro-environmental conditions). Nulliparous and multiparous non-lactating does showed a significant positive response to this biostimulation: fertility was improved by + 12.9 % and 14.0 %, respectively. On the contrary, these two methods of mother-litter separation did not adversely affect the reproductive performance of lactating does. The interval between the application of the biostimulation and insemination may have been too long, as PAVOIS *et al.* (1994), DUPERRAY (1995) and ALVARIÑO *et al.* (1998) found positive effects on fertility when insemination occurred immediately after the 24h mother-litter separation.

♦ 24 to 48 hours, just before insemination

In the following experiments, does were inseminated shortly after suckling their young. Using only lactating does, MAERTENS (1998) demonstrated that in comparison with a control group, a 40h mother-litter separation improved sexual receptivity, fertility and litter size (+38.0 %, + 11.1 %, +1.1 born

alive). Moreover, does were as fertile as those treated with 20 I.U of PMSG. Effects were more pronounced for primiparous (+ 30.3 %) does, and those in their second lactation (+12.3 %), and remained positive after 4 lactations (+ 7.5 %). However, the separation reduced the growth of young rabbits from the 11th day *post partum* until weaning (-47 g, corresponding to 5 % of the weaning weight). ALVARIÑO *et al.* (1998) used 2995 multiparous females inseminated on day 4 or 11 *post partum*. Does were separated from their litters by a metallic screen, beginning 0, 24, 36 or 48 hours before insemination. In 4 days lactating does, fertility was improved both after a 24h (+ 16.8 %), 36h (+ 32.4 %) and after a 48h (+ 34.4 %) mother-litter separation. Prolificacy was only increased after a 48h separation. In 11 days lactating does, a minimum of 36h was necessary to improve fertility (+ 10.5 %). However, the weaning weight gradually decreased from 24h to a 48h separation (-9 % compared to the control weaning weight). As in the experiment of MAERTENS (1998), a mother-litter separation did not impair the pre-weaning viability of young rabbits. Moreover, a 36h mother-litter separation resulted in a comparable or even higher fertility rate than PMSG treated does.

These two experiments, which are in agreement with the results of PAVOIS *et al.* (1994) and DUPERRAY (1995), clearly demonstrate that a 36-40h mother-litter separation, when performed on a healthy herd immediately before insemination on day 11 *post partum*, leads to at least a 10 % gain in fertility rate. Sometimes the performance was better than for PMSG treated does. The problem of the decreased weaning weight (-5 to -10 %) of the young still remains. Fortunately the pre-weaning viability is not affected. Nevertheless, a 24h mother-litter separation before insemination is sufficient to increase the fertility rate of 4 day lactating does (+ 16.8 %).

Several hypotheses to explain the positive response of the mother-litter separation in physiological terms can be formulated. In the experiments of MAERTENS (1998) and ALVARIÑO *et al.* (1998), does were submitted to one suckling suppression combined with a delayed one (from 36 to 48 hours). So, prolactin secretion is briefly reduced and delayed, and could briefly suppress its antagonistic effect on reproductive performance (release of gonadotrophins). A second hypothesis could be related to the oxytocin release, necessary for milk ejection. Oxytocin also affects uterine contractions and thereby could contribute to the transport of spermatozoa to the

fertilisation site if insemination occurs shortly after suckling. A third hypothesis is that a mother–litter separation can act as a positive stress and influence the hormonal balance. Of course, all these phenomena could interact.

Finally, further experiments are needed to find out whether mother–litter separation has an effect on post weaning performance, and if compensatory growth can minimise the growth retardation. It would also be of interest to study the effect of separation on further milk production. For the sake of animal welfare, new experiments are still necessary to define the optimal moment and duration of a brief mother–litter separation.

CONCLUSION

In conclusion, the results of these biostimulation methods are very promising and offer an alternative to hormonal induced oestrus. The multidisciplinary nature of our group should provide us with a physiological understanding of the effects of these stimuli on the hormonal balance of the doe. At present, further experiments are in progress, including some concerned with lighting programs (well suited to cyclic production). The IRRG group is convinced that only a concerted action and multidisciplinary research can rapidly develop alternative methods. They must be easy to apply, inexpensive and consistent with animal welfare.

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REFERENCES

- ALVARIÑO J.M.R., DEL ARCO J.A., BUENO A. 1998 Effect of mother–litter separation on reproductive performance of lactating rabbit females inseminated on day 4 or 11 post partum. *World Rabbit Sci.*, Vol. 6, 191–194.
- BOITI C. 1998. The International Rabbit Reproduction Group. *World Rabbit Sci.*, Vol. 6, 175–178.
- CASTELLINI C., CANALI C., BOITI C. 1998. Effect of mother–litter separation for 24 hours –closing the nestbox and change of cage– on rabbit doe performance. *World Rabbit Sci.*, Vol. 6, 199–203.
- DUPERRAY, J. 1995. Enquête terrain sur la Guyostimulation. *Cuniculture*, 22, 87
- LEFEVRE B., MORET B., 1978. Influence d'une modification brutale de l'environnement sur l'apparition de l'oestrus chez les lapines nullipares. *Ann. Biol. Anim. Bioch. Biophys.*, 18 (3), 695–698
- LUZI F., CRIMELLA C. 1998. Effect of change of cage on reproductive performance of rabbit does. *World Rabbit Sci.* Vol. 6, 195–198.
- MAERTENS L. 1998. Effect of flushing, mother–litter separation and PMSG on the fertility of lactating does and the performance of their litter. *World Rabbit Sci.*, Vol. 6, 185–190.
- PAVOIS, V., LE NAOUR, J., DUCEP, O., PERRIN, G., DUPERRAY, J. 1994. Une méthode naturelle pour améliorer la réceptivité et la fertilité des lapines allaitantes en insémination artificielle. *6èmes Journées de la Recherche Cunicole, La Rochelle, Vol. II, 528–535*
- REBOLLAR, P.G., ALVARIÑO, J.M.R., DEL ARCO, J.A., BUENO A., 1995. Control de celo en conejas nulíparas: manejo y tratamiento con PMSG. *Inf. Tech. Eco. Agr.*, Vol. Extra 16, Tomo I, 455–457.
- THEAU–CLÉMENT M., 1998 . Biostimulations applied to rabbit reproduction : theory and practice. *World Rabbit Sci.*, Vol. 6, 179–184.