# EXAMINATION OF FACTORS INFLUENCING RABBIT SURVIVAL (PRELIMINARY RESULTS)

**GYOVAI M[1]., MAERTENS L[2]., NAGY I[1]., BIRÓ-NÉMETH E[1]., RADNAI I[1]., PRINCZ Z[1]., GERENCSÉR ZS[1]., SZENDRO ZS[1].**

[1]University of Kaposvár, Faculty of Animal Science, 7400 Kaposvár,
Guba S. str. 40., Hungary,
szendro@mail.atk.u-kaposvar.hu
[2]Center for Agrcultural Research-Ghent, Department of Animal Nutrition and Husbandry,
Merelbeke, Belgium

## ABSTRACT

Sevenhundred-eightyfour female new-born rabbits were used to study the effect of birth weight (BW), number of does (ND), feeding regime during the rearing period (FI) and age at first insemination (AI) on their survival rate. They were divided into 3 groups according to their birth weight (BW): low /L/: 35-45g, medium /M/: 53-58g, high /H/: 65-70g. After the initial weighing, new litters of 8 kits were constituted with only L, M or H kits. Kits of each group were nursed by one /1/ or two /2/ does (ND) in equal proportion. After weaning at 21 days of age all the groups were halved and then were fed either *ad libitum* (AL) or restricted (R). In the R group, the rabbits' food consumption was limited to 10, 9, 8, 7 and 6 hours/day between the ages of 4-6, 6-9, 9-12, 12-15 and 15-18 weeks, respectively. All 12 groups were halved again and the does were first inseminated at either 15.5 or 18.5 weeks of age. Preliminary results showed that the most important factor of cumulative survival of suckling rabbits is the BW. It was 88.8, 86.8 and 72.4% for H, M and L kits, respectively. The effect of ND was significant only at the level of 0.10 (1=80.4 and 2=85.1%; P=0.07). The combined effect of BW and ND on kit survival was significant. The lowest values were in treatments L1 and L2 (70.3 and 73.9%) and they were followed by M1 and H1 (83.5 and 84.9%) and then by M2 and H2 (90.5 and 92.9%). The cumulative survival of rabbits between days 21 and 108 was significantly affected by BW (M=87.2, H=87.0 and L=78.5%; P<0.05). The effect of ND and FI was not significant. None of the factors (BW, ND, FI and AI) had a significant influence on the survival of does between the first AI and day 915 but slightly better results were received in group 2A and AI at 18.5 weeks of age.

**Key words:** rabbit, survival, birth weight, nursing method, feeding regime.

## INTRODUCTION

The efficiency of rabbit breeding is mainly determined by the mortality of suckling and growing rabbits and does. However the number of studies that investigate factors during rearing on lifespan of rabbit does is limited, which encouraged the authors for performing the present experiment. Mortality of suckling and growing rabbits and does is usually

effected by different factors. The aim of the experiment was to evaluate the effect of birth weight, number of nursing does, feeding regime, and age at first AI on survival of rabbits from birth until 130 weeks of age.

## MATERIAL AND METHODS

The experiment was carried out at the Kaposvár University on Pannon White rabbits. The experiment was set-up using a 3x2x2x2 factorial design. New-born rabbits were divided into 3 groups according to their birth weight /BW/ (low /L/: 35-45g, medium /M/: 53-58g, high /H/: 65-70g). After the initial weighing new litters of 8 young were constituted with exclusively L, M or H kits. The litters were nursed by either one or two does /ND/ respectively according to SZENDRO *et al*. (2002). Weaning took place at the age of 3 weeks followed by a further division during the following week in all 6 groups (28 days of age). The groups were then halved again and were fed either *ad libitum* /AL/ or restricted /R/. Feed intake /FI/ was limited to 10, 9, 8, 7, and 6 hours/day between the ages of 4-6, 6-9, 9-12, 12-15 and 15-18 weeks. Otherwise the feeders were closed. Before the first insemination /AI/ the groups were randomly divided into two again and they were inseminated either at 15.5 or 18 weeks of age /1AI/. From the 4$^{th}$ day before the first insemination all rabbits received their diet *ad libitum*. Re-insemination of does occurred 18-19 days after the first and 10-11 days after the subsequent parturitions. The pregnancy was tested by palpation 10 days after insemination. Non-pregnant does were re-inseminated 3 weeks after the first insemination. After 3 successive inseminations non-pregnant does were culled together with sick animals. (Number of rabbits are shown in Table 1.)

**Table 1. Number of rabbits at birth, at weaning and at first AI.**

| Age | Birth weight | | | Nursing does | | Feeding regime | | First AI, week | |
|---|---|---|---|---|---|---|---|---|---|
| | Low | Med. | High | One | Two | Ad lib. | Restr. | 15.5 | 18.5 |
| at birth | 268 | 265 | 251 | 422 | 362 | - | - | - | - |
| at weaning | 191 | 227 | 223 | 335 | 306 | 319 | 322 | - | - |
| at first AI | 150 | 196 | 193 | 280 | 259 | 265 | 274 | 250 | 289 |

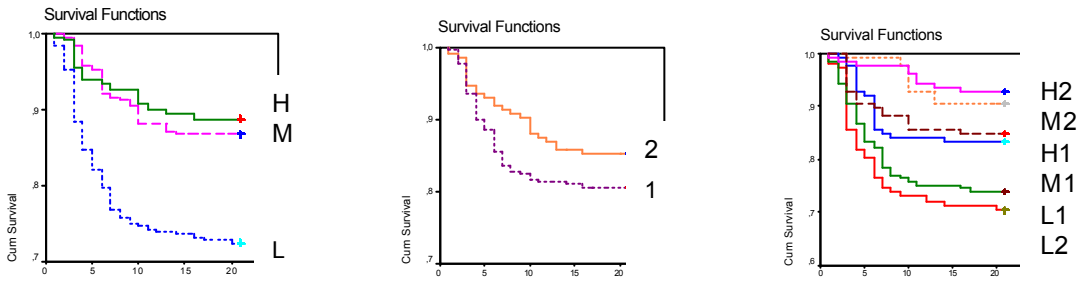
Mortality of the various groups was analysed using the survival function [S(t)] (KLEINBAUM, 1996), which estimates the probability that objects of an experiment would survive longer than a specified ("t") time. Survival of the various groups was monitored during three subsequent periods between the ages of 0-21, 21-108 days and from the first AI (at the age of 15.5 or 18.5 weeks) to a further 130 weeks. Comparison of the survival functions among the groups was performed using the Log-Rank test (KLEINBAUM, 1996). The authors wish to note that the experiment is still in progress, thus the exact survival time of all the rabbits is not yet known.

## RESULTS AND DISCUSSION

### Suckling rabbits (0-21th day)

From the aspect of the newborn rabbits' survival, BW is important. The survival rate of group "L" was significantly lower than that of group "H" and group "M" (0.72 vs. 0.88, 0.87). The frequency of non-viability was higher in group "L", which was demonstrated by the rapid decrease of the survival curve (Figure 1a). Without cross-fostering rabbits weighing up to 35 g or 35 45 g at birth showed 100% and 50% mortality until weaning (SZENDRO and BARNA, 1984). Placing kits of similar body weight into the same litter can however reduce mortality significantly. POIGNER (2000) found that the mortality of new-born rabbits – weighing similar to L M and H groups in our experiment – was 15.6%, 6.8% and 7.2%, respectively. Recently, PERRIER *et al.* (2004) reported that the mortality of L kits (<35 g) decreased from 22.5 till 4.2% if these L young remain in their original litter or placed together in litters exclusively with L kits. This effect tended to increase, in their experiment, if the litter size decreased from 12 to 8 L kits.

The effect of ND was smaller but still reasonable (0.80 vs. 0.85; P=0.07). Substantial differences were found in the survival probability of the two groups at the end of the first week, thereafter the two survival curves ran parallel (Figure 1b). Similar results were published by SZENDRO *et al.* (2002). When analysing the effects of BW and ND on the kits' survival together, it can be concluded that large BW resulted in poor survival regardless of the number of ND (survival probabilities at the 21st day were 0.74 and 0.70). However, the survival in groups "M" and "H" was higher when nursed by two does compared to those nursed only by one doe (0.90-0.93 vs. 0.83-0.85).

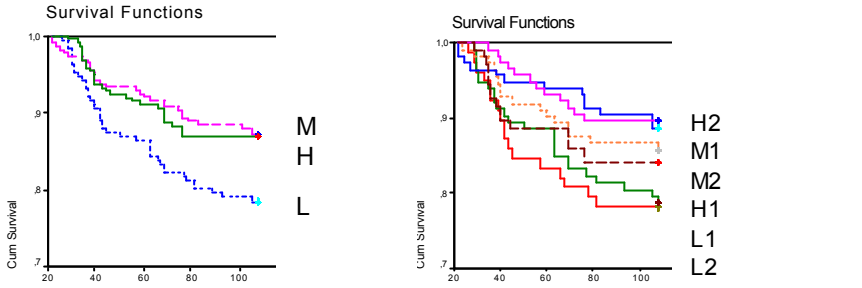



L= Low, M= Medium, H= High birth weight; 1 and 2=number of rearing does

**Figure 1. Survival probabilities between the 0-21st day depending on birth weight and number of rearing does.**

**Growing rabbits (21-108th day)**

Body weight affected the survival of growing rabbits. (Figure 2a). The survival probability of groups "H" and "M" decreased to a similar level during experimental period (0.87, 0.872), it was however significantly lower (0.78) in case of group "L" (P<0.05).




**a., Birth weight** **b., Birth weight and nursing does**

L, M, H, 1, 2: see in Figure 1

**Figure 2. Survival probabilities between the 21-108th day depending on birth weight and number of rearing does.**

Earlier researches (GYARMATI, 2000; GYOVAI *et al*. 2003) showed the superiority of the rearing method using two does. Yet according to the present results neither the ND (1 vs. 2) nor the FI (*ad libitum* vs. restricted) had a significant influence on survival during the second stage of our analysis (to the 108th day).

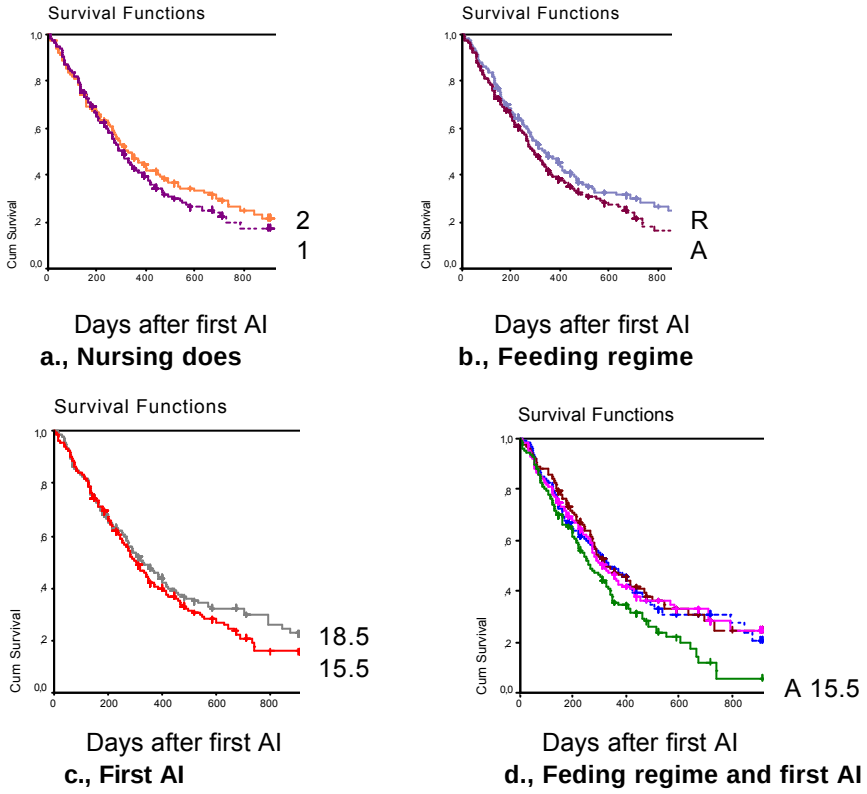
Analysing the effects of the BW and the ND together on the survival probability (Figure 2b) group "L" had the lowest ranking (0.78-0.79), whilst the ranking among the other groups was random (0.84-0.85).

**Does (first AI-further 2.5 years)**

The survival of does did not depend on initial BW. Examining several factors at the same time no significant differences were found. The characteristics of these results were however worth mentioning. Group "R" reared by two does performed somewhat better (0.41-0.42, p=0.31, p=0.11) than group "A" reared by one doe (0.38-0.37; Figure 3a and 3b). Though the survival curve of the does inseminated at the age of 15.5 weeks was lower than that of the other group inseminated at the age of 18.5 weeks (Figure 3c), the time of insemination did not significantly influence survival (P=0.28). Nursing by two does significantly increases the body fat content of the kits both at the end of the suckling period (SPENCER and HULL, 1984) and at the age of slaughter (GYARMATI *et al*., 2000). Restricted feeding during rearing and subsequent *ad libitum* feeding, improve the condition. It can be supposed that better condition (more fat depot) is beneficial concerning life time productivity. XICCATO (1996) observed that pregnant and lactating nulliparous does showed negative energy balance. MILISITS *et al*. (1999) observed substantial (lipid) losses during pregnancy and lactation in later parities as well. ROMMERS *et al.* (2002) observed an increased litter size in the first parity with increasing body weight. However, heavier weight

at the start of the reproduction period did not contribute to an improved feed intake or increased body weight development during the subsequent reproduction period. Recently ROMMERS (2003) reported that does restricted fed during rearing performed better than A does when inseminated at 17.5 weeks.

The pooled effect of the ND and FI was not significant (P=0.27) but it has to be mentioned that group "A" reared by one doe (which corresponds to the usual practice) showed lower cumulative survival (0.33) than the other three groups (0.40-0.42). Evaluating the common effect of FI and time of 1AI the differences (Figure 3d) were close to being significant (P=0.069). Survival probability of group "A" inseminated at the age of 15.5 weeks was poor (0.29) on the other hand survival of group "R" inseminated at the age of 15.5 weeks and groups "A", "R" inseminated at the age of 18.5 weeks gave similar trends (0.39, 0.43, 0.44).




A=*ad libitum*, R=restricted; 15.5 and 18.5= age (weeks) of first AI; 1,2: see in Figure 1

**Figure 3. Survival probabilities of does depending on the number of rearing does, feeding regime and age at first insemination.**

## CONCLUSIONS

The survival of new-born rabbits was effected by their birth weight. Survival rate can be increased by two does nursing. Kits with low birth weight had a poor viability shown by the low survival curve (compared to the other groups) of these kits even when nursed by two does. Kits having low birth weight showed lower survival probabilities after weaning

compared to the other groups regardless of the number of rearing does. None of the factors studied influenced survival rate of does during their reproductive period. Nevertheless it is worth mentioning that animals that were nursed by two does, fed restricted after weaning and inseminated at the age of 18.5 weeks survived somewhat longer than their counterparts.

## ACKNOWLEDGEMENT

Financial help of OTKA TS 044743 is acknowledged

## REFERENCES

GYARMATI T., SZENDRO ZS., MAERTENS L., MILISITS G., BIRÓ-NÉMETH E., RADNAI I., MATICS ZS., 2000. Effect of suckling twice a day on the performance of suckling and growing rabbits. *World Rabbit Sci.,* **8(1),** 283-290.

GYOVAI M., SZENDRO ZS., BIRÓ-NÉMETH E., RADNAI I., MATICS ZS., OROVA Z., 2003. Einfluss von unterschiedlichen Aufzuchtmethoden auf dis Leistungen von Mutterkaninchen. *13. Arbeitstagung über Haltung und Krankheiten der Kaninchen, Peltztiere und Heimtiere, Celle,* 9-17.

KLEINBAUM, D. G., 1996. Survival Analysis. A Self-Learning Text. Springer-Verlag. New York.

MILISITS G., ROMVÁRI R., DALLE ZOTTE A., SZENDRO ZS. 1999. Non-invasive study of changes in body composition in rabbits during pregnancy using X-ray computerized tomography. *Ann.Zootech.* **48,** 25-34.

POIGNER J., SZENDRO ZS., LÉVAI A., BIRÓ-NÉMETH E., RADNAI I., 2000. Effect of birth weight and litter size on growth and mortality in rabbits. *World Rabbit Sci.,* **8(1),** 17-22.

ROMMERS J.M., MEIJERHOF R., NOORDHUIZEN J.P.T.M., Kemp B., 2001. Effect of different feeding levels during rearing and age at first insemination on body development, body composition, and puberty characteristics of rabbit does. *World Rabbit Sci.,* **9,** 101-108.

ROMMERS J.M., MEIJERHOF R., NOORDHUIZEN J.P.T.M., Kemp B., 2002. Relationship between body weight at first mating and subsequent body development, feed intake , and reproductive performance of rabbit does. *J. Anim. Sci.,* **80,** 2036-2042.

ROMMERS J.M., 2003. Strategies for rearing of rabbit does. Ph.D. Thesis, Wageningen University, Animal Sciences group, 169p.SPENCER S. A., VINTERJ., HULL D., 1985. The effect in newborn rabbits of overfeeding on fat deposition, gross energetic efficiency, and metabolic rate. *Pediatric Research.* **19(1),** 127-130.

SZENDRO ZS., BARNA J. 1984. Some factors affecting mortality of suckling and growing rabbits. *3rd World Rabbit Congress, Rome,* 166-173.

SZENDRO ZS., GYARMATI T., MAERTENS L., BIRÓNÉ NÉMETH E., RADNAI I., MILISITS G., MATICS ZS., 2002. Effect of nursing by two does on the performance of sucking and growing rabbits. *Amin. Sci.,* **74.** 117-125.

XICCATO G., 1996. Nutrition on lactating does. *6th World Rabbit Congress, Toulouse,* **1,** 29-47.