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ABSTRACT

Eighty litters containing 545 kits from 43 New Zealand White does were weaned by being moved to a different cage (abrupt weaning, (AW)) or by the doe being moved and, after seven days, the kits being moved to another cage (phased weaning, (PW)). New Zealand White bucks sired 286 weanlings and Altex bucks sired 259. There were no differences between weaning weights for the AW and PW kits. At all later ages, AW weanlings were heavier ($P<.05$) than PW. The difference at weaning was 2.1%, increased to 6.0% at day 35, and then declined. Altex sired kits were heavier at all ages than New Zealand White sired kits. The rate of gain over the entire period was greater ($P<.05$) for the Altex (41.4±.38 vs. 42.8±.37 g/d, respectively.) Weanlings from first or second parity does were heavier ($P<.01$) at weaning, 35 and 49 d and had higher rates of gain from days 28-49 than weanlings from does with higher parities. It was concluded that phased weaning of rabbits is counter-productive and all changes for the weanlings should take place at one time. Altex sired kits have superior growth, even early in the growing period, especially for first and second litter does.

INTRODUCTION

Rabbit growers have many schemes for weaning kits that they feel are "the best" and create the least stress on the kits. Few of these schemes have actually been evaluated to determine their effects. VERITA and FINZI (1980) showed that moving rabbits weighing 1.9 kg into different cages was a stressor that reduced feed intake for three days. They related this to weaning and inferred that moving kits at weaning could have a negative impact on post-weaning gains. POMYTKO et al. (1981) weaned at 45 days and found no effect on either the doe or the litter that could be related to method of weaning. MCNITT (1986) and PATTON et al. (1986) compared weaning by moving the kits or moving the does and found no differences in kit performance between the methods.

A method practiced by some growers is to remove the doe from the cage and, a week later, transfer the litter to a fattening area. In this manner, the change of cage takes place a week after separation from the doe. The stress thus is presumably less at the time of weaning although it takes place over a longer period of time.

The present study was carried out to determine whether inducing longer term, but presumed lower level stress would increase the performance of the weanlings as compared with abrupt separation of the weanling from the doe and moving to a fattening cage.

MATERIALS AND METHODS

Animals and treatments

Between October 1998 and March 1999, alternate litters having at least five kits from

43 commercial type New Zealand White does were assigned to be weaned at 28 d either by being weighed, sexed, ear tagged and moved to a different clean cage in another area of the rabbitry (abrupt weaning, AW) or by being weighed, sexed, ear tagged and returned to the doe's cage (phased weaning, PW). In the latter case, the doe and the feeder were moved to another cage isolated from the weanlings. A clean, disinfected feeder was supplied for the weanlings but the cage itself was not cleaned. After seven days, the kits were moved to another cage in different area of the rabbitry. All weanlings were weighed every seven days (except for 34 kits that were not weighed at day 35) until they reached 49 d. Eighty litters containing 545 kits were used. Of these, 286 kits were sired by New Zealand White sires and 259 by Altex sires. The Altex is a meat-type terminal sire breed developed in the U.S. (LUKEFAHR et al. 1996).

All rabbits were housed in 76 x 76 x 46 cm quonset-style cages inside a building with window flaps that exposed the rabbits to ambient temperatures but provided protection from rain and wind. Each cage was provided with an automatic waterer. Each weaning cage contained 3 to 5 weaned kits. If a litter contained 5 kits, all were placed in one cage. If the litter contained 6 or more, the kits were placed in two cages with 3, 4 or 5 kits per cage. A standard commercial ration containing 18% crude protein and 18% crude fiber was provided *ad libitum*.

Statistical analysis
Dependent variables included body weights at 35, 42 and 49 days, and the growth rate for the entire period from day 28 to 49. Weight at weaning was used as a baseline. Data for weanlings that died during the experiment were removed from the analysis. Independent variables included method of weaning, sire breed (Altex or New Zealand White), and doe parity class (parity 1-2 = class 1, parities 3-6= class 2, parities 7-9 = class 3, and parities 10 and above = class 4). Growth data were analyzed using the general linear models procedure of SAS (1995). For analysis of individual weaning weight, sire breed, doe parity class, and the sire breed x parity class interaction were included as independent variables with number of kits in the litter as a covariate. For the other ages, sire breed, treatment, doe parity class, and all two way interactions were included as independent variables with litter weaning weight as a covariate.

RESULTS AND DISCUSSION

Mortality was low, with only 13 deaths among 545 fryers with 2.1% in the AW and 2.3% in the AW groups. Similarly, there was 2.3% and 2.4% mortality among the New Zealand White and Altex sired kits, respectively. The covariates (number of kits in the letter or litter weaning weight) were important sources of variation ($P<.01$) for all analyses except gain from 28-49 days.

Treatment effects
Table 1 shows the effects of abrupt or phased weaning on the weight of the fryers at 28, 35, 42, and 49 days as well as the daily gain over the period from day 28 to 49. There were no significant differences between the mean weights at weaning for the abrupt and phased weaned kits. At all ages after that, the fryers that had been weaned abruptly were heavier ($P<.05$) than those subjected to phased weaning. The

difference between the groups at weaning was 2.1% and increased to 6.0% a week later when the phased weaned kits were moved to different cages. The percentage difference declined further at days 42 and 49. This may indicate that there is more stress involved in being in the doe's cage without the doe than in being separated from the doe and moved to a different cage. Previous studies (MCNITT 1986, PATTON et al. 1986) did not find significant differences in weight gain from 28 to 56 d between weanlings that were moved and those that remained in their birth cage. Including the full feeding period may have masked effects that occurred early in the fattening period. The former however did note a numerical 1.1 g/d advantage for the kits that had been moved. This is similar to the 2.0 g/d advantage seen with the abruptly weaned kits in the current study.

Table 1. Effect of weaning treatment on growth of fryers (least squares means±s.e.)[1]

	Abrupt weaning		Phased weaning		
Age of kits (d)	**n**	**Weight (g)**	**n**	**Weight (g)**	**% Difference**
28 (weaning)	263	475±7.7	269	465±7.6	2.1
35	240	797±7.1[b]	258	749±6.9[a]	6.0
42	263	1121±8.9[b]	269	1067±8.9[a]	4.8
49	263	1375±9.8[b]	269	1333±9.7[a]	3.1
Rate of gain, d 28-49 (g/d)	263	43.1±.38[b]	269	41.1±.37[a]	-

[1] Means in the same row with different superscripts differ (P<.05)

Effects of sire breed

The mean weight of the Altex sired kits was greater at all ages than that of the New Zealand White sired kits and the rate of gain over the entire period was greater for the former (P<.05) (Table 2). This is expected since the Altex have been selected for 70 d weight and developed for use with New Zealand White does to take advantage of their superior mothering characteristics (OZIMBA and LUKEFAHR, 1991). MEDELLIN and LUKEFAHR (1999) reported that Altex sired kits were 37.3±20 g heavier at weaning (28 d) and 140±37 g heavier at 70 d than New Zealand White sired kits. There was an

Table 2. Effect of sire breed on growth of fryers (least squares means±s.e.) [1]

Sire breed	New Zealand White		Altex	
Age of kits (d)	**n**	**Weight (g)**	**n**	**Weight (g)**
28 (weaning)	253	447±6.6[a]	279	464±6.6[b]
35	233	761±7.2[a]	265	785±6.8[b]
42	253	1085±9.0[a]	279	1103±8.8[b]
49	253	1339±9.8[a]	279	1369±9.7[b]
Rate of gain, d 28-49 (g/d)	253	41.4±.38[a]	279	42.8±.37[b]

[1] Means in the same row with different superscripts differ (P<.05)

important interaction between treatment and sire breed (P<.01). At 49 days, the AW, Altex sired kits were heavier than all other groups (P<.01) while the Altex sired, PW kits were numerically lighter than the other kits. This relationship was also true for rate of gain from 28-49 d. This may indicate that for some reason, perhaps genetic make-up (1/2 Flemish giant, 1/4 Californian and 1/4 Champagne d'Argent), Altex weanlings are more prone to stress from dam separation than the New Zealand White weanlings.

Weanlings from does in their first or second parities were heavier (P<.01) at weaning, 35 and 49 d and had higher rates of gain from days 28-49 than weanlings from does with higher parities (Table 3). In contrast, ROUVIER et al (1973) found that weanlings from first litter does had lower weights at 56 d than weanlings from does of later parities. LUKEFAHR et al. (1983) reported that growth to 56 days was highest for weanlings from does in their fourth or fifth parities although OZIMBA and LUKEFAHR (1991) using a similar population, found no effect of parity on weight at 70 d. There is no apparent explanation for the better performance of weanlings from the younger does in the present study.

Table 3. Effect of parity class on growth of fryers (least squares means±s.e.) [1,2]

Parity class	Class 1		Class 2		Class 3		Class 4	
Age of kits (d)	n	Weight (g)	N	Weight (g)	n	Weight (g)	n	Weight (g)
28 (weaning)	134	533±9.2[b]	162	436±7.8[a]	123	435±8.7[a]	113	417±9.8[a]
35	111	805±11[b]	151	769±8.7[a]	123	763±9.8[a]	113	756±10[a]
42	134	1125±13	162	1081±11	123	1087±13	113	1082±13
49	134	1412±14[b]	162	1344±12[a]	123	1314±14[a]	113	1346±15[a]
Rate of gain, d 28-49 (g/d)	134	44.4±.62[b]	162	41.1±.49[a]	123	40.0±.56[a]	113	41.0±.63[a]

[1] Means in the same row with different superscripts differ (P<.01)
[2] Class 1 = parities 1 and 2; Class 2 = parities 3 to 6; Class 3 = parities 7 to 9; Class 4 = parities >9

At weaning, Altex sired kits from does in parity classes 1 and 2 were heavier (P<.05) than New Zealand White sired kits from does in the same classes (550±11 and 464±10 vs. 517±14 and 408±11 g , respectively). Furthermore, at days 42 and 49, Altex sired weanlings from does in parity class 4 were heavier (P<.01) than New Zealand White sired weanlings (1114±21 and 1408±23 vs. 1049±17 and 1283±19 g, respectively). This was also true for average daily gain from days 28-49 (45.0±.89 and 38.7±.72 g/d, respectively). This may have resulted from the superior growth characteristics of the Altex overcoming the poorer milk production from the younger does while stimulating later growth of the weanlings from the does from higher parity classes. There were no significant parity class by treatment interactions until day 49 when AW weanlings from does in parity classes 1 and 2 had higher (P<.01) weights than PW weanlings (1461±21 and 1371±17 vs. 1364±18 and 1316±17 g, respectively). A similar relationship also held for 28-49 d gain with 47.1±.80 and 43.0±.67 vs. 42.5±.70 and 40.4±.64 g/d, respectively).

These results indicate that phased weaning of rabbits is counter-productive and that all changes (doe removal, cage change, etc.) for the weanlings should take place at one time. The Altex sired kits have shown their superiority in terms of growth, even early in the growing period, especially for first and second litter does.

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