# STUDY OF THE BODY COMPOSITION OF GROWING RABBIT. I. FROM BIRTH TILL WEANING

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**Abstract** - The authors studied the body composition of suckling rabbits on day 0, 7, 14, 21, 28, 35 and 42 after birth. The dry matter (DM) continuously increases from birth still day 14, but after that the changes are practically negligible. Ash content increased still day 35 in both sex, after practically remains unchanged. The crude protein concentration continuously increases from birth still weaning. The fat content reaches its maximum on day 14, which is followed by a declination still weaning.

## INTRODUCTION

It is a well-known biological phenomenon that the age and sex have determining influence on the majority of physiological parameters. However, data concerning the body composition are scarcely and sometimes contradictory. MOULTON (1923) has found, that the mammals become chemically mature at different ages, the proportion of the total life span elapsed prior to the attainment of chemical maturity was approximately 4 % for all species investigated: rat 50 days, guinea pig 50 days, cat 100 days, dog 200 days, swine 150-300 days, cattle 150-300 days and man 500-1000 days. The chemical maturity means the age at which the concentration of water, protein and ash in the fat-free body becomes constant. In this respect there is a difference at birth, i.e. the cattle and guinea pigs are more developed chemically than are man, dog, cat, swine and rabbit.

The mentioned work and the other early studies demonstrated that the concentration of the water decreases and the ash and protein content increase during maturation. During fattening there is a replacement of water by fat REID *et al.* (1955) propose a correction of protein concentration according to the age.

SPRAY and WIDDOWSON (1951) investigated the rabbit's body composition in different period of their life. The young (15-35-day-old) rabbits were fatter, than the new-born did and the adult rabbits contained more ether extract, than the growing (2-4-month-old) animals. DE BLAS and GALVEZ (1975) used the comparative slaughter technique to determine the energy and protein requirement for growth in the very young rabbits. The Giant of Spanish breed rabbits were slaughtered in groups at birth, 10, 20, 30, 40, 50 and 60 days of age. The crude protein and the gross energy concentration in the total body dry matter decreased with the age; that of the ash increased. On the other hand, the energy content of the dry weight gain increased (5.18, 5.52, 5.52, 5.47 and 5.89 kcal/gram, according to the sampling times). They found a positive correlation between the energy content of the empty body (y, kcal) and the empty body weight (x, gram): $y = 1.734\ x - 88.536$.

In another trial, comparing the New Zealand and Spanish Giant suckling rabbits, FRAGA *et al.* (1978) confirmed, that the age influenced body composition and was highly correlated to weight. This influence was significant for every body constituent, except ash, at all ages. There was a significant decrease with age in water content and an increase in nitrogen and ash content. From the age of 25 days the composition tends to stabilize at both breed. At 29 days of age, the N-content of the fat-free dry body presented a maximum (13.00-13.10% DM), and the ash content a minimum (14.18-14.52% DM). In the subsequent period these values returned to those of new-born rabbit, i.e. 12.62-12.65% N of DM and 15.69-16.20% ash in DM.

RATHBUN and PACE (1945) in their fundamental work on guinea-pig reported about demonstrable sex differences in body composition, supposed, that the animals were compared on a fat-free body weight basis. The female guinea pigs averaged 4.7% more fat than the males. SHEBAITA (1977) established that the water concentration of the mouse fat-free body at mature age decreased with increasing fat percent in the male, while in the female is constant (criticism of the mechanical use of the so called "water concept").

In their experiment with suckling (0 to 35 days of age) FRAGA *et al.* (1978) found no sex influence on body composition of suckling rabbits. On the contrary, they found a sex effect on the proportion of N in the bodies of growing (4-12-week-old) rabbits (FRAGA *et al.*, 1983). Males had 1% more nitrogen than females at the same body weight. Males contained less (0.8%) fat than females. In the first phase of the present study we tried to follow the changes in body composition from birth till weaning on day 42 and to clarify the large and time of the possible sex difference.

## MATERIAL AND METHOD

Offspring of 12, artificially inseminated New Zealand White does were involved in the 6-week-long trial. The lactating does ate exclusively a commercial (HAGE-PURINA) pelleted concentrate (Table 1) *ad libitum*. The same was the single creep feed for the suckling rabbits besides the mather's milk. The does were made kindled by receiving 4 IU oxytocin (ENJ. AUV injection) intramuscular on day 31 of pregnancy.

On day 0, 7, 14, 21, 28, 35 and 42 the suckling rabbits were weighted individually and 3 male and 3 female average individuals have been chosen for the body composition analysis (Table 2). The sampling was unproportional in order to maintain the average of eight in litter size for the remaining does. The selected suckling rabbits were overslept by nembutal injection and stocked at -20 $^{o}$C.

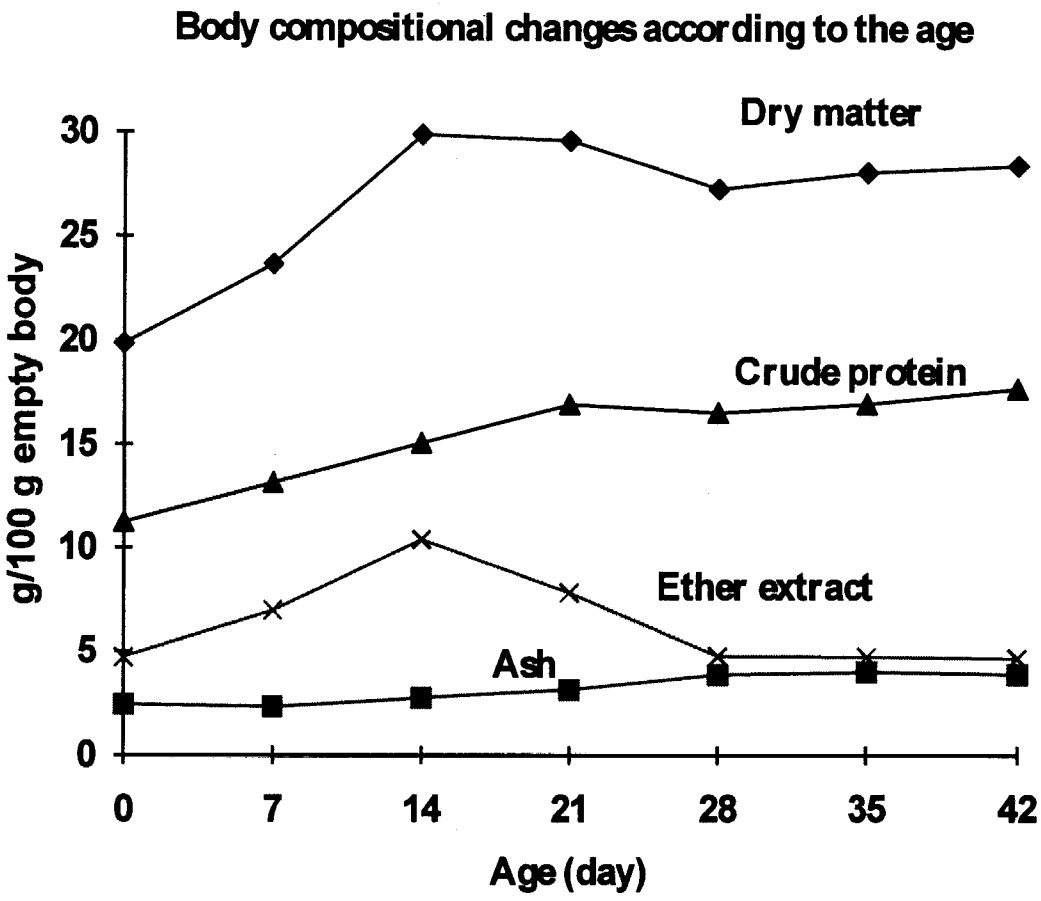
Before the analysis the gut content has been removed and the samples individually ground. The 21 male and 21 female growing rabbits' body composition has been determined by direct chemical analysis, according to the A.O.A.C. (1975) recommendation.

**Table 1 : Chemical composition and nutritive value of the experimental diet**

| Parameter | Unit | Value |
|---|---|---|
| Dry matter | % | 86.00 |
| Digestible energy | MJ/kg | 11.30 |
| Crude protein | % | 16.50 |
| Ether extract | % | 2.70 |
| Crude fiber | % | 15.50 |
| Lysin | g/kg | 7.0 |
| Methionin | g/kg | 3.2 |
| Met+Cys | g/kg | 6.0 |
| Calcium | g/kg | 10.0 |
| Phosphorus | g/kg | 5.5 |

**Table 2 : Body compositional changes according to the age and sex**

| | Dry matter | Ash | Crude protein | Ether extract |
|---|---|---|---|---|
| Male | Day 0 | | | |
| x | 20.13 | 2.50 | 11.43 | 4.78 |
| $s_x$ | 0.56 | 0.05 | 0.21 | 0.28 |
| Female | Day 0 | | | |
| x | 19.59 | 2.43 | 11.04 | 4.65 |
| $s_x$ | 0.35 | 0.07 | 0.21 | 0.23 |
| Male | Day 7 | | | |
| x | 24.15 | 2.42 | 13.35 | 7.25 |
| $s_x$ | 0.29 | 0.07 | 0.26 | 0.16 |
| Female | Day 7 | | | |
| x | 23.19 | 2.29 | 12.99 | 6.75 |
| $s_x$ | 1.01 | 0.06 | 0.09 | 0.86 |
| Male | Day 14 | | | |
| x | 29.60 | 2.75 | 15.12 | 10.04 |
| $s_x$ | 0.47 | 0.05 | 0.18 | 0.45 |
| Female | Day 14 | | | |
| x | 30.20 | 2.78 | 15.07 | 10.74 |
| $s_x$ | 0.42 | 0.06 | 0.32 | 0.15 |
| Male | Day 21 | | | |
| x | 29.90 | 3.11 | 16.67 | 8.18 |
| $s_x$ | 0.49 | 0.12 | 0.11 | 0.25 |
| Female | Day 21 | | | |
| x | 29.33 | 3.24 | 17.18 | 7.52 |
| $s_x$ | 1.12 | 0.04 | 0.91 | 0.30 |




## RESULTS

The chemical composition of the whole empty bodies is shown in Table 3. One can state that the dry matter (DM) continuously increases from birth still day 14, but after that the changes are practically negligible. The were no significant sex difference in the dry matter concentration.

The ash content increases still day 35 in both sex, after practically remains unchanged.

The crude protein (CP) concentration continuously increases from birth still weaning and a stabilization of values cannot be experienced.

The fat (ether extract=EE) content reaches its maximum on day 14, which is followed by a declination still weaning, attaining the initial (day 0) concentration.

**Table 3 : Body compositional changes according to the age and sex**

| | Dry matter | Ash | Crude protein | Ether extract |
|---|---|---|---|---|
| Male | Day 28 | | | |
| x | **26.62 | 3.86 | 16.40 | 4.43 |
| $s_x$ | 0.49 | 0.52 | 0.55 | 0.55 |
| Female | Day 28 | | | |
| x | **28.00 | 3.91 | 16.68 | 5.11 |
| $s_x$ | 0.18 | 0.57 | 1.61 | 1.33 |
| Male | Day 35 | | | |
| x | 27.87 | 3.96 | 16.80 | 4.82 |
| $s_x$ | 0.90 | 0.04 | 0.30 | 0.58 |
| Female | Day 35 | | | |
| x | 28.36 | 4.10 | 17.15 | 4.67 |
| $s_x$ | 0.59 | 0.31 | 0.31 | 1.08 |
| Male | Day 42 | | | |
| x | 28.29 | 3.94 | 17.81 | 4.46 |
| $s_x$ | 0.29 | 0.19 | 0.36 | 0.15 |
| Female | Day 42 | | | |
| x | 28.64 | 3.86 | 17.58 | 4.86 |
| $s_x$ | 1.00 | 0.15 | 0.65 | 0.49 |

**$p<0.05$ between sexes

## DISCUSSION - CONCLUSIONS

During the first 6 weeks of the growing rabbit's there are no sex differences in the dry matter, ash, crude protein and fat concentrations of the empty body. To be able to critically evaluate the influence of sex on body composition, one have to cite the results of other species. GARRETT *et al.* (1971) have found that the heifers were dryer, with more ash and nitrogen than steers. These sex differences were small, but significant. On a fat-free basis, barrows contained more water (76.7 *vs* 76.3%) and less protein (19.9 *vs* 20.3%) than gilts did (CHIBA *et al.*, 1990). Data of FOMON *et al.* (1982) demonstrated, that there is not a sex differences in throughout infancy and childhood of the human. The adolescent girls and mature women contain more fat than the boys and men. The tendency resembles that of SPRAY and WIDDOWSON (1951) rabbit data. REID *et al.* (1955) have not found sex differences in case of the cattle. FERREL *et al.* (1979), used comparative slaughter procedures, found rams with more water (12.3%) and protein (9.4%) and less fat (31.7%) than ewes. The present results confirm those of FRAGA *et al.* (1978), carried out in the first 5 weeks of growing rabbit's life.
Till day 14 the augmentation of crude protein, fat and minerals (ash) retention could occur on account of the water content. Being the fact that from day 14 the dry matter concentration practically did not vary, but that of the fat decread, the increasing protein and mineral building in may have been realized instead of the fat's one.
After our data the 6-week-old growing rabbit has not reached yet the state of chemical maturity. Our data are close of those of FRAGA *et al.* (1978) in respect that in the first 4 weeks the N-content of the body increases. However, in their trial, they found the maximum value on day 29, with the ensuing fall. In our case, the augmentation proved to be continuous till weaning, i.e. day 42. The difference could be explained by the various genotypes.

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