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EFFECT OF DOUBLE NURSING ON SOME ANATOMICAL AND PHYSIOLOGICAL PROPERTIES OF THE DIGESTIVE TRACT OF RABBITS BETWEEN 23 AND 44 DAYS OF AGE

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Anatomical and physiological properties of the digestive tract were examined and compared in young rabbits nursed either by one (SS) or by two does (DD) daily up to the age of 35 days. At the age of 23, 30, 37 and 44 days, 8 young per treatment were euthanised. Double suckling and the subsequent higher level of solid feed intake after weaning were found to exert a stronger influence on the weight of the entire gastrointestinal tract and that of its individual parts (the stomach, small intestine, caecum and colon) than on its length. The quantity of the gastric content was found to rise with advancing age in both groups (from 36 to 70 g and from 37.5 to 79 g). In both groups the pH of the stomach was higher during the suckling period (4.5–5.3) than subsequent to weaning (1.6–2.4). The quantity of the caecal content also increased with age (from 4 or 8 g), but on the 37th day significantly higher quantities of caecal content were recorded in DD rabbits (50.5 g compared with 35 g). The pH of the caecal content decreased more slowly from an initial high value (6.0 and 6.5 in SS and DD rabbits, respectively), and by the 37th day had settled at a low value (5.7–5.8) in both groups. The dry matter content of the caecal content decreased from 270–273 g to 188–207 g in both groups. Total volatile fatty acid (tVFA) and acetic acid (C2) concentration, which amounted to 66–88% of tVFA, rose; in SS rabbits they were at higher levels by the 30th day (53.6 and 42.2 mmol/L, respectively), and remained at an increased level until the 44th day ($P < 0.05$). The ratio of C3 : C4 was high on the 23rd day (2.5 and 2.4), but dropped at the age of 30 days (0.5 in SS and 1.7 in DD, $P < 0.05$) and, further, by the 37th day (0.2 in SS). In SS rabbits coliform count proved significantly lower (10^5) on the 23rd day than in DD rabbits (10^6). By the 37th day this count had decreased in both groups and subsequently remained at a low level ($< 10^4$). By the 23rd day *Bacteroides* were present in large quantities (10^8) in the caecum and showed no change with advancing age or feeding regime.

Key words: Digestive system, digestive physiology, rabbits, double suckling

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The natural behaviour of rabbits is to suckle their young only once a day (Lebas, 1970; Hudson and Distel, 1982; Szendrő et al., 1993). Up to the age of 20 days young rabbits are nourished exclusively by milk (Lebas et al., 1986; Kustos et al., 1996), after which they gradually adapt to solid feed. Young rabbits are weaned at 28 days at the earliest in practice, but most commonly between 32 and 35 days of age in commercial units.

Experiments performed with meat-type rabbits (McNitt and Moody, 1988; Szendrő et al., 1998; Gyarmati et al., 1999; Szendrő et al., 2002) have provided clear-cut evidence that young rabbits do show an inclination to suckle twice daily from two different does. Consequently, they have access to 80–85% greater quantities of nutrients than those suckled only once a day. The weight advantage attained in this way is maintained during the fattening period. On the basis of a number of findings relating to mortality (Szendrő et al., 1998) it can be hypothesised that problems from the aspect of digestion physiology will be encountered in the adaptation to solid feed after weaning in young rabbits which have previously suckled twice a day.

The aim of this experiment was to examine and to compare certain anatomical and physiological properties of the digestive tract in young rabbits suckled either once or twice daily up to the age of 35 days.

Materials and methods

The Pannon White rabbits used in these investigations were either reared by a traditional method, i.e. suckled once a day from birth and allowed to adapt to solid feed (SS), or suckled twice a day by two mothers from birth until weaning at the age of 35 days (DD). The additional daily suckling was carried out by an additional doe which had produced a litter on the same day but whose progenies had been removed. One doe was placed into the nest box at 08:00 a.m. every day while the second doe was introduced at 20:00 p.m. Immediately after nursing, the does were removed from the young. Nursing twice a day was maintained until weaning. The details of the procedure applied for suckling was described by Gyarmati et al. (2000).

The animals were housed in single-floor wire cages in a building heated in winter (minimum 15 °C) but not cooled in summer (maximum 26–28 °C). The length of daily illumination was 16 h. The young rabbits were fed a non-medicated rabbit diet (CP: 168 g/kg, CFat: 29 g/kg, CF: 141 g/kg, 10.3 DE MJ/kg), supplemented with barley and hay. The various feeds provided were available *ad libitum,* and the rabbits also had free access to drinking water from weight-valve self-drinkers. As it was not possible to measure feed consumption in this experiment, data for daily intake were adopted from a previous experiment performed by Gyarmati et al. (2000). The newborn rabbits of average body

weight were allocated into litters of eight; these litters were then divided at random into two groups. Ten litters, i.e. 80 young rabbits, were put into each group. On day 23, 30, 37 and 44 after birth 8 healthy animals from each group were euthanised by CO_2 gas at 14:00 o'clock. Body weight was measured after exsanguination. The digestive tract was removed immediately and the stomach, the small intestine, the caecum and the colon were separated.

The empty weight and length of the entire gastrointestinal (GI) tract and its individual parts were recorded. The quantity of the gastric and caecal content was measured and the pH value of the fresh gastric, intestinal and caecal content was determined by a manual automatic pH meter (OP-110, Radelkis, Hungary).

The dry matter content of the chyme samples was determined according to Hungarian Standard ISO 6496:1993 entitled 'Determination of the nutritive values of feeds'.

Volatile fatty acid composition of the caecal content (acetic, propionic, butyric, isobutyric, valeric, isovaleric and capronic acid) was determined by a gas-chromatographic method. One g of sample was diluted with 10 ml deionised water, then mixed with 85% phosphoric acid. The samples were centrifuged for 10 min. The supernatant was collected, frozen for 24 h and then filtered. One ml diethyl ether was given to 1050 µl of the supernatant, and then injected into the Chrompack CP 9000 gas chromatograph. FFAP 30 m × 0.32 mm capillary column and flame ionisation detector were used.

For bacterial assays, serial dilutions were made from 1 g aliquots of chyme. The counts of *Bacteroides*, coliforms, lactobacilli and streptococci were determined as follows: The *Bacteroides* spp. were cultured on Schaedler agar, supplemented with esculin, neomycin and Fe-ammonium citrate, in anaerobic thermostat at 37 °C for 96 h. Lactobacilli were cultured on MRS medium, in anaerobic thermostat at 37 °C for 48 h. Streptococci were cultured on Edward's medium, in aerobic thermostat at 37 °C for 48 h. The total coliform count was determined on Drigalski's medium, in aerobic thermostat, at 37 °C for 24 h. After their respective incubation periods, colonies were visually counted. In case of chemical and microbiological examinations four replicates were examined in each group and period.

The experiment was carried out in the experimental animal house belonging to the Department of Small Animal Husbandry. Analyses were performed in the laboratory of the Department of Animal Physiology and Hygiene, except for VFA determination, which was performed in the Chemical Institute of the faculty.

Statistical analyses were performed using the SPSS (1996) programme package. Differences between the groups and between the dates of examination were determined by analysis of variance.

Results

Mortality

Mortality rates in the experimental groups did not differ significantly before or after weaning, and were below 10% in each group.

Weight and length of stomach, small intestine, caecum and colon

The *weight of the empty GI tract* (Table 1) proved to be significantly higher in the DD group at the age of 23 days, which allows us to infer that up to that age twice-daily suckling exerted a substantial influence on the dimensions of the digestive system. The digestive system of the DD rabbits remained significantly heavier during the whole experimental period than that of the rabbits of Group SS.

Table 1

Body weight and weight of different empty parts of the gastrointestinal (GI) tract according to age and nursing regime

Groups	Age (days)							
	23		30		37		44	
	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.
Body weight after exsanguination (g)								
SS	360.0[a]	38.0	585.0[a]	87.5	855.0[a]	58.3	1193.8[a]	87.0
DD	645.0[b]	91.0	892.5[b]	69.6	1288.8[b]	105.2	1565.0[b]	103.5
Total GI tract (g)								
SS	26.5[a]	2.99	49.1[a]	7.32	79.7[a]	7.54	103[a]	4.48
DD	43.3[b]	2.52	67.3[b]	11.1	93.1[b]	14.6	121[b]	8.89
Stomach (g)								
SS	15.4	1.56	11.7	1.83	15.2[a]	2.25	17.6[a]	2.13
DD	11.0	1.32	13.5	1.51	18.5[b]	4.63	21.9[b]	2.95
Small intestine (g)								
SS	10.2[a]	1.31	15.8[a]	2.90	25.9	4.02	32.8[a]	3.31
DD	16.0[b]	2.65	22.4[b]	3.77	30.1	4.58	39.2[b]	2.12
Caecum (g)								
SS	5.3[a]	0.53	11.2[a]	2.64	18.0	1.75	22.8	2.64
DD	8.5[b]	0.50	15.8[b]	2.75	21.2	3.92	25.9	2.69
Colon (g)								
SS	3.5[a]	1.19	10.4	1.87	20.6	2.72	29.7	2.37
DD	7.8[b]	1.26	15.6	4.10	23.2	5.06	33.6	6.72

[a, b]denote significant differences between groups ($P < 0.05$); SS: nursed once daily; DD: nursed twice daily by two different mothers

The *weight of the empty stomach*, although not significantly different (presumably due to the low number of animals involved), seemed lower in the group suckling once daily than in the rabbits of group DD, except on day 23 (Table 1). At the age of 37 and 44 days, DD rabbits had stomach weights significantly exceeding those of the SS rabbits.

In the DD group the *weight of the empty small intestine* exceeded the values recorded for the rabbits of Group SS, the differences proving to be significant in most instances (Table 1). The effect exerted by twice-daily nursing only prevailed up to the age of 30 days, there being no substantial difference in the *length of the small intestine* from the 5th week onwards. Only at the age of 30 days was a statistically significant difference observed between SS and DD young (Table 2).

Table 2

Length of the different parts of the GI tract

Groups	Age (days)							
	23		30		37		44	
	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.
Small intestine (mm)								
SS	1640	192	2090[a]	205	2790	289	3100	213
DD	1840	52.9	2470[b]	118	2880	210	3130	268
Caecum (mm)								
SS	223[a]	22.2	327	27.1	426	36.0	486	40.7
DD	257[b]	23.1	362	24.2	456	31.6	485	32.9
Colon (mm)								
SS	502[a]	138	757[a]	64.9	965[a]	38.2	1140	81.2
DD	673[b]	40.4	878[b]	59.8	1140[b]	70.0	1160	82.8

[a, b]denote significant differences between groups ($P < 0.05$); SS: nursed once daily; DD: nursed twice daily by two different mothers

At the ages of 23 and 30 days the *weight of the empty caecum* proved to be significantly higher in the DD rabbits than in the SS young (Table 1). Although the same tendency could be observed up to the age of 44 days, the difference did not prove statistically verifiable in every instance. In the case of the *length of the caecum* differences between the SS and DD rabbits proved significant only when the rabbits were 23 days old (Table 2).

The *weight of the colon* (Table 1) was significantly higher in DD rabbits than in SS young at the age of 23 days. Although it also proved higher at the other ages studied, these differences were not statistically verifiable. With respect to the *length of the colon* (Table 2), significant difference was detected between SS and DD young at the ages of 23, 30 and 37 days.

Examining the weight of the GI tract compared to the exsanguinated body weight (BW), the following correlation could be found: the relative growth of the GI tract and different parts of it were in direct proportion to the body weight (data not shown). The *GI/BW ratio* in the period examined was 7–9% in SS and 7–8% in DD rabbits, no significant differences between groups were observed. The *stomach/BW ratio* on days 23, 30 and 44 was somewhat higher (4, 2.2%, respectively) in traditionally reared rabbits, than in young nursed twice daily (1.7, 1.5, 1.4%, respectively). On day 37 the *caecum/BW ratio* showed a temporary increase in SS rabbits.

Quantity and pH of the gastric and caecal content

The *quantity of the gastric content* was found to rise with advancing age in both groups (Table 3). The slight degree of difference between the two groups did not prove significant at any point. In both groups the *pH* of the stomach was higher during the suckling period than subsequent to weaning. For rabbits suckled twice a day gastric pH was observed to fall more slowly, not reaching the value characteristic of fully developed rabbits at the age of 44 days (Table 3). The difference between groups was significant at day 37.

Table 3

Quantity and pH of the gastric and caecal content

Groups	Age (days)							
	23		30		37		44	
	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.
Weight of the gastric content (g)								
SS	36	5	47	4	53	5	70	6
DD	37.5	4.5	50	5	64	6	79	8
pH of the gastric content								
SS	5.3	0.2	4.6	0.5	1.8[a]	0.2	1.6	0.3
DD	5.2	0.3	4.5	0.4	2.4[b]	0.3	1.6	0.2
Weight of the caecal content (g)								
SS	4	1.5	16	3	35[a]	4	66.5	7
DD	8	2	20	4	50.5[b]	5	77	8
pH of the caecal content								
SS	6[a]	0.3	6.1	0.2	5.8	0.3	5.7	0.4
DD	6.5[b]	0.2	6.3	0.4	5.8	0.4	5.8	0.3

[a, b]denote significant differences between groups ($P < 0.05$); SS: nursed once daily; DD: nursed twice daily by two different mothers

The *quantity of the caecal content* also varied between the two groups (Table 3). On the 37th day significantly higher quantities of caecal content were recorded in DD rabbits, but this difference had diminished by the 44th day. In the rabbits suckled twice daily the pH of the caecal content was significantly higher at day 23 and decreased more slowly from an initial high value, and by the 37th day had settled at a low value in both groups. Throughout the experimental period the *pH* of the *chyme* sampled from the *small intestine* varied between 6.8 and 7.1; no significant difference was ascertained either between samplings or between groups (data not shown).

Dry matter content and VFA concentration of caecal chyme

The *dry matter content* of the caecal chyme decreased from 270–273 g to 188–207 g in both groups with advancing age (Table 4). *Total volatile fatty acid (tVFA*) concentration increased; in the rabbits suckled once daily this was at a higher level by the 30th day, and remained at an increased level until the 44th day ($P < 0.05$). The concentration of *acetic acid* (C2), which amounted to 66–88% of tVFA, was found to change in parallel with the curve obtained for total volatile fatty acid concentration, though the differences between groups could not be statistically proven.

On the 23rd day, alongside acetic acid, *propionic acid* (C3) was found to be in the greatest quantity (amounting to 16 or 13% of tVFA); with advancing age this quantity subsequently decreased, while that of *butyric acid* (C4) rose (Table 4). In correspondence with the changes observed in tVFA, higher acetic and butyric acid concentrations were measured by the 30th day in the rabbits suckled once daily, while at the same time propionic acid concentration was found to be at a higher level in the rabbits suckled twice daily. The difference between groups was significant at 37 days of age.

The *ratio of C3:C4* was high on the 23rd day, but had decreased sharply by the 30th day and, further, by the 40th day. Significant difference was observed at day 30. The quantity of the *minor volatile fatty acids* (mVFA), i.e. branched-chain fatty acids (isobutyric, isovaleric) and valeric acid was low (1.8 mmol/L) by the 23rd day in the rabbits suckled once daily, and showed no subsequent change (data not shown). The concentration of these fatty acids in the rabbits suckled twice daily was 4.1 mmol/L on the 23rd day and 4.9 mmol/L on the 30th day, but by the 37th day the value had fallen to 0.8 mmol/L.

Composition of the caecal microflora

Total anaerobic germ count proved high (10^{10}–10^{11} bacteria per g chyme) in both groups. By the 23rd day *Bacteroides* were present in large quantities (10^8) in the caecum and no large change was observed with advancing age (Table 5).

Table 4

Dry matter content and VFA concentration of caecal chyme

Groups	Age (days)							
	23		30		37		44	
	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.
Dry matter content (g/kg)								
SS	273	8	216	8	211	6	207	6
DD	270	6	221	9	210	7	188	5
tVFA content (mmol/L)								
SS	29.4	2.8	50.0[a]	5.6	54.0[a]	6.2	70.4[a]	8.2
DD	26.4	3.4	31.2[b]	4.1	38.4[b]	5.2	51.1[b]	6.1
Acetic acid (C2) content (mmol/L)								
SS	21.0	1.8	42.2	5.9	43.0	6.5	60.3	8.2
DD	17.5	1.5	27.2	3.4	30.8	5.2	43.3	3.6
Propionic acid (C3) content (mmol/L)								
SS	4.7	1.1	2.0	0.2	1.8	0.1	1.5	0.3
DD	3.4	1.8	3.1	0.1	2.9	0.2	1.6	0.2
Butyric acid (C4) content (mmol/L)								
SS	1.9	0.5	4.3	0.7	7.4[a]	1.0	7.6	1.2
DD	1.4	0.4	1.8	0.4	3.9[b]	0.1	6.1	0.5
C3/C4 ratio								
SS	2.5	0.3	0.5[a]	0.2	0.2	0.05	0.2	0.05
DD	2.4	0.3	1.7[b]	0.3	0.7	0.2	0.3	0.1

[a, b]denote significant differences between groups ($P < 0.05$); SS: nursed once daily; DD: nursed twice daily by two different mothers

In the group suckled once a day the coliform count proved significantly lower (10^5) on the 23rd and 30th day than in the rabbits suckled twice daily (10^6) (Table 5). By the 37th day this count had decreased in both groups and subsequently remained at a low level ($< 10^4$). Streptococci were detected only on the 23rd and 30th days (Table 5), while lactobacilli could not be detected at all (data not shown).

Discussion

The *weight and length of the GI organs* of SS young, together with the changes occurring with age in these characteristics, were found to concur with most of the relevant data in the literature (Lebas and Laplace, 1972; Alus and

Edwards, 1977; Piattoni et al., 1997). The results obtained in this study corroborate the conclusions drawn by Lebas and Laplace (1972) and by Yu Bi and Chiou (1977), according to which change in the length and weight of the GI tract follows an almost linear curve between the ages of 2 and 9 weeks. However, on the basis of the data obtained it seems that twice-daily suckling and the subsequent higher consumption of milk and solid feed affect the weight of the digestive system.

Table 5

Composition of the caecal microflora according to age and nursing regime

Groups	Age (days)			
	23	30	37	44
	means	means	means	means
Bacteroides (germ count/g chyme sample)				
SS	2.8×10^8	1.8×10^8	3.7×10^8	5.6×10^8
DD	1.2×10^8	6.0×10^8	2.6×10^8	4.6×10^8
Coliforms (germ count/g chyme sample)				
SS	$1.5 \times 10^{5\,a}$	$4.3 \times 10^{4\,a}$	2.6×10^3	4.3×10^3
DD	$5.5 \times 10^{6\,b}$	$2.9 \times 10^{6\,b}$	3.0×10^4	4.0×10^3
Streptococci (germ count/g chyme sample)				
SS	3.0×10^5	3.5×10^3	$< 10^3$	$< 10^3$
DD	1.7×10^5	2.2×10^3	$< 10^3$	$< 10^3$

[a, b]denote significant differences between groups ($P < 0.05$); SS: nursed once daily; DD: nursed twice daily by two different mothers

Before weaning the *stomach*, referred by Lebas (1975) as an organ serving as a container, is not much larger in young rabbits suckling once than in those suckling twice a day. This could be explained by the assumption that between the morning and evening suckling the stomach empties almost completely, if not entirely. If this was not the case, it would be difficult to account for the finding that the stomach could accommodate an 0.89 higher quantity of milk than the milk intake characteristic of Group SS (Gyarmati et al., 2000). The absence of significant differences in the quantity of the gastric content between groups is a supplementary indication.

DD young have a limited solid feed intake up to the age of 30 days. In our previous experiment (Gyarmati et al., 2000) it was shown that rabbits suckled twice up to the age of 23 days and subsequently only once until weaning at 35 days (DS rabbits) began to eat solid feed sooner than those of Group DD. When rabbits suckled twice up to the age of 23 days, after which they were weaned (D0), solid feed intake was very limited due to early weaning. It was

only after this transitional period (about 2 days) that their feed intake began to increase sharply. By the end of the fattening period there was no longer any significant difference between the different D treatments. However, the difference observed between the D groups and the rabbits of Group SS was largely accounted for by the fact that, even at this age, the daily feed intake recorded in the rabbits which had suckled twice daily still slightly exceeded that of those which had suckled only once a day (Gyarmati et al., 2000). This could explain the higher stomach weight found after weaning in Group DD (Table 1).

It seems that the feed intake of the rabbits influenced the *length of the small intestine* less strongly than it influenced its *weight*. This difference may have been caused to a minor degree by higher milk intake due to twice-daily suckling, but to a greater degree by higher levels of solid feed consumption. The significant difference between SS and DD young with respect to the weight of the small intestine was ascertained less frequently up to the age of 37 days than at the age of 44 days (Table 1).

The observations made in this study indicate that the *weight* and the *length of the caecum* were the characteristics primarily influenced by twice-daily suckling. Up to the age of 30 days more substantial and clear-cut differences developed between Group SS and Group DD. This observation corresponds to those reported by Padilha et al. (1995), who found that in rabbits reared exclusively on milk up to the age of 42 days the weight of the caecum wall increased considerably between the ages of 29 and 42 days. Piattoni et al. (1997) also established that the level of solid feed consumption influences the development of the caecum. Both very early weaning and a switch to solid feed at a later stage manifest themselves equally in the growth of the caecum. When the young begin to eat significant quantities of solid feed, the caecum starts to increase in weight. Alus and Edwards (1977) reported similar findings. They described relatively slow growth in the caecum (in terms of its wall and its capacity) from birth up to the age of 10 days. However, by the age of 40 days, with growth parallel to the increase in feed consumption, the caecum was found to grow to as much as ten times its original size. This was presumably a consequence of the more rapid growth of the organs which occurred due to faster growth in the rabbits suckled twice daily. The temporary decrease of the *caecum/body weight ratio* in DD rabbits on day 37 might have been due to a temporary unbalanced (non-allometric) growth of the caecum.

In DD rabbits significantly higher quantities of caecal content were recorded on day 37, but this difference had diminished by the 44th day.

Twice-daily suckling and the intake of larger quantities of solid feed were equally instrumental in the development of the dimensions of the *colon*. Twice-daily suckling was found to exert an influence both on the weight and the length of the colon.

The findings of this study concerning the *caecal VFA content* show a tendency similar to that of the experimental results obtained by Padilha et al. (1996) with rabbits suckled twice daily up to the age of 42 days, reared exclusively on milk. The total caecal VFA concentration measured by the above-mentioned authors (12.5 mmol/L) was substantially higher than that found in our study. The reason for this could be ascribed to the solid feed from the 25th–28th day in our twice-daily suckled young. This may provide an explanation for the mass colonisation at an early stage by *Bacteroides* also observed in the rabbits suckled twice daily (see below). In the same experiment performed by Padilha et al. (1996) the concentration of branched-chain volatile fatty acids and valeric acid remained at high levels throughout the experimental period. In the present study high concentrations were recorded prior to weaning in the rabbits suckled twice daily, which indicates that more intensive proteolytic fermentation processes were taking place.

Padilha et al. (1996) found that the *coliform count* is primarily dependent on the age of the animal, not on its feeding and nutrition. Prohászka (1980) and Morisse et al. (1985) stated that a relation can be demonstrated between coliform count, pH and tVFA concentration. In the present experiment, in addition to higher coliform count, higher pH and slightly lower tVFA concentration were also recorded on the 23rd day in the group suckled twice daily. However, subsequent to weaning, even despite the lower tVFA content, coliform count was found to be at a low level similar to that in the rabbits suckled once a day.

In conformity with data in the literature (Gouet and Fonty, 1973; Fekete, 1988) the intestinal microflora was found to consist (characteristically of the rabbit, but in contrast with other monogastrics) of simple, non-sporulated, strictly anaerobic, Gram-negative *Bacteroides.* According to studies by Gouet and Fonty (1973), *Bacteroides* rapidly become established in the caecum and the colon, as early as the 1st to the 2nd week of life. This can be due to the consumption of the few pellets of hard faeces left in the nest by the mother after suckling as it was observed by Hudson et al. (1996).

Conclusions

Double nursing and the subsequent higher level of solid feed intake after weaning were found to exert a stronger influence on the weight of the entire gastrointestinal tract and that of its individual parts (the stomach, small intestine, caecum and colon) than on its length; however, the effect was not significant with regard to relative growth (GI/BW). Double suckling or earlier feed intake had no significant effect on the quantity of the gastric content and on the dry matter content of the caecal chyme, whereas suckling twice resulted in higher gastric and caecal pH, lower C2, C4 and higher C3 concentration of the caecal chyme. On the basis of these findings it can be ascertained that in the rabbits

suckled twice daily these digestion physiology parameters reached the values characteristic of fully developed rabbits more slowly and at a later stage than in other young rabbits reared by the traditional method of once-daily suckling.

The results obtained indicate that double nursing of rabbit young could be not only a model to study disorders in the digestion physiology of double-suckled rabbits but also for weaning problems, and may assist in establishing appropriate preventive measures from the aspect of the animal.

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