Comparison between the Behavior, Productive Performance and Stress Level of Different Weaning Ages of Young Rabbits

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Abstract

Thirty six, New-Zealand, white growing rabbits of both sexes were divided into three equal groups (12 animals / group) according to the weaning age (21, 28 and 35 day). The mean duration of the behavioral patterns and productive parameters were measured weekly. Concerning the behavior of growing rabbit, the mean duration of food consumption (min.) and drinking (min.) increased significantly ($P \leq 0.01$) in 28 day weaning than 21 and 35 day. The mean duration of resting (min.) increased significantly ($P \leq 0.05$) while, the mean duration of locomotory behavior (min.) decreased significantly ($P \leq 0.01$) in later weaned groups (35 day) than early weaning (21 day). Concerning the productive performance of growing rabbits, the highest body weight (g) and daily weight gain (g) were obtained in later weaning age group (35 day). The lowest daily weight gain (g) was noted in the third week of growing. The highest mortality rate (%) was observed in rabbits weaned at 21 days of age. Cortisol hormone levels (ng/ml) increased significantly ($P \leq 0.01$) in early (21, 28 day) than later (35 day) weaned rabbits at weaning and at slaughtering. Our results suggest that later weaning of young rabbits at 35 day improves the growth rate, behaviors and allows young rabbits to live with minimal stress levels during the growing period.

Key words: Growing rabbits, Weaning age, Cortisol, Body weight

Introduction

In rabbit production weaning period is the most critical part, as at that time young rabbits are very sensitive to multi-factorial digestive problems. Early weaning of rabbits (age 21 d) have some benefits from nutritional and animal health point of view as it did not result in detrimental changes in the digestive physiological parameters ***(Kovacs et al., 2008)***. It decreases the frequency of digestive problems and diminishes pathogen transmission by restricting contacts amongst kit and does ***(Schlolaut, 1988)***. Also, it reduces doe body energy output by decreasing the lactation period and ensures better coverage of kit nutritional requirements by separate kit and dam feeding ***(Nicodemus et al., 2002; Salama et al., 2015)***. Conversely, early weaning not

permit the full improvement of rabbit stomach related catalysts and a few supplements go undigested through the digestive tract into the caecum, where the beneficial bacteria has been colonized after the age of 14 days ***(Gidenne and Fortun-Lamothe, 2002).***

The weaning age influences the production parameters in rabbits as early weaning (21 day) resulted in reduction of growth rate from 4% to 26% ***(Barreto and De Blas, 1993; Morton et al., 2005a)***, worse feed conversion ratio of rabbits weaned at 21 day when compared to that weaned at 32 days of age **(Xiccato et al., 2000)**, lowered body mass of weaned rabbits ***(Trocino et al., 2001),*** smaller body weights of rabbits also, daily weight gains until day 42 ***(Gallois et al., 2004).*** Early weaned rabbits (25 day) has more intensive growth rate, as they demonstrated a deferral concerning the development of bulk when contrasted with regularly weaned (30 day) rabbits because of the higher mucous surface, relating to a higher assimilation potential and higher stomach related limit ***(Gallois et al., 2005).*** Development rate of early weaned rabbits was moderately diminished, they demonstrated a postponement as to the buildup of muscle mass when contrasted with typically weaned rabbits ***(Vachkova, 2008).*** Then again, a few authors revealed that weaning age had no consequences for developing rabbits weight during fattening ***(Gidenne et al., 2004),*** growing rabbit performance such as weight gain and feed intake ***(Zita et al., 2012).***

Later weaning of growing rabbits (35 days of age) increase the final body weight as milk consumption and the simultaneous increasing solid feed intake resulted in better growth ***(Kovacs et al., 2008)***. Additionally, weight of rabbits weaned at 35 days of age and butchered at 95 days of age was factually higher than body weights of rabbits weaned at 21 days of age ***(Vachkova et al., 2010).*** Plus, youthful rabbits weaned at 35 days of age had a higher final body weight and every day weight gain than other weaning ages at 25 and 30 days of age. Also, they had improved growth performance, economic efficiency and welfare under Egyptian environmental conditions ***(Salama et al., 2015).***

Weaning can be an exceptionally distressing period for youthful rabbits as they undergo both an unexpected difference in eating routine and condition and in addition detachment from their mother ***(Read et al., 2015 and Combes et al., 2013)*** and will result in more immobile, frightened rabbits and higher freezing time ***(Verga et al., 2004).*** Hypothalamic–pituitary–adrenal (H.P.A.) responses may be affected by subordination stress, defeat, or fear ***(Koob and Heinrichs, 1999).*** So that, both corticosterone and cortisol are touchy to social stress and great indexes of the stress

reaction as there is a solid connection between the levels of these hormones and protective agonistic behavior in rabbits ***(Szeto et al., 2004).***

Early weaning at 21 days of age resulted in an increased mortality rate of rabbit offspring up to 53% ***(Mendez et al., 1986 and Zita et al., 2012)***. This higher mortality indicates that a late weaning at the age of 35 days is preferable in order to reduce mortality rate ***(Gidenne and Fortun-Lamothe, 2004 and Salama et al., 2015)***. If weaning occurred too late, while the kits may be stronger and lower mortality, the welfare of the doe may be decreased and ultimately reduce her productivity ***(Morton et al., 2005b).***

The roles and interactions of weaning age and performance of young rabbits are not yet completely identified. However, their knowledge is essential to determine the basic requirements of young rabbits around weaning and after that during the growing period till slaughtering ***(Ribikauskas et al., 2010).*** So that, the aim of this work is to investigate the effect of weaning age on the behavior and productive performance of growing rabbits.

Material and Methods

Animals

36 New-Zealand white growing rabbits of both sexes were used in this experiment. They were divided randomly into three equal groups 12 animals each, according to the weaning age. The groups were formed after weaning in the same day at different ages 21, 28 and 35 day old represented by group A, B and C respectively ***(Kovacs et al., 2008).*** The does were inseminated 25 days after the kindling to keep away from interactions between gestation and milk production processes. The study was carried out from 1st of April to end of June 2015.

Housing

The animals were kept in groups of three animals in a wire mesh cage. The dimensions of each cage were 0.40 m × 0.36 m × 0.25 m (length × width × height). There were one nipple drinkers and one feeder (36 cm width, 10 cm length and 10 cm height, content: about 3 kg). Every feeder was partitioned into four compartments, bringing about synchronous access by four rabbits. Animals could consume commercial pellets not obligatory. Rabbits were held under natural light/dim cycle (application. 16/8 hrs).

Observations and records

Rabbit behavior was recorded once a week for 24 hrs using 3 Panasonic WV Ns202ae network video cameras connected to a computer with DVR card for a continuous video recording one camera for each group at the same time recording.

The same group of 12 individuals were observed every week by focal animal observation (5 min/one hour) was carried out with life

scoring of all occurrences of all activities of the focal individual ***(Altmann, 1974).*** The mean duration (min.) spent in each behavioral pattern was recorded per (24 hrs) observation.

The following behavioral patterns were scored according to ***Ribikauskas et al. (2010).***

1- Eating: Consumption of feed from the feeder, gnawing the pellet.

2- Drinking: Drinking water from nipple drinkers.

3- Resting: Sleeping, lying at any position (unsleeping, stretched) sitting.

4- Locomotory behaviors: Any voluntary change of position (treading, running, hopping, prancing).

5- Comfort behaviors (self-grooming): Any behavior form connected with the own body of the animal (washing, licking, starching).

6- Social and marking behaviors: The behavior forms described at the comfort behaviors conducted on other rabbits (marking each other with the chin).

The animals were weighed once per week after weaning for five weeks till the slaughtering day at the end of the fattening period in all groups. Live body weight and number of dead rabbits were recorded for all groups at the same age (5^{th}-10^{th} weeks). Daily weight gain and mortality rate were calculated. In addition, relative growth rate were calculated on a group basis according to ***North (1981)*** and ***Salama et al. (2015):***

Relative growth rate = [(W2 - W1) x100]/ [1/2 (W2+W1)]

Where: W1= the initial weight, and W2 = the final body weight

Serum samples and Cortisol hormone level estimation.

To study the influence of treatments on mean serum Cortisol level, blood samples were collected on day of weaning from the ear vein and on the slaughtering day, 30 day after weaning from rabbits of the different groups. After slaughtering each rabbit, we received the blood into sterilized tubes. After that, the collected blood samples immediately centrifuged at 2000×g for 10 min. Serum samples were stored at -20 $^{\circ}$C until analyzed.

Cortisol was assayed according to ***(Lewis and Elder, 1985)*** using a commercial ELISA kit produced by Calbiotech a life science company (CO103S-CBI). The sensitivity of the assay is <1.5 ng/ml.

Results

Table (1): *Behavioral patterns duration (min.) in 24 hrs behavioural observation of the different growing rabbit groups (Means ±S.E) for four weeks after weaning*

Behavioral patterns	1st week	2nd week	3rd week	4th week	Total
Feeding duration (min.)					
Group A (35 day)	33.80± 4.76	33.60± 4.78	37.67± 2.09	22.45± 4.86	31.88^{b}± 2.32
Group B (28 day)	70.08± 8.54	45.10± 8.68	46.57± 10.89	33.05±16.51	48.70^{a}± 6.09
Group C (21 day)	41.07± 4.21	44.30± 11.86	33.40± 5.85	21.77± 3.81	35.13^{b}± 3.81
Drinking duration (min.)					
Group A (35 day)	5.30^{b}± 1.53	4.73^{b}± 1.28	2.62^{b}± 0.48	4.13^{b}± 0.67	4.20^{b}± 0.54
Group B (28 day)	5.27^{b}± 0.90	5.33^{b}± 2.67	7.88^{b}± 2.09	2.32^{b}± 0.78	5.20^{ab}± 0.93
Group C (21 day)	2.05^{b}± 0.63	3.70^{b}± 2.01	15.60^{a}± 3.02	7.82^{b}± 3.86	7.29^{a}± 1.66
Resting duration (min.)					
Group A (35 day)	168.63±8.81	177.30±8.77	168.15± 2.78	188.32±7.38	175.60^{a}±3.83
Group B (28 day)	121.25±8.27	159.27±14.2	165.95±10.61	191.92±6.31	159.60^{b}± 7.19
Group C (21 day)	152.33±6.05	150.05±13.94	162.67± 8.00	189.25±8.43	163.58^{ab}±5.52
Locomotory behaviors duration (min.)					
Group A (35 day)	16.45± 1.83	4.70±1.43	8.87± 1.15	6.93± 1.46	9.24^{b}± 1.15
Group B (28 day)	17.85± 3.08	8.32± 1.66	4.15± 1.03	4.85±1.36	8.79^{b}± 1.46
Group C (21 day)	24.63± 2.18	12.60± 3.35	8.60± 1.34	7.40± 1.28	13.31^{a}± 1.75
Comfort behaviors duration (min.)					
Group A (35 day)	23.42^{ab}±1.94	17.58^{bc}± 3.45	21.73^{bc}± 3.09	14.57^{bc}±1.86	19.33± 1.44
Group B (28 day)	23.87^{ab}±5.36	32.12^{a}± 4.31	12.68^{c}± 1.58	21.02^{bc}±1.80	22.42± 2.23
Group C (21 day)	18.07^{bc}±3.21	24.95^{ab}± 3.21	18.28^{bc}± 3.39	12.37^{c}± 2.28	18.42± 1.70
Social and marking behaviors duration (min.)					
Group A (35 day)	0.85± 0.45	0.87± 0.38	1.13± 0.43	0.90± 0.34	0.94± 0.19
Group B (28 day)	0.83± 0.54	1.60± 0.39	0.27± 0.15	0.58± 0.35	0.82± 0.21
Group C (21 day)	0.75± 0.27	1.10± 0.65	0.32± 0.15	0.13± 0.07	0.58± 0.19

Means in the same column with different superscripts are significantly different ($P \leq 0.01$)

Table (2): *Body weight (g) of the different weaning age growing rabbit groups from the first to the fifth week after weaning (Means ±S.E)*

Groups / Weeks	Group A (35 day)	Group B (28 day)	Group C (21 day)	Total
1st week	707.50±26.02	701.67±39.28	695.33±38.98	701.50^{e}±21.22
2nd week	973.33±31.55	1047.33±28.17	875.33±36.90	965.33^{d}±21.72
3rd week	1211.67±35.37	1248.08±33.94	1135.83±39.67	1198.53^{c}±21.89
4th week	1416.75±36.16	1470.83±40.72	1313.75±40.18	1400.44^{b}±24.52
5th week	1791.67±38.35	1679.17±40.10	1637.50±41.34	1702.78^{a}±24.96
Total	1219.02^{a}±51.00	1248.58^{a}±42.92	1132.75^{b}±46.05	1200.12±27.10

Means in the same row with different superscripts are significantly different ($P \leq 0.01$)

Means in the same column with different superscripts are significantly different ($P \leq 0.01$)

Table (3): *Daily weight gain (g) of the different weaning age growing rabbit groups from the first to the fifth week after weaning (Means ±S.E)*

Groups / Weeks	Group A (35 day)	Group B (28 day)	Group C (21 day)	Total
1st week	38.82^{bc}±2.73	42.47^{ab}±1.80	24.86^{g}±2.75	35.38^{A}±1.89
2nd week	34.05^{cde}±1.72	30.45^{efg}±1.77	37.23^{bcd}±2.84	33.91^{A}±1.31
3rd week	29.30^{efg}±1.77	28.68^{efg}±1.83	25.42^{fg}±1.92	27.80^{B}±1.07
4th week	34.41^{cde}±1.18	31.81^{def}±2.04	46.24^{a}±2.30	37.49^{A}±1.50
Total	34.14±1.06	33.35±1.20	33.44±1.77	33.64±0.79

Means in the same column with different superscripts are significantly different ($P \leq 0.01$)

Means in the same row with different superscripts are significantly different ($P \leq 0.01$)

Table (4): *Mortality rate (%) and Relative growth rate (g) of the different weaning age growing rabbit groups (Means ±S.E)*

Groups	Mortality rate (%)	Relative growth rate (g)
Group A (35 day)	0±0	81.03^{a}±4.69
Group B (28 day)	3.32±2.03	93.06.16^{b}±3.19
Group C (21 day)	6.64±4.07	67.16^{b}±b3.19

Means in the same column with different superscripts are significantly different ($P \leq 0.01$)

Table (5): *Cortisol hormone levels (ng/ml) of the different weaning age growing rabbit groups (Means ±S.E) at weaning and at slaughtering*

Groups	Cortisol hormone levels (ng/ml)	
	at weaning	at slaughtering
Group A (35 day)	17.95^{b}±0.93	18.33^{b}±3.29
Group B (28 day)	25.43^{a}±1.86	32.263^{a}±2.39
Group C (21 day)	28.62^{a}±4.19	35.65^{a}±2.35

Means in the same column with different superscripts are significantly different ($P \leq 0.01$)

Discussion

The recorded data in table (1) revealed that there was a highly significant difference ($P \leq 0.01$) between weaning age groups (35, 28 and 21) in feeding duration (min.) (31.88±2.32, 48.70±6.09 and 35.13±3.81) and in drinking duration (min.) (4.20±0.54, 5.20±0.93 and 7.29±1.66) respectively. The obtained results were in agreement with ***Hudson et al. (2000); Gallois et al. (2004) and Morisse and Maurice (1996).***

Concerning resting and locomotory behaviors as shown in table (1), results revealed a highly significant difference ($P \leq 0.01$) between weaning age groups in resting duration (min.) (175.60±3.83, 159.60±7.19 and 163.58±5.52) and in locomotory behaviors duration (min.) **(**9.24±1.15, 8.79±1.46 and 13.31±1.75**)** respectively. These results disagreed with ***Matics et al. (2004)*** who recorded that early weaned young like to huddle together. This higher resting and lower locomotory behavior durations of later weaned groups (35 day) may be attributed to larger body size will decrease the space allowed to move so resting is preferred as discussed by ***Mirabito et al. (1999)*** and ***Ribikauskas et al. (2010).*** With increasing in age from the first to the fifth week after weaning there was a higher tendency of all growing rabbit groups to rest than to move. This may be explained by ***EFSA Journal (2005)*** who concluded that when rabbits get heavier and bigger they are less able to carry out certain behaviors due to obvious space restriction.

Results in table (2&3) showed that there was a highly significant difference ($P \leq 0.01$) between weaning age groups in body weight (g) (1219.02±51.00, 1248.58±42.92 and 1132.75±46.05) and in daily weight gain (g) (34.14±1.06, 33.35±1.20 and 33.44±1.77) respectively. The highest body weight and daily weight gain were obtained in later weaning age group (35 day). This result was in consistent with ***(Trocino et al., 2001; Gallois et al., 2004; Vachkova et al., 2010; Zita et al., 2012; Salama et al., 2015).*** The

obtained results may be attributed to there was a sudden increase in the solid feed intake after weaning in all groups. But, in group G35 the feed intake was higher already on day 28, related to the decreasing milk production of the doe. So that, milk consumption and the simultaneous increasing solid feed intake resulted in better growth according to ***Kovacs et al. (2008).*** In contrast to these facts were data that early weaning has no effect on rabbit body mass during fattening ***(Gidenne et al., 2004).***

In relation to growing rabbit's mortality rates %, there was a significant difference ($P \leq 0.05$) between weaning age groups (0±0, 3.32±2.03 and 6.64±4.07) as showed from table (4). The obtained results agreed with ***Mendez et al. (1986)*** and ***Salama et al. (2015).*** *I*n addition, ***Gidenne and Fortun-Lamothe (2004) & Zita et al. (2012)*** found that a higher mortality rate in the early weaned rabbits (21 days). These results indicate that a late weaning at the age of 35 days is preferable in order to reduce mortality rate.

Concerning the relative growth rate (g) results from table (4) showed that there was a highly significant difference ($P \leq 0.01$) between weaning age groups (88.10±4.69, 67.16±3.19 and 67.16±3.19). These results go hand by hand with ***(Barreto and De Blas, 1993; Gallois et al., 2005; Vachkova, 2008)***.They may be attributed to a delayed growth rate in early weaned rabbits because of the buildup of muscle mass as compared to normally weaned rabbits according to ***Vachkova (2008).***

Results in table (5) showed that there was a highly significant difference ($P \leq 0.01$) between weaning age groups in cortisol hormone levels (ng/ml) at weaning (17.95±0.93, 25.43±1.86 and 28.62±4.19) and at slaughtering (18.33±3.29, 32.263±2.39 and 35.65±2.35) respectively. The obtained results agreed with ***Verga et al. (2004) and Read et al. (2015).***

Conclusion

Early weaning of young rabbits at 21 day, increases the duration of ingestive and locomotory behavior but, it decreases the duration of resting behavior during the growing period. In addition, it recorded the highest mortality rate and was more stressful than later at 28 and 35 day. On the other hand, there was no effect on comfort, social and marking behaviors duration. Later weaning of young rabbits at 35 day improves the growth rate. Also, the highest body weight and daily weight gain were obtained.

Recommendation

Our results suggest that weaning of young rabbits at 35 day to improve the growth rate, behaviors and to allow young rabbits to live with minimal stress levels during the growing period.

References

Altmann, S.A. (1974): Observational study of behaviour: sampling methods. Behaviour 49, 227-267.

Barreto, G., De Blas, J. (1993): Effect of dietary fi bre and fat content on the reproductive performance of rabbit does at two remating times during two seasons. World Rabbit Sci. 1, 77-81.

Combes, S., Gidenne, T., Boucher, S., Fortun-Lamothe, L., Bolet, G., Coureaud, G. (2013): Rabbit from birth to weaning: what tools for more robust rabbits?, Proc.: 15èmes Journ. Rech. Cunicole, Le Mans, France, pp. 63-77.

EFSA Journal (2005): The Impact of the current housing and husbandry systems on the health and welfare of farmed domestic rabbits. European food safety authority journal 267, 1-31.

Gallois, M., Gidenne, T., Fortun-Lamothe, L., Le Hueron-Luron, I., Lalles, J.(2005): An early stimulation of solid feed intake slightly influences the morphological gut maturation in the rabbit. Repr. Nutr. Dev. 45, 109-122.

Gallois, M., Gidenne, T., Fortun-Lamothe, L., Le Huerou-Luron, I., Lalles, J.P. (2004): Weaning age and development of the small intestinal mucosa in the young rabbit, 8th world rabbit congress". digestive physiology, management and economics, wool and fur, meat quality and processing and fao rabbit science and production in developing countries sections. World Rabbit Sci., 2006, Puebla, Mexico., pp. 1079-1085.

Gidenne, T., Fortun-lamothe, I., Lapanouse, A. (2004): Feeding strategy for the early weaned rabbit: interest of a high energy and protein starter diet on growth and health status, Proc. 8th World Rabbit Sci Congress, Puebla, Mexico (WRSA), pp. 853-860.

Gidenne, T., Fortun-Lamothe, L. (2002): Feeding strategy for young rabbits around weaning: a review of digestive capacity and nutritional needs. Anim. Sci. 75, 169-184.

Gidenne, T., Fortun-Lamothe, L. (2004): Growth, health status and digestion of rabbits weaned at 23 or 32 days of age, Proc. World Rabbit Congress, 7-10 sept. , Puebla.

Hudson, R., Schaal, B., Martinez-Gomez, M., Distel, H. (2000): Mother-young relations in the European rabbit: physiological and behavioural locks and keys. World Rabbit Sci. 8(2), 85-90.

Koob, G.F., Heinrichs, S.C. (1999): A role for corticotropin releasing factor and urocortin in behavioral responses to stressors. Brain Res. 848, 141-152.

Kovacs, M., Milisits, G., Szendrı, Z., Lukács, H., Bónai, A., Pósa, R., Tornyos, G., Kovács, F., Horn, P. (2008): Effect of different weaning age (days 21, 28 and 35) on caecal microflora and fermentation in rabbits, In: Xiccato, G., Trocino, A., Lukefahr, S.D. (Eds.), 9th World Rabbit Congress.

Nutrition and Digestive Physiology Verona - Italy, pp. 701-704.

Lewis, I.G., Elder, P.A. (1985): An enzyme-linked immunosorbent assay(ELISA) for plasma cortisol. Journal of steroid biochemistry 22, 673-676.

Matics, Z., Szendro, Z., Radnai, I., Biró-Németh, E., Gyovai, M., Orova, Z. (2004): Study of a two-phase rearing method for growing rabbits 8th world rabbit congress". digestive physiology, management and economics, wool and fur, meat quality and processing and fao rabbit science and production in developing countries sections. World Rabbit Sci., 2006 Puebla, Mexico, p. 57.

Mendez, J., De Blas, J., Fraga, M. (1986): The effect of diet and remating interval after parturition on te reproductive performance of the commercial doe rabbit. J. Anim. Sci. 62, 1624-1634.

Mirabito, L., Galliot, P., Souchet, C., Pierre, V. (1999): Accommodation for 2 cage fattening rabbits or 6 people: Study of time budget. 8th me Journ. Rech. Rabbit, ITAVI ed., 55-58.

Morisse, J.P., Maurice, R. (1996): Influence of the stocking density on the behaviour of fattening rabbits kept in intensive conditions., Proceedings of the 6th World Rabbit Congress, Toulouse, pp. 425-429.

Morisse, J.P., Maurice, R. (1997): Influence of stocking density or group size on behaviour of fattening rabbits kept under intensive conditions. Appl. Anim. Behav. Sci. 4, 351-357.

Morton, D., Verga, M., Blasco, A., Cavani, C., Lavazza, A., Maertens, L., Mirabito, L., Rosell, J.M., Stauffacher, M., Szendrő, Z. (2005b): The impact of the current housing and husbandry and husbandry systems on the health and welfare of farmed domestic rabbits. The European Food Safety Authority Journal (EFSA) 267, 1-31.

Nicodemus, N., Gutierrez, I., Garcia, J., Carabano, R., de Blas, C. (2002): The effect of remating interval and weaning age on the reproductive performance of rabbit does. Anim Res 51, 517-523.

North, M.O., 1981. Commercial Chicken. Production Annual. 2nd Edition, Production 6th Ed. Interstate Printers and Publishers. INC., USA.

Read, T., Combes, S., Gidenne, T., Destombes, N., Grenet, L., Fortun-Lamothe, L. (2015): Stimulate Feed Intake before Weaning and Control Intake after Weaning to Optimise Health and Growth Performance. World Rabbit Sci 23, 145-153.

Ribikauskas, V., Ribikauskienė, D., Skurdenienė, I. (2010): Effect of housing system (wire cage versus group housing) and in house air quality parameters on the behaviour of fattening rabbits. World Rabbit Sci. 18, 243 - 250.

Salama, M.S., Morsy, W.A., Mohamed, R.A., Eltholth, M.M., El-Midany, S.A. (2015): Effect of

weaning age and housing model on feed intake, growth performance, hemato-biochemical parameters and economic efficiency of post weaning New Zealand White rabbits. Alexandria Journal of Veterinary Sciences 46, 48-56.

Schlolaut, W. (1988): Present husbandry and management conditions and development trends in rabbit production., Proc. 4th World Rabbit Congress, Budapest, Hungary, pp. 93-112.

Szeto, A., Gonzales, J.A., Spitzer, S.B., Levine, J.E., Zaias, P.G., Saab, N., Schneiderman, N., McCabe, P.M. (2004): Circulating levels of glucocorticoids hormones in WHHL and NZW rabbits: circadian cycle and response to repeated social encounters. . Psychoneuroendocrinology 29, 861-866.

Trocino, A., Xiccato, A.G., Sartori, P.I.Q. (2001): Effect of starter diet and weaning age on growth, caecal fermentation and body composition of young rabbits, Proc. of the second meeting of Workgroup 3rd and 4th COST Action 848, Gödöllő, Hungary, pp. 52-53.

Vachkova, E.G. (2008): Studies of some endocrine and metabolic parameters, morphometric characteristics and absorbtive area of gut in rabbits depending on weaning age, PhD Thesis, Faculty of Veterinary Medicine, Department of Pharmacology, Animal Physiology and Physiological Chemistry, Stara Zagora, Bulgaria.

Vachkova, E.G., Penchev Georgiev, I., Bivolarski, B.L., Konakchieva, R. (2010): Relationships between plasma concentrations of epidermal growth factor, insulin and iodated thyroid hormones in early and normal weaned rabbits. Revue Méd. Vét. 161, 30-36.

Verga, M., Zingarelli, I., Heinzl, E., Ferrante, V., Martino, P.A., and Luzi, F. (2004): Effect of housing and environmental enrichment on performance and behaviour in fattening rabbits., Proc.: 8th World Rabbit Congress, Puebla City, pp. 1283-1288.

Xiccato, G., Trocino, A., Sartori, A., Queaque, P.I. (2000): Early weaning of rabbits: effect of age and diet on weaning and post-weaning performance., Proc. 7th World Rabbit Congress, Valencia, Spain, pp. C, 483-490.

Zita, L., Ledvinka, Z., Mach, K., Kočár, J., Klesalová, L., Fučíková, A., Härtlová, H. (2012): The effect of different weaning ages on performance in hyla rabbits, Proceedings 10 th World Rabbit Congress, Sharm El- Sheikh -Egypt, pp. 61-64.

الملخص العربي

مقارنة بين السلوكيات و الاداء الانتاجي و مستوي القلق في الاعمار المختلفة للفطام في الارانب الصغيرة

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تم تقسيم 36 أرانب من الارانب البيضاء النيوزيلندية النامية من كلا الجنسين إلى ثلاث مجموعات متساوية (12 حيوان / مجموعة) وفقا لعمر الفطام (21 و 28 و 35 يوما). تم قياس متوسط مدة الأنماط السلوكية والمعدلات الإنتاجية بشكل أسبوعي. وفيما يتعلق بسلوك الأرانب النامية، ازداد متوسط مدة استهلاك الغذاء (بالدقيقة) والشرب (بالدقيقة) بشكل ملحوظ ($P \leq 0.01$) في عمر 28 يوم من الفطام عنه في 21 و 35 يوم. في حين انخفض متوسط مدة السلوك الحركي (بالدقيقة) بشكل معنوي ($P \leq 0.01$) في مجموعات الفطام المتأخر (35 يوم) من الفطام المبكر (21 يوم). و فيما يتعلق بالأداء الإنتاجي للأرانب النامية، فقد تم الحصول على أعلى وزن للجسم (بالجرام) وزيادة الوزن اليومي (بالجرام) في مجموعات الفطام المتأخر (35 يوما). وقد لوحظ انخفاض الوزن اليومي (بالجرام) في الأسبوع الثالث من النمو. و قد لوحظ أعلى معدل وفيات (٪) في الأرانب الفطام في 21 يوما من العمر. وارتفعت مستويات هرمون الكورتيزول (نغ / مل) بشكل ملحوظ ($P \leq 0.01$) في مجموعات الفطام في الوقت المبكر (21، 28 يوم) عنه في الأرانب المفطومة في وقت متأخر (35 يوم) عند الفطام وعند الذبح. و تشير نتائجنا إلى أن الفطام في وقت متأخر للأرانب الصغيرة عند 35 يوم يحسن معدل النمو والسلوكيات ويسمح الأرانب الصغار للعيش في الحد الأدنى من مستويات القلق خلال فترة النمو.