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# FEEDS & FEEDING


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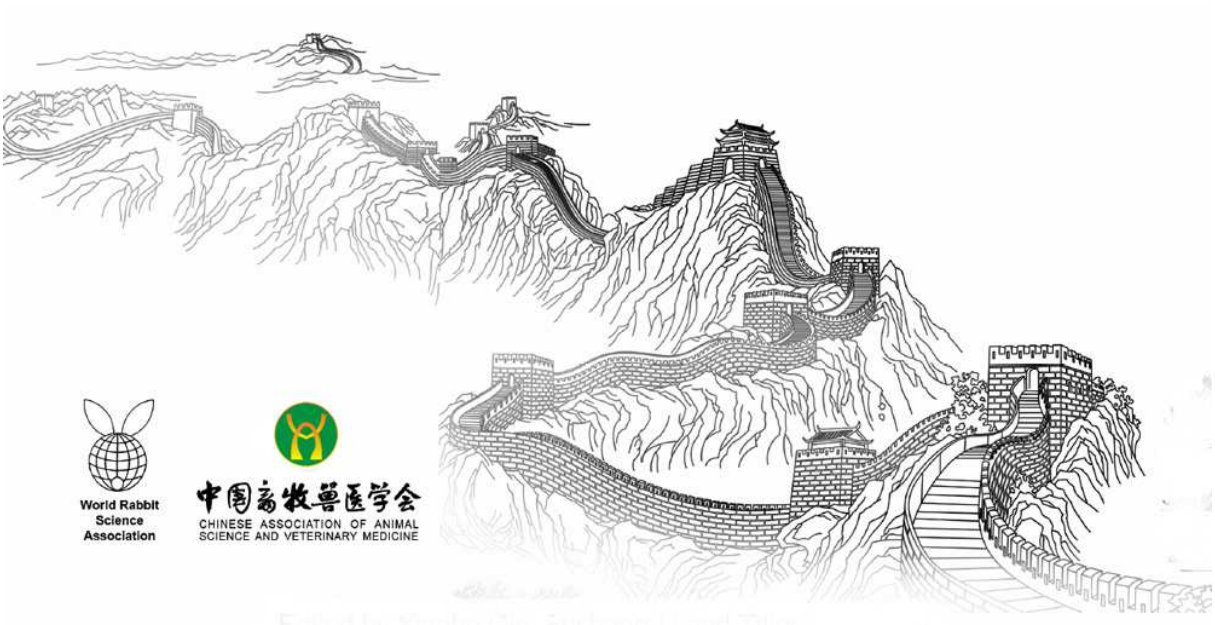

# INTEREST OF A FASTING PERIOD TO IMPROVE GROWTH PERFORMANCES OF FATTENING RABBITS

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## ABSTRACT

In order to study if the beneficial effect of feed restriction is due to a decrease in the feed intake or to a fasting period during the day, four groups of 120 rabbits each were formed at weaning time. The J0 and J10 groups were fed ad libitum respectively during 24 hours and 14 hours a day. The aim was to force the J10 rabbit group to fasten during 10 hours. The 1R80 and 4R80 groups were feed restricted (80 % of ad lib.) and respectively fed in one and four distributions a day, to limit the fasting period for the 4R80 group.
Group J10 has a similar feed intake as group J0 but has a better average daily gain (ADG) and feed conversion ratio FCR (+1.2g/d and -0.10 respectively, P<0.05) during fattening. Group 1R80 had a better FCR than J0 and J10 groups (-0.29 and -0.19 respectively, P<0.05). Group 4R80 has a more important mortality rate (P<0.05) and a smaller ADG than the three other groups (from -1.2 to -7.2g/d, P<0.05). It was concluded that the improvement of feed efficiency of restricted rabbits is due to the presence of a fasting period and the decrease in feed intake.

**Key words**: fattening rabbits, fasting period, feed restriction, growth performances, mortality rate.

## INTRODUCTION

Feed restriction is recognized to be a practice that reduces digestive disorders in rabbits after weaning (Gidenne *et al*., 2012). A more than 20% decrease in feed intake allows a reduction in mortality and morbidity (Gidenne *et al*., 2003, Boisot *et al*., 2003). The practice of feed restriction not only results in a reduction in feed intake, but also in a change in the food consumption pattern. While a rabbit fed *ad libitum* eats all day long and has an intake peak over the night (Prud'hon et al.; 1975), a 80 % restricted rabbit eats its total ration over a 8-10 hour period. This rabbit has therefore a long fasting period of 14-16 hours a day. According to Duperray et al. (2012) under Epizootic Rabbit Enteropathy (ERE) conditions, a 80 % feed restriction does indeed lead to a significant mortality decrease in the same way as an access to feed limited to 14 hours a day. This observation leads us to consider whether the value of quantitative feed restriction lies rather in the reduction in feed intake or in the presence of a fairly long fasting period during the day. This trial was conducted to answer this question by comparing two groups fed ad libitum and two groups with a 80 % feed restriction, each of them submitted or not to a long fasting period.

## MATERIALS AND METHODS

### Animals and experimental design

The trial is conducted at the Talhouët Research Center, an InVivo NSA research centre located in Saint-Nolff (France). 480 rabbits are placed in groups at weaning (36 days) as a function of sex, litter of origin and their weight on the day before weaning. They are allotted to 4 groups and housed in collective cages of 6 rabbits between weaning and slaughter (71 days). The animals are housed in a closed building.

The animals are all fed with the same non-drug fattening feed, which characteristics are given in table 1.

The groups differ from one another by their feeding method. Group J0 is fed ad libitum with access to the feed 24 hours a day. Group J10 is fed ad libitum for 14 hours a day, that means a daily 10-hour fasting period. The feed is accessible in this case between 3.30 p.m. and 5.30 a.m. Group 1R80 is feed restricted between the whole period at a rate of 80% based on theoretical ad libitum feed intake. The ration is dispensed once a day at 3.30 p.m. At least, the ration of group 4R80 is dispensed at 3.30 p.m., but a feeder blocking system allows portioning of food intake into 4 meals lasting 1h30, at an interval of 4h30.

**Table 1:** Feed composition (gross, theoretical values)

| Composition | Feed |
|---|---|
| ED (kcal/kg) | 2330 |
| Protein % | 15.6 |
| Cellulose % | 16.7 |

The rabbits are weighed individually after 35, 44, 51, 57 and 71 days. Consumption is measured per cage on the same days. Mortality is monitored daily. In case of mortality in groups 1R80 and 4R80, the number of rations dispensed is adjusted. In groups J0 and J10, account is taken of mortality for the consumption calculations, considering that a rabbit consumes until the day of its death.

### Statistical analyses

The weight and average daily gain (ADG) data are studied by analysis of variance, testing the effects of sex, block and group. A block is formed of rabbits of the same mean weight and same original litter. The consumption and feed conversion ratio (FCR) data are studied by analysis of variance, testing the effects of block and group. The mortality data are compared by a comparison of frequency ($chi^2$).

## RESULTS AND DICUSSION

### Mortality

The mortality rate during the trial was very low (0.8%, i.e. 4 rabbits). However, all the animals that died during the trial belong to group 4R80. Hence, mortality achieves 3.3% in group 4R80 versus 0% in the other groups ($P<0.05$).

### Feed consumption, growth and feed conversion ratio

Results are shown in tables 2, 3, 4 and 5.
Access to feed restricted to 14h a day (group j10) results in a reduction in feed intake during the first and second week of fattening (4% and 3% respectively, $P<0.05$) versus access over 24h (group J0). The feed intake of the rabbits in group J10 is subsequently greater ($P<0.05$) or indeed similar to that of group J0. Consequently, over the entire fattening period, groups J0 and J10 show an identical mean feed intake of 149g/day. These results indicate the rabbits' ability to adapt to the dispensing method implemented. Both groups 1R80 and 4R80 consume the same quantity of feed-121g/day on average-resulting in a feed restriction rate of 81% over the entire fattening period.

Although group J10 growth lags slightly behind group J0 during the first week ($P<0.05$), this delay is subsequently compensated, and both groups get a similar weight at slaughter.

The 81% feed restriction results in a decrease in live weight from the first trial week onwards ($P<0.05$), resulting in a loss of weight of approx. 220g at 71 days versus groups J0 and J10 fed ad libitum ($P<0.05$). It results in a reduction in ADG of between 11% and 13%. Although both 81% feed restricted groups received the same quantity of feed, group 4R80 weighs 44g less on average than group 1R80 at 71 days ($P<0.05$) and displays a 3% lower ADG ($P<0.05$).

**Table 2:** rabbits consumption (g/day)

| | J0 | J10 | 1R80 | 4R80 | P group |
|---|---|---|---|---|---|
| 35-44days | 124 a | 119 b | 87 c | 85 c | <0.05 |
| 44-51days | 148 a | 143 b | 105 c | 105 c | <0.05 |
| 51-57days | 144 b | 154 a | 121 c | 121 c | <0.05 |
| 57-71days | 166 a | 168 a | 151 b | 148 b | <0.05 |
| 35-71days | 149 a | 149 a | 122 b | 120 b | <0.05 |

**Table 3:** rabbits weight (g)

| | J0 | J10 | 1R80 | 4R80 | P group |
|---|---|---|---|---|---|
| 35days | 1026 | 1026 | 1026 | 1026 | NS |
| 44days | 1501 a | 1459 b | 1351 c | 1335 c | <0.05 |
| 51days | 1855 a | 1830 a | 1620 b | 1609 b | <0.05 |
| 57days | 2081 a | 2110 a | 1887 b | 1876 b | <0.05 |
| 71days | 2642 a | 2676 a | 2460 b | 2416 c | <0.05 |

**Table 4:** average Daily Gain (g/day)

| | J0 | J10 | 1R80 | 4R80 | P group |
|---|---|---|---|---|---|
| 35-44days | 52.9 a | 47.7 b | 35.9 c | 34.5 d | <0.05 |
| 44-51days | 50.0 b | 53.1 a | 38.9 c | 39.1 c | <0.05 |
| 51-57days | 41.2 c | 49.1 a | 45.2 b | 44.1 b | <0.05 |
| 57-71days | 39.5 ab | 40.5 a | 40.5 a | 38.8 b | <0.05 |
| 35-71days | 44.7 b | 45.9 c | 39.9 a | 38.7 d | <0.05 |

The feed conversion ratio results given in table 5 show that the J10 group FCR value is reduced by 0.10 points, i.e. 3.1% (P<0.05),compared to J0 group.
Reducing the animals' feed intake by around 20% results in an overall decrease in FCR of 0.28 point (i.e. -8.3%, P<0.05) and 0.26 point (i.e. -8.3%, P<0.05) for the 1R80 and 4R80 respectively.

**Table 5: f**eed conversion ratio

| | J0 | J10 | 1R80 | 4R80 | P group |
|---|---|---|---|---|---|
| 35-44days | 2.35 b | 2.53 a | 2.44 ab | 2.50 a | <0.05 |
| 44-51days | 3.02 a | 2.70 b | 2.73 b | 2.69 b | <0.05 |
| 51-57days | 3.54 a | 3.15 b | 2.69 c | 2.76 c | <0.05 |
| 57-71days | 4.29 a | 4.18 a | 3.76 b | 3.79 b | <0.05 |
| 35-71days | 3.36 a | 3.26 b | 3.07 c | 3.09 c | <0.05 |

## DISCUSSION

The results observed here confirm that restricted access to feed for 14 hours a day is not detrimental either to the rabbits' consumption or growth within a healthy context as observed by Salaün *et al*. (2010). It appears that fasting the rabbits for 10 hours a day gives the same beneficial effects as quantitative feed restriction: reduction in digestive disorders (Duperray *et al*., 2012) and an improvement in feeding efficiency. Such a rhythm (14h of consumption followed by 10h of fasting) is probably more consistent with the natural rhythm of rabbits, which are nocturnal animals.

81% quantitative feed restriction allows a greater improvement in the feed conversion ratio, but leads to a major reduction in growth and weight at slaughter. Portioning distribution of the ration of the feed restricted animals resulted in a significant decrease in ADG, in spite of statistically identical feed intake and feed conversion ratio. Although the overall mortality rate is low, the mortality results of group 4R80 seem to suggest a negative effect of portioning the meals. The multi-site study conducted by the GEC group did not detect this portioning effect on mortality during fattening when the ration is

divided over 2 meals (Gidenne *et* al. 2008). Furthermore, the ADG results might also indicate some degree of morbidity in this group.

80% feed restriction allows a reduction in digestive disorders (Gidenne *et al*., 2003) and a gain in FCR here of around 0.3 points, whereas fasting of animals fed ad libitum allows a reduction in FCR of 0.10 points only. Even though fasting for 10h does not make it possible to achieve the levels of feed efficiency provided by quantitative feed restriction, this practice furthermore offers the advantage of not being detrimental to weight at slaughter or to yield (Salaün *et al*., 2010).

## CONCLUSION

A 10-hour fasting period during the day improves the FCR in animals fed ad libitum without restricting their feed intake and reduces digestive disturbances in feed restricted animals. Hence, the beneficial effects of feed restriction might be explained by the reduction in feed intake, but also partly by the existence of a fasting period during the daytime.
However, unlike quantitative feed restriction, a fasting period of 10h a day permits to obtain a growth and a weight at slaughter as good as those of rabbits fed ad libitum, in healthy conditions.

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# Interest of a fasting period to improve growth performances of fattening rabbits

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## The Message

The objective of this study is to determine if the positive effects of fattening rabbit feed restriction are due to:
1- the reduction in feed intake,
2- or to a long fasting period during the day.

Our findings indicate that a 10 h fasting period have the most beneficial effects on rabbits performances : growth, slaughter weight and digestive health.

## Introduction

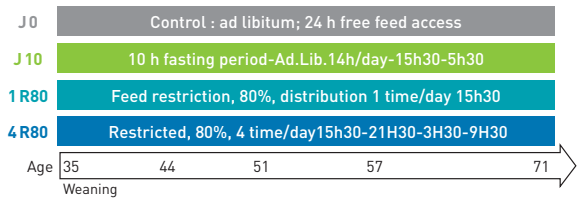
Feed restriction is recognized to be a practice that reduces digestive disorders in rabbits after weaning (Gidenne et al., 2012). According to Duperray et al. (2012) under Epizootic Rabbit Enteropathy (ERE) conditions, a 10 hours fasting period leads to a significant mortality decrease in the same way than a 80 % of Ad Libitum level feed restriction.

So, we asked us what is the most important: fasting period or quantitative feed restriction?

## Methods

480 rabbits allocated at weaning in 4 groups of 120 (20 cages of 6 animals).
Measures: live weight, ADG, consumption, FCR, Mortality Rate.

**4 groups:**




## Results: mortality

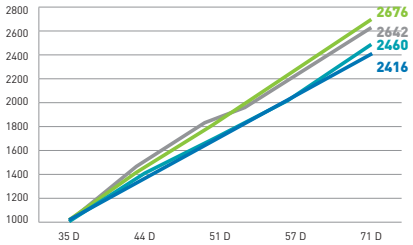
Global mortality rate is low but split up the meal in 4 parts have negative effect on rabbit sanitary status.

Mortality Rate : 35-71d

| J 0 | J 10 | 1 R80 | 4 R80 | Chi² |
|---|---|---|---|---|
| 0 % | 0 % | 0 % | 3,30 % | < 0,05 |

## Results: live Weight

Best performances are obtained with J10 and J0 groups




| | | J 0 | J 10 | 1 R80 | 4 R80 | P value |
|---|---|---|---|---|---|---|
| Live weight at 71 d | g | 2642 [a] | 2676 [a] | 2460 [b] | 2416 [c] | P<0,05 |
| | % | 100 | 101,3 | 93,1 | 91,4 | |

## Results: global performances

Best FCR performances are obtained with R groups but growth is strongly lowered.

| | J 0 | J 10 | 1 R80 | 4 R80 | P group |
|---|---|---|---|---|---|
| ADG 35-71 d (g/day) % | 44,7[b] 100 | 45,9[a] 102,7 | 39,9[c] 89,3 | 38,7[c] 86,6 | < 0,05 |
| Feed intake 35-71 d (g/day) % | 149[a] 100 | 149[a] 100 | 122[b] 81,9 | 120[b] 80,5 | < 0,05 |
| FCR 35-71 d % | 3,36[a] 100 | 3,26[b] 97 | 3,07[c] 91,4 | 3,09[c] 92 | < 0,05 |

## Conclusions and perspectives

**Beneficial effect of fasting period is confirmed:** Compared to a free access to the feed, a 10 h fasting period doesn't affect growth performances and decreases FCR (-0.1 pt). It permits also to reduce mortality due to digestive disorders (Duperray et al 2012).
**Quantitative feed restriction** (80%) is the best way to decrease FCR but it strongly lowered growth and slaughtering weight.
**Split up the meal** in 4 parts have a negative effect on final weight and mortality rate.

**Hypothesis:** a resting period of intestinal tract is favourable on a physiological point of view, in relationship with caecotrophy.
**On a practical point of view,** "fasting technic" is interesting for rabbits breeders in order to optimize zootechnical performances and reduce digestive disorders.