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IMPACT OF FEED RESTRICTION AND OF THE HYGIENE OF HOUSING ON RABBIT PERFORMANCES AND HEALTH

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ABSTRACT

Limiting the post-weaning intake of the young rabbit is known to improve its resistance to digestive troubles, while poor hygiene of housing is supposed to have a negative impact on performances and health. These two factors have been studied in a 2 × 2 factorial design: free intake "AL" or restricted at 70% of AL, and high vs low hygiene of housing. The poor hygiene of housing was obtained by avoiding cleaning the room before and during the experiment. This experimental design was applied to four groups of 105 rabbits, fed a pelleted experimental diet. They were housed in two rooms (control and poor hygiene) and in collective cages, from weaning (28 days) to slaughter (63 days). No significant interactions were found between the two main factors, restriction and hygiene, for performances and health parameters. With a 30% reduced intake the weight gain was meanly reduced by 16% (49.9 vs 41.7 g/day from 28 to 63 days old, P<0.001). Accordingly, the feed conversion was sharply improved for restricted rabbit groups by 16% (2.47 vs 2.11 from 28 to 63 days old, P<0.001). The level of housing hygiene did not modify significantly the growth, although the post weaning tended to be lower during the two weeks after weaning (42.6 vs 41.3 g/days, P = 0.09). The feed conversion was surprisingly better for rabbit housed with a poor level of hygiene (2.30 vs 2.25 from 28 to 63 days old, P = 0.03) sourcing from a slightly lower intake (107.0 vs 103.2 g/days, P = 0.02). Over the whole experiment (28 to 63 days old), the mortality rate was relatively low (11%) suggesting a relatively good health status. Although the number of rabbits was insufficient to reach substantial conclusions about the health impact, we detected a positive impact of the feed restriction on the mortality rate during the post-weaning period (28-40 days old): 1.9 vs 6.2% (P = 0.046). For the whole growth period, restriction of low hygiene did not affect significantly the mortality rate, although we recorded the highest mortality for the rabbits fed freely in poor hygiene housing (15/105).

Key Words: Feed Restriction, Hygiene, Rabbit, Health

INTRODUCTION

Limiting the post-weaning intake of the young rabbit is now known to improve its resistance to digestive troubles (Gidenne et al. 2012), while the feed conversion is improved. In contrast a poor hygiene of housing is supposed to have a negative impact on performances and health, as demonstrated in the piglet (Le Floc'h et al. 2010). However, these two factors may interact in determining performances and health as recently showed in pig (Pastorelli et al. 2012). We thus aimed to determine the effect of a moderate post-weaning feed restriction in the rabbit to cope with a poor housing hygiene, in terms of growth and health.

MATERIALS AND METHODS

Restriction and housing hygiene were studied according to a 2 × 2 factorial design: free intake "F" or restricted "R" at 70% of F, and high vs low hygiene of housing (H and L), and thus corresponded to four groups of 105 rabbits: HF, HR, LF, LR. Rabbits (INRA hybrid line) were fed the same pelleted experimental diet (crude protein 17.4%, ADF = 18.4% as fed) and housed in collective cages (5 rabbit/cage), in two independent breeding rooms (high or low hygiene), from weaning (28 days) to slaughter (63 days). The intake of the R groups was adjusted three times per week to reach 70% of the intake of F groups within each room. The poor hygiene of housing was

obtained by avoiding cleaning one breeding room before and during the experiment. Mortality was checked daily, while morbidity (rabbits having clinical signs of diarrhea or a very low growth) was checked weekly as for the intake and live weight control.

RESULTS AND DISCUSSION

No significant interactions were found between the restriction and hygiene, for performances or health status. From 28 to 63 d old the mortality rate was relatively low (meanly 11%) suggesting a good health status. Although the number of rabbits was insufficient to reach substantial conclusions about the health impact, we observed that mortality from digestive troubles started one week after weaning (Figure 1) and levelled after 7 weeks of age.

We detected a significant positive impact of the feed restriction on the mortality rate during the post-weaning period (28-40 days old): 1.9 vs 6.2% ($P = 0.046$). For the whole growth period, restriction or low hygiene did not affect significantly the mortality rate, although we recorded the highest mortality for the rabbits fed freely in poor hygiene housing (15/105).

In parallel, the morbidity rate was not affected by the restriction strategy, but was surprisingly lower in low hygiene of housing (Table 1) during the post weaning period.

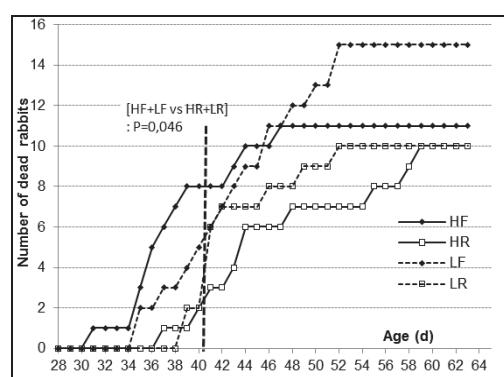


Figure 1. Effect of housing hygiene and of restriction on the post-weaning mortality kinetic

With a 30% reduced intake the weight gain was meanly reduced by 16% (49.9 vs 41.7 g/days from 28 to 63 days old, $P < 0.001$, Table 2). Accordingly, the feed conversion was sharply improved for restricted rabbit groups by 16% (2.47 vs 2.11 from 28 to 63 days old, $P < 0.001$), as found previously (Gidenne et al. 2012). The level of housing hygiene did not greatly affect the growth, although the post weaning daily gain tended to be lower during the two weeks after weaning (42.6 vs 41.3 g/days, $P = 0.09$). The feed conversion was surprisingly better for rabbit housed in poor hygiene conditions (2.30 vs 2.25 from 28 to 63 days old, $P = 0.03$), sourcing from a slightly lower intake (107.0 vs 103.2 g/days, $P = 0.02$).

Table 1. Effect of housing hygiene and of 30% intake restriction on rabbit morbidity*

Period (days old)	Groups				P levels		
	HF	HR	LF	LR	Hygiene	Restriction	H × R
28-42	10/105	7/105	3/105	4/105	0.045	0.92	0.46
43-64	11/97	13/102	4/98	10/98	0.072	0.13	0.26
28-64	16/105	18/105	5/105	11/105	0.006	0.14	0.29

* number of morbidity cases on initial number of alive rabbits within a period

H: high hygiene of housing; L: low hygiene of housing; F: free feed intake; R: restricted feed intake

Table 2. Effect of housing hygiene and of 30% intake restriction on rabbit performances

	Groups				P levels			
	HF	HR	LF	LR	RMSE	Hygiene	Restriction	H × R
Feed intake (g/d)								
28-42 days old	88.10	58.80 ^u	87.10	58.60 ^u	4.50*	0.310*	nc	
43-64 days old	149.60	108.50 ^u	143.40	103.30 ^u	6.60*	0.016*	nc	
28-64 days old	125.30	88.60 ^u	120.90	85.40 ^u	4.80*	0.017*	nc	
Live weight (g)								
28 days old	650.00	649.00	651.00	647.00	84.00	0.960	0.760	0.86
42 days old	1363.00	1127.00	1337.00	1118.00	152.00	0.260	<0.001	0.61
63 days old	2410.00	2115.00	2377.00	2105.00	211.00	0.330	<0.001	0.62
Weight gain (g/d)								
28-42 days old	51.00	34.20	49.20	33.40	7.40	0.086	<0.001	0.47
43-64 days old	49.60	47.00	49.00	46.70	6.40	0.460	<0.001	0.83
28-64 days old	50.30	41.90	49.40	41.50	4.90	0.210	<0.001	0.62
Feed conversion								
28-42 days old	1.75	1.73	1.78	1.76	0.09	0.130	0.300	0.88
43-64 days old	3.00	2.31	2.93	2.21	0.12	<0.010	<0.001	0.77
28-64 days old	2.48	2.11	2.45	2.05	0.08	0.030	<0.001	0.62

* Root mean square error and P levels for the comparison of LF and HF groups only;

^u For LR and HR groups the intake level is fixed, and thus means have a null variance and were not compared. nc: not calculable

CONCLUSION

Our strategy of feed restriction improved sharply the feed conversion, from 2 weeks after weaning, and was beneficial for the health of the rabbit during the post-weaning period. Our model of hygiene degradation seemed insufficiently stressful to affect the health of the rabbit, and should be further investigated.

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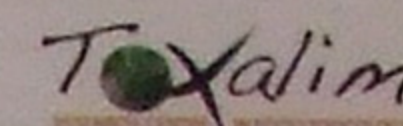
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Impact of feed restriction and of the hygiene of housing on rabbit performances and health

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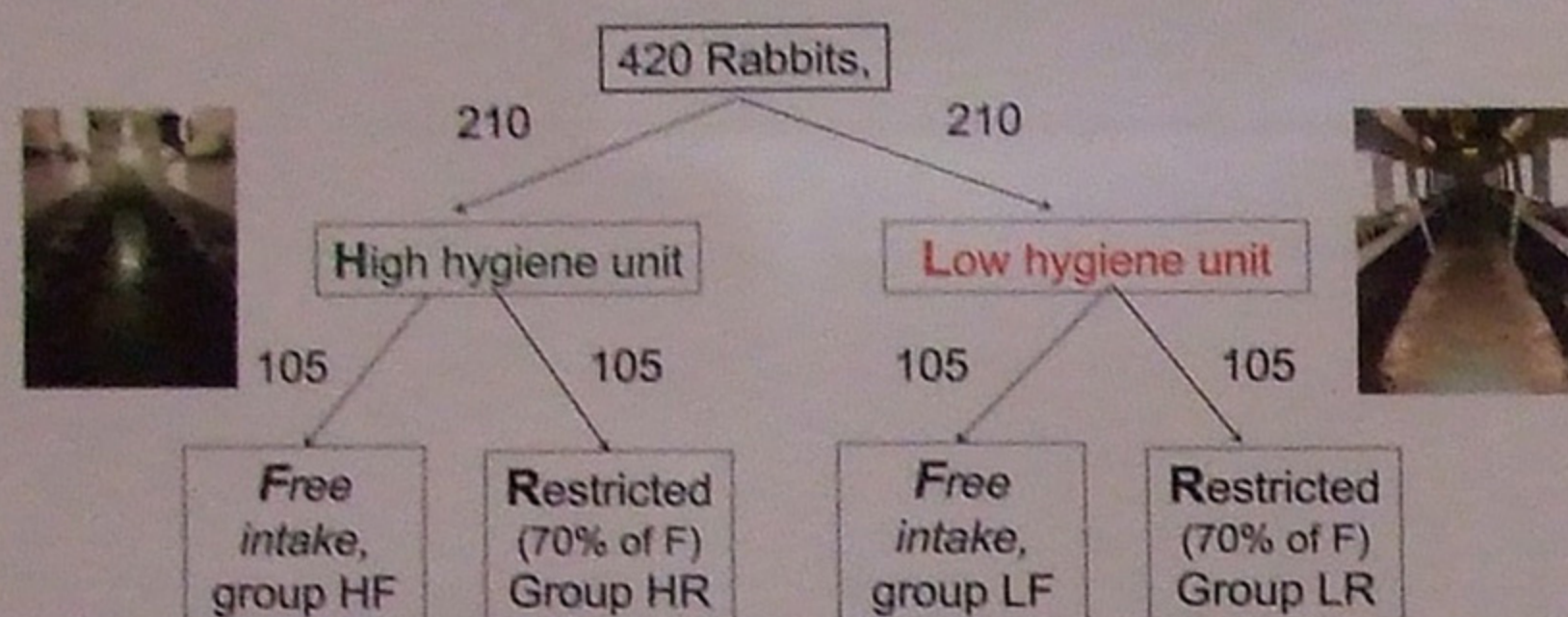


Strategies to limit the intake of rabbit after weaning improve its resistance to digestive troubles (Gidenne *et al.* 2012), while increasing the feed conversion. By contrast, a poor hygiene of housing is supposed to have a negative impact on performances and health.

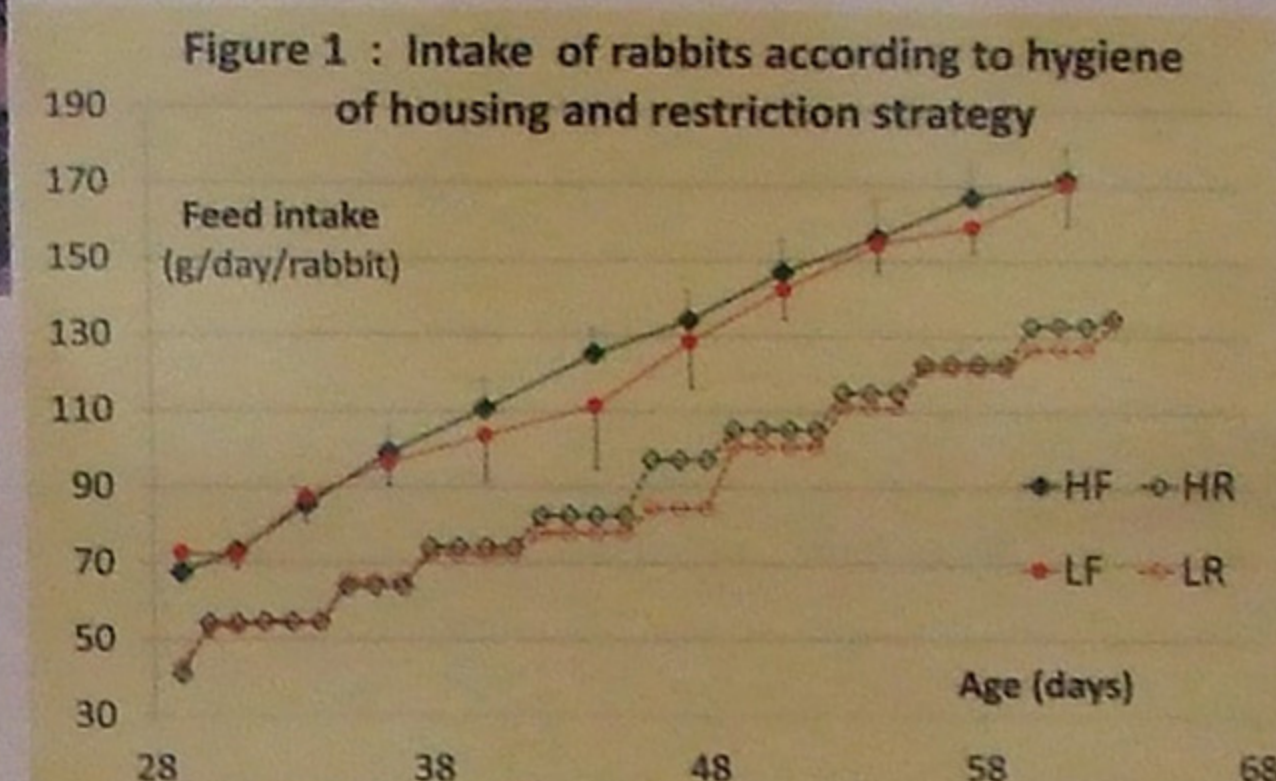
Objectives

Determine the effect of a moderate post-weaning feed restriction in the rabbit to cope with a poor housing hygiene, in terms of growth and health.

Material and Methods



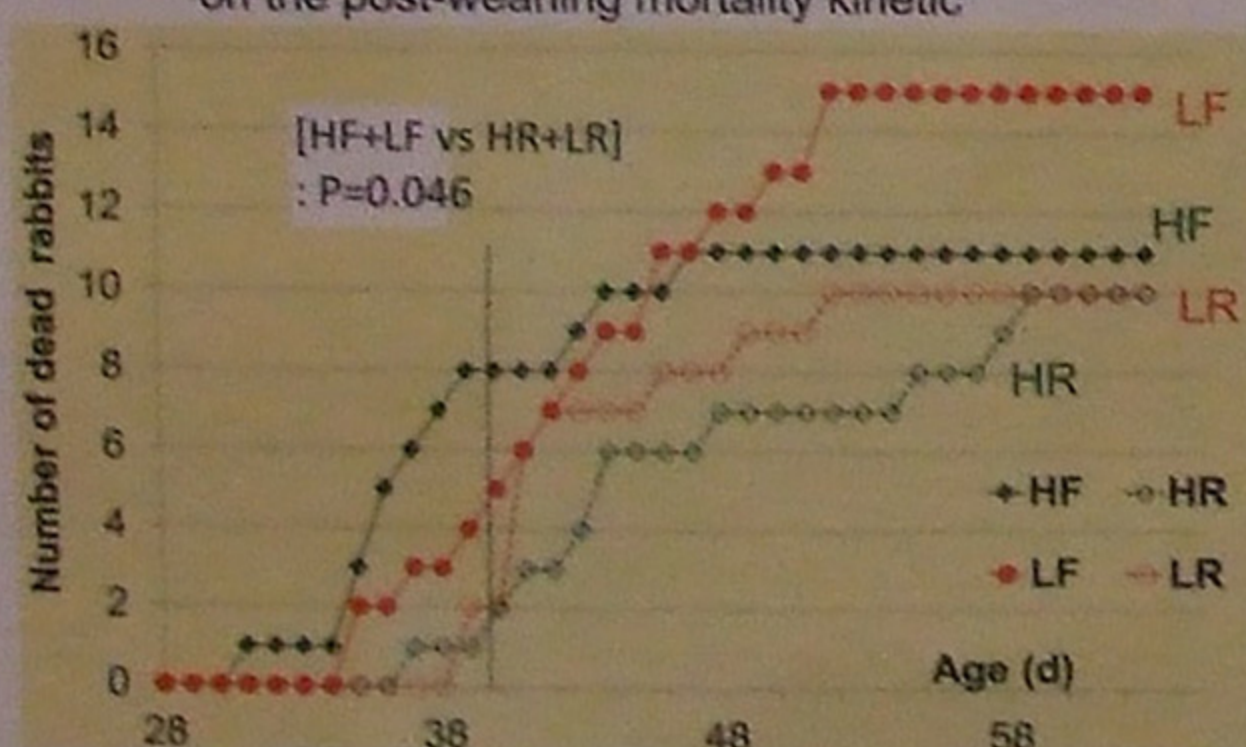
All rabbits were fed one pelleted diet (crude protein 17.4%, ADF=18.4% as fed) and housed in collective cages (5 rab./cage), in two independent breeding rooms (high or low hygiene), from weaning (28d) to slaughter (63d). The "low" hygiene of housing was obtained by avoiding cleaning one breeding room before and during the experiment.



A low hygiene reduced the intake (28-63d) by 4%: 107.0 vs 103.2 g/d (P=0.02)

Results and discussion

Figure 2. Effect of housing hygiene and of 30% restriction on the post-weaning mortality kinetic



Mortality from digestive troubles started one week after weaning (figure 2) and averaged 11% at 63d old. The feed restriction reduced the mortality during the post-weaning period (28-40d old): 1.9 vs 6.2% (P=0.046).

Over the whole trial, the restriction or the poor hygiene did not significantly affect the mortality rate, although we recorded the highest mortality for the rabbits fed freely in poor hygiene housing (15/105).

Table 1. Effect of housing hygiene and of restriction on rabbit morbidity*

Period	Groups				P levels		
	HF	HR	LF	LR	Hyg.	Restr.	H x R
28-42d old	10/105	7/105	3/105	4/105	0.045	0.92	0.46
43-64d old	11/97	13/102	4/98	10/98	0.072	0.13	0.26
28-64d old	16/105	18/105	5/105	11/105	0.006	0.14	0.29

*: number of morbidity cases on initial number of alive rabbits within a period

The morbidity rate was not affected by the restriction strategy, but was surprisingly lower in low hygiene of housing (table 1) during the post weaning period.

Table 2. Effect of housing hygiene and of 30% restriction on growth and feed conversion of rabbits

	Groups				P levels			
	HF	HR	LF	LR	RMSE	Hyg.	Restr.	H x R
Live weight, g								
28d old	650	649	651	647	84	0.96	0.76	0.86
63d old	2410	2115	2377	2105	211	0.33	<0.001	0.62
Weight gain, g/d								
28-42d old	51.0	34.2	49.2	33.4	7.4	0.086	<0.001	0.47
43-63d old	49.6	47.0	49.0	46.7	6.4	0.46	<0.001	0.83
28-63d old	50.3	41.9	49.4	41.5	4.9	0.21	<0.001	0.62
Feed conversion								
28-42d old	1.75	1.73	1.78	1.76	0.09	0.13	0.30	0.88
43-63d old	3.00	2.31	2.93	2.21	0.12	<0.01	<0.001	0.77
28-63d old	2.48	2.11	2.45	2.05	0.08	0.030	<0.001	0.62

A 30% intake reduction reduced the daily gain from 28 to 63d old by only 16% (49.9 vs 41.7 g/d, P<0.001), and improved the feed conversion by 16% (2.47 vs 2.11, P<0.001).

A poor hygiene of housing did not greatly affect the growth, although the daily gain tended to be lower during the two weeks after weaning (42.6 vs 41.3 g/d, P=0.09).

The feed conversion was surprisingly better for rabbit housed in poor hygiene conditions (2.30 vs 2.25 from 28 to 63d old, P=0.03), sourcing from a slightly lower intake (107.0 vs 103.2 g/d, P=0.02).

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In conclusion, our strategy of feed restriction improved sharply the feed conversion, from 2 weeks after weaning, and was beneficial for the health of the rabbit during the post-weaning period. Our model of hygiene degradation seemed insufficiently stressful to affect the health of the rabbit.

