THE EFFECT OF DIFFERENT FLOOR TYPES ON FOOTPAD INJURIES OF RABBIT DOES

ROMMERS J.M., MEIJERHOF R.

Centre for Applied Poultry Research, P.O. Box 31, 7300 AA Beekbergen, The Netherlands

Abstract - A research was conducted to investigate the influence of cage floor type on the incidence and the severity of footpad injuries of does. Seven different floor types were tested and compared with the traditional wire floor (control). Five of the floortypes were especially designed for rabbits (Materlap (two types), Chabeauti, Igodt and plastic slats), the others were designed for poultry (Vencomatic) and ducks (Red Rooster).
The research was performed in two succeeding experiments from March 1993 till December 1995, using 60 cages in each trial. Nulliparous New-Zealand White does with well furred footpads were used and placed in the cages around 12 weeks of age. Natural mating was started at 14 weeks of age and does were maintained in production by mating 5-7 days post-partum. The condition of the hindfeet and the contamination of the floors were scored at 4-week intervals.
Footpad injuries were reduced and the number of does removed due to severe footpad injuries was decreased by using alternative floor types. Not all alternative floor types gave the same results. One floor type (Vencomatic) caused bonefractures by does getting stucked with their hindpaws in the meshes. The findings suggest that the smoothness of the floor type may be of importance for preventing footpad injuries.
The contamination of the alternative floors by droppings differed, two of the tested alternatives stayed as clean as the wire floor (Vencomatic and Red Rooster). The construction of three floor types was not strong enough (both Materlap floors and the slats). The price of the alternative floor types was higher than the traditional wire floor.

INTRODUCTION

In the Netherlands, footpad injuries of does are considered as undesirable from a welfare point of view. A survey conducted in 1993 including 40 commercial rabbitries showed that 25% of these farms replaced does due to footpad injuries. Measurements in our own facilities showed that 15% of the replacements was due to footpad injuries (unpublished results). Because footpad injuries might reduce the productivity of a commercial rabbitry it is desirable to avoid them both from a welfare and an economical point of view.
The incidence of footpad injuries is influenced by the breed and age of the animals, the climate in the house and the material of the cage. The New Zealand White rabbit, which is commonly used on dutch rabbitries, is recognized for its well furred footpads. Selection is used to control footpad injuries within a strain. The temperature, humidity and the level of ammonia in the house will influence the condition of the skin and can be controlled by ventilation. The housing of the does on wire cage floors is also recognized as an important factor (JURRIENS, 1981; LEBAS *et al.*, 1986; OKERMAN, 1988).
To investigate the influence of the cage floor on the incidence and the severity of footpad injuries, a research was conducted at the Centre for Applied Poultry Research. In this study two succeeding experiments were carried out in which 8 different types of floors were tested, including the traditional wire floor (control). The main purpose of the first experiment was to investigate if footpad injuries could be controlled by using alternative cagefloors and if the duration of life of the does (number of litters produced per doe) could be prolonged. In the second experiment the effect of alternative floor types on footpad injuries, productivity and practical applications were investigated.

MATERIALS AND METHODS

Animals and husbandry

Two experiments were conducted. The first experiment (A) was performed from March 1993 to October 1994, the second experiment (B) from October 1994 to December 1995. Both experiments were carried out in a compartment with 60 does and 4 bucks, housed in cages of 50x60x30 cm (l x w x h) in a deep-pit system.
The animals were a strain of New Zealand White rabbits, breeded at the Centre. The animals were housed under controlled illumination (16L:8D) and were fed and watered ad libitum. A minimum inside temperature of 16 °C was maintained.
In both experiments nulliparous does with healthy coated feet were placed in the cages at about 12 weeks of age and were first mated at 14 weeks of age. Natural mating was used and does were kept in production by mating

5-7 days post-partum. The litters were weaned at 30 days. Does removed due to health problems or low productivity were replaced by other nulliparous does. The number of litters produced at removal was recorded. During the experiments injured footpads were not treated but does with severe footpad injuries were removed.

Floor types

8 different floor types were used, including the traditional wire floor (control). The traditional wire floor consisted of galvanized metal with a wire thickness of 2,45 mm and mesh size of 10x74 mm. From the alternative floors 5 of them were designed especially for rabbits, the other 2 are designed for poultry and ducks. The alternative floor types replaced the original wire cage floor. In table 1 details of the tested floor types are given.
In experiment A the slats, Igodt and Materlap1 floor were compared with the wire floor (15 cages per treatment). Experiment B was carried out with the wire, the Igodt, Materlap2, Chabeauti, Red Rooster and Vencomatic floor; each floor was present in 10 cages.

Table 1 : Details of the tested floor types.

Details	Type / Firmname							
	wire	slats	Igodt	Materlap 1	Materlap 2	Chabeauti	Red Rooster	Vencomatic
Material	metal	synthetic	metal	synthetic	synthetic	synthetic	synthetic	synthetic
Meshform		slats	round	rectangle	rectangle	diamond	rectangle	oval
Mesh size (mm)	10x74	13	15	7x11	20x11	14x24	20x21	20x48
Wire thickness (mm)	2,45	30		5	5	4	8	
supporting floorarea between meshes (mm)			6x6					5x20
Dimension of floor (cm)			50 x 60	45 x 61,5	45 x 61,5	45,5 x 61,5	124,5 x 60,5	120 x 57,5
colour		white	metal	white	white	white	gray	white

Observations

1. The productivity of the does (number of litters, litter size (born alive and dead), number of youngs weaned and litter weight at 21 and 30 days).
2. The condition of the hind feet: Once every four weeks the footpads of all does were examined and scored according to the following classification:
   score 0 = no horny skin visible, coated footsole.
   score 1 = horny skin, area ∅ <1 cm.
   score 2 = horny skin often cracked, area ∅ 1 - 2,5 cm.
   score 3 = horny skin with deep crackes, area ∅ > 2,5 cm, with or without open wounds.
   Does with score 3 were removed.
3. The construction and contamination of the floors.
   The contamination of the cage floors was scored at the same time as the condition of the footpads. The following classifaction was used:
   score 0 = clean, no droppings attachted to the material of the cage floor.
   score 1 = droppings attached to the material of the cage floor, but none of the meshes of the cage floor were blocked.
   score 2 = droppings on the cage floor, blocking the meshes of the floor.
   Floors with score 2 were cleaned.

Statistical analysis

The average per cage for footpad score, number of produced litters and productivity parameters were analysed with ANOVA procedures, using a randomized block design.

RESULTS AND DISCUSSION

Productivity

During the experiments does were replaced. In table 2 for both trials the total number of does tested and the average number of produced litters per treatment during the trialperiods is given. In the first trial no differences in produced litters was found. In the second trial, the average number of produced litters seemed increased on the Vencomatic, Materlap-2 Chabeauty and Red Rooster compared to the wire and Igodt floor, but only a significant difference was proved for the Vencomatic floor compared with the wire and Igodt floor (*lsd* 2.1).
The production parameters of the second trial were analysed. In table 3 the average of the produced litters per treatment for number born alive, percentage born dead, percentage of youngs weaned and weight on 21 and 30 days is given. The variation in born dead was high due to some litters, which had 100% mortality. No indication for differences in productivity were found.

Table 2 : The number of does tested and the average number of litters produced on the different floor types in experiment A and B.

	Experiment A					
floor type	wire	Igodt	Materlap 1	slats		
no. of cages	15	15	15	15		
no. of does tested	27	25	26	27		
average no. of litters produced	3,0	3,5	3,3	3,9		
	Experiment B					
floor type	wire	Igodt	Materlap 2	Chabeauti	Red Rooster	Vencomatic
no. of cages	10	10	10	10	10	10
no. of does tested	27	24	22	19	19	19
average no. of litters produced	3,6	3,7	5,4	5,1	4,7	5,9

Table 3: Productivity of the does for the different floor types (based on the average per cage).

	Experiment B					
floor type	wire	Igodt	Materlap 2	Chabeauti	Red Rooster	Vencomatic
no. of litters	77	78	86	75	80	82
# born alive	9,3	8,4	8,2	8,7	9,0	8,7
Mortality at birth (%)	7,7	7,7	9,1	7,2	4,9	8,0
% weaned	90,3	80,8	85,3	86,8	86,9	84,3
Average weight at 21 days (g)	335	356	352	352	355	376
Average weight at weaning (g)	679	705	697	693	734	700

Figure 1 : The percentage of does with injured footpads (score >1) on the alternative cage floors versus the wire floor (control)

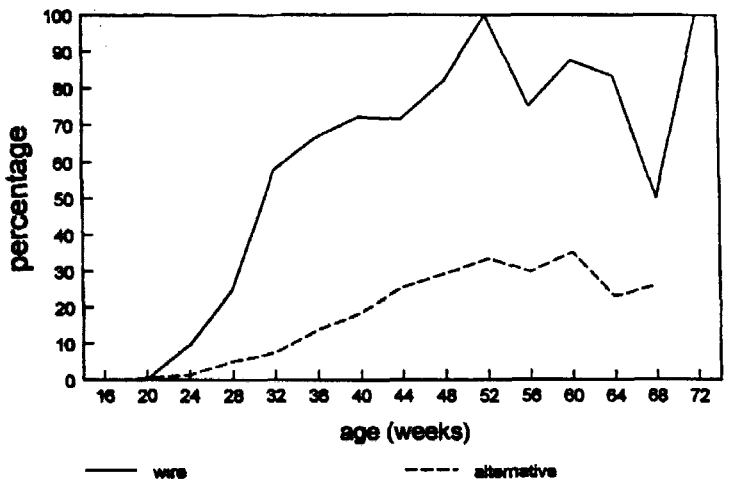
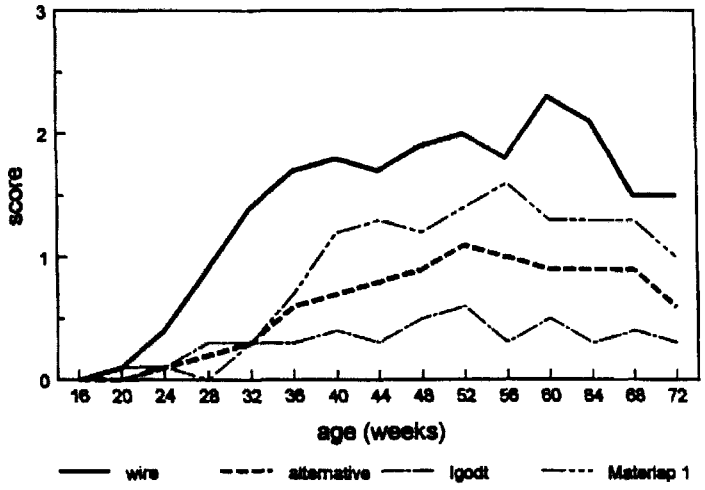


Figure 2 : Average score of footpads of does on the alternative cage floors (average all floor types) versus the wire floor and the average footpad scores of does on the Igodt and the Materlap 1 floor.



Footpad injuries

Feet injuries were seen on the hind paws. They often started as a barely visible swelling which could be felt by palpating. In the following stage the skin became thick and horny and a small spot of bare skin was visible. Large areas with horny cracked skin could develop but the spots were not bleeding. In a later stage the cracks could started bleeding and open wounds were often visible.

Figure 1 shows the percentage of does which developed feet injuries on the different alternative floor types versus the wire floor. Footpad injuries mainly developed after the second litter was weaned. On the wire floor the incidence of does with severe injuries of footpads was higher than on the alternative floors as shown in figure 1. Approximately 80% of the animals on the wire floor had severe foot problems after the fourth litter whereas on the alternative floors this percentage stayed on average below 30%. After the fourth litter does were replaced because open wounds had developed. The replacements of does due to severe foodpad injuries was lower on alternative floor types than wire. The number of does removed due to injured footpads (score 3) on the different floortypes in trial A and B is given in table 4. After the age of 52 weeks the number of does still in production declines and on average the results are then based on does with good footpads.

In figure 2 the average score of the footpads of does housed on alternative floors versus the wire floor is given. The average scores are based on the results obtained in both experiments. The results of the wire floor in trial A and B were similar. In both trials the wire floor gave a significant higher average footpad score (experiment A: $p<0.05$; experiment B: $p<0.001$). After 52 weeks the lines suggest more variation but this is due to the fact that the number of does still in production declines and that the average score is then based on a smaller number of animals.

Differences between alternative floor types

The effect of the alternative floor types on the incidence of footpad injuries was different. In figure 2 the two extremes are given to illustrate the differences in footpad injuries observed between floor types. In experiment A the slatted and the Igodt floor gave significant ($p<0.05$) lower footpad scores than the Materlap1 floor. The findings of the Igodt floor in experiment A and B were similar.
In experiment B the average footpad scores of the does kept on the Materlap2 floor were comparable to the wire floor and significant ($p<0.05$) higher than the other tested alternatives (Igodt, Chabeauti, Vencomatic and Red rooster floor).

In both experiments the wire floor and Materlap floors resulted in reduced footpad quality. When looking at the construction of the floors it was noticed that the Chabeauti, Igodt and Vencomatic floor have a very smooth surface whereas the two types of Materlap and also the Red Rooster can be compared with the wire shape. The results suggest that the smoothness of the floor may be of importance for preventing footpad injuries.
On the Vencomatic floor there were 4 does getting stucked with one of their hindpaws into the meshes of the floor causing bonefractures. This makes the floor not acceptable for rabbits.

Table 4 : Number of does removed due to injured footpads (score 3) on the tested floor types in trial A and B.

	Experiment A					
floor type	wire	Igodt	Materlap 1	slats		
no. of does tested	27	25	26	27		
no. of does removed with injured footpads	9	2	3	-		
	Experiment B					
floor type	wire	Igodt	Materlap 2	Chabeauti	Red Rooster	Vencomatic
no. of does tested	27	24	22	19	19	19
no. of does removed with injured footpad	7	-	3	3	1	1+4*

* does removed with a broken hindleg

Construction and contamination of the floor types

During the period of time the floor types were tested, the construction of the slats and the Materlap floors was not rigid enough. These floor types had to be replaced during the trial period because the material started to break. All floor types were installed in the cages without any support underneath the floors. Perhaps the breaking of the Materlap floors can be prevented by installing extra support.
The passage of droppings through the meshes differed between the floor types. Only the Vencomatic and the Red Rooster stayed as clean as the wire floor. The other floor types had to be cleaned after a period of 4 weeks because the meshes were blocked by droppings.
All floortypes could be cleaned easely by using a high-pressure sprayer.
During the trialperiod, on average 25% of the Igodt and the Chabeauti floors were cleaned with intervals of 4 weeks. An average of 10% of the cages with the Materlap floors had to be cleaned every 4 weeks.
In table 5 a review of the findings of the tested floortypes is given.

Table 5 : Review of the findings of the tested floortypes (+ = good, ±= moderate, - = poor)

Characteristics	Type / Firmname						
	Wire	Slats	Igodt	Materlap 1+2	Chabeauti	Red Rooster	Vencomatic
Footpad injuries	-	+	+	±	+	+	-
Contamination	+	±	-	±	-	+	+
Construc-tion*	+	±	+	-	+	+	+
price	++	±	-	+	±	+	+

* All floor types were placed in the cages without support underneath the cage floors.

Practical applications

The results show that it is possible to reduce footpad injuries by using alternative floortypes. But for using alternative floortypes in a commercial rabbitry it is important that the advantages of the wire floor are maintained as much as possible. The wire is used because it prevents the animals from getting contaminated by their own droppings. These floors don't get dirty by droppings fast and can be cleaned and desinfected easely. The cages can be used for a long period of time and the price of the wire is relative low. Table 5 shows that there are alternatives

which meet these practical advantages but they are more expensive than the wire floor. There was no indication that the production of the does is higher on alternative floors. The removal of does due to severe footpad injuries was lowered.
The manufacturer of the Materlap floor commented that the construction of the floor has been improved in the newer types.

CONCLUSIONS

1. Footpad injuries can be reduced by using alternative cage floors. The effect of the alternative floors on the severity of footpad injuries differed but was lower than on the wire floor. The Vencomatic floor is not suitable for rabbits because does got stuck with there hindpaws in the meshes, resulting in bonefractures.
2. The replacement of does due to severe footpad injuries was lower on alternative floors.
3. Alternative floors didn't influence the production of the does.
   The contamination of the floors by droppings differed between floor types.
4. The Vencomatic and the Red rooster floor stayed as clean as the wire floor.
5. The construction of the Materlap floors and the slats was not strong enough because the floors cracked through breaking of the material.
6. Alternative floors were more expensive than the wire floor, which was not compensated by improved production results.

REFERENCES

JURRIËNS G., 1981. Wonden aan voeten en voetzolen. *Fokkersbelangen*, **30**, 312-313.

LEBAS F., COUDERT P., RANVIER R., de ROCHAMBEAU H., 1986. The rabbit. Husbandry, health and production. *Rome, Food and Agriculture Organization of the United Nations.*

OKERMAN L., 1988. Disceases of Domestic Rabbits. *Oxford, Blackwell Scientific Publications.*