IMPACT OF SPACE ALLOWANCE ON VEAL CALVES' BEHAVIOR AND PERFORMANCES

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I. INTRODUCTION

Veal production and its consumption are specific to France. Indeed, France is the world's leading consumer of veal calves with 3.2 kg carcass weight equivalent per capita. In 2022, approximately 1.2 million calves were slaughtered in France, which is the second largest producer in the world behind the Netherlands and ahead of Italy [1]. Veal calf production in France is organised around specialised fattening farms, mostly in closed facilities with dynamic ventilation. This type of production is organised per batch, with all calves (from dairy farms) arriving at the same time in the fattening facility at an average age of about 20 days. In most farms, they are housed in groups of 5 to 8 calves on wooden slatted floor. Throughout their fattening period, they are fed with milk and solid feed (a mixture of cereals, proteins and fibre) until they leave for the slaughterhouse (after about 5.5 months of fattening) [2]. In a context of structurally decreasing volumes produced and consumed, the veal industry must face up to new societal expectations and to a potential change in regulations concerning housing conditions, to improve the welfare of calves [3]. In 2021, the European Commission undertook to present a new legislative proposal on animal welfare by the end of 2023. To this end, the European Food Safety Authority (EFSA) has been asked to provide scientific advice on farm animal welfare. Although no measures have yet been adopted, EFSA's recommendations on veal calves, published in March 2023, provide an initial overview of the issues that could be discussed, such as an increase of calf space allowance from 1.8 m² to 3 m² per calf. In this context, a trial was carried out to investigate the impact of the space allowance in veal calves' production.

II. MATERIALS AND METHODS

At the Calf Research and Innovation Center (CIRVEAU), 83 male Prim Holstein calves were divided into three batches with three different space allowances per calf 1.8 m²(control), 2.25 m² and 3 m² per calf. The calves were initially housed individually for the first 28 days. After this period, they were grouped collectively. In one configuration, there were 5 calves per pen, and each pen had an area of 9m², resulting in a density of 1.8 m² per calf. In another setup, there were 4 calves per pen, with each pen providing 2.25 m² per calf. Lastly, in the 15 m² pen, 5 calves were housed together, allowing a density of 3 m² per calf. The calves were fattened for 168 days on wooden slatted floor and received the same feeding plan on a base of 250 kg of solid feed. Twice a day (at 7:15 am and 5:30 pm) and during the whole fattening period, reconstituted milk was distributed individually in buckets with feeding teats. The solid feed was then distributed in collective troughs. Water was available to the calves. The health protocol was identical for all calves (vaccination on arrival against RS-BVD and ringworm, as well as an anti-lice treatment). Calves were weighed every 28 days. At each weighing, a cleanliness score was given to each calf. Individual milk consumption was measured, as well as collective solid consumption (per pen). All sanitary treatments were recorded individually and daily. Regarding calves' activities as play behaviors or abnormal behaviors, scans sampling observations on a 5-minute time step were carried out from 6 am to 8 pm on 3 days, complemented by continuous sampling observations (D33, D99 and D161). Pedometers were placed on one of the back legs on 8 calves per batch for at least 2 weeks around the 3 days of observations. They were used to measure the lying/standing position and the number of steps taken by the animals. Significance

differences (P<0.05) among samples were determined by analysis of variance (ANOVA) using the Least Square Difference method of the General Linear Model procedure of R (R project 4.2.3).

III. RESULTS AND DISCUSSION

Among the 3 play behaviors observed, head-to-head was the most frequent, followed by running behavior and finally overlapping (p-value < 0.01). There was no difference in the frequency of head-to-head behavior in the finishing period (D112-D175) between the batches (5.3 times per calf for the control batch vs 4.8 times per calf for the 3 m² batch, NS). The racing behavior became less and less frequent during fattening and was very infrequent in the finishing period for all batches. No significant difference was observed between batches in the total frequency of play behavior per calf. Furthermore, the calves in the 3 m² batch did more steps than the calves in the other batches, which seems to be due to the size of the pen (15 m² instead of 9 m²) than to the space allowance itself (table 1). Regarding the abnormal behavior, material sucking (pica) was the most prevalent, followed by tongue playing and finally foreskin sucking (p-value < 0.01). No difference was observed in the average time spent per calf in pica. The increase of space allowance did not reduce the duration of negative behavior of the calves, nor did it have any impact on zootechnical performance (batch 1.8m² = 1250 g/d, batch 2.25m² = 1227 g/d and batch 3m² = 1245 g/d, NS) or carcass quality (table 2).

Table 1 – Calves activity per batch

Indicators	Fattening period	Batch 1.8m²		Batch 2.25m²		Batch 3m²		
		Mean	SEM	Mean	SEM	Mean	SEM	P-value
Number of steps	Start-up	302.6	62.2	325.2	76.0	363.9	89.7	0.21
	Growth	296.6^{ab}	51.0	285.2^{a}	72.4	370.2^{b}	47.7	0.04
	Finishing	261.9^{a}	49.8	281.7^{a}	72.8	391.6^{b}	116.3	0.001
	Total	287.8^{a}	55.7	304.3^{a}	74.0	375.2^{b}	86.9	0.006

Table 2 – Carcass Characteristics

Indicators	Batch 1.8m²		Batch 2.25m²		Batch 3m²		
	Mean	SEM	Mean	SEM	Mean	SEM	P-value
Carcass weight (kg)	140.0	10.9	138.4	11.9	139.6	12.8	0.87
Ratio output (%)	54.2	1.64	53.9	1.63	54.2	1.2	0.65
Conformation P (%)	50		33	-	50	-	-
Conformation O (%)	50	-	67	-	50	-	-

IV. CONCLUSION

In conclusion, reducing density does not increase the average duration of play, nor does it reduce the time spent by calves in abnormal behavior. Further research is needed to explore other means, such as enrichment of the environment and adaptation of the feed ration, to enable calves to express their natural behaviour more easily.

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