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Assessment of a novel cubicle partition in respect to animal welfare

A novel cubicle partition was assessed in the Swiss authorisation procedure for mass-produced farm animal housing systems. The behaviour of 13 dairy cows selected as focal animals was compared in cubicles with a conventional and the novel partition. The results showed that the novel partition meets the requirements of species-appropriate animal livestock husbandry in spite of the fact that it does not comply with all specific regulations for partitions stipulated in the Swiss animal welfare legislation.

Keywords
Dairy cows, cubicle housing system, cubicle partition, animal welfare, animal behaviour

Abstract
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The comfort of lying cubicles for dairy cows is mainly affected by their dimension, the quality of the lying area as well as the position and shape of the elements of the cubicles. Therefore, these characteristics control the behaviour of the animals [1]. Cows have contact with the elements of the cubicles such as the neck rail and the cubicle partitions to a varying degree [2]. These elements are species-appropriate if they guide the animal but do not restrict the species-specific movements. The assessment of mass-produced farm animal housing systems in respect to their species-appropriateness is compulsory since its introduction with the Swiss Welfare Legislation in 1978 [3]. With the adoption of this procedure, the quality of mass-produced farm animal housing systems in terms of animal protection has been improved [4]. In the current investigation, a novel cubicle partition was assessed in respect to animal welfare within the framework of such an authorisation process. A detailed assessment of this novel partition was necessary because it deviated in two critical aspects from the specific regulations of the Swiss Animal Welfare legislation: the minimal clearance was less than 125 cm wide and the height of the brisket board was more than 10 cm.

Materials and Methods

The investigation took place in the research barn of the Agroscope Reckenholz-Tänikon ART Research Station in Tänikon (Switzerland) in spring 2011. In a group of 18 lactating dairy cows, 13 were chosen as focal animals for observations of their behaviour in relation to the use of the lying cubicles. Data were individually collected in two blocks of two weeks each, during 5 days per week and for four hours daily (80 h in total). Cows spent the initial two weeks of data collection in cubicles with the familiar partition (conventional partition, **Figure 1**). Thereafter the novel partition (**Figure 2**) was installed. Animals then had two weeks to familiarise themselves with the novel partition before the second block of data collection began.

The partitions were installed in two rows of elevated cubicles facing the wall. In one of the rows, they measured 260 cm in length and 272 cm in the other row. In both rows, the length of the lying area between the heel kerb and the brisket board was 200 cm and the width including the partitions was 128 cm.

The conventional partition was an older, off-the-shelf partition that had been authorised earlier. While standing, cows were hardly restricted and could stand diagonally. Lying animals were guided such that their body did not extend into the neighbouring cubicle. At the same time, the clearance height of the partitions allowed animals to stretch their legs and lie in a relaxed way. The conventional partition was fixed to the floor in the lunge space such that cows needed to aim their head between the pipes during head lunges while getting up. The neck rail was mounted at a height of 100 cm.

The novel partition limited the position of the standing cows more strongly than the conventional partition due to its shape. The partition runs relatively high above the lying area and its shape incorporates the neck rail. The partition is elastically attached to absorb collisions of animals getting up. The position of the lying cow is not guided by the partition but by two lateral elements on the floor made of plastic. These floor elements were fixed at the border of two cubicles and were 14 cm high

Fig. 1

Conventional partition

Fig. 2

Novel partition

and 100 cm long. Due to the construction, the lunge space was largely free of pipes. The brisket board was made of a pipe with a diameter of 14 cm.

Based on the observation of the behaviour of the cows, it was analysed whether the cows could deal with the novel partition at least equally well as with the conventional partition. Data on those behavioural aspects were therefore collected that were shown in the lying cubicles and were likely to be affected by the partitions (**Table 1**). The behaviour during lying down and getting up as well as their duration was continuously recorded, as was licking of the hind part of the body while standing in the cubicle. Positions while lying and standing (with two or four legs in the lying cubicle) were collected at intervals of 10 min. Dirtiness of the cubicles due to defecation was assessed daily according to the scheme of Oswald [5].

The total lying duration and the duration of single lying bouts was measured using MSR-loggers during 48 hours in the last week of each block.

Statistical evaluation of all behavioural variables was based on the Wilcoxon test comparing the data of the focal cows between the block with the conventional partition and the block with the novel partition. The dirtiness index was compared using a Mann-Whitney-U-Test and assuming that the data of each day were independent.

Results and Discussion

The proportion of lying down with more than two steps with the front legs was significantly smaller with the novel compared to the conventional partition (**Figure 3a**). This is an indication that cows in the cubicle with the novel partition were less hesitant while lying down. There were no significant differences in the proportion of lying down with more than two head sweeps nor in the proportion of lying down with pawing the ground (**Table 1**). I.e., no difference in hesitation of the animals could be shown based on these two indicator variables. The maximum duration of lying down was shorter with the novel partitions (**Figure 3b**) whereas the median duration did not differ between the two partitions and was in the same range as in other studies [2; 6].

The proportion of lying down and getting up with hitting the partition and/or neck rail was significantly smaller with the novel compared to the conventional partition. This was mainly caused by the low neck rail of the conventional partition.

Also, the proportion of getting up with an atypical head lunge, i.e. when cows either balked or lunged repeatedly, was significantly smaller with the novel compared to the conventional partition (**Figure 3c**). Obstructions in the head room can lead to longer durations of getting up [6]. In this experiment, neither the maximum nor the median duration of getting up differed significantly comparing the two partitions, though.

In respect to lying postures, there was a difference for 'lying with carpal joint on brisket board' that could only be observed at a low frequency with the novel partition. There was no statistically detectable difference in respect to 'lying with fore legs stretched out' even though the novel brisket board was 4 cm higher than that with the conventional partition. The posture 'lying with the body on the lateral floor element' could only be shown with the novel partition and occurred in about 60% of the observations. The degree to which parts of the body lay on the floor element and the rear part of the cow's body extended into the neighbouring cubicle varied. No skin alterations could be found on the body regions in contact with the floor elements.

The frequency of licking the hind part of the body did not differ significantly between the two partitions even though the position of the standing cows was more restricted with the novel than with the conventional partition. There were no significant differences in total lying duration, the number nor the duration of single lying bouts, nor the proportion of observations while standing with two legs in the cubicle, either. This is an indication that cows accepted the lying cubicles equally well independently of the type of partition. The dirtiness index reached low values only and did not differ significantly between the types of partition.

Table 1

Comparison of the behaviour of dairy cows (n = 13) in cubicles with the conventional and the novel partition

Verhaltensparameter berechnet pro Kuh und Erhebungsblock ***Behavioural elements calculated per cow and type of partition***	**Median (Minimum-Maximum)**		**p-Wert** ***p-Value***
	Kontroll-Abtrennung ***conventional partition***	**Test-Abtrennung** ***novel partition***	
Anteil Abliegevorgänge mit > 2-mal Umtreten vorne *Proportion of lying down > 2 steps with fore legs*	**0.36** (0.00–1.00)	**0.08** (0.00–0.85)	0.025
Anteil Abliegevorgänge mit > 2 Pendelbewegungen des Kopfes *Proportion of lying down > 2 head sweeps*	**0.70** (0.25–1.00)	**0.67** (0.00–1.00)	n. s.
Anteil Abliegevorgänge mit Scharren/*Proportion of lying down with pawing the ground*	**0.08** (0.00–0.67)	**0.00** (0.00–0.69)	n. s.
Maximale Dauer der Abliegevorgänge [s]/*Maximum duration of lying down [s]*	**9** (5–35)	**6** (4–16)	0.005
Median Dauer der Abliegevorgänge [s]/*Median duration of lying down [s]*	**5** (4–8)	**5** (4–7)	n. s.
Anteil Abliegevorgänge mit Anschlagen an Abtrennung und/oder Nackenriegel *Proportion of lying down with hitting partition and/or neck rail*	**0.67** (0.36–1.00)	**0.23** (0.00–0.50)	< 0.001
Anteil Aufstehvorgänge mit Anschlagen an Abtrennung und/oder Nackenriegel *Proportion of standing up with hitting partitions and/or neck rail*	**0.96** (0.70–1.00)	**0.77** (0.50–1.00)	0.033
Anteil Aufstehvorgänge mit untypischem Kopfschwung *Proportion of standing up with atypical head lunge*	**0.67** (0.00–1.00)	**0.25** (0.00–0.92)	0.013
Maximale Dauer der Aufstehvorgänge [s]/*Maximum duration of standing up [s]*	**9** (5–31)	**8** (6–83)	n. s.
Median Dauer der Aufstehvorgänge [s]/*Median duration of standing up [s]*	**7** (4–16)	**6** (5–14)	n. s.
Anteil Beobachtungen „Liegen mit Karpal-gelenken auf Bugschwelle“ *Proportion of observations while ‚lying with carpal joint on brisket board‘*	**0.00** (0.00–0.00)	**0.00** (0.00–0.11)	0.036
Anteil Beobachtungen „Liegen mit gestreckten Vorderbeinen“ *Proportion of observations while ‚lying with fore legs stretched out‘*	**0.10** (0.02–0.16)	**0.08** (0.00–0.20)	n. s.
Anzahl Lecken der Hinterhand bezogen auf alle Beobachtungen bei Stehen in der Liegebox *Proportion of licking hind part of the body per number of observations while standing in cubicle*	**0.01** (0.00–0.10)	**0.01** (0.00–0.06)	n. s.
Durchschnittliche Gesamtliegedauer [min/24 h]/*Average lying duration [min/24 h]*	**627** (500–754)	**646** (431–753)	n. s.
Durchschnittliche Anzahl Liegeperioden [24 h]/*Average number of lying bouts [24 h]*	**9.5** (6.0–14.5)	**8.5** (6.5–12.0)	n. s.
Durchschnittliche Dauer der Liegeperioden [min] *Average duration of lying bouts [min]*	**64** (40–98)	**78** (40–110)	n. s.
Anteil Stehen mit 2 Beinen in der Liegebox bezogen auf alle Beobachtungen bei Stehen in der Liegebox *Proportion of observations while standing with 2 legs in cubicle per number of observations while standing in cubicle*	**0.41** (0.08–1.00)	**0.37** (0.05–1.00)	n. s.
Index der Verschmutzung der Liegebox Kot [%]/*Dirtiness index [%]*	**4.2** (0.0–12.5)	**7.3** (0.0–14.6)	n. s.

Conclusions

The results show that the tested, novel cubicle partition meets the requirements of species-appropriate animal livestock husbandry in spite of the fact that it does not comply fully with the cubicle width and the height of the brisker board stipulated for partitions in the Swiss animal welfare legislation. Based on the results of this experiment, the decision of the authorisation procedure was favourable to the novel partition.

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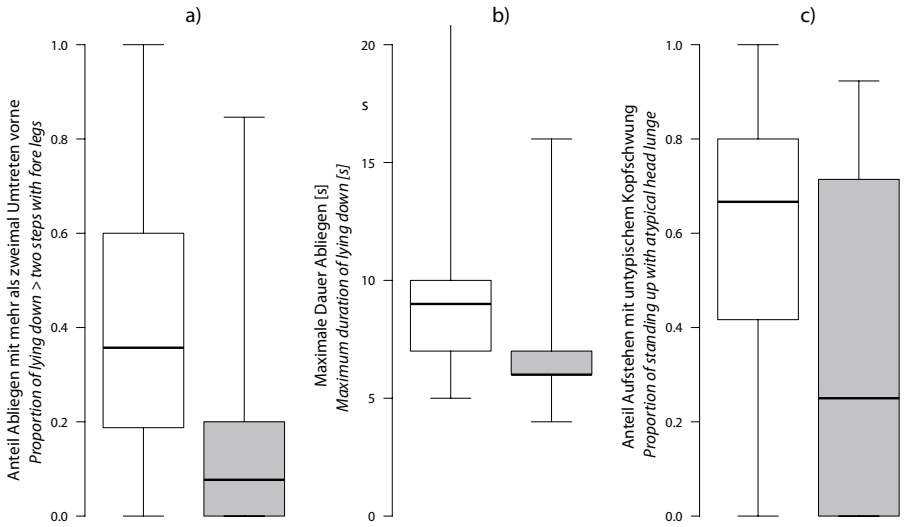
Fig. 3



Proportion of lying down movements with more than two steps with fore legs (a), maximum duration of lying down movements (b) and proportion of standing up movements with atypical head lunge (c) of dairy cows in cubicles with the conventional partition (white) and the novel partition (grey)

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