

## **Research Paper Summary**

### **Dairy cows value an open area for lying down**

**Short title: Cows prefer open lying areas**

**Key words: calving; claw horn lesion; dairy; lameness; nonsteroidal anti-inflammatory drug**

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#### **Practical point**

It's important that the housing environment meets the needs of dairy cows, particularly in all-year-round housed systems. This study found that cows lay down for longer on open lying areas compared to cubicles and had a higher motivation for an open lying area than cubicles. Providing open lying areas in sheds could allow farmers to better meet the behavioural needs of housed dairy cows and improve their welfare.

#### **Background**

Most British dairy cows are housed at some point during the year, and high numbers of UK farms employ an all-year-round housing system. Therefore, it is important to ensure housed environments meet the needs of cows. Previous studies have shown that dairy cows are motivated to access open lying areas, though it is often hard to tease apart the effect of surface type and location in these studies (i.e. comparing pasture outdoors and cubicles indoors).

Motivation tests require animals to “work” to gain access to a resource to quantify the value the animal places it. A preference test allows an animal to choose between variations of a resource or between different resources, with the assumption they will choose the resource that best provides for their welfare. Previous research has been carried out on cow lying preferences, investigating cubicle modifications (stall width and length; neck rail placement; surface type). Although cows appear to place more importance on the lying surface of a cubicle, preferring softer surfaces, a trade-off preference study found that when choosing where to

lie, an open lying space is more important to cows than their preferred lying surface. Cow preference for cubicles has been compared against open lying areas, such as pasture and open resting areas, both indoors and outdoors, with the results suggesting that cows have a preference for an open lying area.

### **Work undertaken**

This research aimed to measure cow motivation for lying down on an indoor open mattress (MAT) compared to indoor mattress-bedded cubicles, removing the confounding factor of surface type and location. This was repeated for an identically sized indoor deep-bedded straw yard (ST), to investigate whether surface type affected motivation for an open lying area.

Thirty Holstein-Friesian dairy cows were housed in groups of 5 in an indoor robotic milking unit with free access to the milking robot and access to six mattress-bedded cubicles per group. To assess motivation, cows were required to walk increasing distances via a one-way indoor raceway to access open lying areas. Raceway distances were “Short” (34.5 m), followed by “Medium” (80.5 m) and “Long” (126.5 m). Cows could choose to walk the raceway leading to the MAT or ST to lie down, or they could lie down on the cubicles for “free” (i.e. easily and without “working” by walking a distance).

A 3-day familiarisation period was used at the start of each experimental period, where cows had access only to the ‘Cubicle Area’. This ensured they could familiarise themselves with their grouping, robot access and cubicles. For the duration of the study, cows always had ‘free’ access to cubicles and did not have to work to gain access to them.

During training periods, cows were encouraged to walk the raceway, with someone walking quietly behind them, showing them how to gain access to the open lying space they had access to at the time. Following the familiarisation period, the first 3-d training period (at “Short” distance) allowed for one-way gate training and allowed cows to become familiar with the length raceway length which had to be walked to access the first open lying area (Surface A).

This training period was followed by a 3-d choice period, where cows had the choice to use the raceway to gain access to the open lying area, paying the price of walking the Short distance (34.5 m), or could access the cubicles for ‘free’. The raceway length was then changed to the

“Medium” distance (80.5 m), and cows had 1-d training, followed by another 3-d choice period. Finally, the raceway length was changed to the “Long” distance (126.5 m), and cows had a 1-d training period followed by a 3-d choice period.

Following this, the lying surface animals had access to was changed from Surface A to Surface B and the series of training and choice periods repeated (i.e., surface change from mattress bedded with sawdust (MAT) to deep-bedded straw (ST) or vice versa).

Video footage was used to obtain lying bout start and end times for cows lying in the cubicles and experimental areas. Total time spent lying and number of bouts lying in each area was calculated. Times spent lying down and non-lying (standing and performing other behaviours while standing) in open lying areas was calculated for each choice period for each cow. Additionally, frequency of raceway completions for each cow was recorded.

The study found that there was an effect of location on lying time per 24-h, with cows having higher lying times in open lying areas than in cubicles. There was no significant effect of distance on total lying time, but there was a significant interaction between distance and location. The study found that as distance required to be travelled to access open lying areas increased (“Long”), lying time on open lying areas decreased and increased on the cubicles.

However, cows still chose to lie down for longer on the open lying areas at this distance (>60% of lying time), compared to free access cubicles, showing they were motivated to access open lying areas rather than lying in cubicles. Despite shorter lying times in open areas with a longer raceway, the study never found a ceiling effect, which is when the cost is too much and never paid- i.e., the distance to walk is too great for cows to do it.

Surface type did influence motivation, with cows showing higher motivation for, and lying down longer on, the open lying area when it was a deep-bedded straw yard (ST) compared to MAT. However, authors note that this could be due cows lack of experience with an open mattress lying area and previous experience of open straw yards during dry periods. The study found no interaction between surface type and distance travelled to access the open lying areas. This suggests that surface type had a limited

effect on motivation and that access to an open lying area was the main driving factor for cows in the study.

## Conclusions

This study showed that cows were motivated to access and lie down in open lying areas compared to cubicles and that cows had a higher motivation for an open deep-bedded straw area than an open cow mattress. The study also showed that surface type had a smaller effect on motivation than walking distance, showing that cows placed greater value on an open lying area regardless of surface type.

Given cows value access to open lying areas, providing access to these areas in sheds has the potential to improve cow welfare in commercial dairy cattle housing systems in the future.

## Reference

Laura Shewbridge Carter, Marie J. Haskell, David Ball, Jenny Gibbons, W. Edwin Harris, S. Mark Rutter. 2022, Dairy cows value an open lying area, PLoS ONE 17(5): e0268238.

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