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14 Cow welfare aspects in Automatic Milking Systems

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Abstract

The number of cows per farm is increasing rapidly in Finland. In this situation the farmer is facing the question how to manage all the work at the farm. Professional stockpersons are nowadays difficult to find and the labour is expensive compared to the price of milk. Automatic Milking Systems (AMS) could be a solution to these problems from the farmer's point of view. The milk production of cows may also improve in AMS due to more frequent milking. In AMS a cow and a stockperson are the users of a new technology. Welfare questions of the cow and the stockperson must not be forgotten when this new technology is taken into use.

In Finland the first farms with AMS have been using their systems for over one year. Research is done at Suitia research farm of the University of Helsinki and alongside the first two private farms with AMS have been followed up. Milk quality, udder health, cow behaviour, and the work of a stockperson are the research subjects. This paper deals with the aspects of cow welfare in AMS, using literature and observations from the Suitia research farm and the first Finnish private farms.

The welfare of a cow is largely dependent on her stockperson, also in AMS. AMS provide the stockperson with several new tools to follow up the cows and evaluate their welfare, like data from activity and eating, but still there is no single instrument for the welfare evaluation. With AMS the behaviour of a cow, her individual characteristics as well as gregarious behaviour, is emphasised. Hence, a stockperson should be aware of the social structure of the herd in order to find ways to avoid social stress in the group of cows and provide enough resources (enough place and time to eat and rest) to the cows.

In AMS cow traffic arrangements are decisive in the cow's welfare point of view because it is not only the moving of the cow in the barn, but also her eating, lying, and milking which is controlled by the traffic arrangements. Forced cow traffic, where the only possibility for the cow to go from the lying area to the feeding area is by passing the milking unit, can be used at the start to train the cows to use the milking unit. However, it is not recommended for continued use because it can restrict the behaviour of the cows. Feeding during milking is necessary in AMS, because the milking itself is not attractive enough for the cows to pay enough visits to the milking unit.

Cow welfare questions like the effect of AMS on human-cattle interactions needs to be studied. Also on farm solutions on combining grazing with AMS are needed.

How do cows adjust to AMS and how should they be guided?

Calmness, patience and persuasion of the stockperson are needed when cows are introduced to AMS. The farms that start using AMS have normally a totally new barn and therefore, the building with its interior and equipment, e.g. flooring, lying stalls, feeding table, concentrate feeders, ventilation, gates, and of course the milking unit or the robot itself, is also new to the cows.

First it is worthwhile to persuade cows with the help of concentrates to use the new gates of the barn. The introduction to the milking robot should also be done with the help of attractive concentrates instead of forcing the cows to the milking unit. If the cows have voluntarily entered into the milking unit they probably do not get bad experiences from the place and thus they learn to use the unit independently without fear. Milking itself should be as comfortable as possible to ensure proper milk let down.

It is worthwhile to start the introduction period with the herd's most active and courageous cows. Every cow in a group is an individual. However, the cows are highly gregarious animals and thus, control and observe each others behaviour in a group. When the most courageous and curious cows of the group start using the milking unit voluntarily, the threshold for the other cows to enter into the milking unit may be lowered. This phenomenon of social learning is found to be useful when animals are habituated to new feeds (Nicol, 1995).

It demands courage from a cow for the first time to separate herself from the group and to enter into the robotic milking unit. However, after the cow is accustomed to the milking unit, she may feel herself so comfortable that she does not want to get out from the unit. To solve this problem companies have developed equipment, such as electricity or compressed air, which can help to drive cows from the unit after the milking.

Heifers may be quicker to habituate themselves to AMS compared to older cows. Kovalcik and Kovalcik (1986) studied the learning ability and the memory of the heifers and the older cows. They noticed that the heifers were able to learn a new task quicker compared to the older cows, but the older cows remembered the task for a longer time than the heifers. It may be easier for a cow coming from a loose housing barn to habituate herself to AMS compared to a cow coming from a tie stall barn; because the cow from the loose housing system already knows that she has to move between the feeding, lying, and milking places.

Both of the first two private Finnish farms with AMS had Finncattle cows in their herds when they started to use AMS. The stockpersons from both of the farms reported that it was those Finncattle cows - which are known of their curious and active characteristic - that first started using the milking unit, the concentrate feeders, and the new gates and thus showed example to the other cows. In the Suitia farm the heifers are brought from two to three weeks before calving to the AMS barn in order to reduce fear and better habituate the animals to the system after the calving.

The impact of a stockperson on cow welfare in AMS

AMS provide the stockperson with several new tools to follow up the cows and evaluate their welfare, like data from activity and eating, but still there is no single instrument for the welfare evaluation in these systems. The stockperson is still responsible for feeding, health, heat detection, cleanness of the barn, animals and the milking unit, and good milking hygiene. The cleanness of the cow is even more important in AMS compared to the conventional system. In addition, the stockperson should maintain positive contacts with the animals to avoid animals' fear of humans and in this way assure easiness of handling.

It can be hypothesised that if the stockperson is well motivated to his work and has a positive attitude to the animals, his better working conditions in AMS compared to the conventional system (less physically and mentally hard work of milking) can improve the welfare of the stockperson. The improvements in the welfare of the stockperson can also improve the welfare of his cows in a way that the stockperson has more time to focus on the welfare of the animals. It should be remembered, that it also takes time for the stockperson to get used to AMS. According to the opinions of our stockpersons at the Suitia farm, it can take up to half a year to get really well used to AMS.

The freedoms and possibilities of cows in AMS

According to the Five Freedoms (Brambell Commission) the welfare of an animal is fulfilled if the animal has freedom to express normal behaviour and freedom from:

- hunger and thirst
- discomfort
- pain, injury or disease
- fear and distress

In a free stall barn every cow should have at least one stall where she can lie down. This prospect allows all cows of a group a possibility to rest together. Cows should always have the possibility to eat ad lib roughage together and good-quality water should be all the time available. In the context of AMS it is often mentioned that the cows have freedom to make individual choices. However, it should be remembered that the cows are highly gregarious animals and thus synchronised behaviour belongs to their natural behavioural pattern (Castrén 1997; Boissou et al., 2001).

Possibility to move

The possibility of a cow to move in AMS barn is controlled by cow traffic arrangements. Cow traffic arrangements are decisive in the cow's welfare point of view, because it is not only the moving of the cow in the barn but also her eating, lying, and milking which is controlled by the traffic arrangements. The aim is to get the cows voluntarily and with even intervals to the milking unit. The feeding and the lying areas and the milking unit can be separated by different gates which prohibit or allow the cows to move between the different areas.

In forced cow traffic it is only possible for the cows to go from the lying area to the feeding area by passing the milking unit. In free cow traffic the cows have possibility to move freely between these areas. The forced cow traffic can be used at the start to train the cows to use the milking unit in the AMS barn, but is not recommended for continued use because it can restrict the feeding behaviour of the cows. In the free cow traffic it can happen that the milking unit is not attractive enough for the cows to go to be milked enough often (Ketelaar-de Lauwere et al., 1998). One possible compromise between the free and the forced cow traffic is an arrangement where cows can freely move between the roughage feeding and the lying area, but in order to reach the concentrates they have to pass the milking unit (Ketelaar-de Lauwere, 1999).

In the Suitia barn we followed 17 cows out of the group's 26 cows during the summer 2001, when forced cow traffic was used. The cows made on average 6,5 circles per day inside the barn (SE 0,45). There was a positive correlation between the dominance value of a cow and

it's activity (circles per day inside the barn) indicating that the most active cows had higher dominance values ($r_p = 0,62$, $P < 0,05$).

The first AMS farms in Finland have used the forced traffic at the beginning. Later on selection gates have been installed to let the cows go to the feeding and the lying area without passing through the milking unit in certain conditions e.g. if the time from last milking does not go over certain limit. One farm in Finland is using totally free cow traffic.

Possibility to eat

Roughage and water should be ad lib available for the cows and they should have enough time to eat (Lindström, 2000). With the forced cow traffic it can happen that there appears rush near the milking unit when there are many cows who want to go milking or eating at the same time. Rush can appear for instance at the most favourable milking or eating times, during the robot maintenance or repair, or in case the capacity of the milking robot is overloaded by too many cows behind it. During the rush hours the high ranking animals will go to the milking first and the low ranking ones will wait and go after the higher ranking cows (Ketelaar-de Lauwere et al., 1996). The waiting time for the subordinate cows is out of their eating and lying time. It should be noted that no correlation between the dominance value of a cow and its milk production has been found (Boissou et al., 2000). It is thus as important to the subordinate cows to have enough time to eat as it is to the higher ranking cows.

Due to their synchronised behaviour the cows should be able to eat roughage together. Therefore, there should be enough places and space to eat. It is also worth noticing that not all the cows in a group can eat next to each other due to differences in social hierarchy. In the AMS barns the cows have to, in some extent, work in shift and it is thus not possible for them all to eat together. Therefore, it is assumed that less eating space is needed in the AMS barns compared to the normal free-stall barns (Morita et al, 2000). However, there still is need to thoroughly examine the need of the feeding space in AMS barns.

Possibility to rest

In the forced cow traffic the subordinate cows may have to wait for access to the milking unit and to the feeding area. Therefore, in forced traffic, the resting time for the subordinate cows may also be diminished. In the loose housing and also in the AMS barn every cow should have at least one lying stall (Morita et al., 2000). Again, cows like to rest together due to their synchronised behaviour and on the other hand not all the cows can rest side by side due to the differences in the social hierarchy. In addition, the insufficient amount of lying stalls can impose cows to lie down on the floor. This in turn makes cows dirty and can block the alleys.

Possibility to go milking

Concentrates should always be offered to the cow during milking. In a study of Prescott et al. (1998) the milking itself was not attractive enough for the cows to pay enough visits to the milking robot. There were significantly more visits to the milking unit when concentrates were offered compared to the situation when concentrates were not offered. This phenomenon may be even clearer when the cow is low yielding (Prescott et al., 1998). Giving the cows something to eat during milking also betters their production parameters compared to the cows that are not offered anything to eat during milking (Svennersten-Sjaunja et al., 2000).

The efficient use of a milking robot demands that the robot is used constantly round the clock. Anyhow, there are more and less popular milking times during the day. The cows with the lower dominance values may have to use the unpopular milking times whereas cows with the higher dominance values can go milking during the more popular times (Ketelaar-de Lauwere et al., 1996).

Possibility to go on pasture

In AMS cows should have possibility to go on pasture during the summer. Until now there have been only few studies concerning grazing combined with the automatic milking. The pastures should be in the vicinity of the AMS barn. Ketelaar-de Lauwere et al. (2000) observed that the cows did come into the barn from the pasture if the distance between the pasture and the barn was less than 350 meters. Wredle and Spörndly (2001) observed that if the distance between the barn and the pasture was 50 meters instead of 260 meters the cows returned more frequently from the pasture into the barn. The restricted grazing compared to the unrestricted grazing gives higher milking frequencies (Ketelaar-de Lauwere et al., 1999).

The willingness of the cows to be outside in the pasture or inside the barn was dependent on the outside temperature and the sward height. At the lower sward heights cows were more inside the barn compared to the higher sward heights and at the higher outside temperatures cows were more inside the barn compared to the lower outside temperatures (Ketelaar-de Lauwere et al., 2000). The cows clearly preferred lying in the pasture than inside the barn (Ketelaar-de Lauwere et al., 1999). The cows also wanted to be outside although there was extra feed offered inside the barn (Wredle and Spörndly, 2001). The cows had tendency to come from the pasture into the barn as a group, due to their gregarious behaviour, and this caused peaks to the milking unit (Ketelaar-de Lauwere et al., 1999). Using water as a way to persuade cows to come from the pasture inside the barn, if water is only offered inside the barn and not on the pasture, is not ethical animal husbandry as water should always be ad lib available for the animals.

Conclusions

With AMS the behaviour of a cow, its individual characteristic as well as gregarious behaviour, is emphasised. A good AMS cow likes to move, is active, curious, and brave, and thus learns easily.

The welfare of a cow is largely dependent on her stockperson, also in automatic milking systems. Hence, a stockperson should be aware of the social structure of the herd. The stockperson ought to know the ways to avoid social stress in a group of cows and provide enough resources, enough place and time to eat and rest, also for the subordinate cows.

The synchronised behaviour of the cows is to some extent broken down in AMS. The welfare consequences of this phenomenon should be studied more with maximum number of cows. More studies, especially on farm solutions are needed on combining grazing with AMS.

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