An Investigation of Automatic Milking Systems and their Impact on Dairy Cow Welfare

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Introduction

Farmers and researchers are interested in improving cow welfare in the dairy industry. One area of research involves use of automatic milking systems (AMS) on farms. These robotic systems have been shown to be effective in decreasing the prevalence of lameness in the herd (Leach *et al.*, 2012) and decreasing cow stress (Dijkstra *et al.*, 2012). According to Jacobs & Siegford (2012), cow wellbeing is directly correlated with productivity and AMS have been shown to increase milk yield by up to 12%. Current research is aimed at investigating this correlation further.

Discussion

In the past two decades, AMS have become more prevalent around the world, although they are still outnumbered by conventional parlour-style dairies. In addition to lowering labour costs, AMS increase productivity, decrease the presence of stressful stimuli for the cows while also monitoring cow health more effectively than human surveillance can.

Compared with cows milked in conventional parlours, cows in AMS have more freedom to control their daily activities and rhythms, and more opportunities to interact with their environment (Jacobs & Siegford, 2012). In conventional parlours, cows are herded in all at once and milked one by one. A study conducted by Dijkstra *et al.* (2012) states that such cows often have to stand waiting for long periods in a confined area before entering. The study affirms that such an environment is stressful for the cows because they cannot eat, drink, lie down, or move about (Dijjkstra *et al.*, 2012). For many, the waiting period can be more than one hour at each milking. With cows being milked twice a day, this has a significant negative impact on their daily time budget, so some behaviours must be sacrificed (Dijkstra *et al.*, 2012). Ultimately, these cows become frustrated, which significantly impairs their welfare. Finally, increased waiting time limits access to food and water, which ultimately reduces food intake and, subsequently, production. With AMS, the cows are able to set their own milking schedule, coming and going as they please, which eliminates the stress involved with the waiting areas and significantly improves welfare.

AMS are also beneficial because they can closely monitor udder health in the herd, which is crucial in preventing the onset and spread of clinical mastitis. Mastitis is an extremely common condition in dairy cows, and it is painful and detrimental to welfare (Cyples *et al.*, 2012). A recent study discovered that cows suffering from mastitis spend less time lying down during the day because of udder pain (Cyples *et al.*, 2012). Lying down is an important behaviour for all cows as this is when normal rumination and digestion occurs. On the other hand, increased lying-down time facilitates recovery in sick animals, so any disinclination to lie down is a concern for cows suffering from clinical mastitis (Cyples *et al.*, 2012). When clinical and subclinical mastitis is detected early, affected cows can be treated quickly before the problem negatively impacts their overall health.

AMS can also play a significant role in decreasing the incidence of lameness. According to Bruijnis *et al.* (2012), foot disorders and lameness cause serious economic loss for dairy farmers and are considered a most important welfare issue. Indeed, their study went on to state that most affected cows have subclinical foot disorders, which make them difficult to diagnose and treat before more serious lameness issues arise. A study conducted by Leach *et al.* (2012) concluded that early detection and treatment are crucial. The study determined that the usual delay between onset of lameness and treatment (conventionally around 65 days) is the main cause of severe lameness, and that fortnightly monitoring of cows reduced the prevalence of lameness in the herd. The study recorded that in a group of cows in which 30% were detected as lame but remained untreated for four weeks, the prevalence of severe

lameness increased to 50%. .However, the prevalence of severe lameness in a group of cows that were treated immediately on detection of lameness decreased from 25% to 15% over the same period (Leach *et al.*, 2012). Unfortunately, surveillance to this degree is labour intensive and expensive, which is why lameness is so prevalent in dairy herds and so economically devastating. Some AMS use four load cells on the floor of the milking stall to detect small shifts in the distribution of the cow's bodyweight that can indicate lameness at its very early stages (Jacobs & Siegford, 2012). This could be a powerful management tool, allowing dairy farmers to detect lameness early, when intervention is most effective and least expensive, thus improving cow welfare and decreasing costs simultaneously (Jacobs & Siegford, 2012).

Despite many management and welfare advantages, however, there are some disadvantages to AMS that should be considered. Switching to AMS can be expensive: while a double-6 parlour might cost between $48,000 and $180,000, these parlours can serve any number of cows per day, whereas average AMS machine costs to handle about 60 cows would be between $150,000 and $200,000 (Jacobs & Siegford, 2012). A farmer using AMS will also have difficulty increasing his herd numbers without buying new machinery (Jacobs & Siegford, 2012). Furthermore, AMS rely on the cows voluntarily participating in the milking and feeding routine and, if certain cows are disinclined to access the machine, additional labour will be required to complete the process (Jacobs & Siegford, 2012). Finally, certain cows can have behavioural or conformational traits that make them unsuitable for integration into an AMS. For this reason, farms switching to AMS might have to cull animals that would otherwise have been suitable for continued milking (Jacobs & Siegford, 2012). So, in this area, AMS could be said to compromise cow welfare.

Conclusion

To conclude, it is clear that AMS provide numerous advantages over milking parlours when it comes to improving cow health and decreasing stress – two very important aspects in maximising welfare. It is safe to say that the benefits of such systems are potentially immense, and that time and future research will help determine just how advantageous AMS can be.

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