

Risk working conditions in dairy cattle farming-a review

Dimo Dimov¹, Ivaylo Marinov^{2*} and Toncho Penev¹

¹ *Trakia University, Faculty of Agriculture, Department of Applied Ecology and Animal Hygiene, 6000 Stara Zagora, Bulgaria*

² *Trakia University, Faculty of Agriculture, Department of Animal Husbandry – Ruminants and Dairy Farming, 6000 Stara Zagora, Bulgaria*

* *Corresponding author: marinov.ib@abv.bg*

Abstract

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Dairy production is one of the most difficult sectors of agriculture, in particular of animal husbandry. 87% of accidents at work in animal husbandry are caused by cattle. Dairy cattle farming work, especially milking, is physically difficult and involves awkward postures and moves. In the people involved in this activity, and in particular the daily milking of cows, it has been found that most of them complain of pain in the musculoskeletal system. In spite of the reported labor relief in the loose-housing dairy production systems where milking is carried out in a standing position, the workload among workers is localized in the upper limbs, resulting in the majority of them complaining of pain in the musculoskeletal system. Microclimate and lighting conditions are very important because they often are the basis for various occupational diseases. Not in all farms, natural and artificial light and microclimate are satisfactory. The level of illumination in the building under the conditions of tie-housing production system and in milking parlor is essential on the one hand for the normal course of milking as a process, and on the other hand it should not be forgotten that it is the production of raw material, which is basis of various food products. There are not a few cases in which workers in dairy cattle farms develop respiratory problems and diseases due to high level of dust in the air. Under the conditions of current animal husbandry, the noise becomes more and more large but less noticed problem. A number of studies have shown a strong decrease in hearing and even hearing loss even in farmers and longtime workers. Exposure not only to very high but also constant noise leads not only to reduced hearing, but also to the development of certain diseases, such as high blood pressure and other psychosomatic disorders. Extending and deepening studies of working conditions in dairy cattle farming can contribute to improving these conditions and reducing the unattractiveness of this profession.

Keywords: working conditions; milking parlors; dairy cows

Introduction

Agriculture is one of the three most risky work sectors in the world, and farmers and their workers are exposed to a variety of work-related factors that can affect their safety and health (Rautiainen et al., 2002). The number of accidents at work and occupational diseases is much higher than in other occupations (Lundqvist & Gustafsson, 1992). Linden (1986) found that 58% of occupational diseases in agriculture are related to the musculoskeletal system, compared with 49% of all other industries in Sweden. Work in agriculture affects the majority of the important physiological systems, and it is impossible to disregard the fact that, with increasing age of the workers in this area the risk of damages due to physiological changes that occur with ageing also increases (Mitchell et al., 2002). A number of studies around the world have shown that agriculture is

extremely difficult occupation with a variety of everyday tasks which can cause musculoskeletal disorders and injuries in humans. Work operations often involve lifting heavy objects, moving and carrying equipment, taking up unpleasant work postures that are risk factors for back traumas and other musculoskeletal damages. The various machines and equipment used in agriculture are extremely valuable in terms of making work easier and more efficient. This mechanization and automation, however, involves a large number of risks to the life and health of people engaged in this activity, and from there a number of accidents, diseases and traumas occur (Penttinen, 1987; Parton, 1990; Murphy, 1992; Bobick & Myers, 1995). Today, the trends in animal husbandry are towards providing welfare and wellbeing of animals. The development of scientific researches to optimize the conditions of welfare of cows is mainly driven by the need to increase production profitability.

Following new recommendations, farmers are modernizing existing farms to improve animal welfare (Bieda & Herbut, 2007), but the new conditions do not meet the requirements of workers working in those farms.

Cattle farming as a branch of agriculture is probably one of the riskiest. Not only because is a matter of working with animals, much larger than other farmed animals, but the problems that arise from it are quite numerous and serious in importance. According to Pratt, (1992) 32% of injuries in dairy farming are caused by animals. Another study found that 87% of work-related accidents in livestock production were caused by cattle (Layde, 1996).

Milking Parlor Conditions

Dairy farming is one of the most difficult sectors of agriculture and especially the milking of large ruminants. It is well known that dairy farming work, especially milking, is physically hard and associated with awkward working postures and moves (Lundqvist et al., 1997; Stål et al., 2000). From the survey of milk producers of Sweden, a total of 82% of men and 86% of women reported some kind of pain in the musculoskeletal system year-round (Gustafsson et al., 1994). Compared to other professions (Jonsson, 1988), pain and discomfort among dairy farmers are particularly common in the shoulders, elbows, lower back, hips and knees. In addition, women report severe problems with the wrists, as has been found in other studies among people engaged in this type of work (Stål et al., 1996; 1997). The result of the analysis indicates several risk factors for the development of musculoskeletal diseases. Such factors are, for example, gender, age, weight, as well as those related to the organization of work and physical work being done, the number of hours worked per week, the number of milking units used on the farm, the age of the farm building stock, all this has a significant impact on the incidence of reported pain in various body parts. However, it should not be forgotten that human health and occupational safety are directly related to human-animal interaction (Mack, 1979). This sector of agriculture is at risk in terms of accidents at work. According to Hansson et al. (1989), more than a quarter of the accidents at work in agriculture are related to dairy cattle farming, and in particular to their milking and servicing. Milking as an activity was responsible for the majority of the occurred accidents compared to other activities carried out in cattle farms. The transition from tie to loose housing and from milking in a bucket milker and a milking pipeline to milking in the milking parlor of dairy cows significantly improves working conditions for the milkers. Machine milking is associated with a significant risk of injuries and traumas to the wrists and hands (Stål et al., 1999). In the milking parlor, the equipment is static, whereas in tie stall housing and milking at place, this equipment is carried by hand each time by the milkers, which results in a considerable physical loading on the milkers (Statistics Sweden, 2001). Lundqvist, (1988) in one of his

studies on different dairy cattle housing systems found that taking inconvenient posture while working among milkers was within 38% in cases of tie stall housing and in loose housing and milking in milking parlor within 9%. Installing a milking pipeline in tie stall housed cows resulted in a decrease in pain in the musculoskeletal system of the milkers of 29% to 11% (Nevala-Puranen et al., 1993). The transition to milking in milking parlors has led to improvements in the working conditions of the milkers, 86% of milking time they are with the backs upright and both hands below the shoulders compared to 76% in tie stall housing where milking is with bucket milking machine or milking pipeline (Nevala-Puranen et al., 1996). Despite the reported labor relief, a number of studies have found that among workers in loose housing dairy farming systems where milking is performed in a standing position, the work loading is localized in the upper limbs (Stål et al., 1996; Pinzke, 2003; Hartman et al., 2006), due to which it was found that the majority of them complained of pain in the musculoskeletal system (Gustafsson, 1989).

Despite the introduction of mechanization and automation in the rearing and milking of animals, there are still a number of activities involved in performing heavy physical labor such as lifting heavy loads, working in awkward postures, exposure to high noise levels and vibrations (Perkiö-Mäkelä, 2000). A number of studies have found that milking cows in milking parlors is accompanied by heavy physical activity in the upper limbs, especially in female milkers (Kolstrup et al., 2006; Douphrate et al., 2011). Performing activities in the milking parlor, such as udder drying, control milking, milking cup attachment, are often very tiring for the wrists, especially in women (Pinzke et al., 2001). Kolstrup, (2012) reported commonly experienced low back, shoulder, neck, wrist and knee pain among Swedish dairy farmers, with most of these complaints being among female workers in the sector. In a study conducted among farmers who rear their cows in loose housing system and milking in a milking parlor, during the first two hours of milking, they showed no signs of fatigue, such as increased heart rate, pain in the limbs, etc. (Perkiö-Mäkelä and Hentila, 2005). It must not be forgotten that in addition to the occurrence of these muscle pains in different body parts, the provided insufficient duration of time for resting during milking makes milkers inattentive and there is a considerable risk of animal impact, crushing, pressing etc. (Douphrate et al., 2011). Stål et al. (1996) report that, according to dairy farmers with considerable experience, the most stressful and tiring task during milking was the control milking or forestripping (milking the first streams of milk from udder tits).

In addition to improving working conditions for milkers, the transition to milking in a milking parlor provides better conditions for producing safe food for people. Gergovska et al. (2004), in a comparative study between milking in a bucket milker, a milk pipeline and a milking parlor, found significant differences, especially in terms of total number of microorganisms in raw milk.

Despite the observance of all hygiene requirements for milking, for bucket milker the total number of microorganisms varied from 3.5 to 1.5 million/ml, for milking pipeline variation was from 300 to 100 thousand/ml, and for the milking parlor, the variation was about 45 thousand/ml. The total time a cow in milk spends in the milking parlor can vary depending on the number of milkings during the day and on the amount of milk that will be milked from it. The time cows spend in the milking parlor during the day is not much, so it is generally accepted that the conditions inside the parlor do not have as much

impact on the animals in terms of their comfort. However, milkers spend almost their entire working day inside milking parlors and the conditions there have a significant impact on their health and quality of work. The average length of stay in the milking room of the cow is between 8 and 10 minutes and that happens 2 or 3 times a day. A milking is considered safe for workers and the production of safe food, if the milking room is well ventilated, equipped with appropriate machinery, the milkers have established an adequate routine for working with both animals and machinery (Turner and Chastain, 1995; Munksgaard et al., 2001).

Illumination Levels, Air Quality and Noise Levels

Illumination levels

Microclimatic and light conditions are very important because they are often the basis of various occupational diseases (Frazzi & Lodigiani, 1996). The authors note that not in all farms the natural and artificial light and the climate are satisfactory. Artificial illumination in general works well, but needs better maintenance. The authors, however, found no presence of emergency lighting in any farm. The level of illumination in the building of tie stall housing barn and in milking parlor is essential on the one hand for the normal course of milking as a process, and on the other hand it should not be forgotten that it is the production of raw material, which is basis of various food products. It is necessary to observe the condition of the obtained milk directly of the animals in order to guarantee the safety of the product, also a good illumination is a prerequisite for better washing and cleaning of the tits before milking and therefore for a lower risk of contamination of the milk. People working with animals need enough light to cope well with the activities being performed and to rely on the cows' signals on time for any problems that are essential for good management. In general, the recommended values of 100 to 160 lux are sufficient for this, but in areas where it should be better seen, such as milking parlor, maternity pen, the recommended illumination level is 270 to 320 lux. Working in a well illuminated building is always more pleasant than in a dark and gloomy one (Site Dairy Logix). According to the American Association of Agricultural and Biological

Engineering Standards (ASAE, 2006), the recommended value for the level of illumination in a milking parlor, in milking pits and near the udder is approximately 540 lux. This level of illumination is sufficient if different deviations from the normal color and consistency of the milk appear they to be noticed and timely measures to be taken to remedy the problem. These requirements must be taken into account in milking conditions, regardless of the production system used - on-site milking in tie stall housing or in a milking parlor. Lighting parameters are one of the important factors in the hygienic evaluation of buildings for dairy cows. Good lighting is necessary for the normal flow of technological activities and for provision of hygienic and safe working conditions for employees working in the dairy cattle farming. In the end, a well illuminated workplace facilitates workers' activity and is safer for them (Miteva, 2012).

External environmental conditions also affect the working environment conditions to a great extent, especially when the buildings in which the work is carried out do not provide any isolation from the external conditions. Dimov et. al (2017) in a study conducted in southern Bulgaria found no significant differences in the values of temperature-humidity index outside and inside the semi open freestall barn for dairy cows. This indicates poor or complete lack of any isolation of livestock buildings and respectively of the workers inside from the external climatic conditions as high and low temperatures.

Air composition and air dust

The microclimate parameters in livestock premises and milking parlors depend mainly on the efficiency of the ventilation system. Cows emit large amounts of heat, humidity and carbon dioxide. In addition, fermentation processes in manure also affect the microclimate parameters (Nawalany et al., 2010). Ventilation should provide daily an adequate number of exchanges of the indoor air with fresh outside air. If it does not work properly, harmful gas impurities (mainly CO₂, H₂S, NH₃) and particulate matter adversely affect animal welfare and human health (Teye et al., 2008; Herbut and Angrecka, 2014).

There are many cases where dairy farm workers develop respiratory problems and illnesses due to high air dust. The main problem stems from the inhalation of dust particles. The origin of the dust in livestock buildings is predominantly organic. It is most commonly formed from the body surface of the animal (dried skin particles), from the bedding (when placing and cleaning), from dried feces and from the feed (Wang et al., 2000). When this fine dust enters the respiratory system, the human body treats it as a foreign material, against which it must be protected. The main effect of dust on human health is inflammation (chronic irritation) or a toxic reaction. A number of studies from Australia, Finland, Denmark, Sweden, Scotland, the United States and Canada have found high levels of occupational respiratory problems among workers in dairy cattle farms.

According to these studies, about 1 in every 5 workers has bronchitis directly related to air quality, 1 in 20 has asthma, and 1 in 18 will develop symptoms related to "farmer's lung" (Choiniere and Munroe, 2006). May (2004) believes that respiratory problems are significantly more than other occupational diseases among workers in cattle farms. In his studies, the author states that among these problems, the most common for the last 5 years is asthma (hypersensitive respiratory tract). Chronic bronchitis is the second most common problem in non-smoking farmers. Reynolds et al. (1993) found a link between farmers and farm workers lung diseases and exposure of their stay in production buildings, related to a decrease in lung function and an increase in lung disease in older workers.

Noise levels

According to Brouček (2014), under the conditions of current animal husbandry, the noise becomes more and more large but less noticed problem.

Noise from the ventilation system in buildings with intensive livestock production systems, feeding lines, manure cleaning facilities and from the animals themselves is a potential stress factor and affects not only the animals but also the staff who work there. Noise problems are among the most overlooked: no farm is assessing the exceeding of noise thresholds, nor using appropriate ear protectors. This attitude is mainly due to two reasons: first, the lack of awareness among farmers of what damage can be caused by excessive noise exposure, with the consequent underestimation of the importance of protection, and secondly, the widespread but erroneous view that in milking parlors there are no noisy machines, resulting in the refusal of workers to use noise protection devices. People are more sensitive to noise perception in the 500 Hz to 4 kHz range, which is the range of normal ordinary human speech (quiet sounds are heard in this range) (Castelhano-Carlos and Baumans, 2009). The sources of noise in farms can be in addition to ordinary activities (opening and closing doors, washing, staff speeches, setting on feed, etc.). Also, noise caused by mechanical ventilation, animal activity (different moves, cow's own vocalization) (Žitňák et al., 2011; Mihina et al., 2012). According to Šístková et al. (2010), hygienic limit for noise are exceeded only during distribution of feed and bedding and bedding and are therefore only for a short time. According Kauko and Savary (2010) the intensity of the noise in most cases is unacceptable for dairy cows, but also for the operator (milker). Reducing excessive noise is a factor contributing to the improvement of well-being along with other criteria (air parameters, lighting).

Under Directive of the European Parliament and the Council №2003 / 10 / EC, the exposure limit value for the eight hour day is 87 dB. The upper value for taking action of 85 dB, and the lower value for taking action is 80 dB. It can be claimed that the noise values in the animal building are higher than the hygienic limit (due to feed distribution and fertilizer cleaning), but this noise is acting briefly. The loudest noise of 106.8 dB was measured during the manure

cleaning (21.8 dB over limit). The level of background noise (biological noise) arising from the biological manifestations of dairy cows ranges from 72.7 to 83.8 dB (Šístkova et al. 2010). Dimov (2017) found that the average daytime noise levels in semi-open freestall barns for dairy cows are of 52.5 to 83.0 dB. He also reported significant effect of season on the level of noise. The highest noise level during the summer months - by 4-5 dB higher compared with other seasons. During this season, in addition to the noise from the servicing equipment is added and that from the premises cooling fans. In buildings with more capacity and more often applied processes of service (three times milking, cleaning, a larger number of fans, etc.) also a higher level of noise is reported.

According to Depczynski et al. (2005) exposure to noise levels above 85 dB for more than 8 hours a day (or its equivalent sound energy) on a regular basis can cause permanent hearing impairment. Hearing damage can be caused by prolonged and cumulative effects of noise for many years, leading to metabolic damage to cochlea (Clark & Bohne, 1999). A number of studies have shown severe decrease in hearing and even hearing loss in farmers and their families (May et al., 1990; Crutchfield and Sparks, 1991; Plakke & Dare, 1992). Hearing loss is common in older farmers, but it is also observed among young farmers and teens on the farm (Broste et al., 1989). Noise contributes to the development of certain diseases and disorders caused by stress conditions, such as high blood pressure and other psychosomatic disorders (Šístková & Peterka, 2009).

All this influences the psychological state of a person and his ability to perform his work normally. Several studies of the psychological work environment have shown that farmers have high demands on the nature of work. They are also worried about the lack of free time and the ability to exercise sufficient control over situations that arise, the difficulty of performing conflicting tasks, as well as what satisfaction their job will bring and whether they will justify the expectations of their families (Thelin 1998; Holmberg et al., 2004).

Conclusion

The risks to workers in dairy cattle farming are multicomponent and highly variable. On the one hand, working with much larger animals compared to other farm animals, on the other, requires knowledge of the nature of the work (knowing of the behavior of cows, knowing of the presumptive risks in their serving, knowledge of requirements for quality and the hygienic indicators of the milk produced). Farming dairy cows is a heavy physical labor, which among the workers over time causes the occurrence of a number of diseases most often of the musculoskeletal system, respiratory system and hearing, especially to workers with the longest experience in this profession.

None of the components conditioning the working environment in dairy cattle farms should be underestimated. In the scientific literature of Bulgaria lacks studies related to working conditions both in the milking parlor and cattle farming in general, as well as to the consequences for workers. It is necessary to conduct in-depth researches since not a few people are engaged in such activity in the country, and on the other hand, the mentioned working conditions make this profession too unattractive for the modern man.

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