
The Dutch dairy chain works intensively on achieving a set of goals on climate neutral development, improvement of animal welfare and health, maintaining grazing and biodiversity and environment. These goals are yearly monitored by Wageningen Economic Institute. All 16,500 dairy farmers in Netherlands use a management tool, the Annual Nutrient Cycling Assessment (ANCA) to give insight in the mineral cycle (N, P, C) at cow, soil and farm level and in pollution of soil, water and air. Housing and manure management play an important role in achieving these goals. The development of new techniques, especially in housing, aim to improve animal welfare, reduce emissions of ammonia and greenhouse gases, increase manure quality for use as fertilizer or soil improver, and have public support. Two Freewalk housing systems will be demonstrated, a bedding of organic material like wood chips and an artificial floor which separates urine from feces. Different floor types and handling systems of manure, like aerating the slurry, are studied at the Climate Measurement Units on Research Station Dairy Campus. Results of low emission techniques will be shown. For example: the ammonia emission per cow is 30% lower in a Freewalk housing system with wood chips compared with cubicle housing, despite more than twice as much space per cow. A new impressive development to collect urine in the concentrate feeder is the Cowtoilet. The idea is to lower the emission of ammonia and upgrade the urine fraction. Also examples to increase capital efficiency by keeping other species or horticulture on the compost bed during the grazing season will be shown. To maintain grazing, new grazing systems are researched by using sensor data to predict grass growth, grass intake and to save labor by using virtual fencing. The floating farm in the harbour of Rotterdam is in development to get closer contact with the society and local stakeholders by using by-products and waste.

Key Words: dairy cow, animal welfare, compost bedded pack

Comparing cattle welfare in compost barns and freestalls in six European countries. I. Blanco-Penedo*,1, A. Kuipers2, M. Klopf3, and U. Emanuelsen1, 1SLU. Department of Clinical Sciences, Uppsala, Sweden, 2WUR. Wageningen Livestock Research, Wagningen, the Netherlands, 3UL. Department of Animal Science, Goobjje, Slovenia.

The ERA-Net Freewalk project aims to study animal health and welfare, milk quality, environmental and socioeconomic impacts in dairy farms that use compost pack bedding (CPB) versus freestalls (FS). The specific aim here was to assess the welfare of dairy cows and to test the hypothesis that dairy cows in CPB systems have a better welfare than those kept in FS. Forty commercial dairy farms (20 CPB and 20 FS) in 6 European countries were selected for evaluation, using mainly animal-based measures (ABM), from an adaptation of the Welfare Quality protocol. Farms were visited during winter 2017-summer 2018, where 4036 dairy cows were scored by the same observer. The average within-farm prevalence of “dirtiness,” graded as “very dirty,” was 62% of the lower hind legs and 43% of the hindquarters, being lower in FS. Cows with at least one hairless area on the body differed significantly, with 52% and 80% in CPB and FS, respectively. This was most pronounced on lower hind legs. Lesions were present in 9% of CPB vs 24% in FS and swellings in 4% vs 10%. BCS was normal (acceptable) in 92% of the cows but slightly higher in CPB. Light and severe lameness was lower on CPB (22%) vs FS (26%) but varied according to the seasons. Other health parameters were within the safe range according to thresholds of the Welfare Quality, except ocular discharge that was too common in CPB. Time for lying down varied between systems, with 5.33 in CPB vs 6 s in FS, reaching warning thresholds in 24% (CPB) vs 43% (FS). Colliding with housing equipment or cows was also less common in CPB (9%) than in FS (35%). Scores for rising up showed significantly easier movement in CPB (2.31) than FS (2.92); colliding less in CPB (18.3%) than FS (76.7%). The results showed a large influence by the housing system on ABM and comfort around resting. Further analysis (welfare criteria and principles level) are in progress to find the most advantageous system to improve animal welfare.

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Current and future of compost bedded pack barns in North America. J. L. Taraba*, University of Kentucky, Lexington, KY.

A successful compost bedded dairy barn is the result of combining the management of the composting resting bed and the function of the structure enclosing the cow resting area to achieve an environment for excellent cow welfare and comfort while maintaining efficient milk production. The housing structure must provide enough air exchanges for removal of bed and cow produced moisture, heat and gases (e.g., CO2, NH3) and air velocity over the cows for heat dissipation and the compost bed for moisture drying. The system has additional values: reduced environmental impacts on air and water quality. Quality of water and air resources benefit from the resting area composting processes. Odors are reduced through aerobic decomposition, while these same processes bind fertilizer N and P in the organic form, which allow slow release of these plant nutrients after land application. Further, manure storage occurs under roof which allows storage times of one year or longer depending on bedding usage or area allowed per cow. Storage flexibility improves field application timing of the compost to meet field conditions and cropping nutrient needs. Challenges to economic success come from the cost and availability of bedding materials as well as a housing envelope whose structural components can respond to climatic conditions to meet cow comfort in the region of the world where the dairy is located. Bedding materials may be expensive, limited in availability when needed (particularly cold and wet weather). In the United States, wood sawdust is primarily used, but alternate biomass from crop plants need to be assessed so that bedding supplies can be increased. Understanding the impacts that alternate materials exhibit in the compost bed and the housing envelope is needed to adjust the bed and structure management recommendations. An example would be low C/N ratio biomass, e.g., soybean straw, which create composting C/N ratios where high rates of NH3 are released. Various housing strategies for the compost bedded dairies have been implemented throughout the United States in different climatic conditions and will be discussed. This presentation will also summarize various challenges to cow welfare from recent research findings.

Key Words: compost bedded pack barn, housing structure, comfort

The animal welfare paradigm developed by Fraser et al. in 1997 suggests that welfare is optimized at the intersection of 3 key domains: health and biological functioning, affective state, and natural living. These domains are differentially prioritized by stakeholders, with those not familiar with dairy farming tending to emphasize natural living and producers often focusing on optimizing health. The intensification of housing systems for dairy cattle has catered to this health focus, permitting increased capability to provide individualized care. For example, cattle on approximately 39% of US dairy herds are housed in tie stalls, which permit individual rationing and reduce competitive interactions. Similarly, dairy calves are typically separated from the dam at parturition and housed individually over concerns of disease transmission. However, such housing systems come at the expense of natural behavior: in tie stalls, cattle movement is restricted and the opportunity to engage in natural social behavior, pasture grazing, or estrus expression is compromised. Compared with group-housed calves, calves reared individually have impaired cognition, increased fear responses, and reduced solid feed intake before weaning. Moreover, calves permitted to suckle the dam show a diverse repertoire of social behaviors paired with a reduction in oral stereotypies. Particularly given the societal concern that animals lead a natural life, future housing for dairy cattle could be reimagined to incorporate naturalness while maintaining a commitment to animal health and biological functioning. In particular, the distinction between “natural living” and “natural behavior” can be harnessed to incorporate opportunities for animals to express their natural behavior without rendering the system non-operational or antiquated. Preference and motivation testing are also useful tools to determine which natural behaviors are actually of importance to the animal; housing systems may then be modified to accommodate the realization of these behaviors. Examples include improving floor design to facilitate estrus expression, providing pasture access in appropriate weather conditions, and implementing group housing for calves.

Key Words: natural behavior, dairy cattle housing, animal welfare

Transition period and calving housing: Latest information and where are we heading? K. Proudfoot*, Ohio State University, Columbus, OH.

Many advancements in transition cow management and housing have been made over the last decade. The objectives of this presentation are to describe: 1) research to date on the housing of transition dairy cows before giving birth, and 2) opportunities for future research in this area. A focus of transition cow housing research has been on the effect of the cow’s social environment during the 3 weeks before calving on behavior and health. Specifically, researchers have measured the impacts of overstocking and regrouping on behavior, physiological biomarkers, and clinical signs of disease. The results of these studies are variable, especially when assessing one factor alone. However, cows likely experience cumulative stressors during transition, which may have a greater effect on their health. For example, cows that experienced a combination of overstocking, unpredictable feeding times, and social instability were more likely to develop endometritis after calving compared with those housed in more predictable environments. A second area of research has focused on understanding cows’ natural behavior during labor and preferences for a calving environment. For example, cows provided free access to pasture and a barn sought areas with natural tree cover, or manufactured cover (barn) when giving birth. Similarly, when kept indoors, individually housed dairy cows sought a secluded area to give birth, especially if they calved during the day. Providing cows with the opportunity to seclude in group pens may be more complicated, especially when stocking density is high. For example, cows provided with a physical barrier in a group pen were more likely to calve next to the barrier, but this tended to occur only when stocking density was low. Future research should focus on: 1) developing a better understanding of how individual cows cope with transition housing practices, 2) using novel measurements of cow welfare during transition, including their affective state and ability to maintain sufficient sleep, and 3) determining the impacts of housing on cows during the short period after calving when cows are at the highest risk of disease.

Key Words: behavior, welfare, maternity