

# Cow- and Herd-level Associations of Housing, Management, and Lameness with Productivity and Cow Behaviour in Automated Milking Systems

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The objective of this study was to evaluate how herd management, barn design, and lameness relate to productivity in automated milking systems (AMS). Data were collected from 41 AMS farms in Canada (AB: n=15; ON: n=26). Farms averaged 105±56 lactating cows and 2.2±1.3 AMS units. Forty cows/farm were gait scored (or 30% for herds >130 cows) using a numerical rating system (NRS; 1=sound to 5=lame). Cows were defined as clinically lame with NRS≥3 (26.2±13.0%) and severely lame with NRS≥4 (2.2±3.1%).

At the herd level, the prevalence of both clinical and severe lameness were negatively associated with environmental temperature and tended to be lower with wider stalls. Clinical lameness tended to be less prevalent with more frequent scraping of manure alleys. The prevalence of severe lameness in deep-bedded stalls was 0.6% percentage points (p.p.) lower than mattresses. Milking frequency/cow/d was negatively related to the prevalence of clinical lameness (-0.07x/cow/d with each 10 p.p. increase in lameness) and the ratio of cows/AMS (-0.24x/cow/d with each 10 cows added/AMS). Each 1 p.p. increase in severe lameness prevalence reduced daily milk yield/cow by 1 kg/cow/d. Milk harvested/AMS/d was positively associated with more cows/AMS (+32 kg/cow), but dropped by 56 kg/AMS/d with each 1 p.p. increase in severe lameness prevalence. Fewer cows were fetched with more frequent alley scraping. Lying bouts were 12 min longer in deep-bedded stalls compared to mattresses, and 5 min longer with each 10 p.p. increase in the prevalence of clinical lameness.

In a cow-level comparison (30 cows/farm) of lame (NRS≥3: n=353) and sound cows (NRS<3: n=865), lame cows were fetched more often, produced 1.7 kg/d less milk in 0.3 fewer milkings/d, and spent more time lying down (+38 min/d) in longer bouts (+3.5 min/bout).

**Implications:** Lameness is especially problematic for AMS herds, reducing productivity at the cow- and herd-level. Although few cows were severely lame, producers need to identify and reduce clinical lameness. Improving stall width and base, scraping alleys more frequently, and optimizing stocking density at the AMS are potential ways to minimize lameness and optimize productivity.