

## **FREE-STALL STOCKING DENSITY AFFECTS PRODUCTIVITY**

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I was recently asked about the effect of stocking density in a free stall barn upon dairy cow productivity. The incentive to utilize a stocking density above 100% (more than 1 cow per free stall space) is driven by economics; the fixed cost of the building and production facilities is allocated over a greater number of cows. However, this must be balanced by the impact upon cow comfort and cow behavior. Cow comfort and cow behavior have an economic correlation with milk production. Peter Krawczel from the University of Tennessee and Rick Grant of the William H. Miner Agricultural Research Institute in New York co-authored a very good article on this topic and I'll summarize some of their work to answer this stocking density question.

Let's start with these basics: dairy cow health, welfare and productivity is related to the time that cow has to rest, eat and ruminate. Normal daily behavior of a dairy cow is to rest 12 to 14 hours, eat for 3 to 5 hours over the course of 9-14 "meals" per day, and ruminate 7 to 10 hours. Much of that rumination time occurs during resting time. Then, of course there is time allocated to milking, drinking, socializing, and other management activities.

Krawczel and Grant reported on and summarized the findings of a range of studies and research that looked at the effect of free stall stocking density upon dairy cow resting time, feeding and rumination. Resting time can be defined as the time the cow spends lying down in a stall. It is perhaps the most important factor to evaluate because it impacts on other cow behavior and cow productivity. The most pronounced negative impact upon cow resting or lying time can be seen when stocking density reaches 120% and greater. Cows will prioritize rest over feeding. In overcrowded situations cows will spend more time standing idly waiting for a free stall space to become available so that they can lie down and rest. To make matters worse, cows deprived of normal lying time by a reduction of just 2-4 hours will attempt to recoup that lost resting time over the course of the next 40 hours. Therefore, when a stall becomes available cows actually spend more time lying down resting; resulting in longer wait times for other cows.

The reduction in lying down time and increased standing time waiting for a stall to become available was found to have other detrimental health impacts, namely: 1) greater strain on hooves when cows are forced to stand on concrete for extended periods of time, in some cases leading to higher incidence of lameness, 2) increased levels of blood cortisol as a stress response and associated with suppression of the immune system and 3) less blood flow to the uterine horn when standing as compared to lying down, possibly having an impact on fetal growth.

If overcrowding is accompanied with a decrease in feed bunk space per cow, then there are further negative impacts. A common recommendation is to provide at least 23-24 inches of bunk space per cow. In one study, increasing the bunk space to 40 inches per cow reduced the number of aggressive interactions per cow and increased the percentage of cows feeding during the first 90 minutes after delivery of a fresh batch of total mixed ration. However, in most cases, if stocking density is increased above 100%, no additional feed bunk space is made available so there tends to be overcrowding at the feed bunk as well. In this situation studies have shown that feeding time decreases and aggression increases.

Krawczel and Grant concluded that milk quality was affected by overcrowding. Milk fat was reduced, somatic cell count increased and the number of clinical cases of mastitis increased. They stated that overall milk production was not statistically affected although they speculated that the short duration of most studies and/or the small number of cows involved may have affected the ability of those studies to detect changes in milk production. While I have not been

involved in this type of research, my personal opinion, and that is all it is, leads me to think that if a cow is under stress from overcrowding that leads to reduced resting time, reduced feeding time, and more time facing increased aggression; then over a prolonged period of time that stress will eventually impact milk production.

For those who are interested, the entire article by Krawczel and Grant, including references to all the studies and research cited, can be found at:

<http://go.osu.edu/extensiondairycowcomfort> .