This article provides a simplified context for animal welfare in relation to engineering design features of dairy housing.

For decades, agricultural engineers have been looking at what is best for the cow, which has been partially determined by working with animal scientists and veterinarians. But now many perceptions of dairy animal welfare are coming from people not involved in animal agriculture.

Animal welfare may seem like an emerging issue or perhaps a fad, but it is here to stay. Let's start with some of the seemingly interchangeable language that is used on the topic. Animal WELFARE seems virtually synonymous with animal WELL-BEING. This word choice can be the preference of a group, such as veterinarians who seem to prefer the animal well-being label, or a region, such as Europe or Canada where the animal welfare term is used almost exclusively. Here in the United States the two terms seem interchangeable and may be defined as the application of science to moral concerns about animals. Animal WELFARE is different from animal RIGHTS, the latter often associated with activist controversy over animal farming practices.

This article explores criteria for “reasonable” treatment and animal welfare objectives related to facility design and management. Traditionally, dairy facilities have been designed for productivity, which is often very similar or identical to design for animal welfare. An established set of criteria called the Five Freedoms (Figure 1) offer an overview of the basics of good animal welfare. Reasonably, many aspects of dairy facility design and management can provide living conditions that always, or nearly always, satisfy the Freedoms. The Freedoms originated in the 1960s and 70s from the Farm Animal Welfare Council in the United Kingdom. Earlier, the UK government had commissioned an investigation into intensive animal production partly in response to welfare concerns raised in books documenting poor conditions of some farm animals. Since then, many professional groups, veterinary and animal care organizations have adopted the Five Freedoms as hallmarks of basic good animal welfare.

Animal Welfare Five Freedoms

1. Freedom from Hunger and Thirst by ready access to fresh water and a diet to maintain full health and vigor.
2. Freedom from Discomfort by providing an appropriate environment including shelter and a comfortable resting area.
3. Freedom from Pain, Injury or Disease by prevention or rapid diagnosis and treatment.
4. Freedom to Express Normal Behavior by providing sufficient space, proper facilities and company of the animal’s own kind.
5. Freedom from Fear and Distress by ensuring conditions and treatment that avoid mental suffering.

The first of the animal welfare five freedoms, is Freedom from Hunger and Thirst by ready access to fresh water and diet to maintain full health and vigor. Dairy managers typically do a fine job in this category offering high quality drinking water available at all times and diets that are professionally-designed by dairy nutritionists for various stages of heifer growth and cow lactation (figure 2).
**Freedom from Discomfort** is the second Freedom. This is provided via an appropriate environment including shelter and a comfortable resting area. Modern dairies following "cow comfort" guidelines for facility sizing and design are able to provide appropriate facilities. Maintaining adequate ventilation year round helps assure indoor environments that are as comfortable, and often more comfortable than, outdoor weather conditions (Figure 3). Cows are protected from weather extremes.

The fourth Freedom is the **Ability to Express Normal Behavior** by providing sufficient space, proper facilities and company of other animals. Dairy cattle are group housed most of their lives with the ability to socialize and move freely within the shelter facility. One area where dairy facilities face challenges is allowing cattle to express some of their inherent normal behaviors. Of course not all normal behaviors are desirable, such as fighting, but those that add to the well-being of individual animals are being incorporated into more facilities (Figure 5).

Finally, **Freedom from Fear and Distress** by ensuring conditions and treatment that avoid mental suffering. This may be the most challenging Freedom because documenting "mental suffering" is difficult even if managers can observe freedom from fear and no obvious distress (Figure 6).
Although the formality of a list like the Five Freedoms may appear daunting, there is really nothing to fear about animal welfare. Producers are familiar with animal welfare audits and good practices. Dairy facilities have been designed with animal needs in mind and the industry does quite well already in most aspects of animal welfare. Animal productivity is often a surrogate to measure welfare and that is appropriate. But now animal agriculture is being asked to consider more than simple productivity. Modern dairy facilities are and should be designed for physical comfort and animal health while providing a low stress environment.

The animal welfare topic is intertwined with most aspects of dairy farming and many societal issues, some noted here. This complexity does not mean problems cannot be tackled and management fine-tuned, but it does mean that food safety, labor, economics and the environment also play key roles in decision making. One difficulty is in setting reasonable animal welfare goals. Of note is that farm animal welfare topics have international interest thereby providing a large network for ideas and solutions here and abroad.

Animal agriculture has a lot of good features such as high productivity with good health and low mortality. There are animal care guidelines, and certified welfare audits along with practices developed through scientific knowledge. But then again, there is emotion and new debate about some agricultural practices that need to be addressed through even more diligence to suitable animal welfare features, such as those featured in the Five Freedoms.

Acknowledgements: Thanks for suggested improvements to peer reviewers Daniel McFarland, Penn State Extension dairy agricultural engineering educator and Daniel Ciolkosz, Assistant Professor and Research Associate agricultural and biological engineering.

June 2018

Authors

Eileen E. Fabian (Wheeler), Ph.D.
Professor of Agricultural Engineering
fabian@psu.edu
814-865-3552