Interventions in herd health management could be classified in 3 parts, organized chronologically as prevention, early treatment, and late treatment (Figure 1). The efficacy and efficiency of the intervention, as well as the performance and prognosis of cattle, decreases from left to right in Figure 1. Therefore, it is well known that the major and most efficient impact in the health management of any population is prevention medicine. Perhaps, the greatest progress in dairy science and veterinary medicine in the last four decades has been a shift of paradigm from late individual treatment to a population preventative medicine focus (LeBlanc et al., 2006).
According to Radostitis, since the beginning of the 20th century to approximately 1980 the focus of veterinary medicine has been eradication of infectious diseases (tuberculosis and brucellosis), individual treatment of sick animals, identification and treatment of infertility and mastitis as well as some subclinical diseases (internal parasites). In the last 40 years, the scientific community and cattle industries continued to contribute with new knowledge that allowed a better understanding of the underlying cause of clinical diseases and decreased performance of cattle. This allowed a shift of paradigm of the whole industry and changed the focus from individual treatment of diseased animals to management practices to control risk factors to decrease incidence of diseases (LeBlanc et al., 2006). In turn, these management practices result in improved cattle welfare and performance. Examples of management practices to decrease disease incidence and increase productive and reproductive performance are:

- Use of anionic salts that significantly reduced the incidence of clinical hypocalcemia in dairy cows.
- Feeding the right amount of energy on prepartum diets to meet energy requirements of cattle and reduce the risk of fatty liver and ketosis.
- Diets that maximize intake in the early postpartum decreasing incidence of metabolic and infectious diseases and improving overall cattle performance.
- Better design and maintenance of facilities and use of heat abatement technologies to meet cattle behavioral needs and maximize cow comfort.
- Lameness prevention programs including scheduled foot trimming and use of foot baths.
- Immunization programs, including both active immunity and passive immunity programs. Active immunity with antibodies or cellular immunity obtained through vaccination programs. Passive transfer of immunity through appropriate harvest, processing and delivery practices of colostrum.
- Genomic selection based not only on production but also on reproductive and health performance.

Health events are interrelated. For instance, hypocalcemia increases the risk of retained placenta of cattle (Kimura et al., 2002), and both events increase the risk of metritis. In turn, metritis increases the risk of clinical endometritis, affects cyclicity, decreases conception rate at first service and affects overall reproductive performance. In addition, causes of diseases are multifactorial in nature. For instance, retained fetal membranes hanging outside the vulva of a cow along with a blunted immune response due to hypocalcemia and ketosis may altogether contribute to increased risk of metritis. Therefore, management practices that prevent one particular disease have effects that go beyond solely the prevention of that disease. Nutrition and management practices that prevent metabolic diseases (e.g., hypocalcemia, ketosis, fatty liver) also improve the immunity of cattle and thus reduce the incidence of infectious diseases (e.g., mastitis, metritis, pneumonia).
Prevention medicine is not solely the domain and responsibility of veterinarians. Instead, it is achieved through interdisciplinary efforts of veterinarians, animal scientists, nutritionists, animal welfare scientists, mechanical engineers (esp. those working with ventilation), as well as from dairy farm owners, managers, supervisors and employees.

Noticeably, population medicine focusing on preventing risk factors involved also a shift from managing individual animals in emergencies to educating and advising managers and supervisors and training dairy farm employees to prevent health events. This becomes even more important due to the continuously growing average herd size in dairy operations (LeBlanc et al., 2006). Knowledge about biologic systems is necessary but not enough to address issues at dairy operations. A holistic approach understanding the social and economic aspects of dairy production is also necessary. Furthermore, knowledge about automation and precision technologies will be paramount considering their continuously increasing use driven partially by labor scarcity. These precision technologies produce massive amount of data that should be interpreted and used by skilled users to guide interventions (artificial insemination, health screenings, treatments, etc.) The use of data generated by precision technologies provides not only the opportunity to provide early treatment of diseases but also disease prevention by adjusting ration formulations and management practices.

References


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