J. Dairy Sci. 89:1267–1279

Major Advances in Disease Prevention in Dairy Cattle

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ABSTRACT

This paper describes some of the major points of progress and challenges in health management of dairy cattle in the last 25 yr. A selection of the leading contributors in the field is acknowledged. Specific advances in the areas of transition cow management, epidemiology, udder health, applied immunology, housing design, calf health, and health-monitoring tools are described. The greatest advances in dairy health in the last 25 yr have been the shifts to disease prevention, rather than treatment, as well as from focus on individual animals to groups and herds. A fundamental advancement has been recognition of the multifactorial nature of almost all diseases of importance in dairy cattle. Epidemiology has been a critical new tool used to describe and quantify the interconnected risk factors that produce disease. Another major advance has been redefining disease more broadly, to include subclinical conditions (e.g., subclinical mastitis, ketosis, rumen acidosis, and endometritis). This expansion resulted both from improved technology to measure function at the organ level and, just as importantly, from the evolution of the health management paradigm in which any factor that limits animal or herd performance might be considered a component of disease. Links between cattle and people through consideration of environmental or ecosystem health are likely to further expand the concept of disease prevention in the future.

Notable successes are decreases in the incidence of milk fever, clinical respiratory disease in adults, contagious mastitis, and clinical parasitism. There has also been improved protection through vaccination against coliform mastitis and bovine virus diarrhea. Since 1980, average herd size and milk production per cow have increased dramatically. Despite these increased demands on cows' metabolism and humans' management skills, the incidence of most common and important diseases has remained stable. Great progress has been made in understanding the biology of energy metabolism and immune function in transition dairy cows, the time at which the majority of disease occurs. Coupled with an emerging understanding of how best to provide for dairy cows' behavioral needs, transition cow management promises to be the foundation for progress in maintenance and enhancement of the health of dairy cows in the next 25 yr.

Key words: dairy cow, health, preventive medicine, veterinary

INTRODUCTION

Perhaps the single biggest advance in dairy health in the last 25 yr has been the paradigm shift from treatment of clinical illness to disease prevention. Shifts in philosophy, key assumptions, and priorities underlie the specific advances in science and technology. A fundamental advancement has been recognition of the multifactorial nature of almost all diseases of importance in dairy cattle. Epidemiology has been a critical new influence and tool to describe and quantify the interconnected risk factors that produce disease. In turn, health management or production medicine is characterized by an integrated, holistic, proactive, data-based, and economically framed approach to prevention of disease and enhancement of performance. Health management has been defined as the promotion of health, improvement of productivity, and prevention of disease in animals within the economic framework of the owner and industry, while recognizing animal welfare, food safety, public health, and environmental sustainability. Accordingly, disease prevention, considered broadly, is no longer the sole domain of veterinarians. Conversely, to deliver health management and effective disease prevention veterinarians must integrate consideration of nutrition, housing, and whole farm management systems into recommendations of best practices. Veterinarians are therefore evolving from task-oriented providers of therapy to advice-oriented consultants (Figure 1).

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Received June 30, 2005.
Accepted July 5, 2005.
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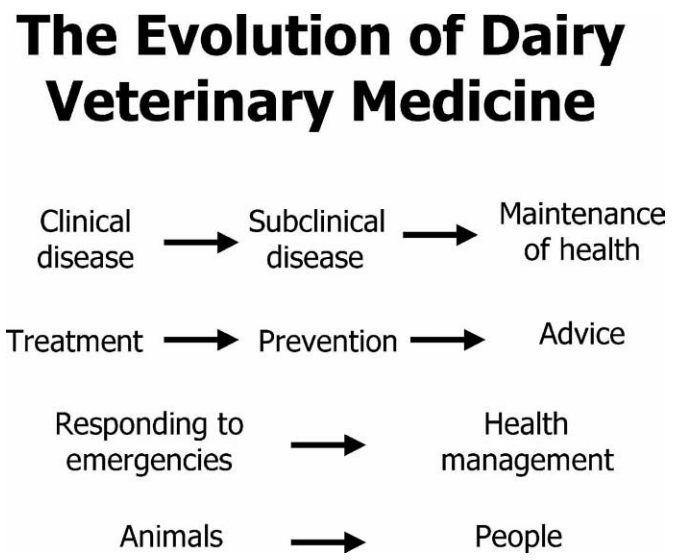

Figure 1. A schematic representation of the evolution of paradigms and practices in dairy cattle veterinary medicine over the last 25 yr.

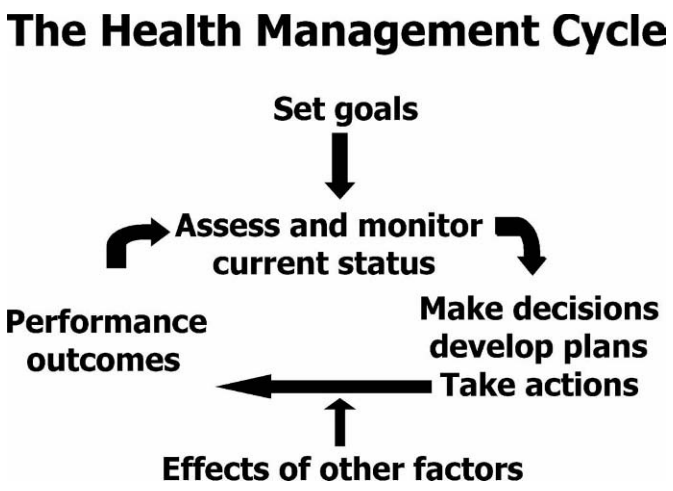

Figure 2. The health management cycle. This conceptual framework can be applied to monitoring and continuous improvement of specific management areas on a dairy farm. Current measures of performance are quantified and compared with internal or external targets or benchmarks. A specific, measurable, and time-defined goal is set, and policies and practices are implemented to achieve the goal. Over time, performance will be affected by other influences or new variables. Actual performance is measured in a planned and systematic way, and a new iteration of the cycle begins. A key point is that the cycle is repeated routinely.

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HISTORICAL PERSPECTIVE

Radostitis has described 4 phases in the development of preventive veterinary medicine. In the late 19th and early 20th centuries, as the profession of veterinary medicine was formalized, a major focus of activity was the eradication of clinical infectious diseases. Examples were the elimination of tuberculosis and brucellosis that were devastating to livestock, threatened the food supply, and had enormous public health significance. In the next phase, starting around 1940, the declining role of the horse for transport and labor shifted attention to food animals. Antibiotics became available, which revolutionized the treatment of common diseases and veterinary practitioners routinely performed successful surgeries, such as caesarean sections. Veterinary service was focused on treating the sick individual animal. This era was a time of unprecedented economic growth in the developed world, creating a constantly expanding demand for food and increased economic value of farm animals, making individual animal treatment profitable, and fuelling huge demand for veterinary services. Disease prevention efforts continued to be directed at eradicating potentially devastating conditions, but vaccination began to be used in parallel; for example, in control of brucellosis. A third phase began in the mid-1960s when efforts began to shift to proactive, rather than reactive, interventions. The major evolution in this era was the recognition of subclinical disease as a limiting factor on productivity. For example, internal parasite burdens could be measured and treated with effective new pharmaceuticals, with noticeable improvements in animal productivity. This period marked the beginning of producers paying for scheduled visits to the farm in the absence of an emergency or a clinically ill animal to be treated. Disease prevention efforts in dairy cattle focused on identification and treatment of infertility and mastitis. Among others, Douglas Blood was a notable leader in advancing dairy veterinary medicine in this period. The fourth phase outlined by Radostitis began in the late 1980s. Herd health programs were well established, and veterinarians increasingly collected quantitative data and analyzed records in an effort to identify production-limiting problems at an early stage. Reproductive management continued to be a fundamental task, but evolved from focus on problems of individual cows to systematic programs to prevent uterine disease and efficiently inseminate nonpregnant cows. Veterinarians sought new analytical skills, including the application of economics to dairy management decision making. The interconnected nature of the components of disease or reduced animal performance was increasingly recognized. Furthermore, there has been integration of other disciplines, notably nutrition, into the health management approach to preventive medicine (Figure 2). To this end, leading veterinarians have pur-