

# Bellwether

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## CPM-Dairy *Software That Brings a New Approach to Dairy Nutrition*

Feed continues to be the major input cost to dairy operations, often approaching 50-60% of the value of milk sold. Indirectly, nutrition influences profits by affecting milk production levels of lactating cows, growth rates of heifers and reproductive efficiency. The Center for Animal Health and Productivity at New Bolton Center has been actively involved in the development of computer software that will control feed cost, promote animal health and production, and help minimize environmental pollutants. The Center for Animal Health and Productivity, in conjunction with Cornell University and the Miner Agricultural Research Institute, Chazy, NY, will be releasing a new dairy ration evaluation and formulation computer program. The new program is called CPM-Dairy in recognition of the collaborative efforts of faculties at the three institutions. At Penn, the development of this program was coordinated by Dr. William Chalupa and Dr. Ray Boston and evolved from concepts



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## *CPM-Dairy: Software That Brings a New Approach to Dairy Nutrition*

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learned in various spreadsheet versions that have been used in the field over the last several years.

CPM-Dairy uses two approaches to evaluate and formulate rations: a modification of the classical National Research Council (NRC) system and the Cornell Net Carbohydrate and Protein system (CNCPS). CNCPS in CPM-Dairy differs from traditional programs by accounting for dynamic attributes of feed ingredients such as passage and digestive rates. Passage rate is the speed at which a feed ingredient leaves the rumen and determines how long it is exposed to the resident microbial population. Digestive rates determine how quickly nutrients are assimilated from feed ingredients. By using these attributes of feed ingredients, rumen function is modeled in a manner that allows for a better estimation of ruminal microbial yields from various feed combinations. The microbial population produced in the rumen is digested further down the GI system and is a vital source of protein, often forming 50% of the cow's total protein requirement. Through this process and along with other metabolic and anatomical adaptations, the cow's digestive system plays a vital role in the conversion of feed ingredients unusable to man into useful products. To feed the cow, the rumen must be fed in a symbiotic fashion so that maximal efficiency can be achieved. CPM-dairy models this process.

To evaluate or formulate a ration, a nutritional consultant will first visibly inspect the feeds to examine their quality and physical characteristics (fiber length). Samples of the feed ingredients are then sent to a forage testing laboratory for analysis of nutrient content. The laboratory results are faxed to the nutritional consultant and are entered into the computer program. The program allows dairy rations to be formulated or evaluated for heifers, dry cows as well as lactating cows. Nutrient requirements are determined by the physiological state of the animal (body weight, milk production level, milk composition,

growth rate) as well as environmental factors (temperature, wind chill, coat matting, etc.). Linear and nonlinear programming are mathematical techniques used in the program to formulate least-cost-rations and ensure that the nutrient requirements of the rumen microbes and cow are met. Thus these methods will identify which ingredients should be fed as well as how much should be feed for each ration.

The program is expected to gain rapid utilization and replace many traditional software programs in the field. The program will continue to capture the economic benefits associated with least cost formulations, but, by modeling the underlying biological process, will allow further economic efficiencies to be gained. The CAHP's Field Investigation Unit is currently using the program to evaluate production and health problems on dairy herds in the Commonwealth. The Production Medicine Program at the 1998 Penn Annual Conference will feature the CPM-Dairy program and provide a hands on training opportunity for practitioners.

CPM-Dairy will be an integral component of other software under development at the CAHP. Ration and manure data from CPM-Dairy can be used in the Dairy Nitrogen Planner, a spreadsheet program developed by Dr. Zhengxia

Dou, Dr. James Ferguson and Dr. Richard Kohn, to help understand the environmental consequence of ration and cropping decisions on nitrogen flows in dairy operations. This Dairy Nitrogen Planner program will help dairy producers develop efficient nutrient management plans to minimize the environmental impact of their production systems. The CPM-Dairy program will also provide the basis for development of dynamic programming approaches to ration formulation. This new approach to ration formulation investigates the economic effects of feeding specific sequences of rations to cows and can be used to capture further economic benefits in terms of seasonal feed prices and feed availability. These methodologies have been used to formulate optimal sequences of rations for dairy heifers and will be applied to investigate feeding strategies in lactating cows.

The CPM-Dairy program is a representative product of the research themes of the Center of Animal Health and Productivity, that is to develop tools and techniques that improve the economic health and viability of animal production systems. ■

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### *Dr. Brinster honored by City*

The American Philosophical Society in Philadelphia was the site of a special ceremony in November. Here Dr. Ralph Brinster was honored by the City of Philadelphia as the recipient of the John Scott Prize. The award, established in the early 19th century by John Scott, a druggist from Edinburgh who provided funds to the City of Philadelphia to present awards to people who had made useful inventions. The first award was presented in 1834. Dr. Brinster was honored "for his pioneering research in transgenesis. The transgenic animals

pioneered by Professor Brinster produce insight into such human genetic disorders as birth defects, cancer and heart disease."

The other honoree was Dr. Frank A. Cotton, a chemistry professor at the University of Texas. Past recipients of the prize have included innovators and scientists such as Mme. Currie, Thomas Edison, the Wright brothers, Edwin Land, Jonas Salk, Guglielmo Marconi and many others selected to follow John Scott's wish of honoring "ingenious men or women who make useful inventions."