THE FUTURE OF DAIRY CATTLE BREEDING

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Abstract:

Before the twentieth century, any improvement in the performance of livestock was merely through phenotypic selection. During the twentieth century significant achievements were made in selecting animals to improve performance. Major breakthroughs that have led to the genetic improvement of dairy cows include: The development of performance testing stations, mating systems, breeding strategies, economic indices, advanced statistical models, discovery of the structure of DNA, recombinant DNA technologies, marker aided selection, and more importantly, the advancements made in computer technology. Most breeding strategies in the past were focused on increasing milk volume and milk components. Breeding strategies that were based on increased production have helped towards meeting the increasing demand for higher volumes of cheaper milk. However, these strategies ignored traits that were not thought to directly influence milk production. More recently many traits of economic importance have gained attentions that were previously absent from the selection criteria, such as health and reproduction. Cows of the future must be efficient in production while simultaneously enjoying better welfare conditions. That is, conditions that are environmentally friendly, produce less greenhouse gas emissions, and are capable of producing competitive volumes of milk. Trailblazing breeding companies use cutting-edge, advanced genetic evaluation and reproduction technologies to secure higher shares of today's highly competitive market. Selection criteria have always been changing and will continue to change to meet the demands of the changing market. Four main components of genetic gain, namely selection intensity, accuracy of evaluation, genetic variation and generation interval will experience radical changes in the foreseeable future. Genomic evaluation is becoming increasingly cheaper; meaning a higher number of animals will be candidates for selection. Animals will be more accurately evaluated at a much younger age. Better knowledge of the genetic structure of populations will help in conserving genetic variation, even creating new variation. All of these factors will result in much faster genetic improvements. Many traits that have traditionally been measured at later stages of an animal's life will be evaluated before the animal reaches sexual maturity. While many of these advances are now in place to varying extents, it will not be far from reality to think of introducing meiosis during embryonic stages which will reduce generation interval significantly. At some point in the future the “cows” will not be evaluated at the farm level. They will be genomically tested during early embryonic stages and those who are selected will go into meiosis to produce laboratory “progeny”. After several test tube “generations” the final products will go to the farm for performance testing and commercial use. If history has taught us anything, it is that it's not a question of “if” this will happen; it is a question of “when”.