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Opinion Article

Role of Genetics in Improved Traits of Livestock

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DESCRIPTION

Quantitative genetics and animal breeding have traditionally been used to achieve livestock genetic improvement. Genetic selection, augmented by artificial insemination, has increased milk production in dairy cattle by 100 pounds per cow annually. In the last ten years, gene and quantitative trait mapping has made significant progress, which means that traditional approaches to animal breeding as well as more recent methods for marker-assisted selection will be able to continue livestock genetic improvement. Additionally, new avenues for genetic improvement in production animals have been opened up by modern biotechnology.

The rationale for genetically engineering livestock for agricultural purposes has been to produce animals with altered traits like disease resistance, wool growth, body growth, or milk composition for the 15 years since the first transgenic farm animals were produced. The majority of the time, the goal was either to change traits for better production efficiency or to change the properties of the animal product, like wool or milk, so there were more ways to make it. The majority of transgenes introduced into livestock species are gene constructs, which are made to alter body composition and express various growth factors either directly or indirectly. Although other constructs based on the release of Growth Hormone (GH) and Insulin-like Growth Factor-I (IGF-I) have also been utilized, the majority of these transgenes expressed Growth Hormone (GH). Pigs and sheep that expressed these constructs generally weighed less and used less feed. However, they also experienced a number of complications, including joint issues, as a result of high, unregulated levels of GH in their blood, requiring strict hormone regulation. Two research groups recently presented preliminary data on the development of GH and IGF-I transgenic pigs with improved growth- and performance-related characteristics.

The fact that the desired effects on growth and body composition traits were achieved without apparent abnormalities in both experiments suggests that swine breeders might one day have access to useful animals. Additionally, GH-transgenic fish with potential utility have been produced; however, biological containment of the transgene in species with existing wild fish populations is a major concern. Numerous mammals' milk protein genes have been cloned. The advertiser components from specific milk-protein qualities from at least one animal varieties have been utilized to work with articulation of transgenes in the mammary organs of mice, sheep, goats, dairy cattle, bunnies and pigs. Although their expression levels can vary, these transgenes are developmentally correct. Either the production and recovery of pharmaceutically useful, biologically relevant active proteins or research into the function of the promoter have been the primary focuses of research into the targeting of transgene expression to the mammary gland of farm animals.

In an effort to separate high-value pharmaceutical proteins from milk, a number of private companies have produced transgenic cows, sheep, goats, and pigs that target transgenic expression to the mammary gland. However, adding a new gene or altering an existing gene makes it possible to use transgenesis for agricultural purposes, such as altering the properties and composition of milk and the milk protein system's functional properties. We have developed transgenic mice whose milk contains either human lysozyme or modified bovine casein, a protein used in cheese making and other industrial applications. Consequently, we have measured changes in the mouse milk protein system's physical and functional properties, including smaller micelles and stronger gels. The production of human lysozyme in the milk of transgenic mice increased the milk's antimicrobial properties as well. This could help cows avoid infections in the mammary gland and possibly get rid of undesirable pathogens in the gut of humans who consume the milk.

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