

Hi-Tech Bovine Genomics Tool



Consumers want high-quality, tender, juicy beef, and the freshest, tastiest dairy products. But how do they get it? It's not something done at the processing plant or the supermarket; cattle must be born with many of these qualities.

ARS researchers in Maryland and Nebraska are developing more efficient ways to ensure cattle have the desired traits to meet consumer demands. To do this, they are using more precise techniques to look at a cattle's genetic makeup based on DNA markers.

Using the same BeadChip technology—a glass slide containing thousands of DNA markers—that was used in deciphering the human genome, ARS scientists worked with University of Missouri professors and Illumina, Inc., a San Diego firm that manufactures BeadChip, to design a chip for genomics-based studies on dairy cattle. The researchers developed a new genomic method—called genome-enhanced improvement—to identify bulls that produce offspring with optimum milk production and other traits.

The BeadChip can be used to specifically characterize single DNA markers in over 50,000 locations distributed across the bovine genome. The researchers have used this tool to examine DNA from more than 700,000 cows and bulls representing several commercial dairy and beef breeds, as well as ARS cattle populations. The information is being used to connect DNA data to traits of interest, such as milk, fat and protein production. Eventually, information from the markers will help beef producers streamline their breeding efforts. This technology has revolutionized dairy breeding efforts, and should ultimately help make the U.S. breeding industry more globally competitive.

ARS researchers worked with Illumina to commercialize this new high-tech tool, called the BovineSNP50. Since its inception in early 2008, sales of the BovineSNP50 have more than topped \$100 million.

The research was so intriguing and valuable to scientists worldwide that the researchers formed the CGC—Cattle Genomics Consortium—to continue sharing and exploring genetic data generated using BeadChip. ARS scientists have also developed other SNP tools—including the BovineHD, Bovine3K and BovineLD. By designing tools with different numbers of markers, producers have the flexibility of using the chip that best fits their need. This technology is also being used to identify genetically important traits in sheep, pigs, and plants.

This technology supports U.S. sustainable agricultural production and the USDA Secretary's global food security priorities.

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