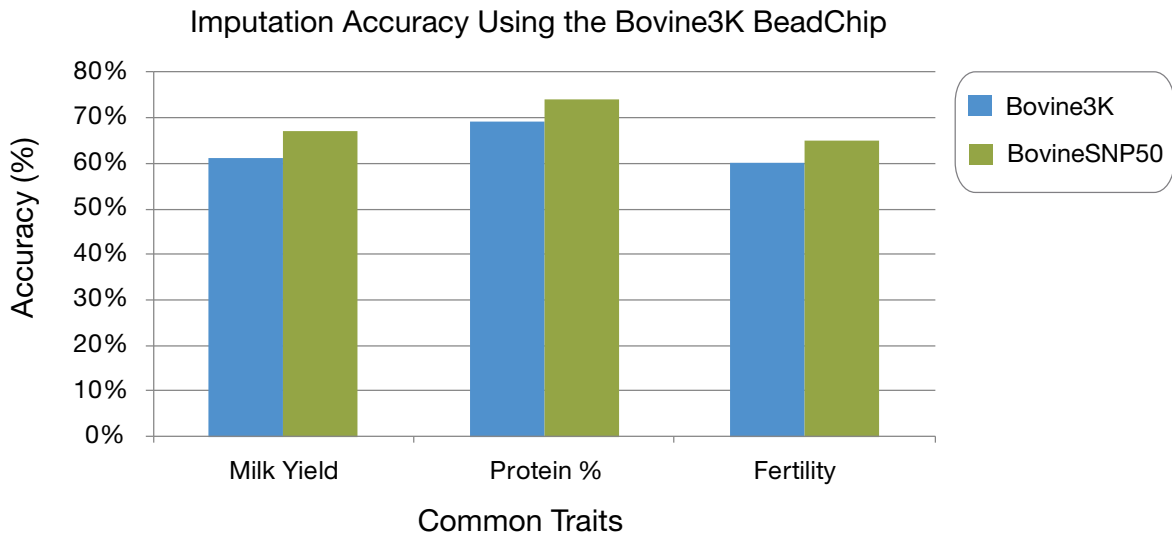


Figure 2: Bovine3K BeadChip Imputation Accuracy



Phenotypes were predicted based upon genotypes using SNP content from the Bovine3K and BovineSNP50 BeadChips. The accuracy of those predictions is shown for each BeadChip. Relative to the BovineSNP50, the Bovine3K generated 80–90% prediction accuracy, demonstrating its effectiveness for evaluating of genetic merit.

High call rates and accurate genotype calls are important for successful imputation studies. Illumina ensures that every Bovine3K BeadChip offers > 99% average call rate across common beef and dairy cattle breeds (Table 1).

Assay Workflow

GoldenGate technology uses IllumiCodes, unique 23-bp single-stranded DNA oligos, to correctly identify each DNA sample as well as the loci being interrogated³ (Figure 3). During sample preparation, primers containing IllumiCodes and universal primer sites are hybridized directly to the genomic DNA. Since the IllumiCodes are discrete within the well, each allele can be independently examined during downstream analysis. Unbound genomic DNA is removed and only hybridized DNA is amplified and labeled with fluorescent dyes.

The resulting fluorescently labeled PCR products are hybridized to a Universal BeadChip. The BeadChip contains randomly assembled universal beads, each displaying an IllumiCode corresponding to a specific locus. DNA will bind to the bead containing the complementary IllumiCode. Unbound DNA is removed and the bound DNA with fluorescence signal provides the individual SNP genotype readout.

Table 1: Bovine3K BeadChip Performance and Specifications

Parameter	Results	Product Specification
Average Call Rate*	99.8%	> 99%
Reproducibility	100%	> 99.9%
Mendelian Inconsistencies	< 0.1%	< 0.1%

* Based on genotype results from HapMap samples.

This information is then analyzed for automated genotype clustering and calling. The entire assay can be completed in only three days with convenient stop times incorporated into the process.

Illumina Solutions for Genotyping

The Bovine3K BeadChip is compatible with the BeadArray™ Reader, iScan, and HiScan™SQ systems. These cutting-edge array scanners feature high-performance lasers and powerful optical systems that enable rapid scan times and precise assay detection. The HiScanSQ system can also perform Illumina sequencing by synthesis chemistry, the world's most widely adopted next-generation sequencing platform.

Illumina's convenient modular design enables researchers to easily build out the system for evolving research needs. An optional Laboratory Information Management System (LIMS) is available to accurately and efficiently track samples. Robotic automation capabilities can be added to improve throughput for labs processing large numbers of samples. With the GoldenGate assay workflow, data are processed directly by Illumina's GenomeStudio® software to provide streamlined genotype calling, analysis, and reporting. Researchers can also choose to use Illumina's expert FastTrack Genotyping service to have samples genotyped and data delivered in a format suitable for downstream analysis.

Product Summary

Developed through a collaboration between Illumina and USDA-ARS, the Bovine3K BeadChip features 2,900 strategically selected SNPs that span the bovine genome, providing a high capacity to predict genetic merit for a number of important traits. This 32-sample BeadChip, along with the proven GoldenGate assay, presents a cost-effective, high-throughput solution for accurate genetic analysis in many breeds of beef and dairy cattle.

