African American Admixture Panel

Targeted multi-sample genotyping panel from Illumina delivers high-quality data and is a powerful tool for conducting admixture mapping studies.

Highlights of the African American Admixture Panel

- **High-Quality Data:**
  Proven GoldenGate® technology
- **Targeted Content:**
  Powerful method to detect disease susceptibility loci
- **High Throughput:**
  Quick and efficient assay of 96 samples simultaneously

Figure 1: African American Asmixture Panels are Deployed in Multi-Sample Sentrix Array Matrix Format

Admixture mapping experiments are facilitated by high-throughput sample analysis. Marker panels are deployed on a 96-sample Sentrix® Array Matrix.

Introduction

Admixture mapping can be a powerful method for identifying genomic regions harboring common disease susceptibility loci in recently mixed populations. The Illumina African American Admixture Panel contains 1,509 SNPs for admixture mapping studies in African American populations. This specialized content was developed and validated in collaboration with Dr. David Reich at Harvard Medical School and the Broad Institute of MIT and Harvard.

Admixture mapping requires a genome-wide panel of markers that can differentiate chromosomal segments in admixed individuals by their ancestral origins. African American populations are of particular interest for admixture mapping studies due to the recent mixture of African and European populations. There have been an average of six generations since African and European populations intermixed after relocation into North America. Thus, there has been relatively little recombination between African- and European-derived chromosomes in African American populations. This low amount of recombination has yielded chromosomal segments of either European or African ancestry that are typically tens of megabases long (average ~17cM1). The Illumina African American Admixture Panel enables a highly-efficient scan across the entire genome for genetic disease risk factors using a minimum number of markers. By targeting markers to these large single-ancestry derived chromosomal segments, only relevant variance in the admixed population is interrogated. By specifically targeting variation between European and African chromosomes, relatively few markers provide the same power as hundreds-fold more randomly chosen SNPs. Consequently, many more samples can be analyzed with an intelligently targeted genotyping panel at much lower cost.

Admixture Mapping With a Targeted Genotyping Panel

The Illumina African American Admixture Panel facilitates detection of susceptibility loci of genetic variants that differ in frequency between ancestral African and European populations. Population admixture events between previously geographically separated populations, such as occurred between African and European populations in America, introduce new linkage disequilibrium (LD). Samples from disease cases can be genotyped and compared to find regions of the genome where the proportion of African ancestry is different from the genome-wide average. Regions with African ancestry deviating from average are likely to contain genetic variants associated with disease. Finding a disease-associated region with this panel allows more in-depth focused studies aimed at uncovering direct causes. Illumina iSelect™ Infinium® Custom Genotyping Panels and sequencing using Illumina Genome Analyzer powered by Solexa® Technology are both excellent options for subsequent fine-mapping.

Association studies using Illumina panels based on GoldenGate Assay technology allow for broad genomic screening, and are highly efficient due to the rationally targeted SNP marker selection. A streamlined panel of 1,509 targeted loci yields approximately 75% of the power for admixture mapping, as would be expected with 300,000–1,000,000 loci required for dense non-specific whole-genome scans. Furthermore, efficiency is greatly enhanced by using the high-throughput multi-sample Sentrix Array Matrix format, which permits 96 simultaneous assays.

Admixture mapping is a useful method to study diseases that differ in frequency between different populations. Diseases where African American admixture mapping is anticipated to be effective include prostate cancer[2,3], Type-II diabetes, autoimmune diseases (e.g. multiple sclerosis[4]), hypertension[5], asthma[6], and obesity[7]. Earlier ver-

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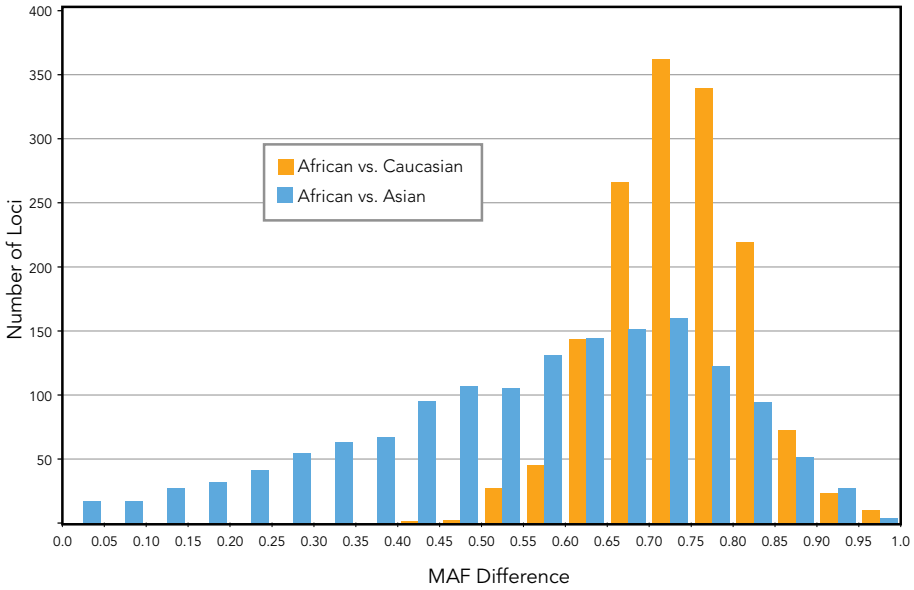
Figure 2: Markers Target High Inter-Population Variability



The SNPs on the African American Admixture Panel show high minor allele frequency differences between African and Caucasian (orange) or Asian (blue) populations, ideal for admixture mapping.

sions of the panel have allowed researchers to successfully localize genes associated with multiple sclerosis[4], prostate cancer[2], and serum markers of inflammation[9]. For example, a strong association between a 3.8Mb chromosomal region (8q24) and susceptibility to prostate cancer in African Americans was recently found using an earlier version of this panel[2].

Targeted Content

The optimal set of loci for admixture mapping are those with high frequency differences between African and European populations (Figure 2). This African American Admixture Panel was designed using a multi-step selection process. Millions of SNP loci across the genome were screened bioinformatically to determine those most likely to provide ancestry information in African American populations[8]. The resulting thousands of SNP loci in several African and European populations were then screened and verified using the Illumina GoldenGate Assay. SNPs failing Hardy-Weinberg equilibrium testing (P >0.01) were eliminated. This optimized set of markers detects a majority of the variation differentiating African and European chromosomal segments.

High-Quality Data

The African American Admixture Panel was subjected to rigorous functional testing to ensure high-quality, reproducible data. Samples derived from each of three HapMap population groups (Caucasian, Asian, and African) exhibited call rates greater than 99.8%, with 100% reproducibility across 15 replicates and 60 triplicates (Table 1).

Illumina Solutions for Genotyping

The high quality and low cost per genotype of the African American Admixture Panel are made possible by powerful Illumina technologies that include the GoldenGate Assay with multi-sample Sentrix Array Matrix format. Illumina genotyping solutions enable linkage and association mapping, as well as high-resolution, genome-wide scans of greater than 1,000,000 markers per BeadChip. Illumina genotyping panels with standard or custom content can be accessed via Fast-Track Genotyping Services or with an Illumina System. The combination of Illumina's proprietary assay technologies and intelligent content selection delivers the most comprehensive DNA analysis solutions now available.

Table 1: African American Admixture Panel Data Quality (285 Samples, 15 Replicates, 60 Triplicates)

Population	AVG MAF (LOCI)	Call Rate	AVG HET (DNA)	Reproducibility	Heritability
Caucasian (CEU)	11.92%	99.89%	19.46%		
Asian (JPT+CHB)	23.49%	99.92%	30.66%		
African (YOR)	14.32%	99.86%	22.87%		
Overall		99.89%		100%	100%

Ordering Information

Catalog No.	Product	Description
GT-17-230	African American Admixture Panel	One oligo pool (OPA) for 1,509 SNP loci. Sufficient for 96 DNA samples.
GT-95-201	Single Use Activiation Kit (576 Samples)	Used in combination with the GoldenGate Assay Kit. Contains regents for six 96-well plates.
GT-95-205	GoldenGate Assay Kit II with UDG (96 Samples)	Sufficient reagent for preparing genotyping reactions for 96 DNA samples. Contains UDG enzymes for contamination control.
FA-12-112	Sentrix Universal-96 Array Matrix (1536-plex)	A single Sentrix Array Matrix that can process 96 samples with up to 1536 assays/sample.

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Additional Information

Visit our website or contact us at the address below to learn more about Illumina DNA Analysis solutions.

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