

Axiom Chicken Genotyping Array

High-density array for genotyping layers and broilers across multiple breeds

The Applied Biosystems™ Axiom™ Chicken Genotyping Array is the first commercially available high-density chicken genotyping array. This array includes hundreds of thousands of polymorphic markers that are present in commercial layer and broiler chickens as well as outbred noncommercial populations.

Highlights

- Only chicken genotyping array openly available as a catalog product, allowing effective data sharing
- Enables variation detection both within and between poultry breeds in broilers, white egg layers, brown egg layers, and outbred noncommercial breeds
- 580,961 highly polymorphic genetic variants chosen from a screening of 1.8 million markers
- Designed in collaboration with leading academic institutions and commercial poultry companies that include The Roslin Institute, Aviagen Ltd, Hy-Line International, and the German Synbreed project

Wide range of applications

The Axiom Chicken Genotyping Array can be used for predicting breeding values in both layers and broilers, for genome-wide association studies, high-resolution genetic mapping, Mendelian trait mapping, and selection signature analysis. The parental high-density information from the array can be used to make decisions on breeding poultry to gain incremental improvements in feed conversion ratio, growth rate, saleable eggs, white meat yield, and understanding inheritance traits across and within multiple breeds. The Axiom Chicken Genotyping Array also contains markers associated with wild outbred lines that can be useful in conducting functional research studies, and observing phenotypic effects across outbred and

crossbred lines for better management of indigenous chickens as well as for studying genetic diversity among populations.

Maximum coverage of genetic diversity

SNP discovery was carried out by resequencing 243 chickens from 24 lines representing both elite commercial and experimental lines (Table 1). Sequencing data was aligned to the reference genome Gallus_gallus-4.0.

Array design

The SNPs discovered through resequencing were genotype-tested on the Applied Biosystems™ Axiom™ genotyping platform by screening 1.8 million SNPs across 300 samples that included 186 commercial lines, wild out-group samples, and 32 parent-offspring trios for Mendelian inheritance.

Table 1. Description of sequenced individuals.

| Breed | Type | Breed description (number of breeds) | Number of individuals per breed |
|----------------|---------|--------------------------------------|------------------------------------|
| Aviagen | Broiler | Commercial (4) | 10 |
| HyLine | Layer | Commercial (8) | 10 |
| Synbreed | Layer | Commercial (3) | 3 from one line, 15 from two lines |
| IAH Line | Layer | Inbred experimental (8) | 10 |
| J. Line Roslin | Layer | Nonselected, experimental (1) | 10 |

Markers were selected for inclusion on the Axiom Chicken Genotyping Array based on the following criteria:

- Markers exhibited a range of minor allele frequencies to ensure representation of both rare and common variants
- Markers were uniformly distributed across the genome in layers and broilers
- Greater than 98% call rate across tested samples
- Markers exhibited Mendelian inheritance; highly polymorphic markers were prioritized
- Annotation information was available for defining the effect of the selected variants

Principal component analysis (PCA) shows that markers for layers, broilers, and out-group lines can group the closely related individuals, demonstrating the success of SNP selection criteria (Figure 1).

Superior performance

The Axiom Chicken Genotyping Array is part of the Applied Biosystems™ Axiom™ Genotyping Solution, which generates robust and reliable genotypes with minimal user intervention while helping to reduce costs and processing complexity. Three hundred customer samples representing commercial and experimental lines were genotyped on the array. The samples were prepared manually and processed on the Applied Biosystems™ GeneTitan™ Multi-Channel (MC) Instrument. Array performance was measured

across 559,249 SNPs. The SNPs were filtered as per the Best Practice Supplement to Axiom Genotyping Solution Data Analysis (P/N 703083). The results are summarized in Table 2.

Sample types supported

- Blood on FTA™ cards
- Blood

Genomics presentation

Gheyas AA et al. (2012) Development and characterization of a high-density SNP genotyping assay for the chicken. The Roslin Institute, University of Edinburgh. Poster presentation at the Plant and Animal Genome Conference, San Diego, CA, USA.

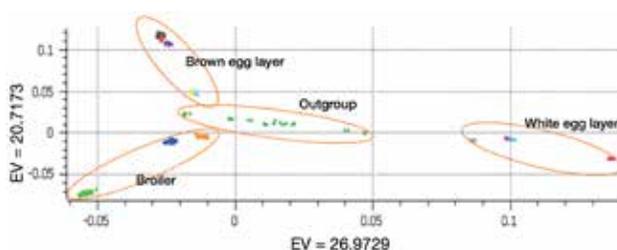


Figure 1. PCA analysis of markers showing closely related individuals grouped together.

Table 2. Genotyping performance on commercial samples.

| Metric | Specification | Customer sample performance |
|---------------------------|---------------|-----------------------------|
| Sample pass rate | >95% | 98.03% |
| Average sample call rate | >98% | 99.79% |
| Reproducibility | >99% | 99.91% |
| Autosomal Mendelian error | <0.3% | 0.1% |

Ordering information

| Product | Description | Cat. No. |
|---------------------------------|--|----------|
| Axiom Genome-Wide Chicken Array | Contains one 96-array plate; reagents and GeneTitan Multi-Channel Instrument consumables sold separately | 902148 |
| Axiom GeneTitan Consumables Kit | Contains all GeneTitan Multi-Channel Instrument consumables required to process one Axiom array plate | 901606 |
| Axiom 2.0 Reagent Kit | Includes all reagents (except isopropanol) for processing 96 DNA samples | 901758 |

Find out more at thermofisher.com/microarrays