Short Written Texts (Industry Publications)

Hardiman, John. ***'Route to greater speed and accuracy in breed progress'.*** *Cobb Focus* (2006) *(p. 6).*


COBB FOCUS

Enhanced hybrid vigor benefits breeder and broiler

Route to greater speed and accuracy in breed progress

The word 'genomics' has become part of the language of animal and plant breeders. But what does it mean for the poultry industry? The leading UK journal ***Poultry World*** *asked Cobb to explain the word to its readers.* ***JOHN HARDIMAN*** *(right), vice president of research and development, compiled the answers to the magazine's questions with the help of* ***ALBERT PASZEK****, director of biotechnology, and* ***RON OKIMOTO****, molecular geneticist.*

Q **What is genomics?**

A It is a science of the genome, the genetic make-up of all living beings. The overall aim of genomics is to discover more about the structure and organization of the genome, and how this relates to differences we see in birds, animals and plants - the phenotypic traits.

Q **The mapping of the chicken genome is hailed as a major advance. What does this mean for you as a poultry breeder?**

A The mapping of the chicken genome aims to identify specific elements of the genome that control individual phenotypic traits. Mapping projects identify specific sequences of DNA (genes) or DNA markers linked to individual genes or regions of genes that control aspects of phenotype.

Genetic mapping enables associations to be found between specific parts of the genome structure and how the bird or animal functions - and how gene variants lead to phenotypic differences. Knowledge of the chicken genome structure enables individual genes to be identified and associations with DNA markers discovered. Effective use of DNA markers in breeding depends on that knowledge.

This identification of specific genes and/or DNA markers provides new and unique information for poultry breeders. Breeders can determine the genetic make-up of single birds with particular gene/marker genotypes and include this information in existing selection methods based on assessing genetic potential with conventional quantitative tools and predicting breeding values by BLUP (best linear unbiased prediction) methods. This enables selections to be made directly on genetic factors controlling variation of traits, achieving a greater accuracy and certainty.

Q **Which parts of the genome are your particular targets at this time?**

A Cobb is focused on improving quantitative traits with economic value for broiler producers and processors. Improvement targets include growth and conformation, performance traits and poultry health. Birds with superior growth rate, muscle yield, skeletal conformation, feed efficiency and health are selected as breeders for subsequent generations. We fund multiple projects aimed at discovering specific genes and genomic regions that control these phenotypic differences. The Biotech Program at Cobb is developing applied selection tools for chicken lines using SNP (Single Nucleotide Polymorphism) markers linked to selection traits. Biotech-based tools and methods are evaluated by us for improving genetic components of disease resistance.

BIOLOGY TEXTS

Short Written Texts (Industry Publications)

Hardiman, John. ***'Route to greater speed and accuracy in breed progress'.***
Cobb Focus (2006) *(pp. 6 & 7).*


COBB FOCUS

Enhanced hybrid vigor benefits breeder and broiler

Q **How much emphasis do you place on welfare as well as performance traits?**

A In short, equal. Only birds with adequate body conformation and physiology for healthy movement and life functions can achieve sustainable production performance. We are also studying environmental and nutritional factors affecting bird well-being and performance; this is essential with Cobb products increasingly used in countries with different nutrient sources and environmental conditions from those in North America. Full alignment of chicken genetics with production management and environment is the only guarantor of chicken well-being and sustainable production performance.

Q **How much easier is it now to make significant advances?**

A The work is in progress and therefore, precise assessment of reaching significant advances with genomic methods is still to be done. We currently collect more phenotypic measurements for our lines than ever before. The data for new conformation traits is, for example, collected with help of x-ray scanning technology and used in BLUP-based selection system. Phenotypic data and DNA samples are collected for tailoring genomic tests to specific genetic lines. Application of genomic tests is expected to provide significant help with genetic improvement for traits difficult and costly to measure.

Sequencing of the chicken genome provides new tools for poultry breeders. Before the chicken genome was sequenced, there were about 2000 DNA markers on the chicken linkage map. The current map for the chicken genome includes about three million DNA markers and accelerates discovery.

Q **How soon will these advances be seen in parent stock and at the commercial level?**

A We expect to see new advances in Cobb parent stock within five years, with an additional two years to allow assessment at the commercial level.

How do new selection methods compare with traditional breeding methods?

Traditional breeding methods rely entirely on quantitative tools dominated by BLUP-based computation of data collected for phenotypic traits and predicting breeding values of birds in pedigreed populations as the basis for selection. Genetic improvement of pedigreed chicken lines produced by selection decisions is transferred via selected animals into non-pedigreed grandparent and parent populations and ultimately to the broilers.

Some limitations of traditional breeding methods include the following:

- Quality of selection decisions depends on quality of collected trait data.
- Routine and objective collection of data for some bird traits is not possible and/or it requires sacrificing of birds, eliminating them from the genetic improvement program.
- It is difficult or impossible to separate selection effects for tightly correlated traits, such as feed conversion and correct fat content.
- Predicting breeding values is limited to birds in pedigreed populations.
- Breeding values predict make-up of chicken genetic potential - but do not provide definitive and repeatable evidence of such make-up.

By contrast, genomic tools provide just this evidence from routine laboratory DNA analysis of a single drop of blood. In addition these tools:

- Permit selection for specific components of the chicken genome with greater accuracy, speed and uniformity.
- Provide ability to separate closely related traits.
- Achieve greater uniformity of non-pedigreed generations with objective measures based on actual bird genotypes.

A further significant benefit is in providing objective assessment of genetic make-up and potential for individual birds from multiple generations of the breeding and production - so enabling full traceability of all chicken generations.