
Genetic Cartography—

Drawing the Chicken Genome Map

Imagine taking a trip and creating the roadmap as you travel. That's exactly what ARS scientists at the Avian Disease and Oncology Laboratory are doing as they draw the genetic map of the domestic chicken.

SCOTT BAUER

Geneticist Hans Cheng is the lead ARS navigator on a project aimed at identifying key genes in the chicken genome.

The project began in 1991 under the direction of Lyman Crittenden, an ARS Hall of Fame scientist who is now retired, in conjunction with molecular biologist Jerry Dodgson at Michigan State University in East Lansing. The goal is to improve the genetic stock of domestic chickens for both scientific and commercial purposes.

"It's a lot like constructing a roadmap," says Cheng. "We are getting directions to our destination and leaving mile markers along the way."

The work is based on the genetic pool of 400 chicks that was developed from a cross made in the early 1990's between a domestic egg-laying chicken and a wild relative.

"It is easier to mark genetic differences between more diverse individuals," says Cheng.

DNA extracted from the blood of 52 of those birds forms the basis of the East Lansing Reference Family and is being used to make the map. A reference family is information on a genetic pool that is used as a base point to compare new genetic information.

The DNA of those birds lives on in the vials stored in Cheng's laboratory and at others around the world where related research is under way. In England, Nat Bumstead developed a similar cross

humans are different. But much of the genetic material has traveled very similarly during the evolution of both species. By using what is known about the location of certain types of genes in the human, where the information is more advanced, we can get a better idea of where to look for some traits in the chicken."

Eugene Smith, an ARS chemist, leads this effort on development of a so-called comparative map by aligning the chicken genome to the human genome.

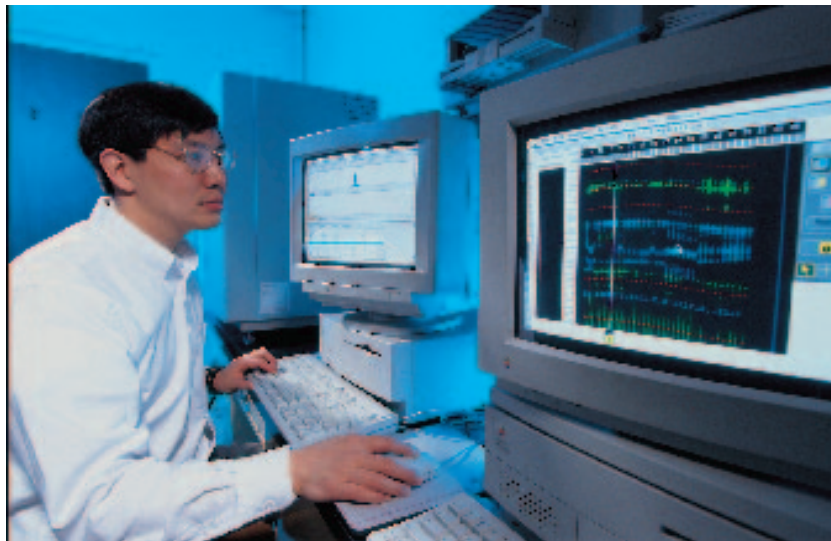
ARS scientists are still building the basic outline of the chicken genome by identifying markers along the

DNA strands that make up the genetic highway of the chicken. Each strand consists of many building blocks, called bases, that are arranged like beads on a string. Embedded in the DNA strands are repeated sequences called microsatellites. Scientists use these microsatellites to zero in on gene sites for a particular trait.

"If I see the same genes or markers together every time, it allows me to say how close the different genes are—that they

interconnect. That's why it's important to have as many markers as possible. We can then see a map of the genome."—By **Dawn Lyons-Johnson, ARS.**

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Geneticist Hans Cheng analyzes information for genetic mapping of chickens using an automatic DNA sequencer. (K7299-11)

between domestic birds, and DNA's of his Compton Reference Family have likewise been distributed. An international consortium of labs is mapping both the East Lansing and Compton Reference Families.

The researchers are also using information gleaned from the multiagency human genome project to help locate genes in the chicken.

"It's a reference tool," says Cheng. "Of course, chickens and