



Earlobe colour in chickens is one of those traits that isn't fully understood. Some Rhode Island Red (RIR) hens have red earlobes whilst others have white ones. Until recently, it wasn't known why. A Chinese study* sheds light on this.

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How did the researchers study this?

The team studied 78 RIR hens at 20 weeks of age. There were 48 hens with predominantly white earlobes and 30 with predominantly red earlobes. They chose to study only hens because they noticed something important: whilst males in this breed nearly always had red earlobes, females showed much more variation. This suggested the trait might be sex-linked.

Using a modern genetic technique called genome-wide association study (GWAS), they examined over 370.000 genetic markers across the entire genome. Think of these markers as signposts along the chromosomes that help identify which regions are different between the white-earlobed and red-earlobed birds.

What was found?

The results were quite clear: they identified a specific region on the Z chromosome that was strongly associated with earlobe colour. This region contains 23 genes.

The most interesting candidate gene they identified is called *SLCO4C1*. This gene belongs to a family that transports various compounds around the body. The researchers suggest it might be particularly important because similar genes are known to transport biliverdin, a pigment involved in creating blue eggshells.

In practice, breeders believe that there is a relationship between earlobe and eggshell colour. This may be due to some genes that determine both characteristics being closely located on the chromosome, or due to a single factor controlling the pigmentation of both the eggshell and the earlobe.

Why?

- Location matters: The significant genetic markers weren't scattered randomly across the genome, they were all clustered together in one region on the Z chromosome, forming what geneticists call a 'haplotype block'. This clustering suggests a real genetic effect rather than chance.

- Sex-linkage explains the pattern: Because the key region is on the Z chromosome, males and females inherit it differently. This also explains why cocks show red earlobes (is dominant) and hens show more variation.

A hen with a single copy of the white earlobe variant will show white earlobes. A cock, however, would need two copies of the white earlobe variant to show white earlobes, which is (obviously) much less common.

- The trait is polygenic: Although one region showed a very strong effect, the researchers also found four other chromosomal regions with smaller effects. This means earlobe colour isn't controlled by a single gene but by multiple genes working together, with the Z chromosome having the largest influence.
- Biological plausibility: The SLCO4C1 gene's known function in transporting compounds fits with what we know about how colours are deposited in chicken tissues. White earlobes result from purine (a type of molecule) deposition, whilst red earlobes reflect the same pigments as the rest of the face.

What does this mean for breeders?

The fact that earlobe colour in RIRs is primarily sex-linked and polygenic has practical implications.

This explains why it is not always possible to predict the earlobe colour of offspring based on the parents alone. The trait depends on multiple genetic factors, with the most important being passed on differently to sons and daughters.

This also confirms what breeders have long suspected: that there is indeed a genetic connection between earlobe and eggshell colour in some cases, possibly through similar pigment transport mechanisms.

So.....

While there is still no simple genetic test for earlobe colour, this research has laid the groundwork for a better understanding of the biological basis of the trait. It shows that even traits that we consider 'simple' can be rather complex when we look at the underlying genetics.

In this study, they used Rhode Island Reds because all chicken breeds are... chickens, the story about white and red ears also applies to other breeds of... chickens.

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Genetics of the extremes (all other genes apart from feather colours): <https://www.chickencolours.com/index.php/genetics-of-chicken-extremes-book/>

*) Genome-wide association study revealed genomic regions related to white/red earlobe color trait in the Rhode Island Red chickens,

DOI 10.1186/s12863-016-0422-1 <https://bmcbiomedcentral.com/articles/10.1186/s12863-016-0422-1>

**) Warren DC. Inheritance of earlobe color in poultry, 1928.



*Doornikse bantam
with a mixed white
and red ear.*