

The genealogy of important broiler ancestor revealed

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Adult females of the HWS and LWS body weight selected White Plymouth Rock lines. Credit: Christa F. Honaker

A new study examines the historical and genetic origins of the White Plymouth Rock chicken, an important contributor to today's meat

chickens (broilers). Researchers at Uppsala University in Sweden, The Livestock Conservancy and Virginia Tech in the USA have used genomics to study breed formation and the roots of modern broilers.

The mid-19th century was an era of excitement among poultry breeders. Newly imported chickens from Asia were crossed with American landrace chickens and specialty breeds from Europe to establish new breeds and varieties that were standardized by the American Poultry Association beginning in 1873. With contributions by multiple breeders using different strategies, histories of these American breeds are sometimes unclear or inconsistent.

Two well-known lines of chickens developed at Virginia Tech represented the White Plymouth Rock. The HWS and LWS lines have been selected since 1957 for high and low body weights, respectively, and are considered representative of the White Plymouth Rock [breed](#) as of the mid-20th century in the USA. The research team sequenced DNA from HWS, LWS, and the eight breeds generally considered to have been used to develop the White Plymouth Rock. They then ascertained the percentage of [genetic contribution](#) made by each of the founding breeds. Furthermore, by measuring each breed's [contribution](#) to individual [chromosomes](#), they were able to determine contribution to specific traits on those chromosomes. Contributions to the male and female chromosomes shed further light on the breed history.

The results confirmed that the Dominique, a very old American breed, was the major contributor to the Plymouth Rock. Dominique, Black Java, and Cochin breeds contributed to the maternal ancestry, while contributions on the male ancestry included Black Java, Cochin, Langshan, Light Brahma, and Black Minorca. Perhaps surprisingly, the proportional contribution of each of the founders is consistent with early breed history and records, despite [selection](#) in the 19th century for white feathers, clean legs, single comb, and yellow skin, and selection in the

early 20th century for increased body size and egg production.

Differences in the overall ancestral contributions to the HWS and LWS lines were minor, despite more than 60 years of selection for 8-week body weight. Contributions to individual chromosomes were more apparent, and subsequent analyses may provide more insights into the relationship between ancestry in specific chromosome regions and long-term selection for body weight differences. Such analyses may have implications for genetic contributions to today's broilers.

The livestock and poultry breeds of today are the result of foundation, isolation (genetic drift), and selection, both natural and intentional.

"Genomic analysis has proven to be a good tool for understanding genetic contributions to breed development. Through additional study of founder contribution to chromosomes and genes, such analyses may also reveal more about the importance of drift and selection in closed populations. Such work also highlights the importance of conserving pure breeds and selected lines of chickens," says Örjan Carlborg, Professor at the Department of Medical Biochemistry and Microbiology, Uppsala University, and lead author of the study.

More information: Y Guo et al, A genomic inference of the White Plymouth Rock genealogy, *Poultry Science* (2019). [DOI: 10.3382/ps/pez411](https://doi.org/10.3382/ps/pez411)

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