

Genetic study of black chickens shed light on mechanisms causing rapid evolution in domestic animals

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The genetic changes underlying the evolution of new species are still poorly understood. For instance, we know little about critical changes that have happened during human evolution. Genetic studies in domestic animals can shed light on this process due to the rapid evolution they have undergone over the last 10,000 years. A new study published today describes how a complex genomic rearrangement causes a fascinating phenotype in chickens.

In the study published in [PLoS Genetics](#) researchers at Uppsala University, Swedish University of Agricultural Sciences, North Carolina State University and National Chung-Hsing University have investigated the genetic basis of fibromelanosis, a breed characteristic of the Chinese Silkie chicken. This trait involves a massive expansion of pigment cells that not only makes the skin and comb black but also causes black [internal organs](#). Chickens similar in appearance to the Silkie were described by Marco Polo when he visited China in the 13th century and Silkie chickens have a long history in Chinese cuisine and [traditional Chinese medicine](#).

We have shown that the [genetic change](#) causing fibromelanosis is a complex rearrangement that leads to increased expression of Endothelin 3, a gene which is known for promoting the growth of [pigment cells](#), explains Ben Dorshorst the post-doctoral researcher responsible for the work.

The research group led by Leif Andersson has by now characterized a number of traits in domestic animals, and a clear trend is emerging, namely that genomic rearrangements have contributed significantly to the [rapid evolution](#) of domestic animals. Other examples include Greying with age in horses and mutations affecting the size and shape of the comb in chickens.

We have good reason to believe that such rearrangements have also played a significant role in the evolution of other species, including ourselves, concludes Leif Andersson.

The researchers also studied other chicken breeds where fibromelanosis occurs, including the Bohuslän-Dals svarthöna breed from Sweden, and they found that all fibromelanotic breeds carried the exact same very unusual mutation. This finding is consistent with anecdotal evidence suggesting that this Swedish breed of chicken inherited their black skin and internal connective tissue color from Asian chickens that were first brought to Norway by a sailor on the East Asian trade routes centuries ago. This is a nice example of how humans have distributed a single novel mutation with an interesting effect when they developed breeds of domestic animals around the world.

It is obvious that humans have had a strong affection for biological diversity in their domestic animals, says Leif Andersson.

More information: Dorshorst B, Molin A-M, Rubin C-J, Johansson AM, Stromstedt L, et al. (2011) A Complex Genomic Rearrangement Involving the Endothelin 3 Locus Causes Dermal Hyperpigmentation in the Chicken. PLoS Genet 7(12): e1002412.
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