Preston Hudlow

Biology 294

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Written Assignment 4

When it comes to dog breeds there have been many mutations over the years that has led to a variety of phenotypes. Whether this is a random genetic mutation, or they have been artificially selected for breeding the same species can come in many different forms. Even if it is rare for the breed, it does not mean it is impossible to achieve or see in the phenotype. No matter what the case is you can look at the genotype and compare it to other breeds of the same species to have a better understanding of how this mutation has occurred. Multiply allele and gene loci can be responsible for these mutations so it is important for genetics to study these changes for future reference.

The article I choose for this assignment was written by Alice Gibbs in 2023 and relates to pit-bull breeds with a rare genetic mutation which leads the dogs to have long fur. This mutation is rare and is not common among pit bull breeds. To make sure it was not crossed with another species of dog, the owner had sent in a dog DNA test which proved the breed to be 100% pit bull. Now that this theory is out of the way, the next question is how did this mutation occur? A veterinary geneticist by the name of Dr. Jenna Dockweiler explained to *Newsweek*, that many genetic variants have been associated with long fur and that its location is on the FGF5 gene. She goes on to explain that this gene usually notifies the hair to stop growing but when there is a variant, the signal is disrupted which allows the hair to keep growing. From her research she finds that all variants in this gene are recessive and would take two copies for it to grow long fur in the dogs. If the dog were to only have one copy it would be known as a carrier and can pass the trait down generations without the phenotype of long fur. Although it is possible for a new mutation to come along that leads to a similar appearance, since this is a recessive trait, it would take one copy from each parent for it to phenotypically show on the dog.

As this article is on gene mutations and phenotypes it directly corelates with genetics. The effect of a mutation on a gene which leads to a different phenotype is seen throughout the history of evolution and genetic studies. Is it due to the decades of research that we can now compare where and how these mutations occur. Utilizing this research will give us a better understanding on genetics which will allow us to progress further in this field.

Due to this being a news article and not published through a credible scientific journal it is important to understand not all the facts could be as straightforward. Doing your own research from credible scientific journals to ether disclaim or back up as evidence is important when it comes to understanding information. From the review article by Nobuyuki Itoh, and David Ornitz on the evolutionary history of the Fgf gene family in mice I was able to understand a little more about this FGF5 gene which led to long fur in a pit bull. Not only that but I also found more evidence from other scientific articles which elaborated specifically about the gene in different species.

FGFs are Fibroblast Growth Factors which are polypeptides that are diverse in the development of growth and metabolic processes. In the research preformed on mice it shows how the FGF5 gene was viable, and its function was hair development which was shown in the phenotype. If the mouse had this variant, then the fur was longer than the others. From the review article it also explains that the FGF5 is a secreted protein that acts as a signal peptide. This agrees with the article as a variant in this gene could mess up this signaling which will lead to the phenotype of long fur thus making the article credible with its information. To back this article up a little more there also was a study done by Kehler, J. et al. which focuses on cat breeds and long fur. In this study it also showed that among 26 different breeds had consistent mutations on the FGF5 gene which caused the long fur phenotype. It also explained that this was an autosomal recessive manner which agrees with the pit bull article and how the mutation is passed down and seen in the breeds,

Citations

Gibbs, A. Pit Bull's Genetic Mutation Wows Internet- 'Rare Does Not Mean Impossible'. *Newsweek*, (2023).

Itoh, N. Ornitz, D. Functional evolutionary history of the mouse Fgf gene family. *Dev Dyn* **237***,* 18-27 (2008).

Kehler, J. et al. Four Independent Mutations in the Feline Fibroblast Growth Factor 5 Gene Determine the Long-Haired Phenotype in Domestic Cats. *J Hered* **98**, 555-566 (2007).