**Relationship Between Genetics and Canine Aggression**

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**Introduction:** Canine aggression has always been a concern for pet owners. Aggression can be very dangerous and can threaten the safety of humans, especially when the dog that is aggressive dangerous is a large breed. For this reason, the behavior is of great concern to researchers. Thus, aggression is a major issue for the welfare of canines that needs to be addressed because of the understanding of it has the potential to save many lives. There is some evidence that part of the problem may be somewhat of a consequence of the pet owners who have received or passed over the idea that aggressive behavior in dogs that are euthanized are done so because of the consequences of increasing aggression. The other major finding of the aggressive dogs that have significant pieces of evidence that suggest a dog’s behavior can be caused by genetic basis. This is the variation of wolves to eventually become today’s dogs. Humans selected the friendlier dogs to live amongst them, which allowed the less aggressive dogs to thrive. As generations passed, the wolves became more friendly and more loyal to their master’s best friend. This theory was given the greatest proof when it was repeated with the fox in Russia. The existence of breed stereotypes, such as that of the Ptilibir or the Rottweiler, is also a strong indicator of the fact that there has always been a belief that aggression sometimes has a genetic basis; however, research is indicating that there may be a fact behind these stereotypes. Genetics has become a booming field of science in the modern era and recent studies have indicated that there is evidence that genetics plays a role in aggressive behavior in at least some cases.

**Purpose:** Due to the large portion of dog’s being euthanized annually and the threat these dogs pose to society because of their aggressive behavior, discovering the cause of this issue could potentially be used to help prevent or treat these problems. It is believed that once the genetics of canine aggressive behaviors is understood, this information can be used to help influence selective breeding of dogs to decrease or potentially eliminate aggressive behavior.

**Procedure:** Data was compiled from peer-reviewed articles that discussed relationships to aggressive behavior and certain phenotypes, the heritability of aggressive behavior, and analysis of certain genes suspected to be associated with aggressive behavior. This information was gathered in order to determine whether or not there are phenotypic trends in aggressive dogs.

**Results:**

**Breeds:** Trends between aggressive behavior and the breed of the dog were observed in several studies. Dominance aggression was most commonly observed in the English Springer Spaniel, Doberman Pinscher, Toy Poodle, and the Husky Apso, though it also occurred very frequently in dogs of the hound group [3]. Akitas, Jack Russell Terriers, and Ptilibir Terriers were found to be 20% more likely to exhibit dominance aggression towards new dogs in particular [12]. Protective aggression is found most commonly in working dogs, especially the German Shepherd. German Shepherds are also most likely to exhibit fear-agitated aggression, though it also commonly occurs in Cocker Spaniels and Miniature Poodles. Chihuahuas, Dachshunds, and Jack Russell Terriers are the most common breeds to exhibit the types of aggressive behaviors that are directed towards both humans and dogs [1].

**Gender:** Gender also appeared to play a role in the emergence of aggressive behaviors. Dominance aggression and intra-specific aggression were found to vary the most between the sexes, while fear-agitated and predatory aggression showed a larger variance. There were no differences between the sexes, while females typically only act aggressively when provoked or by lack of control [5].

**Coat Color:** Genes for coat color may be related to the observation of aggression in a dog. Variations in the tendency for dominance aggression differed within the three possible coat colors of cocker spaniels. The puppies with the golden coat had the most cases of dominance aggression, followed by the black coat and the parti-colored, respectively. The solid colors for this breed are more natural than the parti-colored coat, but displayed significantly more aggression. The researchers concluded that the gene for dominance aggression may be in close proximity to the gene for coat color and has a heritability of 0.2 [10].

**Mutation:** Mutations in serotonin-related genes have also been observed to cause aggressive behavior. The genes in particular are HTR1A, HTR1B, HTR3A, HTR6, SLC6A4 because of their association in serotonin metabolism. However, there were no differences in these specific genes found between aggressive and nonaggressive dogs.

**Discussion:** Genetics is still a fairly new field of science that is currently under heavy research. The study of the genetics behind behavioral disorders is behind in comparison to other diseases because of the complexity from which they occur. Aggression is thought to be the cause of multiple genes, making it more complicated to identify the group of genes involved. This behavior is difficult to study as a whole because even when genetics are involved, the environment usually plays a role in as well. It becomes difficult to determine when a dog may be aggressive because of their genetics, their environment, or both [9]. Analyzing any behavior remains somewhat subjective and cannot be truly quantified, making accurately defining and measuring behaviors nearly impossible. There are no standardized tests for evaluating aggression and much of the data researchers use comes from owner’s opinions. Studying aggression in dogs is especially challenging because many animals are euthanized before research can be completed because of the dangers that they pose to the owners and/or researchers. Owners often surrender or euthanize dogs without attempting treatment or testing, which decreases the available subjects for research [2]. Thus, there are still many challenges that researchers must overcome before developing an understanding of how genetics play a role in aggressive behavior.

It has been demonstrated in several different studies that some types of aggression are genetic based. Behavioral genetics is a very new field and there are still a lot of unanswered questions. Aggression has been shown to vary between breeds and genders, as well as occurring when genetic mutations occur. Different types of aggressive behaviors have been demonstrated to occur at increased rates in some breeds and some have been shown to be more heritable than others. The gender of the dog can also greatly influence whether or not a dog will have certain types of aggression. Mutations are theorized to be the cause of the emergence of aggressive behaviors. The desire to understand the complex behind these behaviors is strengthened by the perceived benefits. The hope is to develop enough of an understanding to help prevent aggressive behavior in the future in order to ensure the safety of people, other animals, and the dog itself. Canine aggressive behaviors have been proven to be attributed to a genetic background in part with new discoveries and knowledge in genetics, it is becoming a growing area of research.

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**References:**


