Epigenetics and the Mental Health of Dogs
Dina Berlowitz, from the Company Kynologos, for applied behavioral research in dogs

Summary by Pat Long

The canine genome consists of about 2.1 billion base pairs, which contain about 20,000 genes. The genes make up only about 1.5% of the DNA. Most of the rest of the genome regulates the genes. After all, if each of our cells have the identical genetic code, how does one cell know to be a heart cell, and another know to be a skin or liver or brain cell. How do the cells in a caterpillar know to cocoon and then become a butterfly? The cells all have the same genes, but the gene regulation plays a key role.

Epigenetic is the study of the mechanisms that regulate gene activity without altering the genetic code itself. However, some epigenetic patterns can be passed on. Methylation is one epigenetic mechanism in which a methyl molecule attaches to part of the DNA and suppresses the ability of a gene to function. The care of a dam of her litter can influence gene activity. A study of rats showed that when a rat mother gave good care to the rat pups, the pups grew to be calmer and gentler as adults. If a rat mother was neglectful, the methyl group inhibits genes that help the pups respond to stress. The genes responsible for building cortisone receptors in the hippocampus aren't turned on and the babies have higher blood pressure, higher levels of stress hormones, and are more aggressive. Maternal care influences which genes are activated.

In classic hereditary, we think of genes being passed from generation to generation. But in epigenetics, changes to the regulating activity can also be passed to the next generation. We know that malnutrition of the dam affects the fetus, the consequences depend on intensity, timing, and duration. And if the fetus' germ cells are developing at that time (as in females), it can even be passed to the next generation. And if germ cells are affected, the genome can be permanently changed. Tradition is a third type of heredity, in which the learning and experiences of the adult pass to the infants - puppies mimic their mother's behavior.

Genes are activated by epigenetic control and regulatory process. These processes are influenced by the natural, civil, and psychosocial environment of the individual. There is no genetics without epigenetics.

Practical Consequences

We can recognize and avoid common damaging factors and risks during character development. Reducing stress factors on the parent animals helps them to be better parents. Types of stress include driving long distances for breeding, using a strange male that the bitch doesn't accept. Limited brood care due to disrupting factors can also impact the bitch's ability to be a nurturing dam. Interference during the birthing process can reduce her willingness to tend to the pups. And the pups need to learn to exert themselves in order to gain confidence.

Sufficient stabilizing of the puppies before they leave the litter can help them as well. Puppies that develop a secure bond to the breeder are better able to bond to others in the future. A good puppy play area helps them to develop muscles and confidence. Establish emotional security by enabling secure bonding. Know the stress signals and avoid actions that cause them: licking, yawning, avoiding eye contact, hiding and many more. Learn canine behavior in order to avoid misinterpretation. Play bows are not play bows. They are an assessment position and can be followed by play, rapid flight, or an attack, depending on the situation.

In a new home, one person should be the caregiver to establish a new bond. Avoid overuse of treats; the puppy bonds to the bag of treats and not to the caregiver. Avoid poor puppy play groups. Use activities that help build confidence and resilience.

Learning triggers epigenetic changes.