

Unwanted White

by Leandra Little

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This is the second part of a look at white in our (Norwich Terrier) breed. February's column dealt with breed origins as a possible source. Fast forward to today: The Canine Genome Project and DNA studies have opened another exciting chapter in solving genotype and phenotype puzzles. While the Norwich Terrier's diverse genetic heritage makes it more of a challenge to fix type, it contributes to the overall health of our breed. At the same time, it makes understanding the roots of a phenotype issue like the unwanted incidence of white markings more difficult.

Shelia M. Schmutz, a geneticist in the College of Agriculture and Bioresources at the University of Saskatchewan, specializes in, among other things, canine coat color. It's a complex subject. She said: "There are seven genes that determine coat color already identified at the DNA level. Dr. Clarence C. Little, who wrote the definitive book *The Inheritance of Coat Color in Dogs* in the '50s postulates 10 or 11, but we expect there are many more than that.: Head color may be governed by a completely separate set of genes.

When asked about what could cause white markings in our breed, she offers three possibilities:

Inheritance: "White markings are inherited as a recessive so two parents, neither with white, could easily have a pup with white."

Developmental: "It is not surprising that many dogs have missing pigment on a spot on their chest or tow - these are the last places that pigment cells migrate in the dog during embryogenesis. A lack of pigment in these spots isn't really inherited; it more likely means the dam had a cold for a few days during the gestational period."

Mutation: "One can never rule it out. It could be a new mutation."

Schmutz and others are conducting pioneer studies in the MITF (pronounced "mit-if") gene, which produces random spotting. A mutation in microphthalmia associated transcription factor, "a critical gene in the pigmentation pathway," was first identified in 2007 by researchers at the Broad Institute. MITF is the gene behind solid, flashy, and white Boxers and white Bull Terriers. Those researchers found two mutations (SINE - a type of mutation) near MITF responsible for white markings. These SINE mutations are clearly present in dogs with random or piebald spotting in a wide variety of breeds, including Bull Terriers.

Complicating matters even further, coat color is not a question of simple dominant or recessive. Several genes may work together to produce the variety of colors we see in dog breeds.

The mutations for another common white pattern, called "Irish spotting" has not been so clearly identified. This is the pattern that seems to more closely fit the description of the Norwich puppy born last year. The mutation that has been clearly identified (the SINE near MITF) is not present in that puppy, according to testing run in Schmutz's lab. So the question of heredity or mutation remains unanswered in this case.

For further information on coat color and white patterns, visit <http://homepage.usask.ca/~schmutz/dogcolors.html>