

Color and Pattern Associated Disorders In the Great Dane

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There are very few forms of coloration and pattern in dogs that have any deleterious effect on health, and even those few that are reported to be associated with various disorders do not have a 100% correlation. So it is as important to recognize this less than perfect correlate, as it is to be aware of and prepared for the potential of various defects given certain colors and patterns expressed in a particular dog. To that end, below is detailed a variety of problems associated with various colors and patterns found in the Great Dane. Please note that much of the information on such associations is incomplete and often anecdotal in nature, however what accurate information is available should receive the widest possible dissemination: forewarned is forearmed.

There are no reported problems associated with black pigment per se, and therefore no problems associated with the standard black, fawn, brindle and mantle varieties of the Great Dane. The only reported problem associated with the dilute black (D locus recessive) allele that produces the blue Dane is Color Mutant Alopecia (CMA). CMA is a clinical syndrome characterized by a short, sparse hair coat, hair loss, scaling and bacterial folliculitis. The condition is associated with hairs containing clumped melanin and the distortion and

breakage of the hair shaft. CMA is also known as Color Dilution Alopecia and "Blue Doberman Syndrome" and is seen with some regularity in that breed. CMA can occur in any dog that exhibits the (maltese=dd) blue dilution, although it seems a relative rarity in Danes, despite Lowell Ackerman's assertion that blue Danes be avoided simply because of this potential problem.

The rest of the problems that are pigment related have to do with harlequin family breedings, and generally fall into two genetic categories, but both are associated with lack of pigment and a predominately white dog. The first is color-related problems associated with the dominant Merle allele, and the second is color-related problems associated with the recessive Piebald allele(s). Both are spotting genes that increase the white on a dog-that is they both reduce the amount of pigment that dog has.

The Merle allele is an autosomal incomplete dominant mutation and a pleiotropic allele that is believed to irregularly disrupt the maturation of the melanocytes, thus resulting in the typical "mottled" or "patched" appearance. Like von Waardenburg's Syndrome in humans, and various other "lethal dominant white genes" found in a wide variety of mammals, the Merle allele also can adversely affect various other bodily systems, most particularly the sensory system (i.e. eyes and ears), along with the integumentary system (i.e. skin and haircoat). Homozygous (MM) "double merle" or "white" Danes are usually deaf and may suffer from a variety of skin problems and eye anomalies, all associated with the general

lack of pigment that results when the dog has two "doses" of the merle gene. This association is directly related to the lack of pigment, rather than having an absolutely straight-line association with the Merle allele. Any harlequin or merle (Mm) animal with the pigment severely reduced (less than 15% pigmented as a rule of thumb), or any animal lacking head pigment may very well also suffer from any of the problems listed below.

Dogs who are homozygous recessive for Piebald alleles may also present with deafness, as is seen in the Dalmatian, Boxer and Bull Terrier breeds, as well as a variety of skin problems. Dogs who carry both a single Merle allele and a single Piebald allele can appear as "light-marked" harlequins or "harlequin-heads" and may also suffer from any of the problems listed below. All these undermarked animals carrying for Piebald will also be at a greater risk of producing defective as well as mismarked offspring. So with any predominately white animal, it would seem generally best for breeders to avoid producing and rearing such pups whenever possible, rather than face a situation requiring some time to pass for a complete and appropriate diagnosis, and likely requiring special training and/or special medical treatment.

One can avoid the "double merle" type white (MM) Dane by giving preference to a harl to mantle breeding over a harl to harl breeding whenever feasible, and by not breeding harlequin to merle, or merle to merle. Avoiding the production of "white factored" harlequins and outright peds--all predominately white dogs who may very well have sensory and

other disturbances from their lack of pigment--is rather less straightforward, as they can be born to harl to mantle or even mantle to mantle breedings. Since other breeds have demonstrated that "flashy" marked animals are more likely to be "white factored" (i.e. carry pied recessives), using at least one strongly pigmented animal in any harl to harl, harl to mantle, or mantle to mantle breeding seems the more likely course to reduce the production of white Danes and thus avoid the conundrum of what to do with undermarked and possibly defective offspring. Obviously the use of piers, who cannot contribute to either proper pattern in harls or mantles and who contribute to both defects and mismarkings, should be avoided.

Problems Associated with Predominately White Dogs:

Congenital cataracts associated with microphthalmia. Blinding disorder.

Persistent pupillary membrane. Can be blinding and is a disfiguring eyedefect.

Tapetal hypoplasia. Lack of reflective lens. Can cause night blindness.

Convergent strabismus. Cross-eyed-affects vision.

Enophthalmia. Recessed eyes-can lead to chronic infection.

Microphthalmia-tiny eyeballs. Often lead to total blindness and most have very poor sight from the start. Removal of the eyeball may be necessary.

Medial canthal syndrome. When (commonly) associated with 5 and/or 6-leads to chronic infection and blindness.

Heterochromia iridis/hypochromia iridis. Lack of iris pigment-causes blue eyes and is associated with deafness and can be associated with other eye defects in predominately white dogs.

Colomboma(ta). "Notched" irises and other eye structures which fail to develop properly and close on the suture lines due to the action of the Merle gene. Leads to various defects of vision and even collapse of the eye structure.

Merle deafness--develops in the first month of life and is permanent and often debilitating to proper social development of the dog as usually bilateral. Testable by no later than 6 weeks--associated often with other less apparent defects. Euthanasia is generally recommended.

Piebald deafness--is present normally by 4-8 wks. and bilateral deafness can only be objectively confirmed by a BAER test. When bilateral, euthanasia is generally recommended.

Demodicosis. Immune-mediated hair follicle mange. There appears to be an increased incidence in reported in predominantly white pups.

Atopic dermatitis. Inherited allergies. There appears to be an increased incidence in reported in predominately white dogs.

Skin cancer. Increased incidence is reported in predominately white dogs due to the lack of protecting pigment (melanin) from UV (sunray) exposure. Sunburn also occurs often in dogs lacking pigment and this can lead to tumors/cancer.

Follicular dysplasia. A haircoat problem of broken and dull hairs and "pimply" infection with a high incidence in white coated (and other dilute colored) dogs.

Photo-induced epilepsy. Seizure activity has been reported in white (double merle) Danes thought to be associated with subtle eye structure defects.

Sterility & reduced fertility. Increased incidence in mostly white pups. Quite obviously lowered reproductive success is generally expected with a bitch who cannot hear (or see) her whelps, and a deaf or blind stud dog presents obvious challenges of management as well.

Multiple congenital defects. White pups may have a variety of organ defects which arise only as they grow & first may only be seen (if seen when young at all) as a failure to thrive & keep up with the size, weight & activity level of the other pups, but later result in multiple health problems for the dog.

Social instability and inadequacy. Dogs with sensory defects commonly are unable to interact with their own species as well as with humans with full and satisfactory success. Such pups may well be identified, isolated and treated as different right from the start by the dam and the other littermates. Many develop poorly, fail to adapt and have multiple problems coping with normal daily activities; they are often described as "shy" or "'spooky" and the bite incidence for such animals is high.

Some are "picked on," many have trouble with normal events, especially those involving more than the immediate family (the vet, boarding, etc.), while others need another pet constantly with them to cope with the world at large and suffer

tremendously when this animal is not near them. Death by automobile is a common end for such dogs, but many unfortunately are simply given up to rescue when they become too huge a burden for the family who bought them as a pup. Many will never be placed due to their poor social skills.

About the author

JP Yousha did undergraduate work in molecular cell biology and graduate work in theoretical biology. Thesis topic and particular field of study is autoimmunity and the notion of Self in immunology. Teaches in philosophy as well as biology part-time at various local colleges and universities, as cross-trained at the graduate level in Philosophy of Science. She was a CVT (Certified Veterinary Technician) for many years, prior to returning to academics.

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Glossary

Allele: An alternate form of a gene.

Autosomal mutation: A mutation on a chromosome other than the sex chromosomes.

Dominant: Relates to an allele of a gene which when present in a single dose, masks the presence of another. Usually depicted by uppercase letters.

Genotype: The genetic structure of the animal.

Heterozygote: An individual animal which carries two distinct alleles at a specific locus. A hybrid. Heterozygotes never "breed true", i.e. never consistently reproduce themselves.

Homozygote: An individual animal which carries two of the same allele at a locus. Dominant homozygotes are "prepotent", i.e. always reproduce themselves phenotypically). Recessive homozygotes consistently reproduce themselves when bred to other recessive homozygotes.

Incomplete Dominance: A situation in which the heterozygote state is different from either homozygote.

Locus (pl. Loci): Specific location of a gene on a chromosome.

Phenotype: The physical expression of a trait.

Pleiotropy: Multiple phenotypic effects produced by a single gene.

Recessive: Refers to an allele of a gene which must be present in duplicate in order to indicate its presence. In a single dose

will be masked by a dominant allele. Usually denoted by a lower case letter; may be annotated in an allelic series by a superscript.

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