



CANINE THYROID DISEASE

By:
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Hypothyroidism is the most common endocrine disorder of canines, and up to 80% of cases result from autoimmune (lymphocytic) thyroiditis. The heritable nature of this disorder poses significant genetic implications for breeding stock. Thus, accurate diagnosis of the early compensatory stages of canine autoimmune thyroiditis leading up to hypothyroidism affords important genetic and clinical options for prompt intervention and case management.

Although thyroid dysfunction is the most frequently recognized endocrine disorder of pet animals, it is often difficult to make a definitive diagnosis. As the thyroid gland regulates metabolism of all body cellular functions, reduced thyroid function can produce a wide range of clinical manifestations. Many of these clinical signs mimic those resulting from other causes and so recognition of the condition and interpretation of thyroid function tests can be problematic.

Baseline Thyroid Profiles

A complete baseline thyroid profile is measured and typically includes total T4, total T3, free T4, free T3, T3 autoantibody (AA) and T4AA, and can include canine thyroid stimulating hormone (cTSH) and/or thyroglobulin autoantibody (TgAA). The TgAA assay is especially important in screening breeding stock for heritable autoimmune thyroid disease.

The normal reference ranges for thyroid parameters of healthy adult animals tend to be similar for most breeds of companion animals. Exceptions are the sight hound and giant breeds of dogs which have lower basal levels. Typical thyroid levels for healthy sight hounds, such as retired racing greyhounds, are at or just below the established laboratory reference ranges, whereas healthy giant breeds have optimal levels around the midpoint of these ranges.

Similarly, because young animals are still growing and adolescents are maturing, optimal thyroid levels are expected to be in the upper half of the references ranges. For geriatric animals, basal metabolism is usually slowing down, and so optimal thyroid levels are likely to be closer to midrange or even slightly lower.

Genetic Screening for Thyroid Disease

Most cases of thyroiditis have elevated serum TgAA levels, whereas only about 20-40% of cases have elevated circulating T3 and/or T4 AA. Thus, the presence of elevated T3AA and/or T4 AA confirms a diagnosis of autoimmune thyroiditis but underestimates its prevalence, as negative (non-elevated) autoantibody levels do not rule out thyroiditis. Measuring TgAA levels also permits early recognition of the disorder, and facilitates genetic counselling. Affected dogs should not be used for breeding.

The commercial TgAA test can give false negative results if the dog has received thyroid supplement within the previous 90 days, thereby allowing unscrupulous owners to test dogs while on treatment to assert their normalcy, or to obtain certification with health registries such as the OFA Thyroid Registry. False negative TgAA results also

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can occur in about 5% of dogs verified to have high T3AA and/or T4AA. Furthermore, low grade false positive TgAA results may be obtained if the dog has been vaccinated within the previous 30-45 days, or in some cases of non-thyroidal illness. Vaccination of pet and research dogs with polyvalent vaccines containing rabies virus or rabies vaccine alone was recently shown to induce production of antithyroglobulin autoantibodies, a provocative and important finding with implications for the subsequent development of hypothyroidism.

A population study of 287,948 dogs was recently published by the MSU Animal Health Diagnostic Laboratory. Circulating thyroid hormone autoantibodies (T3AA and/or T4AA) were found in 18,135 of these dogs (6.3%). The 10 breeds with the highest prevalence of thyroid AA from their study were: Pointer, English Setter, English Pointer, Skye Terrier, German Wirehaired Pointer, Old English Sheepdog, Boxer, Maltese, Kuvasz, and Petit Basset Griffon Vendeen. Prevalence was associated with body weight and was highest in dogs 2-4 years old. Females were significantly more likely to have thyroid AA than males.

A bitch with circulating thyroid AA has the potential to pass these along to the puppies transplacentally as well as via the colostrum. Furthermore, any dog having thyroid AA may eventually develop clinical symptoms of thyroid disease and/or be susceptible to other autoimmune diseases. Thyroid screening is thus very important for selecting potential breeding stock as well as for clinical diagnosis.

Thyroid testing for genetic screening purposes is less likely to be meaningful before puberty. Screening is initiated, therefore, once healthy dogs and bitches have reached sexual maturity (between 10-14 months in males and during the first anestrus period for females following their maiden heat). As the female sexual cycle is quiescent during anestrus, any influence of sex hormones on baseline thyroid function will be minimized. This period generally begins 12 weeks from the onset of the previous heat and lasts one month or longer. The interpretation of results from baseline thyroid profiles in intact females will be more reliable when they are tested in anestrus. In fact, genetic screening of intact females for other disorders such as von Willebrand disease (vWD), hip dysplasia, and wellness or reproductive checkups (vaginal cultures, hormone testing) is best scheduled during anestrus. Once the initial thyroid profile is obtained, dogs and bitches should be rechecked on an annual basis to assess their thyroid function and overall health. Generation of annual test results provides comparisons that permit early recognition of developing thyroid dysfunction. This allows for early treatment, where indicated, to avoid the appearance or advancement of clinical signs associated with hypothyroidism.

Aberrant Behavior and Thyroid Dysfunction

The principal reason for pet euthanasia stems not from disease, but undesirable behavior. While this abnormal behavior can have a variety of medical causes, it also can reflect underlying problems of a psychological nature. Investigators in recent years have noted the sudden onset of behavioral changes in dogs around the time of puberty or as young adults. Most of the dogs have been purebreds or crossbreeds, with an apparent predilection for certain breeds. The typical history starts out with a quite, well-mannered and sweet-natured puppy or young adult dog. The animal was outgoing, attended training classes for obedience, working, or dog show events, and came from a reputable breeder whose kennel has had no prior history of producing animals with behavioral problems. At the onset of puberty or thereafter, however, sudden changes in personality are observed. Typical signs can be incessant whining, nervousness, schizoid behavior, fear in the presence of strangers, hyperventilating and undue sweating, disorientation, and failure to be attentive. These changes can progress to sudden unprovoked aggressiveness in unfamiliar situations with other animals, people and especially with children.

Another group of dogs show seizure or seizure-like disorders of sudden onset that can occur at any time from puberty to mid-life. These dogs appear perfectly healthy outwardly, have normal hair coats and energy, but suddenly seizure for no apparent reason. The seizures are often spaced several weeks to months apart, may coincide with the full moon, and can appear in brief clusters. In some cases the animals become aggressive

and attack those around them shortly before or after having one of the seizures. Two recent cases involved young dogs referred for sudden onset seizure disorder shortly after puberty. Both dogs were found to have early onset autoimmune thyroiditis, which was clinically responsive to thyroid supplementation, to the extent that anticonvulsant medications could be gradually withdrawn. The numbers of animals showing these various types of aberrant behavior appear to be increasing in frequency over the last decade.

In dogs with aberrant behavior, a large collaborative study between our group and Dr. Dodman and colleagues at Tufts University School of Veterinary Medicine has shown a favorable response to thyroid replacement therapy within the first week of treatment, whereas it took about three weeks to correct their metabolic deficit. Dramatic reversal of behavior with resumption of previous problems has occurred in some cases if only a single dose is missed. A similar pattern of aggression responsive to thyroid replacement has been reported in a horse.

The major categories of aberrant behavior were aggression (40% of cases), seizures (30%), fearfulness (9%), and hyperactivity (7%); some dogs exhibited more than one of these behaviors. Within these 4 categories, thyroid dysfunction was found in 62% of the aggressive dogs, 77% of seizing dogs, 47% of fearful dogs, and 31% of hyperactive dogs. Outcomes of treatment intervention with standard twice daily doses of thyroid replacement were evaluated in 95 cases, and showed a significant behavioral improvement in 61% of the dogs.

Our ongoing study now includes over 1500 cases of dogs presented to veterinary clinics for aberrant behavior. The first 499 cases have been analyzed independently by a neural network correlative statistical program. Results showed a significant relationship between thyroid dysfunction and seizure disorder, and thyroid dysfunction and dog-to-human aggression. Collectively, these findings confirm the importance of including a complete thyroid antibody profile as part of the laboratory and clinical work up of any behavioral case.

References [available from the author upon request]

About Dr. Jean Dodds

Dr. Dodds received the D.V.M. degree with honors in 1964 from the Ontario Veterinary College, University of Toronto. In 1965 she accepted a position with the New York State Health Department in Albany and began comparative studies of animals with inherited and acquired bleeding diseases. Her position there began as a Research Scientist and culminated as Chief, Laboratory of Hematology, Wadsworth Center. In 1980 she also became Executive Director, New York State Council on Human Blood and Transfusion Services. This work continued full-time until 1986 when she moved to Southern California to establish Hemopet, the first nonprofit national blood bank program for animals.

From 1965-1986, she was a member of many national and international committees on hematology, animal models of human disease, veterinary medicine, and laboratory animal science. Dr. Dodds was a grantee of the National Heart, Lung, and Blood Institute (NIH) and has over 150 research publications. Awards bestowed on Dr. Dodds include, but are not limited to the following: 1974 / Outstanding Woman Veterinarian of the Year; 1977 / Region I Award for Outstanding Service to the Veterinary Profession from the American Animal Hospital Association; 1978 and 1990 / Gaines Fido Award as Dogdom's Woman of the Year; and the Award of Merit in 1978 in Recognition of Special Contributions to the Veterinary Profession from the American Animal Hospital Association; 1984 / Centennial Medal from the University of Pennsylvania School of Veterinary Medicine; 1987 / elected a distinguished Practitioner of the National Academy of Practice in Veterinary Medicine, and 1994 / Holistic Veterinarian of the Year Award from the American Holistic Veterinary Medical Association.

*Today, Dr. Dodds is actively expanding Hemopet's range of nonprofit services and educational activities. The animal blood bank program provides canine blood components, blood bank supplies, and related services throughout North America. Hemopet's retired Greyhound blood donors are adopted as pets through the Pet Life-Line arm of the project. On behalf of Hemopet, she consults in clinical pathology nationally and internationally, and regularly travels to teach animal health care professionals, companion animal fanciers, and pet owners on hematology and blood banking, immunology, endocrinology, nutrition and holistic medicine. She was also the Editor of *Advances in Veterinary Science and Comparative Medicine* for Academic Press.*