

Add or Subtract Anything and the Picture Changes

Part I

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It has been said that the body is divinely inspired, and that if you add to it or subtract from it, its function and appearance change. Don't believe in divinity? Let's turn to composers, artists, photographers, architects and writers because they will tell you the same thing. Augmenting or deducting from a musical score, painting or architectural rendering changes its entire composition. Not into art? Science puts it this way: To change part of the whole is to change the sum of the parts.

To my way of thinking TT's are divinely, artistically and scientifically created. However, choose your own metaphor as we progress to the topic of hypothyroidism, considered to be "the great mimic" for its tendency to be confused with other health problems. The thyroid gland is a crucial part of the entire endocrine system, a system that affects every cell in the body. When there are changes in its functioning it results in a change of the whole.

Canine hypothyroidism came to my attention some 30 years ago. There was a true pioneer in the field (W. Jean Dodds, DVM) whose work taught me a lot. Since then new researchers have come on board, many of whom have provided empirical support for Dodds' original research evidence. While it is irresponsible to leave out this pioneer, this article will focus on some of the more modern scientific findings associated with hypothyroidism.

We will look at research evidence and databases to see if our breed is vulnerable to particular forms of the disease. We'll take a cursory peek at how the thyroid gland can be influenced by external and internal factors. We'll look more deeply at physical symptoms, behavioral symptoms, diagnostic testing and treatment. But first, we must ask the big question.

Have our TT's been vulnerable to developing hypothyroidism? In a study of over 1,500 dogs (non TT breeds) who presented with behavioral problems, 61 percent were diagnosed as being hypothyroid or with suboptimal thyroid function (Aronson, LP and Dodds, WJ).(1) In a 2010 Michigan State University (MSU) study of 287,948 dogs (including non TT breeds) tested using the Orthopedic Foundation for Animals, Inc. (OFA) testing protocols, 6.3 percent were found to have circulating thyroid hormone autoantibodies. MSU's Canine Thyroid Registry

ranked the Tibetan Terrier as 7th highest of all AKC recognized breeds with 294 TT's in the registry. Of those 294 TT's, 17.7 percent had Autoimmune Thyroiditis and 9.5 percent were found to be equivocal.(2) The OFA Registry ranked the TT as having the 8th highest risk. Of 72 TT's registered with the OFA between 1973 to 2013, 11 percent were found to be hypothyroid with another 16.7 percent being equivocal.(3) The AKC declares "autoimmune hypothyroidism is known to be heritable"(4) and it is presenting itself in epidemic proportions in pure bred dogs today.

So, we know hypothyroidism is represented in our breed. We know that, statistically speaking, autoimmune hypothyroidism is most likely the most common culprit. Now let's get focused in greater detail on the forms.

Several forms of hypothyroidism exist. According to The Merck Veterinary Manual primary hypothyroidism (destruction of the thyroid gland) accounts for 95 percent of diagnosed cases. *Autoimmune* thyroiditis, the most common form and cause of primary hypothyroidism, occurs when the *subjects' own autoimmune system attack's the thyroid gland*. In response to the attack, the subject's system tries to generate more thyroid hormone until the gland becomes worn out and unable to produce hormones. This type may (or may not) be a clinical or subclinical part of another autoimmune disorder, such as allergies and systemic lupus. The principal cause of secondary hypothyroidism is from the destruction of the pituitary gland by a tumor. There are two uncommon forms. Congenital (juvenile onset) hypothyroidism, and secondary congenital hypothyroidism, the latter of which is associated with clinical symptoms of disproportioned dwarfism.(5) This review is focused on *primary* and *autoimmune* hypothyroidism because they are the most common.

The thyroid modulates metabolic functions, norepinephrine and serotonin. Primary and autoimmune Hypothyroidism, the most common, are considered to be heritable, or at least genetically mediated, i.e., mediating activators *may or may not* be required for manifestation of the disease.

What I prefer to call mediating "activators" can be internal or external events, often with a circular interaction between the two. Activators can include yearly core and rabies vaccinations, some insect control agents, allergies (another autoimmune disorder), unbalanced or deficient diets (including too much or too little iodine), stress, spay / neuter status, medications, surgery, non thyroidal illness (including viral, bacterial, fungal or parasitic pathogens) and exposure to chemicals. The activators can be more subtle, such as, bringing another dog into

the home or moving to a new location, which may be highly stressful. Increase of cortisol, the stress hormone, can leave a dog in a constant state of stress.

There's good reason hypothyroidism is called the "Great Mimic." The thyroid affects every cell in the body, and all the physiological systems. Symptoms can mimic those of other disease processes, including, pancreatitis, Addison's and Cushing's diseases. Also, hypothyroidism can itself be a symptom of other disorders, such as an adrenal gland disorder. As such, the symptoms are highly variable and they may present themselves individually or as symptom clusters. Symptoms can come and go or be continual.

According to W.J. Dodds, the most classical symptoms described decades ago result only *after* more than 70 percent of the thyroid gland had already been destroyed. Those few classical (later stage) symptoms included lethargy, obesity, dull coat with hair loss (rat tails) and heat seeking behaviors due to cold intolerance.(6) But who wants to wait for testing and treatment until permanent damage has already been done? Not me because early recognition of symptoms, accurate diagnostic testing and treatment improves prognosis and quality of life.

Keep in mind that symptoms may present subtly and slowly. Symptoms may appear from 0.5 to 15 years of age.(7,8,9) With that in mind, here are a few of the *behavioral* signs of hypothyroidism in '*approximated*' chronological order of presentation.

Dogs six months old and younger may exhibit poor or fluctuating attachments to owners. These puppies may show difficulty in learning retention and lack of concentration similar to what is observed in children with attention deficit disorders. These dogs may demonstrate fixated activities like ball casing at the exclusion of other behaviors or interactions with the owner.

The behavioral picture shifts for those entering puberty or young adulthood. Aronson and Dodds found that like their younger counterparts, these dogs may manifest none of the classical symptoms of hypothyroidism. Instead they may appear hyperactive (versus lethargic) with a worried look, and they may be underweight. These dogs may suffer from recurrent ear, foot and skin infections along with seasonal allergies. They may shed more than expected. They may suffer from frequent gastrointestinal problems, and may start to whine inexplicably. These dogs may perform nervous or obsessive behaviors, such as, pacing, persistent self grooming and itching, and may start to become fearful

of new people and places. Additional symptoms may include excessive sweating, exercise intolerance, disorientation and other forms of cognitive dysfunction. Dogs may show new dog-to-owner or dog-on-dog aggression.(10,11,12). Beaver and Haug believe that this form of aggression should be regarded and labeled as a form of aggression unique to hypothyroidism.(10)

While the aforementioned symptoms may appear in the truly adult dog, new behaviors may emerge in true adulthood. Behavioral symptoms include a sudden onset of separation anxiety, noise phobias, such as fear of thunderstorms, loss of bowel control, moodiness with erratic temperament and partial seizures. These non tonic clonic seizures can be months to weeks apart or appear in cluster form. Dogs may become hesitant to walk on different surfaces, and start staring at walls or display a change in their bark. *Lethargy, exercise intolerance and weight gain may or may not present at this stage.* Additional symptoms may include behaviors not observed during the earlier years such as a reduction in scenting, hearing, taste and vision capabilities, which is to say that their sensory systems stop working. The loss of sensory input may require early retirement from working, training and performance events. The aforementioned symptoms described can be manifested individually or in groups, sporadically or on a continual basis.

Remember how a change in one part of a system affects the whole? Well, here is a listing, by physiological systems, of more of the influences of hypothyroidism on the body. The most dangerous with the worst prognosis are highlighted with an asterisk. Neuromuscular symptoms include: knuckling over or foot dragging, megaesophagus*, eyelid dropping and head tilt. Dermatological symptoms include: hyper-pigmentation, thickened skin, greasy skin and foul odor. Reproductive abnormalities include: male infertility, lack of libido, testicular atrophy and reduced sperm count. Abnormalities in the female include: failure to conceive, absence of heat cycles, silent heat cycles, lengthy estrus intervals; also, weak, dying or stillborn puppies*. Cardiac problems* include: slow heart rate when at rest, arrhythmia and cardiomyopathy. J. Catharine Scott-Moncrieff, VetMB, MS,,MA, Diplomate ACVIM (SAIM), DECVIM (CA) reports that 75 percent of hypothyroid dogs have increased cholesterol and even higher triglyceride values.(13) Hematologic abnormalities* include: excessive bleeding and failure of bone marrow development; also, low red, white and platelet counts. Ocular symptoms include: corneal lipid deposits and ulceration*, dry eye, tear duct infections and inflammation of the middle layer of the eye. Other abnormalities include: hepatitis* and pathologies of the pancreas, adrenal gland and parathyroid gland*.

Given the impact of hypothyroidism, it's no wonder that controversy and debate surround the disorder, treatment and diagnostic methods for testing. For example, there are naturalists who believe treatment should be only in glandular form (versus use of prescription medications) even in the context of many researchers and veterinarians disagreeing with the practice. The general body of scientific evidence considers autoimmune hypothyroidism to be heritable. Some highly opinionated writers and researchers come right out and state that affected dogs and close relatives should never be bred. But the disease may not be diagnosed until four to six years of age, after a dog's prime breeding years. Some vets try to save clients' money by not using a complete panel. Many veterinarians only use in-house or abbreviated methods for screening and testing: both of which are considered unreliable by many of the most widely respected researchers today. Many vets (and owners) say, 'his coat looks great, he's active and isn't obese so why should we test? Don't worry about it.' Owners attribute subtle, new and different behaviors in their dogs to stages of development or to a number of other explanations. Lastly, the condition is a mimic of other possible health problems that need to be ruled in or out before specific testing of hypothyroidism, which adds to the expense.

Despite the controversies, when you look at all the ramifications to your TT's health — to your TT's relationship with you, your family, and the community, and to your TT's quality of life — one finds it hard not to test and register the results for the benefit of the breed. After all, treatment is easy and relatively inexpensive.

In Part II we will look at *timing* and *medication* issues surrounding testing. We'll look at diagnostic testing methods and protocols, and then follow up with treatment. At the end you will find resources and citations that you can use on your own in the service of clarification and decision-making. After all, it's your TT and your decision.

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Add or Subtract Anything and the Picture Changes

Part II

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Time has a wonderful way of allowing us to filter information and arrive at greater clarity of understanding of complex issues and relationships. It allows us to settle in and regain equilibrium before stepping back into the morass of confusion.

An example of the point at hand is a two sentence conversation I had with a statistics professor decades ago on the first day of class. I approached him after his lecture and said, "Professor.... I'm confused already." He looked straight at me with a blank face, which cut me off like a hatchet. With a flat expression, he said, "Good!" He turned his back on me and walked away. Not another word was spoken. The very next morning, the first thing he said when he addressed the class was, "For those of you who are confused, it's a good thing because you're the ones who will learn." Need I say how grateful I was for that opening class statement? He went on to describe how the study of statics was nothing more than learning a new language. Once I learned the language I totally fell in love with statics and research methodology!

I mention all of this only to assure you that if you're confused by Part I, you have a right to be because even the so-called experts are confused by hypothyroidism and testing options. Vets, breeders and we dog owners are sometimes confused because the research literature is confusing. Sometimes the confusion is due to professional research rivalries and labs who promote their own facilities over the use of others. Our own emotions and personal financial pictures sometimes get in the way of paying heed to the importance of testing options. These are all realities. However, if you persist in seeking out information, *your TTs will benefit from your understanding of their sometimes crazy antics and intermittent health problems*. That stands true even though you may not have the financial resources available for all the most thorough testing methods available in 2014.

Before going to testing options let's peek at medication influences on testing because *timing is important*, especially when it comes to medication effects. According to Scott-Moncrieff, Peter Kinzter (DVM, Diplomate ANBV) (13) and Wendy C. Brooks (DVM, Diplomate ABVP)(14) many medications alter different aspects of thyroid testing. Brooks states that the following drugs depress the production of T4: phenobarbital, potassium bromide, prednisone, corticosteroids, NSAIDS and other anti-inflammatory drugs, propranolol, clomipramine and the long list of sulfonamides, i.e., sulfa based drugs. Dodds adds the following to the

list: dietary soy, soy phytoestrogens, insulin, salicylates, SSRI's (Prozac), furosemide and overdosing with iodine due to the combined affects of iodine enriched kibble with other added food sources, such as fish, and supplemental Kelp.(15) We need to know how long the flush-out period is for different medications following discontinuation.

Recovery time from a non thyroidal illness (NTI) or surgery must be considered when timing for testing. Dodds and others agree that thyroid testing in a female should be done only when she is in anestrus, or 60-100 days from the onset of her last heat, and 90 days post rabies vaccination.

In addition, there are things we need to do before the actual blood draw for testing for hypothyroidism. It is important to do a wellness health check. It is advised that one should run a complete blood count (CBC), urinalysis and fecal exam. In the context of symptoms, we must do testing to rule out pancreatitis, Addison's disease, Cushing's syndrome and diabetes. A nutritional history and a history of changes of behavior should be formulated, especially for those dogs without classic symptoms of the disease or for those who have shown behavioral changes in line with aggression. A history of chemical exposure is important.

Testing for specific factions of the thyroid gland is where the controversy surrounding this insidious disease surfaces the most strongly. So please remember that extremist thinking regarding vaccinations, nutrition, spay / neuter issues, institutional and political systems, research rivalry and personalities, breeders fears over potential losses from their breeding programs and veterinary preferences (born from what they are accustomed to using and from their client's financial situations) all play a role in the controversies. All this makes it even more important to keep a cool head.

OFA tests for free T4, cTSH (canine thyroid simulating hormone) and TgAA (thyroglobulin autoantibodies). OFA states, "...a negative at any one time will not guarantee that the dog will not develop thyroiditis."(3) OFA goes on to say, "since the majority of [hypothyroid] dogs will have autoantibodies by 4 years of age, annual testing for the first four years is recommended. After that, testing every other year should suffice."(3)

Beavers and Haug, who focus on the behavioral signs , such as aggression, of primary hypothyroidism recommend in their AAHA publication, *Canine Behaviors Associated With Hypothyroidism*, a CBC to rule out other possible conditions and

to establish premedication health status. Also recommended are TT4, free T4ED and TSH.(10)

During the IDEXX roundtable discussion, Robertson, Nelsen, and Kintzer agree that the TT4 is a good in-house screening tool for “**normal**” dogs. On the other hand, Scott-Moncrieff disagrees and adds, “*First you need to look at the animal and its signalment. We know that TT4 is highest at 6 months to a year of age. Over the lifetime of that animal, it is going to decrease by 60 percent; we should probably have age and breed specific reference ranges...If the owner’s resources allow, I prefer to go from screening to a thyroid panel and look at everything...the TSH assay alone should not be used as a stand-alone test.*” Nelson states, “*If your TGAA is positive, your T3AA and T4AA may or may not be positive, but if your T3AA and T4AA are positive, the your TgAA is always positive.*”(13)

Dodds states, “Complete thyroid profiling is the most accurate and correct way to diagnose thyroid dysfunction when coupled with clinical information about the animal. For genetic screening, thyroid testing requires not only thyroglobulin autoantibody (TGAA), but also circulating T3AA and T4AA, because not all dogs with autoimmune thyroiditis have positive TgAA, even though T3AA and/or T4AA are elevated [about 6 percent false negatives, presumably because of the epitopes involved weren’t recognized by the TgAA reagent.] Another significant problem is diagnostic over reliance on the canine endogenous TSH test. This test in the dog, unlike the equivalent one in humans, is only ~70% predictive, with a 20-40% discordancy rate (both false positives and false negatives occur).(14) Dodds adds that tests and labs should take into account the breed and age of the dog because normal values change by age and breed type. She goes on to say “*...for genetic screening purposes it (testing) is less likely to be meaningful before puberty.*” Puberty is defined by her as 10-14 months of age for males and during anestrus following the female’s maiden heat. Anestrus begins 12 weeks from the onset of the previous heat cycle plus one additional month. Dodds recommends retesting yearly.(16)

All the above quoted researchers and vets addressed testing for hypothyroidism by a trial use of medication in those highly symptomatic dogs from vulnerable breeds should owners be under financial constraints.

Trial medication testing involves giving thyroid medication for several months to see if symptoms improve, then taking the dog off of the medication for several

months before testing to check levels. However, there are many drawbacks and ethical issues to consider.

Should your dog be diagnosed with hypothyroidism and put on medication, follow-up testing to monitor for correct hormonal levels is required. This medication check testing is done 6-8 weeks following the beginning of treatment. The retesting blood sample is drawn 4-6 hours after the morning dose. Once the correct dosage is obtained and the levels are balanced and within the normal ranges for the breed by age, yearly follow-ups may suffice. Medication is given twice daily at 12-hour intervals for the life of the dog, and is relatively inexpensive.

The Health Committee of the TTCA hopes that covering the issue of hypothyroidism in our breed will help you and yours, and may provide a rudimentary framework for you to work within in the service of the loving care you give to your TT's.

Resources. Some include case studies to depict points made in this review, many of which are downright fascinating. Some include percentages of symptoms found in different groups of hypothyroid dogs. Many provide useful references that you may then use to track down and verify anything you have read or been told by breeders, vets, and trainers. Do look at the lists of references at the end of the individual studies and go to the references yourself.

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