

Hypothyroidism and aberrant behaviours in the Bearded Collie.

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There is a considerable literature on the relationship between thyroid function and neuropsychiatric symptoms in humans and it is generally accepted that psychiatric symptoms are a common clinical complication of hypothyroidism (Denicoff et al; 1996). In the last decade it has been suggested that thyroid or poly glandular autoimmune disorder in dogs is associated with the sudden onset of behavioural change. Behavioural signs reported include aggression, fearfulness, seizure disorder, noise sensitivity, stereotypies and moodiness. (Dodds, 1992, 1997, Dodman et al; 1995, Aronson and Dodman, 1997). Hypothyroidism is considered to be one of the most common endocrinopathies in the dog. As in the human, primary hypothyroidism accounts for 95 per cent of canine hypothyroid cases, the most common being autoimmune thyroiditis (Scarlett 1994, Feldman and Nelson, 1996).

Recently health problems in the Bearded Collie have been causing concern to the breed societies in both England and America. Many of the disorders appear to be autoimmune related. The findings of autoimmune and/or endocrine health surveys carried out in America supported this view, with primary hypothyroidism being the most common disorder. (Aronson, 1992, Report on the Autoimmune Endocrine Health Survey, 1996). In the United Kingdom the breed is not considered to have a predisposition for hypothyroidism. This may merely reflect the relative popularity of this breed in the UK dog population. In view of reported physical and behavioural problems, such as noise sensitivity, hypothyroidism was considered a factor worthy of investigation.

The study was designed to investigate the relationship between aberrant behaviours and hypothyroidism in the Bearded Collie.

MATERIALS AND METHODS

Data on 95 dogs was obtained by questionnaire from Bearded Collie owners

who were perceived to have an in depth knowledge of the breed, for example members of breed societies. The questionnaire provided information on behavioural and physical symptoms. Aberrant behaviours listed in the questionnaire were selected as a result of previous research in this field by Dodds (1992, 1995, 1997), Dodman (1995) and Aronson and Dodman (1997). Physical symptoms selected were those regarded as being typical of canine hypothyroidism (Ramsey 1997, Feldman and Nelson, 1996). (Table 1)

Table 1: Aberrant Behaviours and Physical Symptoms considered in this study.

Symptom Behaviour

Weight Gain	Dog to dog aggression (fight)
Fatigue	Dog to dog aggression (flight)
Cold Intolerance	Dog to human aggression (fight)
Loss of Hair	Dog to human aggression (flight)
Change in Hair Texture	Territorial Aggression
Dry Skin	Irritability
Hard black spots on skin	Mood Swings
Reproductive Disorders	General Fearfulness
Muscular Problems	Separation Anxiety
Eye Problems	Fear of Thunderstorms
Recurrent Infections	Noise Sensitivity
Heart Disease	General Anxiety
Gastric Disorders	Shyness
Loss of Sense of Smell	Hyperactivity
	Low Concentration Span
	Compulsive Behaviours

From these 95, a control group was selected which did not exhibit aberrant behaviours nor symptoms of hypothyroidism (n=21). This was used to establish the normal reference range of thyroid hormone concentrations for the breed. There is evidence that normal hormone levels may vary according to breed size (Feldman and Nelson, 1996). Dogs which exhibited aberrant behaviours *only* comprised the experimental group (n=22). Dogs selected included males and females with ages ranging from 10 - 132 months. (Table 2) Dogs which exhibited physical symptoms of hypothyroidism, whether or not they displayed aberrant behaviours were excluded from the study (n=52) in order to keep confounding variables to a minimum. Of these 52, 34 dogs presented both physical and behavioural symptoms.

Table 2: Sex and Age Distribution of Subjects

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Blood samples were taken from both the control and experimental group and assayed for T4 and TSH. Normal level reference range T4 13-52 nmol/L and TSH <.41ng/mL. (Bio Science Services Ltd [SCL], Cambridge).

RESULTS

Two sample t tests (one -tailed) were used to analyse the results. The experimental group had significantly lower levels of T4 (p=0.01) compared to controls. The mean levels of TSH showed no significant difference. (Table 3)

Table 3: Comparison of Mean levels of T4 and TSH in the Control and Experimental Group

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Mean levels of T4 in the control group fell within the normal reference range (13 - 52 nmol/L). 4 males had levels of T4 falling in the lower half of the accepted normal reference range (< 32.5 nmol / L).

Of the 21 control animals 13 had levels of TSH within the normal reference range (<0.41ng/mL), 3 had slightly raised levels (0.46 - 0.51ng/mL) and 5 had levels over 0.6ng/mL (0.72 - 2.3ng/mL).

In the experimental group both males and females had levels of T4 within the normal reference range. Of these, 14 had levels of T4 that fell in the lower half of the accepted normal range and 12 dogs had raised TSH.

The most common behaviour reported was noise sensitivity, exhibited by 50 per cent of females and 80 per cent of males. (Table 4)

Table 4: Frequency of aberrant behaviours recorded in the experimental group.

Aberrant Behaviours	Males (n=10)		Females (n=12)
Dog to dog aggression (fight)	2	0	
Dog to dog aggression (flight)	1	0	
Dog to human aggression (fight)	0	0	
Dog to human aggression (flight)	1	0	
Territorial aggression	3	1	
Irritability	1	2	
Mood swings	2	2	
General fearfulness	2	1	
Separation anxiety	2	2	
Fear of Thunderstorms	3	4	
Noise sensitivity	8	6	
General anxiety	2	1	
Shyness	2	3	
Hyperactivity	3	2	

Compulsive behaviours	1	2
Low concentration span	2	1

The number of aberrant behaviours exhibited by individual dogs did not appear to be related to levels of T4 or TSH.

Thyroid levels have been found to decline with age. (Ferguson, 1988, Reimers et al; 1990). The results in this study did not appear age related.

The mean level of T4 for females in both groups was higher than the mean level for males whilst the mean level of TSH was lower in females in both groups. (Table 5)

Table 5: Comparison of Mean levels of T4 and TSH in Males and Females

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DISCUSSION

When a thyroid profile is found to be abnormal ie; low T4 (<13-52 nmol/L) or high TSH (>0.41 ng/mL) a diagnosis of hypothyroidism should be considered.

Levels of T4 were found to be significantly lower in in Bearded Collies exhibiting aberrant behaviours than in controls. These results agree with Dodds (1997) and Aronson and Dodman (1997), who state that hypothyroidism may be linked to a number of behavioural conditions and suggest that aberrant behaviours may be one of the earliest signs of thyroid deficiency.

Whilst the results are of interest, it needs to be noted that there are some confounding variables.

- a) It has been found that an increase in T4 can occur during oestrus / pregnancy when serum progesterone levels are raised (SCL 1995). The date of the last season was not known nor whether any of the females in either group were pregnant at the time of testing. Future research may be improved by testing females mid cycle.
- b) Some research suggests that a diurnal rhythm with a peak in serum thyroid hormone concentration at mid-day can occur in the dog though further investigators have been unable to document its occurrence, at least during the sampling times of the studies. (Kempainen and Sartin, 1984, Miller and others, 1992). The times of testing were not recorded in this study.
- c) Certain drugs have been found to cause a decrease in thyroid hormone levels (Ramsey, 1997). Medication should therefore be discontinued for at least four weeks before testing thyroid hormone levels. It is not known if dogs in either group had been receiving drugs during the four weeks prior to testing.
- d) False positive results may be obtained if the dogs have been recently vaccinated (Dodds 1997). This information was not requested.
- e) Levels of TSH >0.6ng/mL were found in 5 of the control dogs.

According to Ramsey (1997) this is considered hypothyroid or occasionally "sick euthyroid". This raises the possibility of there being five undiagnosed cases of hypothyroidism in the control group which may have affected the final results. This may account for the findings that the mean level of TSH for experimental dogs was lower than the mean level for controls. In order to reach a conclusive diagnosis, all tests for thyroid function should be preceded by a thorough clinical examination and routine blood screens to look for evidence of other conditions. These were not requested. This may have resulted in dogs with an undiagnosed medical condition being inadvertently selected for this research.

f) Whilst results of this study showed significantly lower levels of T4 in dogs exhibiting aberrant behaviours, owners' perceptions of canine behaviour can also be a confounding factor. The ability to recognise specific behaviours is dependent upon an owner's experience in this field. It should also be noted that a behaviour perceived to be aberrant by one owner may be regarded as normal by another.

Raised TSH in some of the dogs in the control group would suggest that in addition, owners' observations of physical symptoms could also have been a confounding factor.

g) It has been observed by Aronson and Dodman (1997) that the type of aberrant behaviour exhibited by a hypothyroid dog tends to be typical of the behavioural problems seen for its breed, or predominant breed rather than hypothyroidism producing a specific behavioural problem. The Bearded Collie is regarded by many owners as being naturally hyperactive especially when young.

Although noise sensitivity is not regarded as a problem behaviour in its own right, it can result in unacceptable behaviours. For example excessive barking at high pitched sounds such as the ring of a door bell or telephone. Alternatively, a sudden loud noise may produce an extreme nervous reaction in some dogs. It is reported that there is a line of UK Bearded Collies which appear to have genetic noise sensitivity rather than it being a breed specific behaviour (Wendy Boorer, Pers. Comm.). In view of the findings, which showed noise sensitivity to be the most common aberrant behaviour, it would be interesting to look at the breed lines of these dogs to see if there is any relationship. This information was not requested. However, this observation would suggest that in certain pedigree breeds, where some dogs are found to exhibit specific common aberrant behaviours, the behaviour could be due to such dogs having been bred from a restricted gene pool rather than being breed specific as stated by Aronson and Dodman (1997).

A significant result was obtained despite the small sample groups. The findings of this study suggest that dogs may present a number of aberrant behaviours as a clinical complication of hypothyroidism and that such behaviours may be one of the earliest signs of thyroid deficiency.

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