HOINVILLE, L., MCLEAN, A. R., HOEK, A., GRAVENOR, M. B. & WILESMITH, J. (1999) Scrapie occurrence in Great Britain. *Veterinary Record* **145,** 405-406

HOINVILLE, L. J. (1996) A review of the epidemiology of scrapie in sheep. *Revue Scientifique et Technique – Office International des Epizooties* **15,** 827-852

HOINVILLE, L. J., HOEK, A., GRAVENOR, M. B. & MCLEAN, A. R. (2000) Descriptive epidemiology of scrapie in Great Britain: results of a postal survey. *Veterinary Record* **146,** 455-461

SCHALLER, O., FATZER, R., STACK, M., CLARK, J., COOLEY, W., BIFFIGER, K., EGLI, S., DOHERR, M. G., VANDEVELDE, M., HEIM, D., OESCH, B. & MOSER, M. (1999) Validation of a Western immunoblotting procedure for bovine PrP^{Sc} detection and its use as a rapid surveillance method for the diagnosis of bovine spongiform encephalopathy (BSE). *Acta Neuropathologica* **98,** 437-443

SCHREUDER, B. E. C. (1994) Animal spongiform encephalopathies – an update. Part 1. Scrapie and lesser known animal spongiform encephalopathies. *Veterinary Quarterly* **16,** 174-181

SCHREUDER, B. E. C., DE JONG, M. C. M., PEKELDER, J. J., VELLEMA, P., BROKER, A. J. M. & BETCKE, H. (1993) Prevalence and incidence of scrapie in the Netherlands: a questionnaire survey. *Veterinary Record* **133,** 211-214

Four cases of aggression and hypothyroidism in dogs

J. FATJÓ, C. STUB, X. MANTECA

AGGRESSION and hypothyroidism are, respectively, the most common behavioural and endocrinological canine disorders diagnosed in veterinary medicine (Panciera 1998, Beaver 1999). The classical behavioural changes associated with hypothyroidism are apathy, lethargy and intolerance of cold. However, some dogs suffering from hypothyroidism show a paradoxical reaction of excitement and aggressive behaviour. The aggressive displays can be similar to those shown in cases of dominance- or fear-related aggression, and can manifest in the absence of any other typical signs of hypothyroidism (Aronson 1998, Beaver 1999). Some dogs show a marked response to hormonal replacement, whereas, in others, the reduction of displays of aggression may be only partial (Dodds 1992, Dodman and others 1995, Panciera 2000). The relationship between aggression and hypothyroidism has been reported in the behavioural literature for more than 20 years (Reisner 1991). However, because of the lack of enough documented cases, the link remains speculative for some authors (Panciera 2000). This short communication discusses four cases of aggression in dogs, related to hypothyroidism, with different clinical signs and responses to treatment.

Three of the dogs showed dominance-related aggression towards family members, whereas the fourth showed fear aggression towards strangers. The diagnoses were based on established diagnostic criteria for dominance and fear aggression (Overall 1997). Situations in which the dogs expressed dominance aggression included being disturbed while eating or resting, being restrained, or being punished. The fourth dog displayed fear aggression whenever it was approached by strangers.

In all four dogs, the aggressive behaviour had been present for a long time and had been tolerated by their owners. In dogs 1 and 2, an increase in the frequency and the intensity of aggression over the previous two and 18 months, respectively, was noticed. In dog 3, a sudden, high-intensity attack occurred when the owner's child petted the dog. Similarly, dog 4 viciously bit a person who approached it while it was resting. These changes in the dogs' aggression profiles were responsible for their owners seeking help.

TABLE 1: Thyroid-stimulating hormone (TSH) and basal and free thyroxine (T4) levels in four dogs with aggression related to hypothyroidism

Dogs	TSH	T4
Dog 1 Three-year-old neutered female fox terrier	1·36 ng/ml*	Not detectable*
Dog 2 10-year-old intact male cocker spaniel	1·1 ng/ml*	Not detectable*
Dog 3 Six-year-old intact male golden retriever	1·22 ng/ml†	6·96 nmol/litre†
Dog 4 Six-year-old intact male mixed breed	1·16 ng/ml†	9·1 nmol/litre†

* Reference ranges: TSH 0·02-0·6 ng/ml, free T4 6-28 µg/ml
† Reference ranges: TSH 0·02-0·6 ng/ml, basal T4 11·8-27·5 nmol/litre

Thorough physical and neurological examinations, as well as a complete laboratory work-up including thyroid function tests, were carried out on all of the dogs. Physical examination revealed only a slight increase in bodyweight in dogs 1 and 2. Complete blood cell counts and serum biochemistry were within reference ranges in all four dogs. Thyroid function tests were suggestive of hypothyroidism in all four dogs (Table 1). Accordingly, a diagnosis of aggression related to hypothyroidism was made in all four cases.

All four dogs were treated with 20 µg/kg levothyroxine (Levothroid; Rhône-Poulenc Rorer) every 12 hours. For safety reasons, their owners were instructed to avoid situations that might trigger the dogs' aggressive behaviour. Thyroid hormone levels were monitored and dose adjustments were periodically made.

In all four cases, aggression had decreased but not completely disappeared after eight months of hormone replacement. Dog 2 responded poorly to treatment and improvement was less noticeable by its owner than in the other three cases.

There are no specific external features which permit the consistent identification of aggression related to hypothyroidism in dogs. As the physical signs of thyroid deficiency are sometimes absent or minimal in such patients, clinicians might tend to explain the aggression in purely behavioural terms. In dogs 1, 2 and 3 the aggressive displays could be diagnosed as a form of dominance aggression with a chronic course and having components of irritability and impulsiveness. The fourth dog always showed fear aggression towards strangers.

Although dog 1 also showed aggression in competitive situations, the owner described one episode where the dog growled when alone in a room, in the absence of any identifiable environmental stimulus. However, owners may not always witness this kind of episode, and this information can sometimes only be obtained after completing a very detailed behavioural history.

According to these data, the only way to diagnose aggression related to hypothyroidism is by measuring blood levels of hypophyseal and thyroid hormones. Since hypothyroidism is involved in 1·7 per cent of all cases of aggression in dogs (Beaver 1999), thyroid deficiency should be considered in any case of aggressive behaviour. Some authors therefore recom-

Veterinary Record (2002) **151,** 547-548

J. Fatjó, DVM, **C. Stub, X. Manteca,** DVM, MSc, PhD, Departament de Biologia Cellular i Fisiologia, Facultat de Veterinària, Universitat Autònoma de Barcelona, Bellaterra (Cerdanyola del Vallés) 08193, Spain

mend the inclusion of a thyroid function test as a part of the minimum data needed for diagnosing aggression problems in dogs (Overall 1997, Beaver 1999). Tests that measure levels of thyroxine in conjunction with endogenous thyroid-stimulating hormone concentration are currently preferred by most endocrinologists (Panciera 1998).

Hypothyroidism has been found to affect the turnover of serotonin (Mason and others 1987, Henley and others 1991), a neurotransmitter involved in the control of aggression (Raleigh and others 1991, Saudou and others 1994). Dominance aggression in dogs has also been found to be related to the serotonergic system and low levels of brain serotonin have been linked to dominance aggression in dogs (Reisner and others 1996). Thus, an alteration of the serotonergic activity due to thyroid deficiency may explain the link between hypothyroidism and aggression, and the subsequent reduction of symptoms after treatment with levothyroxine (Aronson 1998). This would support the idea that hypothyroidism could reduce the threshold for dominance aggression and other forms of aggression, as occurred in the dogs described here. In fact, except for the single episode described in dog 1, the aggressive behaviour observed in the four dogs fitted the diagnostic criteria for dominance- and fear-related aggression. Further, in all cases aggression decreased, but was not totally extinguished, after levothyroxine administration.

Aggressive episodes that cannot be explained on the basis of dominance or fear aggression, like the episode observed in dog 1, could be related to other hormonal and metabolic changes caused by hypothyroidism (Polsky 1993). It is interesting to note that a previous problem of seizures was reported in dog 1, a condition also described in another clinical report of hypothyroid aggression in dogs (Dodman and others 1995).

ACKNOWLEDGEMENTS

The authors thank Dr Marta Amat, Dr Ana María Manzanares and Dr Josep Prat for their help in preparing this article. J. F. was the recipient of a fellowship by Purina Veterinary Division (Spain) while preparing this article.

References

ARONSON, L. (1998) Systemic causes of aggression and their treatment. In Psychopharmacology of Animal Behavior Disorders. Eds N. H. Dodman, L. Shuster. Oxford, Blackwell Science. pp 88-92

BEAVER, B. V. (1999) Canine social behavior. In Canine Behavior: a Guide for Veterinarians. Philadelphia, W. B. Saunders. pp137-199

DODDS, W. J. (1992) Thyroid can alter behavior. *DVM Newsmagazine* **23,** 22-23

DODMAN, N. H., MERTENS, P. A. & ARONSON, L. P. (1995) Animal behavior case of the month. *Journal of the American Veterinary Medical Association* **207,** 1168-1170

HENLEY, W. N., CHEN, X., KLETTNER, C., BELLUSH, L. L. & NOTESTINE, M. A. (1991) Hypothyroidism increases serotonin turnover and sympathetic activity in the adult rat. *Canadian Journal of Physiology and Pharmacology* **69,** 205-210

MASON, G. A., BONDY, S. C., NEMEROFF, C. B., WALKER, C. H. & PRANGE, A. J. Jr. (1987) The effects of thyroid state on beta-adrenergic and serotonergic receptors in rat brain. *Psychoneuroendocrinology* **12,** 261-270

OVERALL, K. (1997) Dominance and fear aggression. In Clinical Behavioral Medicine for Small Animals. St. Louis, Mosby-Year Book. pp 106-125

PANCIERA, D. L. (1998) Canine hypothyroidism. In Manual of Small Animal Endocrinology. 2nd edn. Eds A. G. Torrance, C. T. Mooney. Cheltenham, British Small Animal Veterinary Association. pp 103-113

PANCIERA, D. L. (2000) Complications and concurrent conditions associated with hypothyroidism in dogs. In Kirk's Current Veterinary Therapy XIII. Ed J. Bonagura. Philadelphia, W. B. Saunders. pp 327-330

POLSKY, R. H. (1993) Does thyroid dysfunction cause behavioral problems? *Canine Practice* **18,** 6-8

RALEIGH, M. J., MCGUIRE, M. T., BRAMMER, G. L., POLLACK, D. B. & YUWILER, A. (1991) Serotonergic mechanisms promote dominance acquisition in adult male vervet monkeys. *Brain Research* **559,** 181-190

REISNER, I. R. (1991) The pathophysiologic basis of behavior problems. *Veterinary Clinics of North America: Small Animal Practice* **21,** 207-224

REISNER, I. R., MANN, J. J., STANLEY, M., HUANG, Y. Y. & HOUPT, K. A. (1996) Comparison of cerebrospinal fluid monoamine metabolite levels in dominant-aggressive and non-aggressive dogs. *Brain Research* **714,** 57-64

SAUDOU, F., AMARA, D. A., DIERICH, A., LEMEUR, M., RAMBOZ, S., SEGU, L., BUHOT, M. C. & HEN, R. (1994) Enhanced aggressive behavior in mice lacking 5-HT1b receptor. *Science* **265,** 1875-1878

Isospora excretion in scouring camel calves (*Camelus dromedarius*)

M. YOUNAN, S. P. MCDONOUGH, D. HERBERT, J. SAEZ, A. KIBOR

THE coccidia species *Eimeria* and *Isospora* both infect camels, but only *Eimeria* species are recognised as causing disease (Kaufmann 1996). Wernery and Kaaden (2002) describe three independent observations of *Isospora* in diarrhoeic faeces of camel calves: in India (one case), the United Arab Emirates (one case) and Kenya. This short communication describes the observations in Kenya, which affected several calves.

In June and July 2000, three traditionally managed ranch camel (*Camelus dromedarius*) herds (herds A, B and C) in the semiarid Laikipia district of north Kenya were visited once or twice each week, based on distance and availability of transport, over a period of six weeks. Faeces were collected from suckling camel calves aged between one and 70 days at visits in the early morning. Five of the calves sampled showed signs of diarrhoea during the observation period. Faecal samples were collected from the anus using disposable gloves, stored in a cool box (20°C) and examined after 10 to 12 hours for the presence of parasitic stages by direct saline smear (one loopfull of faeces per one drop of normal saline) and by centrifugal flotation (1 g of faeces per 10 ml of a magnesium sulphate flotation solution with a specific gravity of 1·2). The genus *Isospora* was identified by the characteristic oocysts containing two sporocysts (Levine 1970), and the density of *Isospora* was estimated semiquantitatively by counting the number at 100 x magnification in several fields in one coverslip square. A presumptive identification of *Eimeria cameli* was based on the size (80 to 100 µm) and brown pigmentation of the oocysts seen.

Faecal swabs from all the scouring calves were stored for three to five days at 8 to 20°C in Amies medium (Venturi Transystem) before reaching the Analabs laboratory in Nairobi for analysis. They were examined by direct Gram staining, anaerobic culture on 5 per cent defibrinated sheep blood agar (M271; Oxoid), culture on MacConkey's agar (CM 7; Oxoid) and selective Rappaport-Vassiliadis enrichment broth (CM 669; Oxoid) followed by culture of xylose-lysine-desoxycholate agar (CM 469; Oxoid) and brilliant green agar (CM 26; Oxoid).

Excretion of *Isospora* was recorded in three camel calves from herd A and one calf from each of herds B and C; the calves were aged between 18 and 32 days (Table 1). Four of

Veterinary Record (2002) **151,** 548-549

M. Younan, DVM, PhD, Kenya Camel Association, PO Box 795 Nanyuki, Kenya
S. P. McDonough, DVM, PhD, Department of Biological Sciences, College of Veterinary Medicine, S2 116 Schurman Hall, Ithaca, NY 14853-6401, USA
D. Herbert, 122 Nelson Road, Ithaca, NY 14850, USA
J. Sanchez, 25 Monkey Run Road, Ithaca, NY 14850, USA
A. Kibor, DVM, PhD, Department of Animal Health, Egerton University, PO Box 536 Njoro, Kenya

Veterinary Record

Four cases of aggression and hypothyroidism in dogs

J. Fatjó, C. Stub and X. Manteca

Veterinary Record 2002 151: 547-548
doi: 10.1136/vr.151.18.547

Notes