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SHORT COMMUNICATIONS

Assessment of the Swiss approach to scrapie surveillance

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SCRAPIE is a transmissible spongiform encephalopathy of sheep and goats with an almost worldwide distribution (Schreuder 1994, Hoinville 1996). The first case in Switzerland was described in 1981 (Fankhauser and others 1982) and six further cases have been diagnosed since 1990, the year in which the disease became reportable. This short communication describes a study in which the frequency of different neurological diseases in sheep and goats, as identified and reported by farmers in surveys, was compared with results from extensive neuropathological examinations of submitted sheep and goats. The aims of the study were to interpret the questionnaire survey data and to assess the current approach to scrapie surveillance in Switzerland.

In 1998, 9813 sheep flocks with at least five breeding ewes, 199,525 ewes in total, were registered in Switzerland. In addition, the agricultural database contained 706 registered goat flocks with five or more breeding goats, with a total of 13,126 goats. In 1999, a questionnaire was sent by post to a random sample of 4711 of the sheep or goat flock owners. The same questionnaire was administered by telephone to 150 randomly selected owners. In an information campaign, all Swiss small ruminant owners were offered free-of-charge neuropathological examinations of adult sheep and goats submitted with neurological signs to the NeuroCenter (Swiss National Reference Laboratory) at the University of Bern.

The questionnaire approach was appropriate for the collection of data from a large target population within a limited timeframe. The return rate of the postal survey (36 per cent) was similar to that of comparable surveys conducted in the Netherlands (Schreuder and others 1993), but considerably lower than that of a UK study (61·4 per cent) (Hoinville and others 1999). This latter return rate might be the consequence of relatively high scrapie incidence and awareness of the disease, and less stringent consequences for reporting scrapie cases, in the UK.

Overall, 1·7 per cent (95 per cent confidence interval [CI] 1·2 to 2·5 per cent) of all respondents stated that they had observed a suspected scrapie case (by their definition) between 1990 and 1998 – an average of 0·19 per cent of all flocks per year. The nine-year cumulative prevalence of suspected cases of scrapie officially reported to the veterinary authorities was 0·68 per cent (Table 1).

Almost 8 per cent (124 of 1693) of the flock owners who replied to the postal survey had observed sheep and goats with neurological disorders in 1997 or 1998. For the telephone interview survey, this proportion was 9·3 per cent (14 of 150), and the pooled annual flock prevalence was 7·5 per cent (6·4 to 8·6 per cent). On an individual animal level, the owners classified 1·01 per cent (381 of 37,650) of their sheep and goats per year as 'neurological' (95 per cent CI 0·92 to 1·1 per cent). When extrapolated to the 1998 target population, the owners of almost 800 (673 to 902) flocks had observed approximately 2000 (1835 to 2198) sheep and goats with

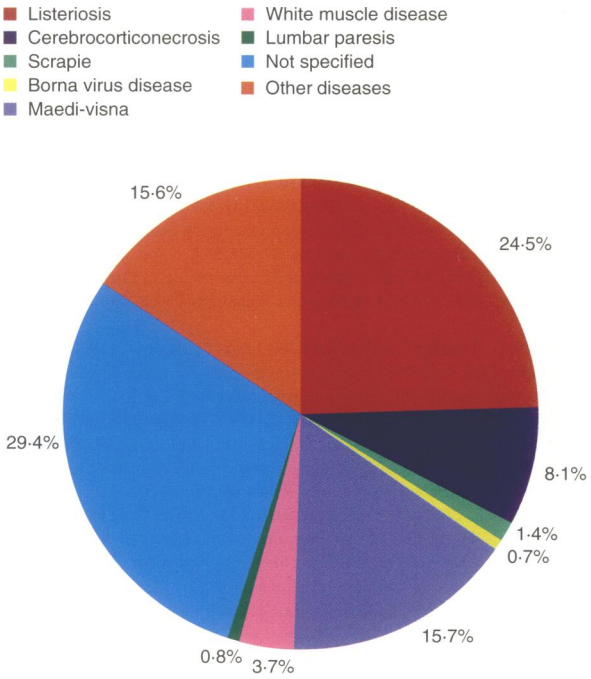

FIG 1: Proportion of owner-reported neurological diagnoses in Swiss sheep and goats with neurological symptoms (n=381). Data from a questionnaire survey carried out in 1999

TABLE 1: Number of Swiss sheep and goat flocks with suspected scrapie cases between 1990 and 1998. Results of postal and telephone interview surveys, and the official number of reported scrapie suspects

Target population (1990 to 1998)	Observed suspects (flocks)	Study population (flocks)	Proportion (%) over nine years (95% CI)	Odds ratio (95% CI)
Postal survey	22	1571	1·40 (0·87-1·94)	2·1 (1·3-3·3)
Interview survey	8	150	5·33 (1·76-8·90)	7·8 (3·7-16·5)
Both surveys combined	30	1721	1·74 (1·18-2·31)	2·6 (1·7-3·9)
Reported scrapie suspects	72	10,519	0·68	1

CI Confidence interval

TABLE 2: Comparison of the proportion of neurological diagnoses as reported by Swiss sheep and goat flock owners in a postal survey carried out in 1999, and in neuropathological examinations carried out at the Swiss reference laboratory for animal transmissable spongiform encephalopathies, University of Bern, between 1999 and 2000

Disease category	Postal survey (%)	Neuropathological examinations (%)	Odds ratio (95% confidence interval)
Listeriosis	24·5	13·7	1·9 (0·81-5·1)
Cerebrocorticonecrosis	8·1	13·7	0·63 (0·26-1·7)
Scrapie	1·4	2·0	0·78 (0·11-34·4)
Lumbar paresis	0·8	2·0	0·42 (0·05-20·0)
Others/unknown	65·1	68·6*	Reference category

*Diagnoses included in the category 'Others/unknown' of the extended examinations were: brain lesions indicative of meningoencephalitis 5·9 per cent, metabolic and nutritional diseases 7·8 per cent, rare central nervous system (CNS) disorders (such as abscesses) 7·8 per cent, other CNS diseases 19·6 per cent; without detectable brain lesions 27·5 per cent; total 68·6 per cent

neurological disorders. Only a very small number of these (two in 1997, and six in 1998) were reported to the veterinary authorities as suspected scrapie cases.

In the postal survey, owners attributed 25 per cent of all neurological problems to listeriosis. Scrapie was suspected in 1·4 per cent of all neurologically diseased sheep and goats. In 16 per cent, other diseases, such as meningitis, tetanus, septicaemia, trauma, enterotoxaemia, pregnancy toxaemia and cardiovascular problems were listed. For the remaining 29 per cent, the owners did not specify an underlying cause (Fig 1).

In a closed question on knowledge about scrapie-specific signs, the owners were asked to identify signs that they associated with the disease. They were given a choice between four scrapie-specific and five non-specific signs. Only nine per cent of the respondents identified one or more of the non-specific signs. In 44 per cent of the responses, the owners identified at least two correct scrapie-specific and no non-specific signs, and in 30 per cent they correctly identified at least three specific and no non-specific signs.

Between May 1999 and December 2000, 10 goats and 40 sheep were submitted to the University of Bern for neuropathological examination. Fifteen were live submissions, of which one sheep was confirmed with scrapie. Listeriosis and cerebrocorticonecrosis (CCN) were the most frequent neuropathological diagnoses in this sample (both 14 per cent). In the category 'others and unknown' (69 per cent), mainly metabolic disorders, such as hepatoencephalic syndrome, swayback, enterotoxaemia, and rare diseases such as cerebellar atrophy, hydrocephalus and cerebral abscess, were recorded. The relative proportions of listeriosis, CCN, and two rare conditions (scrapie and lumbar paresis) among all of the sheep and goats with neurological symptoms were not statistically different between the animals submitted to the laboratory and those identified by the owner survey (Table 2).

These results partly validate the outcomes of the postal survey. They indicate that sheep and goat owners in Switzerland, aided by their veterinary practitioners, have a reasonable understanding of the more important neurological conditions, such as listeriosis and CCN, and are well aware of the typical signs of scrapie. The fact that a range of rare conditions such as cerebral abscesses (7·8 per cent of the submissions) was captured indicates that surveillance for rare neurological diseases in small ruminants in Switzerland is, in principle, functional. Scrapie, which was only diagnosed once during the study period, seems to be a rare disease in Switzerland. This conclusion was supported by the screening of 788 adult fallen sheep brains, collected between January 1999 and December 2000, for protease-resistant prion protein (PrP^{Sc}) using the Prionics Western blot (Schaller and others 1999): all samples were PrP^{Sc} negative.

One remaining problem of the passive surveillance system, however, is that the sheep and goat owners indicated that they had observed 1 per cent of the entire breeding population as having neurological signs, but only a very small proportion of these cases were submitted for further investigation. Similar observations have been made in the UK, where only 13 per cent of the total number of scrapie suspects (as identified by the farmers) were recorded by the veterinary authorities (Hoinville and others 1999, 2000). Intensified efforts to investigate the neurological disease status of the Swiss small ruminant population should therefore be a major part of future scrapie surveillance schemes.

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Four cases of aggression and hypothyroidism in dogs

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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-

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Notes