



**PAPER No: SEAC 78/4**

## **SUMMARY OF THE RESULTS OF SCRAPIE SURVEILLANCE IN SHEEP IN GREAT BRITAIN**

### **Issue**

1. The VLA has produced a report of the results of scrapie surveillance in sheep in Great Britain. The report includes the results of the 20,000 sheep identified for testing of brain stem (obex), submandibular and retropharyngeal lymph nodes and tonsils as recommended by SEAC. A copy of this report is attached.

### **Background**

#### The SEAC Abattoir Survey

2. In its report published in April 1999 the SEAC Sub-Group on Research and Surveillance for TSEs in sheep recommended that more consideration should be given to ways of improving the ascertainment of TSEs in sheep. A SEAC Sub-Group on Surveillance was set up under the chairmanship of Professor Peter Smith to define the objectives of a surveillance programme for sheep and, within the limits of current scientific knowledge and what could be applied practically, recommend approaches to meet these objectives. One of the objectives was to monitor changes in the prevalence of infection in sheep entering slaughterhouses.
3. On 29 September 2000 SEAC was presented with the conclusions from the SEAC Sub-Group on Sheep Surveillance. The Committee endorsed the proposals from the Sub-Group, underlining the importance of carrying out an abattoir survey to monitor changes in the prevalence of scrapie in sheep going into slaughterhouses. Members agreed that it was important to sample the most appropriate tissues, and recommended that in addition to brain, lymphatic tissue should also be examined as this was more likely to carry markers for infectivity throughout the incubation period.
4. At the SEAC meeting on 21 November 2001, the Committee considered Defra proposals for future sheep surveillance work. The Committee was informed that the SEAC abattoir survey would be combined with the EU abattoir survey, which was due to start on 1 January 2002. VLA epidemiologists advised that a total sample of 20,000 head would be required to provide statistically valid results. It was therefore agreed to increase the EU survey (15,000) by 5,000 to a total of 20,000 in order to fulfil the survey requirements. The EU survey requirement was subsequently increased to 60,000 animals aged over 18 months destined for human consumption. The additional 40,000 were only brain stem tested.

5. The results of the 20,000 head abattoir survey are contained within the attached report together with the results of the other scrapie surveillance undertaken, as detailed below.

### The Summary Report

6. Four sources of surveillance are currently available for analysis: the results of routine notifications of clinically suspect cases of scrapie; an abattoir survey of sheep >18 months of age; a survey of fallen stock; and the results of the anonymous postal questionnaire survey in 2002.
7. An analysis of the data from the four sources of surveillance has been undertaken by the VLA. The main findings are highlighted in the report.
8. Members will wish to note the following points when considering the results contained within the report:
  - Paragraph 13 of the report refers to 35 positives - these were positive by the initial screen test, and do not include animals that have been shown to have scrapie by means of an additional test on lymphoid tissue that is not required by EU law.
  - Paragraph 16 refers to 38 positives - these include animals that were positive to confirmatory test on lymphoid tissue in the absence of a screen test positive.
  - Table 5 refers to 38 positives - these include animals that were positive to confirmatory test on lymphoid tissue in the absence of a screen test positive.
9. In conclusion, there are actually 38 positive sheep, but results must be interpreted with care because the additional examinations were carried out only on the target 20,000 sheep heads. For those where brain stems were collected in abattoirs there will have been no additional testing of samples that were negative to the preliminary screen test.

### **Advice sought from the Committee**

10. Members may wish to comment on the results contained in the summary report.

# **SUMMARY OF THE RESULTS OF SCRAPIE SURVEILLANCE IN SHEEP IN GREAT BRITAIN**

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## SCRAPIE SURVEILLANCE IN GREAT BRITAIN, NOVEMBER 2002

### EXECUTIVE SUMMARY

- ◆ Four sources of surveillance are currently available for analysis: the results of routine notifications of clinically suspect cases of scrapie; an abattoir survey of sheep >18 months of age; and a survey of fallen stock. The anonymous postal questionnaire survey in 2002 has been completed and the results of preliminary analyses are available.
- ◆ The results of routine notifications of clinically suspect cases of scrapie indicate that flock owners reverted to reporting these cases in 2002 following the disruption caused by the FMD epidemic in 2001.
- ◆ The results of genotyping confirmed clinical cases of scrapie indicate that animals with an ARR/VRQ genotype have the longest incubation period (ip) and sheep with an ARR- bearing genotype have, in general, a longer ip.
- ◆ The abattoir survey indicates a crude prevalence of infection of 0.07% (35/47,467). Modelling studies provide an improved estimate of the prevalence of infection in the GB sheep flock of 0.35% (95% CI: 0.26 – 0.46) compared to that derived from the 1997/8 abattoir survey, of 0.22% (95% CI: 0.01 – 0.97)
- ◆ The abattoir survey and the survey of fallen stock indicate that current screening tests (WB) have a lower sensitivity than immuno-histochemistry (IHC) examination of the brainstem. Also, estimates of prevalence are unlikely to be improved by the examination of LRS tissues by IHC in addition to that of brainstem samples.
- ◆ The results of genotyping scrapie positive sheep in the abattoir survey indicate a disproportionate number of animals with the ARR/VRQ genotype compared to the results from notified clinical scrapie cases. This is most likely to be due to the longer ip of scrapie associated with this genotype.

- ◆ The results of the fallen stock survey provide a minimum estimate of the prevalence of scrapie affected flocks of 0.45% (95% CI: 0.06 – 0.83) in 2002/03.
- ◆ The scrapie postal questionnaire survey conducted in 2002 recorded 1% of flock owners who thought that they had at least one case of scrapie in the 12 months before the survey.
- ◆ A comparison of the results of genotyping sheep included in the abattoir survey (and in the National Scrapie Plan) with those used in the original VLA genotyping model indicated a close agreement. However, there was evidence that the initial VLA data from “commercial” genotyping has become out of date for two breeds (Swaledale and Suffolk) because of the owners of these breeds actively increasing resistant genotypes.

## SCRAPIE NOTIFICATIONS OF CLINICAL CASES (PASSIVE SURVEILLANCE)

1. Scrapie in sheep and goats was made a notifiable disease within the EU from January 1993. Since then scrapie has been confirmed in 1601 flocks. A scrapie notifications database (SND) was established in August 1998 when the diagnosis of scrapie was supplemented by the genotyping of confirmed cases.
2. The results of this passive surveillance of the sheep population for the period 1998 until 31 December 2002, by genotype where known, are summarised in Table 1 (overleaf). The age at report for confirmed cases appears to be influenced by genotype. The average age at reporting varies significantly (analysis of variance,  $p < 0.0001$ ) among the most frequent genotypes (2002 data). This is shown in table 2.

NSP Group	Genotype	N	Average age (years)
V	VRQ/VRQ	54	38.5 months (3.2)
V	ARH/VRQ	15	38.9 months (3.2)
III	ARQ/ARQ	75	42.8 months (3.6)
V	ARQ/VRQ	128	47.6 months (4.0)
III	ARQ/AHQ	7	59.7 months (5.0)
IV	ARR/VRQ	11	67.7 months (5.6)

**Table 2.** Age at report for different genotype groups

3. In terms of the observed incidence, the most notable finding is the effect of the FMD epidemic in 2001 which significantly suppressed the reporting of scrapie cases. The number of notifications of suspect cases which were confirmed as scrapie during 2002 indicate that flock owners are reverting to notifying suspect cases of scrapie to the State Veterinary Service of Defra.

NSP Group	Genotypes	Number confirmed cases 1998	%total confirmed cases reported	Number confirmed cases 1999	%total confirmed cases reported	Number confirmed cases 2000	%total confirmed cases reported	Number confirmed cases 2001	%total confirmed cases reported	Number confirmed cases 2002 (see Annex 1)	%total confirmed cases reported	total number confirmed cases 98-02	%total confirmed cases reported
I	ARR/ARR	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
II	ARR/AHQ	0	0.00%	1	0.20%	0	0.00%	0	0.00%	0	0.00%	1	0.06%
II	ARR/ARH	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
II	ARR/ARQ	0	0.00%	1	0.20%	2	0.41%	2	0.85%	2	0.62%	7	0.40%
II	Total	0	0.00%	2	0.39%	2	0.41%	2	0.85%	2	0.62%	8	0.46%
III	ARQ/ARH	1	0.48%	0	0.00%	0	0.00%	1	0.43%	3	0.93%	5	0.28%
III	ARQ/AHQ	6	2.87%	12	2.36%	9	1.87%	4	1.70%	7	2.18%	38	2.16%
III	AHQ/AHQ	2	0.96%	3	0.59%	0	0.00%	1	0.43%	0	0.00%	6	0.34%
III	ARH/ARH	0	0.00%	0	0.00%	1	0.21%	0	0.00%	2	0.62%	3	0.17%
III	AHQ/ARH	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
III	ARQ/ARQ	28	13.40%	99	19.45%	84	17.43%	44	18.72%	83	25.86%	338	19.25%
III	Total	37	17.70%	114	22.40%	94	19.50%	50	21.28%	95	29.60%	390	22.21%
IV	ARR/VRQ	6	2.87%	9	1.77%	8	1.66%	9	3.83%	12	3.74%	44	2.51%
V	AHQ/VRQ	0	0.00%	0	0.00%	0	0.00%	1	0.43%	1	0.31%	2	0.11%
V	ARH/VRQ	6	2.87%	23	4.52%	25	5.19%	7	2.98%	18	5.61%	79	4.50%
V	ARQ/VRQ	120	57.42%	248	48.72%	268	55.60%	129	54.89%	138	42.99%	903	51.42%
V	VRQ/VRQ	40	19.14%	113	22.20%	85	17.63%	37	15.74%	55	17.13%	330	18.79%
V	Total	166	79.43%	384	75.44%	378	78.42%	174	74.04%	212	66.04%	1314	74.83%
	<b>Totals</b>	209	100.00%	509	100.00%	482	100.00%	235	100.00%	321	100.00%	1756	100.00%
												0	
Genotype	Unknown	290		89		86		60		83		608	
Total	Cases	499		598		568		295		404		2364	

**Table 1:** Number of confirmed cases of sheep scrapie, by genotype, 1998 – 31 December 2002



## **ACTIVE SURVEILLANCE**

4. Active surveillance for sheep scrapie can be simply subdivided into abattoir surveys and a survey of fallen stock. An initial abattoir survey of sheep was conducted in 1997/8, the results of this survey are not presented here but are referred to in paragraph 19.

## **ABATTOIR SURVEY**

5. An abattoir survey of sheep scrapie was commissioned by the Spongiform Encephalopathy Advisory Committee (SEAC) during 2000 to estimate the prevalence of sheep scrapie in the British sheep flock. This was in the context of the concerns of the possible presence of BSE in the national flock. Subsequently, in May 2001, the EU requested an abattoir survey of sheep and goats (EC Decision 999/2001).

6. This ultimate EU requirement involved the examination of a random sample of 60,000 sheep per 12 month period. However, the basic survey involving a random sample of 20,000 sheep > 18 months of age was expanded and redesigned, as a result of the EU requirements in May 2002 to include a sample of 60,000 sheep > 18 months of age.

7. The design of the abattoir survey involved a systematic sample of sheep (>18 months of age) slaughtered in Great Britain. On administrative grounds, it was decided that those abattoirs currently recorded as slaughtering > 10,000 sheep > 18 months of age formed the sampling frame. The number of samples required from each of the abattoirs was determined proportional to their throughputs.

8. With respect to the testing of the anticipated 60,000 samples, a sampling protocol was designed such that 40,000 sheep were identified for testing of brain stem samples and 20,000 sheep were identified for testing of samples of brain stem (obex), submandibular and retropharyngeal lymph nodes and tonsils.

9. For the 40,000 sample of sheep, the brain stem was screened using the BioRad ELISA and samples positive to this screening test were confirmed by immuno-histochemistry (IHC).

10. The 20,000 samples of sheep heads collected for additional testing, as recommended by the SEAC, were subjected to the following tests. The brainstem was tested by the Prionics western blot (WB) and immuno-histochemistry was undertaken on the brain stem (obex) and samples of the submandibular and medial retropharyngeal lymph nodes and the tonsil.

11. All positive IHC cases, arising from the ultimate sample of 60,000 sheep, were re-read and confirmed by specialist staff at the VLA, Weybridge.

12. All samples are subject to a determination of the PrP allelic variants at codons 136, 154 and 171 (see Annex 1 for results as at May 2003)

13. To date, 35 (0.07%) of the 47,467 samples taken, for which testing is complete, were positive. The results of 16,324 samples for which the full additional test results are available are summarised, by the WB result, in Table 3.

WB	obex	retro	subm	tonsil	Number	Totals	
Positive	+	+	+	+	9		
	+	+	-	+	1		
	+	-	-	-	4		
	+	-	-	u	2		
	+	u	+	+	1	17	WB Pos
Negative	+	+	+	+	4		
	+	+	+	-	1		
	+	-	-	-	4		
	-	+	+	+	1		
	-	+	-	+	2	12	'SEAC' Pos
	-	-	-	-	15428		29 Pos total
	-	-	-	u	441		
	-	-	u	-	87		
	-	-	u	u	8		
	-	u	-	-	92		
	-	u	-	u	13		
	-	u	u	-	9		
	-	u	u	u	4		
	u	-	-	-	24		
	u	-	-	u	2		
	u	-	u	-	1		
u	u	u	u	98	16,219	WB Neg	
Unsuitable	-	-	-	-	85		
	-	-	-	u	2		
	u	-	-	-	1	88	WB Uns (16,324 Tot)

u = unsuitable for examination

**Table 3** Results of WB and IHC tests for animals subject to additional LRS samples

14. These results indicate that the sensitivity of Western blotting on brain stem samples is relatively lower than IHC examination of the brain stem. Twelve of the 29 positive sheep, from which additional tissues were examined, would have been misclassified if only WB screening had been used. Only three of these 29 positives was negative on examination of the brain stem by WB and IHC and detected as infected by IHC examination of LRS tissue. This indicates that the prevalence estimate is not improved by the examination of these LRS tissues. (This was confirmed by deriving

prevalence estimates from the results of CNS only examinations and from the results of the combined CNS and LRS examinations. The confidence limits of the two estimates are overlapping.) In addition, the examination of LRS tissues alone does not provide an alternative to examination of CNS tissue as this would result in the failure to detect approximately one third of the positives (6 out of 17 (for the EU sample) and 4 out of 12 ( for the SEAC sample))

15. The results of genotyping 19,729 scrapie-negative sheep are summarised in Table 4. (see Annex 1 for results as at May 2003)

<b>NSP Genotype Group</b>	<b>Genotypes</b>	<b>%</b>
<b>I</b>	ARR/ARR	19.64
<b>II</b>	ARR/... AHQ or ARH or ARQ	41.67
<b>III</b>	No ARR or VRQ	26.63
<b>IV</b>	ARR/VRQ	5.60
<b>V</b>	VRQ/x not ARR	6.46

**Table 4** Results of genotyping 19,729 negative sheep sampled in the abattoir survey

16. Thirty-eight of the positive samples have been genotyped. The results are summarised in the Table 5. (see Annex 1 for results as at May 2003)

<b>NSP Genotype Group</b>	<b>Genotypes</b>	<b>Number of cases</b>
<b>III</b>	AHQ/AHQ	1
	AHQ/ARQ	1
	ARQ/ARQ	2
<b>IV</b>	ARR/VRQ	9
<b>V</b>	ARQ/VRQ	21
	VRQ/VRQ	2
	ARH/VRQ	2

**Table 5.** Genotypes of 38 positive sheep detected in the abattoir survey.

17. The frequency distribution of these positive animals indicates a disproportionately greater number of ARR/VRQ genotypes and disproportionately lesser numbers of VRQ/VRQ and ARQ/ARQ genotypes compared with the distribution in the notified cases (Table 1). The most likely explanation for this is the longer incubation period experienced in sheep with the ARR/VRQ genotype and the shorter incubation period experienced by the VRQ/VRQ and ARQ/ARQ genotypes (Table 2) and the fact that the majority of sampled animals were >36 months of age. This is simply because in Great Britain there are very few sheep slaughtered between 18 and 36 months of age.

### **Estimation of the prevalence of scrapie infection in the GB sheep flock**

18. The results of the abattoir survey can be used to provide an estimate of the prevalence of scrapie infection in the GB sheep population. To

interpret the results we use a likelihood-based approach that accounts for variation in the prevalence of infection with age and test sensitivity and specificity with stage of infection.

19. For the 1997/8 survey results from four diagnostic tests (those for histopathology, SAF detection, brain IHC and tonsil IHC) were used while for the 2002/3 survey (which is still ongoing) the results for three diagnostic tests were used (ELISA, Western blot and tonsil IHC). Moreover, in the analysis of the 2002/3 abattoir survey it was assumed that: (i) the age distribution of animals sampled was the same as in the 1997/8 survey; (ii) all positive samples came from animals over 36 months old; and (iii) all diagnostic tests are 100% specific.

Survey	Prevalence (%)	
	Estimate	95% CI
1997/8 abattoir	0.22	(0.01, 0.97)
2002/3 abattoir (EU)	0.45	(0.33, 0.59)
2002/3 abattoir (combined)	0.35	(0.26, 0.46)
1998 postal	0.14	(0.05, 0.37)

**Table 6.** Estimates and 95% confidence intervals (CI) for the prevalence of infection in the GB sheep flock.

20. The results of an anonymous postal survey conducted in 1998 provides an alternative source of data with which to estimate the prevalence of infection in the GB sheep flock (Hoinville and others, 1999, 2000). From this survey the prevalence of affected flocks is 6% (percentage of respondents reporting clinical cases in the past five years) and the within-flock incidence is 0.5% (modal incidence of clinical cases within flocks), yielding a prevalence/incidence of clinical cases of 0.03%. To convert this to the prevalence of infection we use an estimate for the

number of infected animals per clinical case of 4.5 (range 1.67-12.17) derived from a stochastic model for the within-flock dynamics of scrapie (Table 6). This produces an estimate for the prevalence of infection consistent with both the 1997/8 and 2002/3 surveys (Table 6).

The model used to estimate the prevalence of infection based on the abattoir survey results also provides predictions of the total number of clinical cases per year (Table 7). For the postal survey, the number of cases was estimated by combining the proportion of flocks reporting scrapie in the previous twelve months (2.7%; 95% CI: 2.2-3.2) with the modal within-flock incidence (0.5%). In Table 7, the prediction is derived from the estimate and the range is derived from the confidence interval for each survey.

Survey	Predicted number of cases	
	Prediction	Range
1997/8 abattoir	5018	(345, 21878)
2002/3 abattoir (EU)	10133	(7426, 13415)
2002/3 abattoir (combined)	7912	(5814, 10480)
1998 postal	4616	(3761, 5470)

**Table 7.** Predicted total number of cases of scrapie per year.

### **Comparison of Genotype distributions from various sources**

21. The genotype distributions used as inputs to the VLA Ram Genotyping model (Arnold et al., 2002) were taken from commercial testing results between 1994 and 2000 for the following pure-breeds of sheep: Swaledale (20,615 samples), Scottish Blackface (238), North Country Cheviot (75),

Welsh Mountain (1,789), Beulah (78), Blue-faced Leicester (248), Charollais (421), Texel (1,843), Suffolk (3,428). Below is a comparison of the genotype distributions from other sources to check the extent of sampling error and possible biases in the VLA genotyping data used.

### Genotypes in cull ewe population

NSP Genotype Group	Genotypes	Abattoir survey (%)	From Ram Genotyping model (%)
I	ARR/ARR	19.6	19.6
II	ARR/...AHQ or ARH or ARQ	41.6	44.4
III	No ARR or VRQ	26.6	25.8
IV	ARR/VRQ	5.6	5.0
V	VRQ/x not ARR	6.6	5.2

**Table 8:** Comparison of the genotype distribution of animals entering the abattoir survey (n=19,841) with the estimated genotype distribution of the breeding ewe population from the Ram Genotyping model. The model included approximately 63% of the breeding ewe population.

## Genotypes in breeding ram population

NSP Genotype Group	Genotypes	NSP samples (%)	From Ram Genotyping model (%)
I	ARR/ARR	28.2	29.7
II	ARR/...AHQ or ARH or ARQ	40.0	42.0
III	No ARR or VRQ	26.6	22.1
IV	ARR/VRQ	1.9	2.7
V	VRQ/x not ARR	3.3	3.5

**Table 9:** Comparison of the genotype distribution of animals tested in the NSP (n=139,139) and the estimated genotype distribution of the breeding ram population from the Ram Genotyping model. The model included approximately 86% of the breeding ram population, with the number of breeding rams for each breed derived from (Merrell, 2000). The relative proportion of each breed in the NSP were broadly in line with the figures in (Merrell, 2000) with the exception of Suffolks; with 31% of the ram population estimated to be Suffolks, but only 15% of the NSP rams tested were Suffolks.

### Genotype distributions by breed

22. The input genotype distributions of the breeds included in the ram genotyping model were compared to the distributions from the NSP samples. The distributions in each case were generally fairly close (and in some cases very close). It appeared that for the breeds for which most testing data was available (the Swaledales and Suffolks), the VLA genotyping data has become out of date due to the breeds actively increasing their resistant genotypes. For example, in the Suffolks the proportion of ARR homozygotes was 48.4% in the VLA input data and 56.4% in the NSP. For the Swaledales, the ARR/ARR proportion was 10.6% in the VLA data, compared to 18.0% in the NSP. However, it can be seen from Tables 8 and 9 that these sampling errors in individual breeds had only a small effect on the estimation of the genotype distributions for the population as a whole.

## **SURVEY OF FALLEN STOCK**

23. The epidemiological design of the fallen stock survey was initially based upon a random selection of registered owners of sheep. A sample of 30,000 owners were contacted and requested to submit 2 dead sheep over 18 months of age. A sampling quota was allocated to each Animal Health Office catchment area based on the geographical distribution and seasonality obtained from the throughput of sheep presented for post mortem at the VLA Regional laboratories. The response declined very rapidly after the first few months. An additional 30,000 flock owners were contacted by post around August 2002. Then in December 2002 a large publicity campaign was launched to stimulate and maintain submissions. Samples of the brain stem, tonsil and medial retropharyngeal and submandibular lymph nodes were taken. The brain stem was tested using the Prionics WB and all samples were examined by immunohistochemistry.

24. All samples are subject to a determination of the PrP allelic variants at codons 136, 154 and 171. (see Annex 1 for results as at May 2003)

25. The ascertainment of fallen stock has proved difficult. This may, in some part, be due to the general problem of owners not wishing to run the risk of having scrapie diagnosed in their flocks. The number of cases submitted in each month is shown in Table 10. There is some evidence of seasonality in the ascertainment of cases, with submissions being greatest during the lambing period, but this is confounded by the efforts made to secure animals for sampling.

Jan 02	Feb 02	Mar 02	Apr 02	May 02	Jun 02	Jul 02	Aug 02	Sep 02	Oct 02	Nov 02	Dec 02	Jan 03	Feb 03	Mar 03
17	255	197	205	89	37	21	9	11	71	52	60	251	387	201

n = 1863

**Table 10** Number of fallen stock cases submitted per month during 2002-03.

26. The flock of origin was known for 1850 of the 1863 cases, and these were obtained from 1150 flocks. Their distribution is shown in Table 11. 89.4% of the flocks (1028) submitted one or two animals. Around 10% submitted between 3 and 9 cases. Six owners submitted 10 or more sheep with one submitting 25.

No. cases per flock	1	2	3	4	5	>5
No. of flocks	749	279	54	35	11	22

**Table 11** Distribution of cases per flock.

27. A total of 8 (0.69%) samples of the 1,148 sheep examined to date were positive to one of the tests. Seven were positive under the EU criteria as they were positive in the Prionics test and one animal was negative in this test, but all samples were positive by the IHC. The results are summarised in Table 12.

WB	obex	retro	subm	tonsil	Number	Totals			
Positive	+	+	+	+	3	7	WB Pos		
	+	+	-	+	2				
	+	+	u	+	1				
	+	+	u	u	1				
Negative	+	+	+	+	1	1,100	WB Neg	1 'SEAC' Pos	
	-	-	-	-	951				8 Pos total
	-	-	-	u	53				
	-	-	u	-	31				
	-	-	u	u	4				
	-	u	-	-	24				
	-	u	-	u	2				
	-	u	u	-	7				
	-	u	u	u	1				
	u	-	-	-	18				
	u	-	u	u	1				
	u	u	-	-	1				
	u	u	-	u	1				
	u	u	u	-	1				
	u	u	u	u	4				
Unsuitable	-	-	-	-	32	41	WB Uns	(1,148 Tot)	
	-	-	-	u	1				
	-	-	u	u	1				
	-	u	-	-	1				
	u	-	-	-	6				

**Table 12.** Results of WB and IHC tests for 1,148 fallen stock for which all results are available

28. As in the abattoir survey, the lower sensitivity of WB of the brain stem relative to IHC examination is evident with 1 of the 7 positive sheep negative on WB. Also the results do not indicate any advantage of examining LRS tissue in addition to brain stem.

29. Of the 1150 flocks from which fallen stock have been submitted, 27 (2.3%) have reported at least one suspect case which has been confirmed as scrapie. The eight survey positive cases originated from 8 different flocks, from which 3 had previously reported a confirmed case.

30. Although not all results are available from the fallen stock cases submitted, there are, at present, 5 positive flocks that have not previously reported scrapie in the population of 1123 flocks not previously identified as scrapie affected. This provides a minimum prevalence of 0.45% (95% CI: 0.06- 0.83%) of scrapie-affected flocks. The continuation of the fallen stock survey will improve the accuracy of the estimates of the prevalence of scrapie affected flocks as will the results of the repetition of the anonymous postal questionnaire survey in 2002. The preliminary analyses of this indicate that 1% of flock owners thought that they had at least one case of scrapie in the 12 months before the survey (Sivam and others, 2003).

31. Seven of the positive animals have been genotyped. The results are shown in Table 13. (see Annex 1 for results as at May 2003)

<b>NSP Genotype Group</b>	<b>Genotypes</b>	<b>Number of cases</b>
<b>V</b>	ARQ/VRQ	6
	VRQ/VRQ	1

**Table 13.** Genotypes of the seven scrapie-positive fallen stock

32. This just reflects the frequency of genotypes in the notified cases, as fallen stock include animals older than 18 months.

33. A total of 399 negative fallen stock have been genotyped. The results are summarised in Table 14. (see Annex 1 for results as at May 2003)

<b>NSP Genotype Group</b>	<b>Genotypes</b>	<b>Number of animals (%)</b>
<b>I</b>	ARR/ARR	92 (23.1)
<b>II</b>	ARR/AQH	33 (8.3)
	ARR/ARH	12 (3.0)
	ARR/ARQ	119 (29.8)
<b>III</b>	ARQ/ARH	8 (2.0)
	ARQ/AHQ	31 (7.8)
	AHQ/AHQ	7 (1.8)
	ARH/ARH	4 (1.0)
	AHQ/ARH	4 (1.0)
	ARQ/ARQ	47 (11.8)
<b>IV</b>	ARR/VRQ	26 (6.5)
<b>V</b>	AHQ/VRQ	6 (1.5)
	ARQ/VRQ	9 (2.3)
	VRQ/VRO	1 (0.3)

**Table 14.** Distribution of 399 scrapie-negative fallen stock by genotype.

## References

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## RESULTS OF GENOTYPING SHEEP FROM ACTIVE AND PASSIVE SURVEILLANCE SCHEMES IN GB

NSP Group	Genotype	Negative cases from abattoir survey †		Negative cases from fallen stock †		Positive cases from abattoir survey †		Positive cases from fallen stock †		Positive cases from passive surveillance 2002 ††	
I	ARR/ARR	6501	19.65%	148	26.10%						
II	ARR/AHQ	3074	9.29%	41	7.23%						
II	ARR/ARH	492	1.49%	19	3.35%						
II	ARR/ARQ	10305	31.15%	167	29.45%					2	0.62%
II	<b>Total</b>	<b>13871</b>	<b>41.93%</b>	<b>227</b>	<b>40.04%</b>					<b>2</b>	<b>0.62%</b>
III	ARQ/ARH	377	1.14%	10	1.76%					3	0.93%
III	ARQ/AHQ	2896	8.75%	39	6.88%	1	2.17%			7	2.17%
III	AHQ/AHQ	564	1.70%	8	1.41%	1	2.17%				
III	ARH/ARH	125	0.38%	7	1.23%					2	0.62%
III	AHQ/ARH	102	0.31%	6	1.06%						
III	ARQ/ARQ	4720	14.27%	65	11.46%	2	4.35%			83	25.78%
III	<b>Total</b>	<b>8784</b>	<b>26.55%</b>	<b>135</b>	<b>23.81%</b>	<b>4</b>	<b>8.70%</b>			<b>95</b>	<b>29.50%</b>
IV	ARR/VRQ	1805	5.46%	33	5.82%	12	26.09%			12	3.73%
V	AHQ/VRQ	552	1.67%	7	1.23%					1	0.31%
V	ARH/VRQ	71	0.21%	1	0.18%	2	4.35%			18	5.59%
V	ARQ/VRQ	1372	4.15%	15	2.65%	26	56.52%	6	85.71%	139	43.17%
V	VRQ/VRQ	125	0.38%	1	0.18%	2	4.35%	1	14.29%	55	17.13%
V	<b>Total</b>	<b>2120</b>	<b>6.41%</b>	<b>24</b>	<b>4.23%</b>	<b>30</b>	<b>65.22%</b>			<b>213</b>	<b>66.15%</b>
	<b>Totals</b>	<b>33081</b>	<b>100.00%</b>	<b>567</b>	<b>100.00%</b>	<b>46</b>	<b>100.00%</b>	<b>7</b>	<b>100.00%</b>	<b>322</b>	<b>100.00%</b>

### Distribution of genotypes from sheep survey animals and confirmed Scrapie notifications

† Preliminary results of 2002/03 surveillance programme at 19 May 2003

†† Confirmed suspect cases of scrapie reported in 2002

## RESULTS OF GENOTYPING GOATS FROM ACTIVE SURVEILLANCE SCHEMES IN GB

NSP Group	Genotype	Negative cases from goat abattoir survey †		Negative cases from goat fallen stock †	
<b>I</b>	<b>ARR/ARR</b>				
II	ARR/AHQ				
II	ARR/ARH				
II	ARR/ARQ				
<b>II</b>	<b>Total</b>				
III	ARQ/ARH				
III	ARQ/AHQ				
III	AHQ/AHQ				
III	ARH/ARH				
III	AHQ/ARH				
III	ARQ/ARQ	57	98.28%	3	100.00%
<b>III</b>	<b>Total</b>	57	98.28%	3	100.00%
<b>IV</b>	<b>ARR/VRQ</b>				
V	AHQ/VRQ				
V	ARH/VRQ				
V	ARQ/VRQ	1	1.72%		
V	VRQ/VRQ				
<b>V</b>	<b>Total</b>	1	1.72%		
	<b>Totals</b>	58	100.00%	3	100.00%

There have been no positive goats in the active surveillance programme.

There has been one positive goat in the passive surveillance during 2002, this was genotype ARQ/ARQ.