



## NATIONAL SCRAPIE PLAN UPDATE

### Issue

1. To update the committee on the scope of the National Scrapie Plan (NSP) for Great Britain.

### Background

2. In 1999 the Spongiform Encephalopathy Advisory Committee (SEAC) made a recommendation for a long term control and eradication programme for scrapie. This led directly to the Department for Environment, Food and Rural Affairs (Defra), the Scottish Executive Environment and Rural Affairs Department (SEERAD) and the National Assembly for Wales, launching the National Scrapie Plan in 2001.
3. There were several reasons for SEAC making their recommendation in 1999 including:
  - the possibility that the BSE outbreak in cattle may have originated from a strain of scrapie
  - it had been clearly demonstrated that sheep were susceptible to BSE following experimental exposure
  - there was, and continues to be, no practical pre-clinical live animal test for diagnosing TSEs
  - epidemiological investigations had clearly shown that sheep had been exposed to the same contaminated feed that had caused the outbreak of BSE in cattle, albeit in smaller amounts.

There was also increasing scientific evidence that, if BSE was present in the sheep population, it would behave less like BSE in cattle, where the disease is more restricted to the central

nervous system, and more like scrapie where there is wide peripheral tissue involvement (Foster et al., 1996)<sup>1</sup>.

4. The NSP's primary aims are to protect animal health by reducing and eventually eradicating scrapie and to protect public health from the theoretical risk of BSE (if it is there and being masked by scrapie) by increasing the levels of genetic resistance to TSEs in sheep. The first initiative launched by the NSP in July 2001 was a Ram Genotyping Scheme (RGS), aimed initially at the registered purebred sector, and subsequently expanded to include purebred non-registered flocks in January 2002.
5. The RGS involves genotyping the prion protein (PrP) gene of rams and then restricting their use based on their genotype. The genotype is used as a marker of susceptibility/resistance to infection, as shown in table 1. Sheep carrying the most susceptible VRQ allele (NSP Types 4 and 5) have to be either slaughtered or castrated. When the RGS was originally launched there were also time restrictions on the use of NSP type 3 rams, however these restrictions have now been lifted ahead of the launch of a compulsory breeding programme.
6. Although the NSP's RGS applies only to Great Britain there is a similar scheme in place in Northern Ireland, under the Department for Agriculture and Rural Development's (DARD) Northern Ireland Scrapie Plan (NISP), launched in January 2003. The NISP's RGS is open to all pure-bred flocks and operates under similar rules as the NSP's RGS.
7. Since the launch of the RGS there have been a number of schemes and services provided by the NSP. More details of the current schemes and services are provided in Annex 1.

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<sup>1</sup> Foster, J.D., Bruce, M., McConnell, I., Chree, A. and Fraser, H. (1996). Detection of BSE infectivity in brain and spleen of experimentally infected sheep. *Vet Rec* 138, 546-548

**Table 1: NSP genotypes**

<b>Genotype</b>	<b>NSP Type</b>	<b>Degree of resistance/susceptibility</b>
ARR/ARR	1	Sheep that are genetically most resistant to scrapie
ARR/AHQ ARR/ARH ARR/ARQ	2	Sheep that are genetically resistant to scrapie, but will need careful selection when used for further breeding
AHQ/AHQ AHQ/ARH AHQ/ARQ ARH/ARH ARH/ARQ ARQ/ARQ	3	Sheep that genetically have little resistance to scrapie and will need careful selection when used for further breeding
ARR/VRQ	4	Sheep that are genetically susceptible to scrapie and should not be used for breeding unless in the context of a controlled breeding programme approved by the NSP Administration Centre (NSPAC)
VRQ/AHQ VRQ/ARH VRQ/ARQ VRQ/VRQ	5	Sheep that are highly susceptible to scrapie and should not be used for breeding

## Progress

- To date more than 1.5 million samples have been sent for genotyping and there are some 10800 members in the RGS. Table 2 shows, for 11 numerically important breeds, the percentages of all animals classed as NSP types 1 or 2, as type 3 or as NSP types 4 or 5.

**Table 2:** Overall NSP genotype distributions for 11 numerically important breeds. Figures relate to animals tested within the RGS or WEGSII with confirmed 2-part genotypes. Male and female animals of all age groups are represented and the figures cover the complete NSP testing period (October 2001 to end December 2004).

<b>Breed</b>	<b>all animals &lt;all years&gt;</b>			<b>total animals</b>
	<b>type 1 &amp; 2* (%)</b>	<b>type 3 (%)</b>	<b>type 4 &amp; 5* (%)</b>	
Beulah	76.9	17.7	5.4	52284
Blackface	54.6	40.9	4.5	121152
Bluefaced Leicester	86.9	12.5	0.5	56463
Charollais	84.5	9.2	6.4	42381
Cheviot	59.7	24.9	15.4	23012
Lleyn	83.3	13.9	2.8	72085
North Country Cheviot	68.1	21.3	10.6	49079
Suffolk	94.8	4.7	0.5	118225
Swaledale	66.0	25.4	8.6	69503
Texel	67.5	27.5	5.0	193406
Welsh Mountain	60.6	29.5	9.9	189639
All Breeds	71.5	21.7	6.7	1317584

\* combined percentages, to nearest 0.1%

9. While the overall statistics provide a global picture of the genotype patterns in breeds, they can disguise the progress made in a breed from one year to the next. Furthermore, we anticipate that, by applying selection strategies based on PrP genotype, a member flock's genotype profile will improve with time. Accordingly we would expect that recent results in long-standing member flocks would compare favourably with those of the majority of newly-joining flocks.
10. Movements in ram lamb genotypes at breed and individual flock level are confirmed by analyses recently performed by the NSP and have been presented in a leaflet, a copy of which is attached at Annex 2.

### **Compulsory Breeding Programme – Outcome of Consultation Exercise**

11. During the summer of 2004 Defra launched a public consultation on a strategic review of the NSP. There were several reasons for reviewing the current NSP policy, not least a European requirement stemming from Commission Decision 2003/100/EC to introduce a compulsory TSE breeding programme for all

sheep flocks of 'high genetic merit'. The consultation document set out several options for consideration, namely

- **Option A:** implementing the EU minimum rules which require the testing of all rams intended for breeding within flocks of 'high genetic merit' and the subsequent slaughter of those found to be carrying the VRQ allele.
- **Option B:** the same as option A plus additional genotyping of rams/shearlings/ram lambs intended for sale and further breeding elsewhere
- **Option C:** the same as option B plus voluntary ewe testing, the participants of which would be required to take action on ARQ/ARQ breeding rams
- **Option D:** making the current Ram Genotype Scheme compulsory

12. Modelling of these options by Janet Roden (University of Wales Aberystwyth) and Simon Gubbins (Institute for Animal Health) assessed the influence they would have on the genotype profile of the national flock as a whole and the subsequent impact that this might have on the prevalence of scrapie. The conclusions of this work were set out in the consultation document. The document also asked for comments on a number of possible definitions for the term 'high genetic merit'.

13. As part of the consultation process views were sought from SEAC's Sheep Subgroup on 26<sup>th</sup> July 2004. At this meeting the Sheep Subgroup requested that two further options be modelled and considered, namely

- **Option E:** the same as option B plus maintaining the voluntary NSP, where farmers could choose whether to join the voluntary NSP.
- **Option F:** the same as option E plus voluntary ewe genotyping and removal of VRQ ewes.

14. The results of this additional work were considered by the Sheep Subgroup and their conclusions relating to all the strategic options were presented at SEAC 84. At the meeting the Committee endorsed the Subgroup's main conclusions that:-

- *the strategy of the NSP underlying breeding for scrapie resistance remained appropriate*
- *that, although Option D remains the most scientifically desirable, there were potential practical difficulties with this option*

- *Option F offered no significant advantage over Option E.*
- *Option E, given high voluntary take up, could also be regarded as precautionary from a risk reduction perspective.*

(The full Sheep Subgroup statement is available at Annex 3)

15. Twenty nine other responses to the consultation exercise<sup>2</sup> were received with the majority supporting Options B and C, with little support for Options A and D.
16. In the light of comments received, taking account of such issues as the estimated reduction in prevalence of scrapie associated with each option, practicality and cost, Government concluded that Option C represented the most appropriate way forward.
17. The Government has since announced that the compulsory breeding programme will take the form of a compulsory ram genotyping scheme requiring the removal of VRQ rams which will be applied to all purebred breeding flocks and to any other flock that produces and sells homebred rams for breeding. It is currently envisaged that the compulsory ram genotyping scheme will be launched during 2006.
18. There will also be an associated voluntary ewe genotyping scheme open to flocks participating in the compulsory ram genotyping scheme which will require participants to remove ARQ/ARQ rams. The exact details of the scheme have yet to be decided but it is unlikely that the scheme will be launched before 2007.
19. In the meantime, the existing voluntary RGS will continue until the compulsory scheme is introduced, although to better reflect the new strategic direction of the NSP, restrictions on NSP Type 3 rams will no longer be applied.

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<sup>2</sup> A summary of the responses are available at [www.defra.gov.uk/corporate/consult/nsp-stratereview/index.htm](http://www.defra.gov.uk/corporate/consult/nsp-stratereview/index.htm)

## **Other Schemes/Services currently ongoing within the NSP**

- **Voluntary Scrapie Flock Scheme (VSFS)**

The VSFS (launched in April 2004) aims to eradicate scrapie and prevent its reoccurrence in flocks historically affected by scrapie. It has now closed to applicants but was open to all owners of sheep flocks that reported a confirmed scrapie case between July 1998 and the date of enforcement of EU compulsory scrapie flock measures (see below). It involves genotype based action with culling and disposal of more susceptible animals, with compensation and some assistance towards genotyping of replacements. There are restrictions on animals that can be brought on and sent off holdings and go into the food chain. Participation is on the basis of a contract for a maximum of 4 years or until the flock reaches the status of ARR/ARR males and ARR/xxx females. To date 329 holdings have participated in the scheme, with about 130 of these being on the Shetland Islands.

- **Compulsory Scrapie Flocks Scheme (CSFS)**

The CSFS (launched in England and Scotland in July 2004 and November 2004 in Wales) was introduced to comply with European Commission (EC) Regulation 1915/2003 amending Regulation 999/2001 that requires all Member States to operate a compulsory scheme to ensure that action is taken on holdings affected with scrapie. There are two options within the Scheme:

- Genotyping and selective culling
- Whole flock cull

The genotyping and selective culling option involves genotyping all sheep in the flock and culling all non-ARR, except ARR/VRQ, sheep (i.e. retaining all sheep that are of NSP types 1 and 2). The flock is then subjected to 3 years of restrictions, based upon NSP genotypes. If the whole flock culling option is taken then the holding either has to remain free of sheep for three years from the date of culling and then restocked with sheep without restrictions or immediately restocked using ARR (except ARR/VRQ) animals and placed under restrictions for three years. More details of the scheme can be found on the NSP website ([www.defra.gov.uk/nsp](http://www.defra.gov.uk/nsp)). To date 147 flocks on 82 holdings are involved in the scheme.

- **Flock Register**

This was launched on the 1<sup>st</sup> June 2005 and is open to all flocks. The Register is a voluntary initiative which aims to recognise the scrapie resistance status of a farmer's flock. There are 5 different categories with flocks in Category A being the most resistant to scrapie.

Category name	Rams	Ewes
<b>A</b>	NSP Type 1	NSP Type 1
<b>B</b>	NSP Type 1	Any
<b>C</b>	NSP Types 1 & 2 (but no ARR/ARQ)	Any
<b>D</b>	NSP Types 1 & 2	Any
<b>E</b>	NSP Types 1, 2 & 3	Any

- **Semen Archive**

Work has begun to establish an archive of semen from rams of susceptible genotypes – those carrying the AHQ, ARH, ARQ or VRQ alleles. The Archive will make it possible to re-establish viable breeding populations of these sheep in the future, if it should prove necessary. This recognises the concerns of some stakeholders, that a TSE strain could emerge that might affect resistant genotypes, or that breed traits may be lost through removal of non-resistant rams. SEAC have previously reiterated the importance of maintaining a bank of such genotypes<sup>3</sup>.

This is a collaborative initiative with the Northern Ireland Scrapie Plan.

Also a Semen Archive Management Board (SAMB) comprising representatives from UK Agriculture and Rural Affairs Departments, the National Sheep Association, the Rare Breeds Survival Trust and the Sheep Trust is providing strategic oversight. Day to day operations are the responsibility of a contracted service provider, Ark Consortium Ltd. The cost of transport, semen collection, freezing and storage is being paid for by Defra or DARDNI.

Presently donor rams are being sought directly from their owners and, with their permission, breed societies have the opportunity to approve their nominations. It is anticipated that it will take about 3 years or so to complete the archive (2004/05 – 2006/07). Ultimately it is, of course, hoped that the Archive will never need to be used, but the success of

<sup>3</sup> [http://www.seac.gov.uk/papers/seac84\\_1.pdf](http://www.seac.gov.uk/papers/seac84_1.pdf) (page 6)

this initiative – being prepared to reintroduce these alleles if necessary – will hinge on the support of individual breeders and breed societies.

- **Selective breeding on PrP genotype in the UK sheep flock: An impact assessment designed to inform Defra strategy – SE0236**

Defra are funding a £1.8m four year research project, started in 2004, to investigate the potential impact of breeding for resistance on economically important production traits. The project has the overall aims of collecting and analysing the information necessary to critically evaluate the impact of widespread selection on PrP genotype in the UK sheep population, and devising optimal breeding strategies for scrapie resistance in the context of an overall genetic improvement programme. To achieve these aims the project will be analysing historically collected data from a number of research flocks as well as new data to be collected from farms currently involved in the NSP. For this further data collection the researchers are targeting farmers not only involved in the NSP, but also part of the Meat and Livestock Commission's (MLC) Signet recording system. Participating farmers will be asked to collect additional data, especially in relation to lamb survival and the mothering capabilities of the ewe. The NSP is also performing additional ewe genotyping in participating flocks. Data will be collected from the major breeds within the terminal sire, longwool and hill sectors, namely Texel, Charollais, Poll Dorset, Bluefaced Leicester, Welsh hill sheep, Scottish Blackface and Cheviot. For the data collection it is necessary to have at least 2000 breeding ewes for each breed. All these different sources of data will be analysed to see if there is any link between breeding for scrapie resistance and economically important production traits.

The project is being run by the Scottish Agricultural College (SAC) and the Roslin Institute, with a number of collaborators including Edinburgh University, MLC, Agricultural Development and Advisory Service (known as ADAS), Veterinary Laboratories Agency (VLA), Rare Breed Survival Trust and the Sheep Trust. Due to the size of the project, and the importance of the research, an independent steering group, chaired by Professor William Hill, is managing the project. This group includes representatives from the farming industry and all results will be made available to the industry.

- **Welsh Ewe Genotyping Scheme (WEGS) II**

WEGS II is a 3-year, £9.3m initiative launched on 26 June 2003, by the National Assembly for Wales. The aim of the Scheme is to help the

Welsh sheep industry position itself to withstand market uncertainties and, eventually, show it to have scrapie resistant status.

Participants have to be members of the NSP, have a purebred flock, and have a holding number in Wales. It provides genotyping of ewe lambs and all sampled animals receive an electronic identification bolus. Certificates are issued for Types 1 & 2, types 4 & 5 must be slaughtered.

Between August 2003 and June 2004, 145,000 sheep have been tested, with an expenditure of £2.74m. The target is to sample 450,000 sheep over the 3-year period.

From August 2004 the Scheme has included breeding advice through regional seminars and a WEGS II artificial insemination (AI) service. Targeted producers, where the flock has a high proportion of scrapie susceptible and/or low proportion of resistant genotypes, are offered more detailed scrapie related breeding advice and the opportunity to join the AI service.