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Llywodraeth Cymru
Welsh Government

Ageing sheep at the slaughterhouse: consultation on a proposal to introduce an optional alternative method to dentition for the purposes of removing Specified Risk Material

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1. Introduction

- 1.1 Defra, the Welsh Government and the Food Standards Agency (FSA) are carrying out a consultation on a proposed amendment to English and Welsh legislation on Transmissible Spongiform Encephalopathies (TSEs), which would permit the option of ageing sheep at slaughter by a means other than dentition for the purposes of removing Specified Risk Material (SRM).
- 1.2 We are also consulting on the implementation protocol for this new optional ageing system (see Annex 1). Under this:
 - Sheep born in the previous calendar year and submitted for slaughter in the calendar year following their birth after an annual cut-off date of 30 June must be considered as aged over 12 months and therefore would require the removal of the spinal cord as SRM. Sheep born in the previous calendar year and submitted for slaughter in the calendar year following their birth before an annual cut-off date of 30 June would be considered as aged under 12 months and would not require removal of the spinal cord, as not deemed to be SRM.
- 1.3 A risk assessment undertaken by the Animal and Plant Health Agency (APHA) confirmed that this would not compromise existing food safety or result in any additional risks to either public or animal health (see Annex 2).
- 1.4 Goats are excluded from this consultation. Dentition checks will remain the only authorised method for ageing of goats at slaughter for the purposes of SRM removal.

2. Context

Background

- 2.1 Transmissible spongiform encephalopathies (TSEs) are fatal brain diseases which include bovine spongiform encephalopathy (BSE) in cattle and scrapie in sheep and goats. Exposure to BSE through the consumption of infected meat is believed to be the primary cause of variant Creutzfeldt-Jakob Disease (vCJD) which can cause fatal brain diseases in humans. The European Food Safety Authority (EFSA) has advised that BSE is the only animal TSE that has been shown to be a risk to human health.
- 2.2 Regulation (EC) No. 999/2001 of the European Parliament and the Council, as amended ('the EU TSE Regulation') lays down rules for the prevention, control and eradication of TSEs, including BSE and scrapie. The government seeks to implement TSE controls, in line with EU requirements, and in the interest of public health and animal health protection. The current domestic TSE legislation in England is the

Transmissible Spongiform Encephalopathies (England) Regulations 2018 and in Wales the Transmissible Spongiform Encephalopathies (Wales) Regulations 2018.

2.3 On 23 June 2016, the European Union (EU) referendum took place and the people of the United Kingdom voted to leave the EU. Until exit negotiations are concluded, the UK remains a full member of the EU and all the rights and obligations of EU membership remain in force. The government will continue to negotiate, implement and apply EU legislation.

2.4 Removal of SRM is the key public and animal health measure to keep potentially infected material out of the human food chain. SRM comprises those parts of cattle, sheep and goats that are most likely to pose a risk of infectivity if the animal from which it comes was infected with a TSE disease. SRM must be removed after an animal is slaughtered and before the carcass enters the human food chain. SRM must be disposed of by incineration or by rendering and it must not go into either the human food chain or animal feed. BSE has never been confirmed to occur naturally in a sheep: the requirement to remove SRM from sheep was first introduced at a time before scientific tests became available to differentiate between BSE and classical scrapie. Although such tests are now available, the removal of SRM from sheep is still required as a precautionary measure.

2.5 The following material is currently designated as SRM in accordance with point 1 of Annex V of Regulation (EC) No. 999/2001 (as amended):

Cattle:

- All ages – the tonsils and the last four metres of small intestine including the distal ileum, the caecum, and the mesentery.
- Over 12 months – skull excluding the mandible but including the brains and eyes, and spinal cord.
- Over 30 months – vertebral column, excluding the vertebrae of the tail, the spinous and transverse processes of the cervical, thoracic and lumbar vertebrae, the median sacral crest and the wings of the sacrum, but including the dorsal root ganglia.

Sheep and goats:

- The skull, including the brain and eyes, and the spinal cord of animals aged over 12 months or which have a permanent incisor erupted through the gum, or aged over 12 months as estimated by a method approved by the competent authority of the Member State of slaughter.

2.6 In the UK, carcasses of sheep older than a year are split to allow easy visual verification of spinal cord removal.

- 2.7 Prior to 30 July 2018, the 'EU TSE Regulation' required that when the age of a sheep was not known, its age would be determined by dentition: if it had one or more than one permanent incisor erupted at the time of slaughter it would be regarded as being over 12 months old and its carcass would be split for the removal of SRM.
- 2.8 However there is evidence that dentition may not be the most accurate method of ageing sheep at slaughter because in some breeds the first permanent incisor can erupt as early as 9 months while in others it may not erupt until 15 months. In addition, ageing by dentition is time consuming for abattoirs and can cause delays at slaughter. The splitting of a carcass means that the value obtained from it is reduced.
- 2.9 On request of the UK sheep farming and meat processing industries, the 'EU TSE Regulation' was amended on 30 July 2018 to permit the ages of sheep and goats at slaughter to be determined by actual age, by dentition "or as estimated by a method approved by the competent authority of the Member State of slaughter".

3. Purpose of the consultation

- 3.1 Defra, the Welsh Government and the FSA are consulting jointly on a proposal to amend the Transmissible Spongiform Encephalopathies (England) Regulations 2018 and the Transmissible Spongiform Encephalopathies (Wales) Regulations 2018, so that English and Welsh sheep industries have the option of taking advantage of the EU's derogation, enabling the ageing of sheep at slaughter to be determined by a means other than dentition.
- 3.2 The proposal is to introduce a new optional ageing system under which sheep born in the previous calendar year and submitted for slaughter in the calendar year following their birth before the cut-off date of 30 June would be considered as aged under 12 months and would not require carcass splitting for the removal of SRM. As explained at paragraph 6.3 below, we are satisfied that this system would not reduce existing food safety or compromise public or animal health.

Examples of how this system would be applied:

- (i) Scenario: Sheep born between 1 January and 31 December submitted for slaughter up to 30 June in year following birth

Action: Age determined to be under 12 months: do not contain SRM and therefore do not require carcass splitting

- (ii) Scenario: Sheep born between 1 January and 31 December submitted for slaughter after 30 June in year following birth

Action: Age determined to be over 12 months: would require carcass splitting for the purpose of removal of SRM.

- (iii) Scenario: Sheep born between 1 January and 31 December submitted for slaughter in year of birth

Action: Aged under 12 months: do not contain SRM and therefore would not require carcass splitting.

4. What we propose to do and when we propose to introduce

- 4.1 In line with the proposal submitted to the European Commission by the UK sheep farming and meat processing industries, we are considering the implementation of an optional alternative ageing system to dentition, under which sheep born in the previous year and submitted for slaughter in the current year after an annual cut-off date of 30 June would be considered as aged over 12 months and therefore requiring SRM removal. Sheep born in the previous year and submitted for slaughter before 30 June would be considered as aged under 12 months and would not therefore require carcass splitting. Dentition would remain as an alternative means of ageing sheep to this new option.
- 4.2 We see this proposal as a useful one, to reduce complexity, costs and burdens in the food chain without compromising food safety or human or animal health. The UK is however at a sensitive time in deciding on its meat trading arrangements. The decision to leave the EU and our potential listing by the EU as a Third Country must influence our decisions in this area. We therefore believe it will be right to take stock following this consultation to consider whether there would be any risks to our wider meat trading capability arising from perceptions about the change.

5. How we propose to do it

- 5.1 Annex 1 sets out a protocol agreed between Defra, the Welsh Government, the FSA and industry stakeholders which keepers, operators of livestock markets and collection centres and food business operators (FBOs) wishing to use the optional alternative method of sheep ageing must follow. This ensures that the age of sheep declared by the original consignor of the sheep is maintained throughout the movement chain to the abattoir and that only animals meeting the criteria set out above for being considered under 12 months do not need to have their age determined by dentition.
- 5.2 Official controls carried out at the abattoir will assure the food business operators' processes and random and risk based checks by means of dentition will be undertaken.

6. Are any risks associated with this proposal?

6.1 The risks of moving from dentition to the proposed method set out in the protocol above have been carefully considered. In the absence of an exact measure for ageing sheep, it is recognised that under this optional alternative method a small number of sheep born in January to June of the previous year with erupted permanent incisors will enter the food chain with their age determined to be under 12 months of age even though they may in fact be over that age. However, this is also true for the dentition method where a small number of sheep over 12 months will enter the food chain because their incisors have not yet erupted. For this reason the Animal and Plant Health Agency (APHA) has conducted a risk assessment to see if there was a potential increase in risk from moving to a cut-off date method compared to using dentition. The risk assessment is at Annex 2.

6.2 A previously developed model, termed the Scrapie Control Model, was used to estimate the potential amount of prion infectivity passed into the food chain by the changing of the ageing of the sheep. Three scenarios were included:

- 1) baseline of dentition;
- 2) using a date based May cut off; and,
- 3) using a date based June cut off.

Several key parameters of the model were highly uncertain, and some of the parameters were given worst case assumptions, so results are likely to be pessimistic (Annex 2 refers). However, even with these highly cautionary assumptions, although the risk assessment showed some slight theoretical increase in risk of infectivity as a result of the small increase in the number of older sheep expected to enter the food chain from using a cut-off date, it concluded in practice that the risk to human health remained negligible (the event is so rare it does not merit consideration) regardless of which scenario was modelled.

6.3 Having assessed the evidence provided by the APHA risk assessment and the Scrapie Control Model, we are satisfied that our proposed optional method of ageing sheep, as described in this consultation document and its annexes, would therefore not reduce existing food safety or compromise public or animal health.

7. What are the costs and benefits associated with this proposal?

- 7.1 The cut-off date of 30 June means farmers, market operators and abattoir owners will have the option of avoiding the burden of checking the teeth of sheep to determine whether they are over 12 months old, which has been criticised for being costly and inaccurate.
- 7.2 Based on outline evidence submitted by industry, if sheep no longer have to be aged through the process of dentition in order to determine whether the animal is over one year old and that the carcass therefore has to be split to remove the SRM, the direct savings would be approximately in the range of £78,000 to £134,000 per year. However the savings actually realised may be less, depending upon the number of farmers and abattoir owners who decide to implement this option. Calculations of the anticipated savings are given in full at Annex 3.
- 7.3 In addition, industry estimate this change in method would provide real certainty and should allow farmers to adjust the timing and pattern of their lambing and submission of animals for slaughter, and should therefore minimise the splitting of lambs aged under 12 months under the dentition method. Industry figures suggest that this could result in indirect savings of up to £24 million a year.

8. What discussions have already taken place with interested parties?

- 8.1 We have held extensive discussions with key industry stakeholders over the past four years. As explained at paragraph 4.1 above, our proposal originates from one submitted to the European Commission by the UK sheep farming and meat processing industries. Defra, the Welsh Government and the Food Standards Agency have worked closely with industry leaders to develop this proposal and the associated protocol at Annex 1. The amendment to the EU TSE Regulation came into force on 30 July 2018 and was published in the Official Journal on 9 July 2018 ¹.

¹ COMMISSION REGULATION (EU) 2018/969 of 9 July 2018 amending Annex V to Regulation (EC) No 999/2001 of the European Parliament and of the Council as regards the requirements for the removal of specified risk materials from small ruminants

8.2 To date no dialogue has taken place directly between governments and consumers. We would therefore particularly welcome the views of consumer and retailer stakeholders, groups and individuals in the course of this consultation.

9. Tell us what you think

About you

9.1 For all respondents

Question 1: What is your name?

Question 2: What is your email address?

Question 3: What is your organisation?

Question 4: Would you like your response to be confidential?

Your comments are invited on the following questions:

9.2 For respondents in the sheep farming and abattoir industries:

Question 5: Would you take advantage of the proposed optional alternative method to age lambs at slaughter by a means other than dentition?

Question 5a: If your answer to question 5 is 'yes', would you operate it exclusively or maintain a dual system of ageing by either dentition or cutoff date? If you would operate a dual system, please outline your reasons for doing so and explain how you would implement both methods.

Question 5b: If your answer to question 5 is 'no', what would be your reasons for continuing to age animals by dentition?

Question 6: What would be the practical advantages and disadvantages for your business from using the proposed optional alternative method?

Question 7: What would you estimate to be the annual costs and savings for your business from using the proposed optional alternative method?

Question 8: Have you any other comments on the proposed optional alternative method?

9.3 For all respondents

Question 9: Would you have any concerns with placing on the market and export of some ovine heads with erupted permanent incisors for human consumption?

Question 10: Do you have any further comments or concerns on this proposal which are not covered by the questions set out above?

Question 11: Do you have any comments on the analysis set out in Annex 3?

Question 12: Do you have any comments on the timing for introducing this new option?

Question 13: Do you have any specific comments on the potential impacts of this proposed optional alternative method of sheep ageing on people with protected characteristics as defined by the Equality Act 2010, in particular where those impacts are thought to be disproportionate because of those 9 protected characteristics? If so, do you have any supporting evidence?

10. How to reply

10.1 A list of interested organisations Defra has approached directly for views will be published on the Defra section of the government website. We welcome views from all interested parties or individuals by **31 October 2019**.

10.2 You can respond to this consultation in one of three ways.

- **Online** by completing the questionnaire at

<https://consult.defra.gov.uk/animal-health-and-welfare/ageing-sheep-at-slaughter>

- **Email** to AgeingSheepConsultation@defra.gov.uk

- **Post** to Defra at:

Animal By-Products and TSEs Team
Area 2B, Nobel House
17 Smith Square
London
SW1P 3JR

10.3 Our preferred method is online because it is the fastest and most cost-effective way for us to collate, analyse and summarise responses.

10.4 Responses to this consultation are also welcomed in the Welsh language.

10.5 Responses received by the deadline will be analysed and a summary will be placed on the consultation section of the government web site.

Confidentiality and data protection

- 10.6 This consultation document and consultation process have been planned to adhere to the Consultation Principles issued by the Cabinet Office.
- 10.7 Representative groups are asked to give a summary of the people and organisations they represent and where relevant who else they have consulted in reaching their conclusions when they respond.
- 10.8 Information provided in response to this consultation, including personal data, may be published or disclosed in accordance with the access to information regimes these are primarily the Environmental Information Regulations 2004 (EIRs), the Freedom of Information Act 2000 (FOIA) and the Data Protection Act 2018 (DPA). We have obligations, mainly under the EIRs, FOIA and DPA, to disclose information to particular recipients or to the public in certain circumstances.
- 10.9 If you want the information that you provide to be treated as confidential, please be aware that, as a public authority, the Department is bound by the Freedom of Information Act and may therefore be obliged to disclose all or some of the information you provide. In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.
- 10.10 This consultation is being conducted in line with the Cabinet Office “Consultation Principles” and be found at:
<https://www.gov.uk/government/publications/consultation-principles-guidance> .

If you have any comments or complaints about the consultation process, please address them to:

Consultation Coordinator

Area 6B, 6th Floor

Nobel House

17 Smith Square,

London, SW1P 3JR.

Or email: consultation.coordinator@defra.gov.uk

Annex 1: Protocol for keepers, operators of livestock markets and collection centres and food business operators in England and Wales on using the optional method of sheep ageing by age declaration (instead of dentition) for the purpose of specified risk material removal

Introduction:

- 1.1. This is a protocol for keepers, operators of livestock markets and collection centres and food business operators in England and Wales wishing to use (instead of dentition) the optional method of sheep ageing for the purposes of determining when specified risk material removal (SRM) should be removed, as approved by the competent authority, i.e. the Secretary of State for Environment, Food and Rural Affairs in England and the Welsh Government Agriculture Minister in Wales.

The age declaration method:

- 2.1 If the food business operator (FBO) at the abattoir chooses on a case by case basis to use the age declaration method (see point 3 below) as approved by the competent authority, under this method:
 - a) Sheep born in the previous calendar year and submitted for slaughter in the calendar year following their birth after an annual cut-off date of 30 June must be considered as aged over 12 months and therefore would require the removal of SRM.
 - b) Sheep born in the previous calendar year and submitted for slaughter in the calendar year following their birth before an annual cut-off date of 30 June would be considered as aged under 12 months and would not require removal of the spinal cord, as it is not deemed to be SRM. Under this method, age of the sheep will be verified by food business operators through checking the age declaration and appropriate validation of their process.

c) The competent authority will assure the food business operator's processes for the removal of SRM and undertake random and risk based checks by means of dentition.

d) Sheep may not be consigned to an abattoir by a producer, market or collection centre without a declaration in accordance with point 3 or they will be subject to ageing by dentition.

Roles and responsibilities:

- 3.1 Responsibility for recording of the year of birth of sheep and making the original declaration sits with the keeper of the sheep at the farm of origin (where the lamb was born). At least the year of birth must be recorded.
- 3.2 The substance of this declaration (i.e. the year in which the animal was born) must follow the animal from place of birth to slaughter. Consequently, declarations from subsequent owners/keepers (including markets) must have a robustly linked system with an audit trail back to the original declaration. Owners/keepers will provide a new declaration when the animal leaves the holding and will retain the declaration received with the sheep for three years following its departure.
- 3.3 In the case of sheep sold for slaughter via a market/ collection centre:
 - (a) The operator of the market/collection centre must make a separate declaration of age for the total consignment leaving the market/centre – as is required for the Food Chain Information (FCI) declarations.
 - (b) The market /centre must retain traceable records from the farm of origin for three years for inspection should the competent authority need to verify them.
 - (c) Any declaration must be linked on the paperwork to the sheep moving out of the market in the same way as markets are required for FCI purposes.
 - (d) On the market declaration form, the “year of birth” must be automatically updated by the market back-office system from one year to the next. This declaration will be different to the original farm of origin “owner/keeper” declaration as it will be included within the pre-populated back-office paperwork and the market/centre office staff will need to sign it off, in the same way as for the FCI.
- 3.4 For sheep sold from one keeper to another for finishing and then sold for slaughter, the declaration made requires traceable records of the original declarations to be kept for three years.

- 3.5 For sheep sold for slaughter directly to a food business operator, the consigning keeper must complete, sign and date the declaration providing the number of sheep and flock marks within the batch (individual numbers are not required). By signing the declaration the consigning keeper declares the year of birth for the sheep within the batch. The keeper must therefore indicate the correct year of birth.
- 3.6 The declaration received by the abattoir FBO must have accompanied the sheep to the abattoir to support the FBO's decision-making on whether the SRM must be removed or not.
- 3.7 Where a batch of sheep arriving at the abattoir includes sheep from more than one flock the declaration will as a minimum distinguish the sheep by flock mark.
- 3.8 If a batch of sheep arrives at the abattoir without an accompanying declaration, the FBO shall make appropriate arrangements to ensure that SRM is handled correctly, either by immediately seeking evidence of any age declaration or reverting to dentition checks, having regard to animal welfare, and local facilities at the abattoir.

Annex 2: Risk analysis: estimating the impact of changing sheep aging methods

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Executive summary

The risk assessment, termed the Scrapie Control Model, aims to estimate, by use of stochastic simulation, of potential prion infectivity passed into the food and protein material chains. This report describes the use of the model to investigate the effect of changes in the aging of sheep. Three scenarios have been included: 1) baseline of dentition; 2) using a date based May cut off; and 3) using a date based June cut off.

Our results suggest that changing to a date based cut off for aging sheep would slightly increase the estimated infectivity entering the food chain and category 3 materials. For classical scrapie it can be seen that there is a slight increase from a baseline mean infectivity of 17,907 OO ID₅₀ per year to 17,953 OO ID₅₀ with a June cut off, although the levels of infectivity do not differ significantly between the baseline and June cut off (P=0.49). For atypical scrapie, annual infectivity is estimated to increase from 14,839 OO ID₅₀ to 18,076 OO ID₅₀, although as for BSE there was no significant difference between the levels of infectivity between the baseline and the June cut off scenario (P=0.34). Results for Sheep-BSE are unclear. At 500,000 iterations, results had still not converged. Given that the disease characteristics for sheep-BSE use those estimated for classical scrapie in the risk assessment, it is likely that the results would change in a similar magnitude to that seen for classical scrapie.

The estimates generated by this risk assessment are likely to represent an upper limit and are highly dependent on a number of parameters:

- Using assessor's opinion, an estimated 5-10% of all re-classified animals are aged between 12-18 months and that the infectivity titre in an animal aged 12-18 months is assumed to be the same as in an adult sheep. These estimates are highly pessimistic – worst case.
- The risk assessment has not been stratified by genotype and where estimates have been made, the most susceptible genotype (type 5) has been used. The genotype of susceptible animals has a significant impact on the tissues infected and period of

the incubation in which tissues types become infected. The use of these data therefore represents a pessimistic assumption.

- The assumption is made that there is a continued decline in the prevalence of classical scrapie infection between 2005 and 2018. The risk assessment annual estimates are highly dependent on the estimated prevalence of disease.
- Sheep-BSE has been included in the risk assessment due to the links with Cattle-BSE. However, there are little data to parameterise the risk assessment for this case. The worst case assumption is used that sheep-BSE is peripherally distributed within sheep using classical scrapie distribution of infectivity as a proxy.

The outputs of the risk assessment are presented in units of ovine oral ID₅₀. No attempt has been made here to provide a summary of the current scientific knowledge regarding the zoonotic potential of these prion diseases of sheep.

Introduction

APHA modellers and risk analysts have developed models that can estimate the impact of different Scrapie surveillance options, changes in the demographics of the slaughter population and the impact for Great Britain (GB) of risk mitigating controls (Adkin et al., 2018 – provided in Appendix 1). This report describes the quantification of the total amount of infectivity present in individual infected sheep and lamb carcasses for the prion diseases sheep-BSE, sheep classical scrapie and sheep atypical scrapie. Three scenarios have been included: 1) baseline of dentition; 2) using a date based May cut off; and 3) using a date based June cut off.

Methods

The original risk assessment and parameter values is provided in Appendix 1. Estimating the amount of infectivity was conducted by development of a probabilistic model with random variables and uncertain parameters described by appropriate probability distributions. The model was implemented in @Risk (© Palisade) Version 6, an add-on package within Microsoft Excel (© Microsoft). The results presented follow the standard form of the arithmetic mean and the 5th and 95th percentile values. Accordingly the latter represent the range of values for which we are 90% certain that the true value lies between. The risk assessment is divided into four components – Surveillance, Abattoir, Infectivity and the Annual extension. Parameters from the first three components are used to estimate the amount of infectivity per infected animal that has by-passed testing controls and entered the slaughterhouse for food production. These components are run in a separate simulation (Model 1). The Annual extension uses the results from Model 1 to estimate the annual amount of infectivity consumed nationally (Model 2).

Scenario 1: Baseline using dentition

The original risk assessment was reviewed for any scientific information that has become available since the last update. Data for the baseline scenario for the number of sheep and lambs slaughtered were not amended from the original risk assessment using values of 1,712,000 sheep and 12,845,000 lambs (2016 slaughter statistics).

One infectivity parameter was modified. Additional data were available for the estimated infectivity that may be present in certain tissues in lambs under 12 months which was previously parameterised by expert opinion. A re-analysis of data from experiments for classical scrapie has estimated the proportion of the incubation period at 12 months for the highly susceptible NSP group in GB denoted Type 5 (Arnold, pers. comm. 2018):

- The mean incubation period (IP) for Type 5 ARQ/ARQ is 45 months. Thus, 12 months equals 27% of the IP.
- The mean IP for Type 5 VRQ/VRQ is 39 months. Therefore 12 months is 30% of the mean IP.

Type 5 genotype group represents the most susceptible genotype group which has the shortest incubation period. The group make up only 3.1% of the proportion of the GB sheep populations, but 60% of the scrapie infected sheep (Arnold & Ortiz-Pelaez, 2014). Therefore, assuming a linear increase in infectivity from exposure to clinical onset and using this data as a proxy for the percentage of infectivity in an animal under 12 months of age as a worst case, the parameter value for $P_{infectivity\ l,sc,t}$, was amended from 40% to 30% for all three scenarios.

Scenario 2: May date based cut-off

Using a date based system as a cut off may result in more animals being defined as 'lambs' rather than 'sheep' when compared to the system using dentition. From analysing the data, the number are not known, but a value of 20,000 may represent a best guess (FSA, pers. comm. 2018). Within this population, the vast majority will be under 12 months old. However, there is the possible of a few animals being aged between 12 and 18 months. There is an increased titre of scrapie infectivity in animals as they progress through the incubation period with tissues found to be infectious for classical scrapie found in experimental animals between the ages of 12 and 18 months (Arnold, pers. comm. 2018). Assuming a linear increase of infectivity during the incubation period:

- The mean incubation period (IP) for Type 5 ARQ/ARQ is 45 months. Thus, 18 months equals 40% of the IP.
- The mean IP for Type 5 VRQ/VRQ is 39 months. Therefore 18 months is 46% of the mean IP.

Therefore, in this risk assessment the number of animals within the 20,000 that are re-classified has been estimated. There are strong financial drivers for slaughtering lambs before 12 months. Therefore numbers are likely to be low. In this risk assessment it was

assumed that 5% to 10% of all animals re-classified as 'lambs' would be between 12 and 18 months. This is likely to be a worst case assumption. The uncertainty associated with the parameter was described in the risk assessment using a uniform distribution.

For those animals classified as 'lambs' and aged between 12 and 18 months, the infectivity titre associated was assumed to be the same as adult sheep. This is again a worst case assumption as current data indicates that levels are more likely to range in the 40% to 50% of clinical titre.

Scenario 2: June date based cut-off

Using the June date at the cut-off, more animals are likely to be classified as 'lambs' when compared to the May cut-off date. The number of additional older animals slaughtered in June classified as 'lambs', P_OSL_lambs , is likely to be a percentage of between 10% and 20% (Royle, email comm. 2018). The uncertainty associated with this parameter has been described using a uniform distribution. The number of older lambs slaughtered in June, N_OSL_June , has also been provided (Royle, email comm. 2018), as shown in Table 1, with the average slaughtered in June by year. The between year variability has been incorporated using a discrete distribution.

Therefore, the additional animals classified as 'lambs' in June been estimated as the multiplication of P_OSL_lamb and N_OSL_June . The resulting number of classified sheep and lambs by age is provided in Table 2.

For those animals classified as 'lambs' and aged between 12 and 18 months, the infectivity titre associated was assumed to be the same as adult sheep. This is again a worst case assumption.

Table 1: Estimated number of older lambs slaughtered in June in GB, by year

Year	Number slaughtered	Weeks in month	Average per June
2014	37080	4	40788
2015	52060	4	57266
2016	52720	4	57992
2017	68413	5	60204
2018	106300	5	93544

Table 2: Summary of estimated mean number of animals slaughtered by scenario

Classification	Age (months)	Number of animals (head)		
		1) baseline	2) May cut off	3) June cut off
Sheep	>12	1,712,000	1,692,000	1,682,969
Lamb	12 to 18	0	1,500	2,177
Lamb	<12	12,845,000	12,863,500	12,871,854

Table 3: Summary of SRM controls (removal of brain and cord) by scenario

Classification	Age (months)	2) baseline	2) May cut off	3) June cut off
Sheep	>12	SRM	SRM	SRM
Lamb	12 to 18	-	-	-
Lamb	<12	-	-	-

Table 4: Summary of estimated infectivity titre by age group in the risk assessment by scenario

Classification	Age (months)	2) baseline	2) May cut off	3) June cut off
Sheep	>12	Adult	Adult	Adult
Lamb	12 to 18	-	Adult	Adult
Lamb	<12	Lamb	Lamb	Lamb

Results

Uncertainty and variability between years is considered in the model and represented by 5th and 95th percentiles (within parentheses), which indicate the range within which 90% of the results lie. The model was run for 500,000 iterations using Latin Hypercube sampling. It should be emphasised that not all uncertainty has been estimated in the calculations, as not all can be quantified. Therefore the 5th and 95th percentiles describe the amount of quantified uncertainty included in the model.

For classical scrapie it can be seen that there is a slight increase from a baseline mean infectivity of 17,907 OO ID₅₀ per year to 17,953 OO ID₅₀ with a June cut off. However, there was no significant difference between levels of infectivity for the baseline and the June cut off (P=0.49). For atypical scrapie, annual infectivity is estimated to increase from 14,839 OO ID₅₀ to 18,076 OO ID₅₀, but with no significant difference between the levels of infectivity for the baseline and the June cut-off (P=0.34). Results for Sheep-BSE are unclear. At 500,000 iterations, results had still not converged. Given that the disease characteristics for sheep-BSE use those estimated for classical scrapie in the risk assessment, it is likely that the results would change in a similar magnitude to that seen for classical scrapie.

Table 5: Infectivity annually for those materials fit for human consumption (food and category 3 materials) by disease OO ID₅₀ per year for three scenarios

Food chain/ Category 3	Scenario 1: Baseline	Scenario 2: May	Scenario 3: June	Sc2-Sc1 Mean	Sc3- Sc1
Classical Scrapie	17,907 (7,546 , 33,154)	17,925 (7,575 , 32,930)	17,953 (7,579 , 33,002)	+18	+46
Atypical Scrapie	14,839 (5,940 , 25,197)	18,025 (7,489 , 32,673)	18,076 (7,401 , 32,576)	+3,186	+3,237
Sheep-BSE	77 (0 , 380)	77* (0 , 382)	77* (0 , 381)	0	0

* Impact on Sheep-BSE inconclusive as risk assessment could not be run to convergence for these results as the difference was very small.

Discussion

This risk assessment has included three prion hazards for the national sheep flock of classical scrapie, atypical scrapie and sheep-BSE, when considering the impact of changes in aging sheep at abattoir. Under proposals the amount of prion infectivity entering materials fit for human consumption would increase slightly under alternative schemes for aging sheep but remain in the same order of magnitude as the current baseline process for aging sheep.

It is important to note that several worst case assumptions have been used to estimate this risk; including that an estimated 5-10% of all re-classified animals are aged between 12-18 months and that the infectivity titre in an animal aged 12-18 months is assumed to be the same as in an adult sheep. Using more realistic scenarios, for example, that animals aged 12-18 months would only have 46% of the clinical titre at that age would reduce down the comparative risk estimated for the date based aging scenarios, however, in order to achieve convergence, the risk assessment simulation times would increase substantially.

References

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- Arnold M, Ortiz-Pelaez A. The evolution of the prevalence of classical scrapie in sheep in Great Britain using surveillance data between 2005 and 2012. *Prev Vet Med.* 2014 Nov 1;117(1):242-50. doi: 10.1016/j.prevetmed.2014.07.015. Epub 2014 Aug 10. PubMed PMID: 25183633.

Annex 3: Estimated financial impact of the proposals

1. The option of using a cut-off date of 30 June for ageing sheep means that farmers, market operators and abattoir owners will no longer have the burden of checking the teeth of sheep to determine whether they are over 12 months old, which has been criticised for being costly and inaccurate.
2. Based on outline evidence submitted by industry in 2016, if sheep and goats no longer have to be aged through the process of dentition in order to determine whether the animal is over one year old and that the carcass therefore has to be split to remove the SRM, the direct savings have been estimated to be approximately in the range of £78,000 to £134,000. However the savings actually realised may be less, depending upon the number of farmers and abattoir owners who decide to implement this option.
3. The current requirement is that each lamb is mouthed for ageing at a single point before they are slaughtered. This mouthing can be undertaken by farmers, the market or at the point of slaughter at the abattoir. The industry provided outline evidence in 2016 based on work undertaken by ADAS in 2014 of the time this takes as follows:
 - Where farmers mouth their lambs on their own, this is likely to take approximately 0.14 man hours per 100 lambs.
 - Should mouthing takes place at the market or at abattoir, where two operators are likely to be used, this is likely to take 0.21 man hours per 100 lambs.
4. Statistics produced by Defra and the Agriculture and Horticulture Development Board (AHDB) state that 5,702,000 lambs were slaughtered between January and June 2018. Farm labour wages per hour in 2018 were estimated to be £9.77 per hour according to the Office for National Statistics (ONS) Annual Survey of Hours and Earnings (ASHE).

Taking these figures, a range of potential savings has been calculated as follows:

Lower bound estimate of savings: If all lambs were to be mouthed by farmers before being taken to the abattoir for slaughter, savings would be:

$$0.14 \times 5,702,000/100 \times £9.77 = £78,000$$

Upper bound estimate of savings: If all lambs were to be mouthed at the abattoir for the purposes of ageing for SRM removal, savings would be:

$$0.21 \times 5,702,000/100 \times £9.77 = £134,000$$

Annex 4: Glossary

ABP - Animal By-Products: Animal carcasses or products of animal origin not intended for human consumption.

ADAS (RSK ADAS Ltd): A UK-based independent agricultural and environmental consultancy and provider of rural development and policy advice.

AHDB - Agriculture and Horticulture Development Board: A levy board funded by farmers and growers and some other parts of the supply chain.

Atypical Scrapie: A TSE in sheep and goats which, unlike classical scrapie (which is a contagious disease) is considered to be a fatal brain disease which occurs spontaneously and could be little or not contagious at all.

APHA - Animal and Plant Health Agency: Defra agency, formed on 1 October 2014 following the merger of the Animal Health and Veterinary Laboratories Agency (AHVLA) with the Food and Environment Research Agency (Fera).

ASHE - Annual Survey of Hours and Earnings: Carried out annually by the Office of National Statistics (see below): the most comprehensive source of information on the structure and distribution of earnings in the UK.

BSE - Bovine Spongiform Encephalopathy: A TSE in cattle, a fatal brain disease believed to be transmitted via infected feed. Exposure to BSE through the consumption of infected meat is believed to be the primary cause of variant Creutzfeldt-Jakob Disease (vCJD) in humans.

Category 3: Low risk animal by-products including parts of animals that have been passed fit for human consumption in a slaughterhouse but which are not intended for consumption.

Classical Scrapie: A contagious TSE in sheep and goats, a fatal brain disease to which certain genetic types of sheep, and all goats, are more susceptible.

Dentition: A method of determining the age of sheep by the number of permanent incisors erupted.

EC - European Commission: The executive body of the European Union.

EFSA - European Food Safety Authority: The EU risk assessment body for food and feed safety.

EU - European Union: The economic and political union of 28 Member States.

EU TSE Regulation: Regulation (EC) No. 999/2001 of the European Parliament and the Council, as amended, which lays down rules for the prevention, control and eradication of TSEs, including BSE in cattle and scrapie in sheep and goats.

FBO - Food Business Operator: The natural or legal persons responsible for ensuring that the requirements of food law are met within the food business under their control.

FCI - Food Chain Information: The food chain information (FCI) declaration is a document that is required to accompany cattle, calves, pigs, poultry, horses, sheep, goats and farmed game to slaughter at an abattoir for entry into the food chain.

FSA - Food Standards Agency: Non-ministerial government department, responsible for protecting public health in relation to food.

Genotype: The part of the genetic makeup of a cell, and therefore of any individual, which determines one of its characteristics (phenotype). Certain genotypes of sheep are more susceptible than others to classical scrapie.

NSP - National Scrapie Plan: An initiative which ran between 2001 and 2009 in the UK to encourage the breeding of sheep for genetic resistance to classical scrapie.

ONS - Office for National Statistics: The UK's largest independent producer of official statistics and the recognised national statistical institute of the UK.

Prion: A type of protein that can trigger normal proteins in the brain to fold abnormally. Prion diseases can affect both humans and animals and are sometimes spread to humans by infected meat products. The most common form of prion disease that affects humans is Creutzfeldt-Jakob disease (CJD).

Ruminants: Any of various even-toed hoofed mammals of the suborder Ruminantia. Ruminants usually have a stomach divided into four compartments (called the rumen, reticulum, omasum, and abomasum), and chew a cud consisting of regurgitated, partially digested food. Ruminants include cattle, sheep, goats, deer, giraffes, antelopes, and camels, and their relatives.

Scrapie: A TSE in sheep and goats. See separate entries for classical scrapie and atypical scrapie.

SRM - Specified Risk Material: Parts of the bodies of animals susceptible to TSE identified as higher risk for carrying infection, that are defined by the EU TSE regulation and that have to be removed and disposed of as (very high risk) Category 1 animal by-product.

Titre: A way of expressing concentration. Titre testing employs serial dilution to obtain approximate quantitative information from an analytical procedure that inherently only evaluates as positive or negative. The titre corresponds to the highest dilution factor that still yields a positive reading.

TSE - Transmissible Spongiform Encephalopathy: Fatal brain diseases which include bovine spongiform encephalopathy (BSE) in cattle and scrapie in sheep and goats.

vCJD - Variant Creutzfeldt-Jakob Disease: A fatal TSE in humans, believed to be caused by exposure to BSE through the consumption of infected meat.