



EXECUTIVE SUMMARY

FSA Project FS102128

A study to review current evidence and outline work-streams to support the development of a policy for smoked, skin-on sheep meat

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Background and introduction

Smoked, skin-on sheep meat¹ is produced from sheep whose wool has been burnt off as part of the dressing process. There is a demand in the UK for sheep meat with the “skin-on”, traditionally from consumers of West African origin whose native culture embraces singed and smoked carcasses of a range of mammalian species². However, current EU legislation prohibits the production of ruminant carcasses with the skin left on and skinning during the dressing procedure is a statutory requirement (Regulation (EC) 853/2004). Food Standards Agency (FSA) has commissioned several scientific studies to explore the potential for the safe production of smoked, skin-on sheep meat. In recent opinions on the scientific validity of these studies, the European Food Safety Authority (EFSA) concluded that more evidence needs to be gathered in order to develop a process for the production of skin-on sheep carcasses that are suitable for human consumption. This study aims to review current evidence and outline work-streams to support the development of a policy for smoked, skin-on sheep meat.

Objectives

There were four objectives of this study:

- i. A critical review of the research work undertaken to date alongside the EFSA scientific opinion as it relates to safety aspects;
- ii. Identification of appropriate research that will inform the decisions on the risks associated with the production and consumption of skin-on sheep meat;
- iii. Exploration and identification of social and market perceptions; and
- iv. To update Hybu Cig Cymru’s “Appraisal of the Opportunities in the Skin on Sheep Meat Market for Wales” based on the findings of the critical review.

¹ The term “smoking” in food technology refers to the process in which food is exposed to natural smoke originated from smouldering wood shavings (EFSA, 2008). The production process described in the FSA studies differs from this definition in terms that the smoke flavour and colour on the skin originate from burnt fleece and not from incomplete combustion of wood. However, for the purpose of this report, term “smoked, skin-on meat/carcass” will be used.

² The species of meat smoked for food include goat, cow, sheep, dog and pig, with goats being predominantly used for this production.

Approach

To realise objectives one and two, the work has been carried out in two stages:

- i. Systematic review on the safety of smoked, skin-on meat from sheep, compared to conventionally produced skin-off carcasses; and
- ii. Critical review on the smoked, skin-on sheep meat production. This part included the identification of relevant public health hazards associated with this production and also possible effects that this process could have on these hazards. Also, other relevant aspects for delivering a safe and hygienic process for the production of smoked, skin-on sheep meat were identified and considered such as official controls and animal welfare implications. Furthermore, the results of this report have highlighted areas of research that need to be addressed before making a case to legalise the production of smoked, skin-on sheep meat in the UK and EU.

Objective three of the study was realised through a survey of slaughterhouse operators' attitudes towards the legalisation of skin-on sheep meat production, but also through the information obtained from consumers of this product from Nigeria. Finally, objective four was realised through the update of Hybu Cig Cymru's "Appraisal of the Opportunities in the Skin on Sheep Meat Market for Wales", based on the findings of the critical review (objective 1).

Systematic Review on smoked, skin-on sheep meat

Initially, the systematic review was conducted to answer the question "What is the level of microbiological and chemical safety of smoked, skin-on sheep/goat/cattle meat compared to conventionally produced skin-off carcasses?" Also, information on other similar products produced worldwide were reviewed, including: (i) skin-on goat meat, produced in Australia; (ii) singed sheep heads (called "svið" in Iceland and "smalahove" in Norway); (iii) smoked, skin-on meat of different species, in West Africa; and, (iv) singed cattle hides (called "ponmo" in Nigeria and "welle" in Ghana).

A review of previous FSA commissioned studies concluded that the evidence (reviewed in this report) does not provide a definitive answer to the microbiological and chemical safety of smoked, skin-on sheep meat, nor its relation to conventionally produced skin-off carcasses. However, the FSA studies do provide an important stepping stone and basis for further development of the process for safe production of smoked, skin-on meat. Furthermore, a systematic review of other studies on smoked, skin-on meat products worldwide found that it was only partly possible to answer the question set out in this study since there are scarce data in the literature regarding smoked/singed, skin-on sheep/goat/cattle meat products. The review identified some gaps in current knowledge

about this product that need to be addressed in further research: (i) the effect of the smoked, skin-on process on public health hazards is not known; (ii) there is no information available in scientific literature on the microbiological profile of smoked, skin-on sheep meat, and (iii) the effect of the smoked, skin-on production and changes in the dressing process of the carcass on official controls need to be evaluated. Overall, further evidence is required to determine whether smoked, skin-on sheep/goat/cattle meat poses greater or lower risk to consumers when compared to conventionally produced skin-off carcasses. Consequently, further studies are necessary to address the gaps in knowledge and to inform the discussion relating to legalising the production of this product.

Critical Review on the smoked, skin-on sheep meat production

In the next step, a critical review was performed to evaluate available evidence on a proposed production method for smoked, skin-on sheep meat and to identify appropriate research required to fill the gaps in scientific knowledge regarding this production. The main aspects covered were to identify the relevant public health hazards arising from this production and the possible effects of the smoked, skin-on sheep meat production process on these hazards, as well as its effects on official controls. Also, animal welfare and occupational health implications were briefly discussed. Some alternative methods for production of smoked, skin-on sheep meat to the one described in FSA commissioned studies were reviewed and proposed.

Different sheep variables were considered. The main source of animals for smoked, skin-on meat production is cull ewes. Animals with specific health problems are identified for culling and sent for slaughter. Different sheep diseases which might affect the skin, particularly Blow Fly strike and sheep scab should be considered in Food Chain Information and/or when developing SOPs for this production. Treatment or prevention of these diseases may pose a risk of high levels of skin residues at the time of slaughter. Also, sheep wool and skin composition could be a significant factor for this production since the meat is consumed with the skin left on. However, there is not much specific data on animal variables affecting skin and wool composition.

Furthermore, a comprehensive list of biological and chemical hazards of public health relevance was created, taking into account different criteria. Bacterial hazards relevant for consideration for assessment of the safety of smoked, skin-on sheep meat were identified as *Bacillus cereus*, *Clostridium perfringens*, pathogenic verocytotoxin-producing *Escherichia coli* (VTEC) and *Salmonella* spp. The assessment of their relevance for this production was undertaken based on the likely occurrence in sheep (particularly on skin) and the evidence that sheep carcass meat is an important source for human exposure to these particular pathogens. Furthermore, the likely effects of this production process on these biological hazards were reviewed. Hence, sourcing of animals, shearing, singeing, high pressure water

washing, toasting and chilling appear to be the steps that could have significant effect on pathogen numbers. However, further research is needed to determine the microbiological profile of smoked, skin-on sheep meat and the true effect of the process on the most relevant bacterial pathogens.

The primary chemical hazards that may be formed during the production of skin-on sheep meat are dioxins, PAHs and heterocyclic aromatic amines. The uniformity of these contaminants across the treated carcass should be established, and dioxins and PAHs should comply with statutory limits. If HAAs are found to be formed by the production of skin-on sheep meat, the quantities produced should be compared with other meat products to determine relative risk.

Several sheep skin diseases could alter the aesthetic quality of the final product due to associated skin damage, scarring or subcutaneous abscess formation. Treatment of these diseases may pose a risk of skin residues. The list of veterinary medicines currently authorised in the UK for use in sheep and considered as most likely to represent an increased hazard for skin-on sheep meat production due to the risk of residues, is provided. The levels of chemical residues from these veterinary medicines in sheep skin should be assessed following treatment with them (especially, with 'pour-on' products). This should include the possible bio-transformation effect on such residues, of the smoked, skin-on production process when withdrawal periods have been observed at slaughter.

The official controls are informed by both statutory requirements and the risk assessment of the regulated processes. Their application and modification will depend on the results of research on identified hazards and the practical observation and application of the process during production. All aspects of official controls, from ante-mortem inspection to HACCP verification, post-mortem inspection, TSE, residue, and chemical contaminant controls should be evaluated on public health, animal health and welfare grounds. A range of relevant conditions for smoked, skin-on sheep carcasses were reviewed and discussed. Any change in the sheep carcass dressing process will require official control procedures to be evaluated and amended. Also, some of the practices may have positive or negative effect on animal welfare, so these implications should also be considered when developing SOPs for this production.

Alongside all the above mentioned aspects, further research requirements were identified, including laboratory based experiments and those needed for validation purposes in commercial settings. These are all listed under the recommendations section.

The current proposed production method for smoked, skin-on sheep meat involves singeing to efficiently remove wool and impart a smoked colour and odour to the carcass. However, some other alternative production methods could also be investigated. These could be used to create a smoked flavour under controlled conditions with a temperature assured to be below 500°C (to minimise formation of toxic contaminants), and/or facilitate standard post-

mortem carcass inspection. Production of smoked skin separately from carcass meat and sheep wool removal by scalding and dehairing prior to singeing are some options that merit further attention.

Survey of slaughterhouse operators' attitudes towards the legalisation of skin-on sheep meat production

Slaughterhouse operator's attitudes towards the legalisation of skin-on sheep meat production were examined using semi-structured telephone interviews. 10% of all operators slaughtering sheep, in addition to all operators slaughtering high numbers of adult sheep, in England and Wales were approached (n=54, 28,9% of all slaughterhouses licenced for the slaughter of sheep). The survey of food business operators (FBOs) indicates that 50% of the responders are inclined to undertake the process. Interest in the production of smoked, skin-on sheep meat was predominantly shown by slaughterhouses with an established client base within the community that traditionally consume this type of product. It is concluded that interest is driven by business considerations and it is supported by interest from existing clients, the prospect of new markets (including exports). Concerns were expressed regarding the structural and operational requirements and the effect that the process would have on the safety, aesthetic and organoleptic characteristics of other products produced in the same establishment.

A review and update of Hybu Cig Cymru's (HCC) report "Appraisal of the Opportunities in the Skin on Sheep Meat Market for Wales"

The original HCC report (2008) was updated using the information gathered in the current report. In addition, using information from the Office of National Statistics, the potential UK consumer population was determined and an increase in the demographic group of 133,000 (85%) was identified between 2008 and 2014. The number of carcasses needed to meet this demand was calculated using the ONS estimates for West African born population in the UK. It is estimated that, based on these calculations, the proportion of carcasses that may be used for skin-on sheep meat production ranges between 1.89 and 3.81% of the UK adult sheep slaughtered in 2014.

Recommendations

The following recommendations on areas that merit further research were suggested:

Recommendations on biological hazards

- An assessment of individual steps in the production of smoked, skin-on sheep meat on their effect on four identified important biological hazards (VTEC, *Salmonella* spp., *Bacillus cereus* and *Clostridium perfringens*) should be performed taking into account different variables.
- Microbiological methods, including those for sampling and laboratory investigation, aimed to be used for trials in this specific smoked, skin-on sheep meat production, should be validated in experimental conditions prior to use.
- The effects of the process on microbiological safety of derived carcasses should be evaluated both in low and high production speed settings, under varied conditions.
- Based on this assessment, clear production protocols should be developed based on HACCP principles, with indication of critical control points, clear set limits, monitoring procedures and corrective actions.

Recommendations on chemical hazards

- Establish the uniformity of formation and presence of PAHs over the treated carcasses and between carcasses, and to ensure that quantities of PAH present are always within regulatory limits.
- Establish whether or not dioxins can be formed in the production of smoked, skin-on sheep meat, and if so, the uniformity of formation and presence of dioxins over the treated carcasses and between carcasses, and to ensure that quantities of dioxins present comply with regulatory limits.
- Because heterocyclic amines may be generated under conditions that may occur during the production of smoked, skin-on sheep meat, analyses for these compounds should be undertaken to give an indication of their potential formation.
- An assessment of the levels of chemical residues in sheep skin following treatment with pharmaceutical products (especially, 'pour-on' products) should be performed along with the evaluation of the effect of smoked, skin-on production process on these residues at the time of authorised withhold and slaughter.

Recommendations on official controls

- It is important to evaluate the information that should be included in the FCI given both the nature of the process and that of the source of animal supply.

- Ante-mortem inspection requirements and associated facilities should be examined in the light of the changes in the post mortem inspection and the risk assessment of the process.
- Both research and practical application should be used for the evaluation of operational/structural requirements as part of a risk assessment for the development of SOPs and HACCP.
- Animal welfare implications should be taken into account when developing SOPs for smoked, skin-on meat production.
- The effects of the process on meat inspection practices and protocols should be evaluated both in low and high production speed settings.
- The labelling, packaging, legal characterisation and health marking requirements should be investigated.
- The effect of the process on the application and validity of official controls for TSEs, drug residues should be evaluated;
- If smoked skin of sheep meat were to become legal, skin and finished product may need to be added to surveillance sampling frames including all carcasses and not just those designated to be used for this type of food production;
- Products should be tested to ensure compliance with regulations for dioxins and PAHs;
- In order to minimise occupational health and safety risks for the staff involved in the production of smoked, skin-on sheep meat, FBOs will need to comply with all related procedures.
- If skin is designated as an edible part of a sheep carcass it may be added to the list of sites for which residues information are required to support applications for Marketing Authorisations of new veterinary products. VMD and EMEA views on this and any requirement for adding sheep skin to the residues surveillance system will be needed.