Beef burgers served less than thoroughly cooked: update

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1. Summary

1.1 This paper provides an update to the FSA Board on potential developments in the science that underpins FSA guidance and advice on less than thoroughly cooked (LTTC) beef burgers and a review of the guidance to businesses and enforcement authorities on the production of such burgers in catering establishments.

1.2 The Board is asked to:

- Agree there are no material changes that would give us cause to revisit our approach on LTTC burgers.
- Agree that proposed revisions of the guidance should now be subject to consultation.

2. Introduction

2.1 The FSA has a statutory objective of protecting public health and consumer interests in relation to food, and for ensuring consumers are kept adequately informed and advised about those matters which significantly affect their capacity to make informed decisions.

2.2 This paper reports on a routine review of the science that underpins the FSA's approach on LTTC burgers. The Board will wish to be assured that, taking into account the nature of the product, the potential public health risks and consumer consumption habits, the risks are being appropriately and proportionately managed through FSA guidance and advice on LTTC burgers

2.3 The paper also reports on a review of FSA guidance, taking into account stakeholder feedback, and sets out proposals for a 12-week consultation on the revised guidance, which provides concise and clear advice to enforcement authorities and businesses wishing to offer LTTC burgers to consumers.

FSA advice on preparation and consumption of burgers

2.4 FSA advice to consumers is that burgers should always be cooked thoroughly when they are prepared at home, as burgers served rare or undercooked may contain harmful bacteria that could cause food poisoning. The advice notes that restaurants are able to put in place strict controls during production and cooking that reduce the risks. However, there is still risk involved in consuming LTTC burgers, so anyone who is more vulnerable to food poisoning is advised

only ever to eat burgers that are thoroughly cooked, regardless of where they are prepared.

2.5 The FSA Board first considered the risks of beef burgers served less than thoroughly cooked in food outlets, at its meeting in January 2015. This followed a shift in consumer consumption habits, with more businesses offering consumers a choice in how their burgers were cooked.

2.6 The Board discussed this further in September 2015. The Board was clear in its view that consumers should avoid eating undercooked burgers. However, the Board could not reach a unanimous position on whether the sale of such burgers should continue, with a split between additional risk management controls being required or seeking a ban. The resulting vote came down narrowly in favour of allowing the continued retail sale of undercooked burgers, but due to the nature of the product and the inherent microbiological risks, this would require measures to be taken that could demonstrate safety through the supply chain process.

2.7 In the interests of providing clarity and allowing informed consumer choice, and reflecting the degree of concern about the risks associated with consumption, the Board decided that local authorities would be advised to focus their attention and if necessary, enforcement action on businesses which lacked either or both of:

- a robust, tested HACCP-based approach which included food safety controls that had been demonstrated to achieve a 99.99% (4-log) reduction in bacterial load; and
- consumer advice to draw attention to the risk of eating rare burgers, particularly for vulnerable groups of consumers.

Consideration of LTTC burgers under the Risky Food framework

2.8 The FSA Board agreed to formalise a Risky Foods Framework in July 2016; this framework was completed and considered by the Board in November 2016 (Annex A). The framework enables the FSA to make consistent and transparent decisions in identifying risky foods and in developing proportionate controls for them. Risky foods are those foods that present heightened risk relative to other foods or other presentations of the same food, based on risk per serving (or per consumption event).

2.9 LTTC burgers are considered a risky food because when raw meat is minced, any surface contamination is spread throughout the final product, unlike whole cuts of meat, where any contamination is on the outside of the meat. This contamination can cause human illness if the burger is not thoroughly cooked right through. Application of appropriate controls allow safer production whilst maintaining the consumer's right to eat such foods, supported by informed choice.

2.10 The risks and controls for LTTC burgers have been considered within the Risky Foods Framework. Some restaurants can put in place strict controls over the

way their burgers are produced and cooked. These controls mean that the risk from burgers that are pink in the middle is significantly reduced.

2.11 Following on from the 2015 Board decision, and in line with the Risky Foods Framework, the FSA produced and published guidance in May 2016, entitled "*The safe production of beef burgers in catering establishments: advice for food business operators and LA officers".* The guidance is intended for food business operators in catering and restaurant settings in England, Wales and Northern Ireland, and for local authority (LA) officers who inspect these establishments. The guidance contains advice on the law and good practice for serving LTTC burgers and applies to burgers made using only beef.

2.12 In July 2016 the Board looked at progress in identifying and implementing controls throughout the supply chain, and the planned steps for mitigating the risk of eating LTTC burgers served in food service outlets. The Board pressed for clear consumer communications to support the control measures. At that the same time the Board responded to industry developments and feedback, by agreeing an amended position, which recognised that where controls could deliver the same effect as thorough cooking i.e. those that can reduce the original bacterial load by 99.9999% (a 6-log reduction), food businesses would be exempt from the need to provide a consumer advisory statement (para 2.7). However, the Board felt it remained important for businesses to provide information to consumers on the adequacy of the controls in place and the difference from home-prepared burgers which should always be cooked through.

2.13 The FSA Board also agreed that the expectations of businesses preparing and serving LTTC burgers were now clear and noted that local authorities would take enforcement action where food businesses were not compliant with the guidance.

2.14 There was a limited update to the guidance in June 2018 to reflect the findings of research into the effectiveness of consumer messaging, an agreed future step of the July 2016 Board meeting. Further in 2019, the FSA established an internal group to review the application of the guidance by food businesses and local authorities, to ensure its objectives were being met and to identify whether any further updates were required (more details are presented in section 4).

3. Evidence and Discussion

3.1 We have completed an evidence review to establish whether there has been any change in the risk assessment, science and evidence, consumer habits and industry practice since the FSA guidance on LTTC burgers was published. We have also considered whether there are any barriers in implementing the guidance. A summary of the evidence package underpinning this update is provided at Annex B.

Risk and epidemiological summary

3.2 The key microbiological contamination risks in LTTC burgers are Shiga-toxin producing *Escherichia coli* (STEC) and *Salmonella* (ACMSF ACM/1196). Of these, STEC is of notable concern due to its low infectious dose and the frequency at which it causes serious and untreatable illness (e.g. haemolytic uraemia syndrome). These complications can cause long term kidney and liver damage, or in some cases lead to death.

3.3 In 2016, there was extensive engagement with key members of the Advisory Committee on the Microbiological Safety of Food (ACMSF) on the time/temperature data for achieving a 6- or 4-log reduction in numbers of STEC. The Committee considered the impact of factors such as bacterial strain variation, burger formulation and visual cues, and how these might contribute to the uncertainty associated with log reductions which could be achieved under real cooking conditions.

3.4 In June 2016, ACMSF Members reconfirmed their advice, which was that burgers should be cooked thoroughly – i.e. reaching a temperature of 70°C for two minutes, or using an equivalent which "delivers a significant pathogen reduction which is sufficient to minimise the risks posed by foodborne pathogens such as E. coli O157, Salmonella and Listeria monocytogenes".

3.5 The number of laboratory-confirmed cases of STEC, and the number of general outbreaks of STEC, in England, Northern Ireland and Wales between 2009 and 2018 are presented at Annex B. Of the 31 outbreaks occurring in England between 2015 and 2018 (an average of 8 a year), 11 (35%) were foodborne and 2 (6%) were linked to burgers. In the same period in Northern Ireland, of the 3 STEC outbreaks, there was no specific food source identified. Data on outbreaks from Wales was not available.

3.6 Public Health England have undertaken national enhanced surveillance of STEC in England and Wales since 2009. This means that PHE collects enhanced surveillance data on all STEC cases, including a food consumption history in the week before onset of illness. PHE established two reporting mechanisms; (1) real-time notification to FSA of all STEC cases and outbreaks linked to consumption of undercooked burgers at commercial premises and (2) prospective detection of acute events that may be linked to undercooked burger consumption via the STEC enhanced surveillance system for further investigation

3.7 The second reporting mechanism was Burger Watch, launched in 2016 and stood down in 2018. This was a surveillance system for determining whether seasonal increases in the incidence of STEC infection coincided with seasonal increases in burger consumption. Confirmed cases of STEC resident in England were asked to complete an enhanced surveillance questionnaire. None of the reporting cases in weeks with above-average burger consumption were linked with an outbreak due to contaminated or undercooked burgers.

3.8 The review of risk and epidemiology evidence indicates there has been little change since the FSA Board last considered LTTC burgers and the guidance was developed. Given the potential for severe disease, it is important that the risks associated with STEC continue to be recognised and controlled.

Science and evidence update

3.9 A systematic literature review (commissioned in 2018) provided quantitative data on the effectiveness of interventions against the main hazards associated with beef during primary production. The review concluded that the most promising interventions to reduce microbial load on beef were (i) interventions that reduce the amount of physical contamination on the hide e.g. FSA's 'clean livestock policy' which is implemented by most FBO's in the UK regardless of whether they serve or intend to serve LTTC burgers; and (ii) carcass pasteurisation treatments and organic acid washes of beef carcasses which are permitted (lactic acid only) but currently not been applied in the UK. Multiple interventions achieved the highest reduction in microbial load, reducing microbiological load by up to 3 log (99.9%).

3.10 Research recommendations also included the sequential use of general hygiene practice and hazard-based interventions at the pre-slaughter, slaughter and post-slaughter stages, as an integral part of intervention-based HACCP.

3.11 Further analysis of the data has been commissioned and is due to finish in summer 2020. This will provide more robust conclusions to support the development of risk management advice and the development of a quantitative risk model.

3.12 A recent literature search identified a small number of papers published since 2016, but there was no new information that changes the evidence underpinning the FSA's LTTC burger guidance. Although the rate of foodborne illness associated with the consumption of burgers remains low, the risks associated with doing so remain the same as they did in 2016. Therefore, there are no material changes that would give us cause to seek a further ACMSF opinion nor revisit our approach on LTTC burgers.

Consumer Research update

3.13 The latest consumer research (summary presented in Annex B) is based on three work strands:

- Consumer research on attitudes and behaviours around rare or medium beef burgers (2015-2016)
- Food and You Waves 4-5 (2016-2018)
- A recent online consumer survey on rare or medium beef burger consumption

3.14 In 2016 the FSA commissioned a study, *FSA Rare Burgers Risk Communication Messaging* to understand if, and the extent to which, exposure to different advisory messages regarding the risks of consuming beef burgers cooked rare or medium had an impact on (i) attitudes towards consuming rare

or medium burgers, (ii) perceptions of risk when consuming rare or medium burger and (iii) reported likelihood of ordering a medium or rare burger.

3.15 Key findings showed that the advisory messages (p.14) had an impact on respondents' perceptions of risks and levels of concern, reducing their reported likelihood of ordering or eating a rare or medium burger.

3.16 As an input to this current review, the FSA commissioned a consumer survey on rare or medium burger consumption. Of those who eat beef burgers outside the home (n=887), the majority (73%) reported that they prefer beef burgers to be served well-done while 19% prefer them served rare or medium.

3.17 In 2018, data from the Food and You survey found that 62% of respondents reported never eating burgers if the meat is pink or has pink or red juices (a slight increase from 60% in 2016) while 15% reported sometimes doing this, 4% never and 3% always.

3.18 These three strands of research are not directly comparable as they use different sampling approaches, questionnaire designs, and question wording which may influence responses. Nevertheless, they provide a similar picture on LTTC burger consumption with the majority of consumers preferring burgers that are cooked well-done, both when eating out or cooking burgers at home and there is no evidence to suggest that the frequency of eating LTTC burgers has increased since 2016.

Industry Practices and Controls

3.19 Any food businesses intending to serve burgers LTTC must pre-notify their local authority. Businesses approved under Regulation EC (No.) 853/2004 producing minced meat intended for use in LTTC burgers must also gain specific approval for this activity. The suppliers of minced beef intended for LTTC consumption should have enhanced controls in place to prevent cross-contamination, minimise bacteriological growth by ensuring appropriate temperature controls during processing and storage, and comply with microbiological process hygiene and food safety criteria.

3.20 There are currently 9 establishments approved (8 in England and 1 in Northern Ireland) for the production of minced meat intended for the serving of LTTC burgers. Some FBOs that initially expressed interest in becoming approved did not complete the application process for different reasons. There were no apparent practical difficulties associated with the FSA approval process and businesses interested in becoming approved have taken appropriate action to comply with requirements.

3.21 Industry feedback suggests that large burger chains understood the requirements for sourcing burgers or mince from approved establishments and have provided the necessary assurances to both the FSA and the Local Authorities that their food safety management systems were effective and functioning properly. We are aware of instances where the appropriate controls

were not being applied, and these were dealt with through the appropriate enforcement interventions.

3.22 Stakeholder feedback (FSA Guidance Workshop 2019) indicated FBOs understood the need for controls as LTTC burgers were a risky food. The largest barriers (particularly for small and medium businesses) to applying the guidance and being able to produce LTTC burgers were the validation and verification procedures required to demonstrate that the handling and cooking process achieves a 4-log reduction in E.coli O157 and other STEC. The main concerns fed back to the FSA were:

- Validation processes are complex and smaller establishments do not have the expertise to fully understand what is expected.
- Administrative burden associated with the validation and verification process, particularly when successful outcome was uncertain.
- Costs associated with securing experts to validate the processes and to implement the appropriate controls, outweigh the benefits.
- Clarification on how different consumer groups can be identified e.g. the age range for someone to be considered a child and therefore vulnerable to the risks associated with LTTC burgers.

3.23 The FSA acknowledge that the validation processes, and the work associated with meeting the appropriate controls are complex. That is why the guidance is being revised, with focus on making the definitions, terminology and practical concepts within the guidance clearer and easier to understand. The revised guidance will also provide additional clarity about how compliance may be achieved.

3.24 We are aware that there are establishments (although none in NI) that offer LTTC burgers from the menu, so are continuing to offer consumer choice and allow for different cooking preferences. Given the potential risk of severe illness associated with the consumption of LTTC burgers, the validation processes and controls are considered justified and given the potential market availability there is a need for continued guidance for this risky food.

Review of FSA Guidance

3.25 The FSA guidance on LTTC burgers is currently being reviewed. The purpose of the review is to consider whether the objectives of the guidance are being met and whether the guidance is easily understood and sufficiently accessible for food businesses and enforcement officers. The review commenced with a stakeholder workshop. Representative stakeholders attending the event included food business operators, local authority officers, food consultants, Public Health England and UK Hospitality. Detailed views and user experience were obtained during the workshop.

3.26 The revised guidance will take account of stakeholder views, with amendments focussing on making the definitions, terminology and practical concepts within the guidance clearer and easier to understand. Where stakeholders indicated

that the language and format of the guidance needed revision, this has been considered.

3.27 The updated guidance will provide additional clarity for businesses on how compliance may be achieved, as well as highlighting best practice that may be implemented to provide a high level of assurance. An example of best practice to be incorporated into the guidance is advice on sourcing minced beef or burgers from establishments specifically approved for producing products intended to be less than thoroughly cooked. A process flow diagram will also be included to assist businesses in identifying the controls required in a methodical manner. There will be further details on how consumer messaging should be provided to ensure it is sufficiently accessible (i.e. font size, position on menu, clearly distinguishable etc.). There will also be an extended glossary to explain technical terms.

3.28 The revised guidance will be subject to a 12-week consultation and a Business Impact Assessment will be completed if necessary.

4. Conclusions

4.1 There are no material changes that would give us cause to revisit our approach on LTTC burgers. The review of the risk assessment, science and other evidence indicates that there has been no significant change in the evidence base underpinning the guidance. Given the inherent risks and potential for severe disease, it is important that the risks associated with LTTC burgers continue to be recognised and controlled.

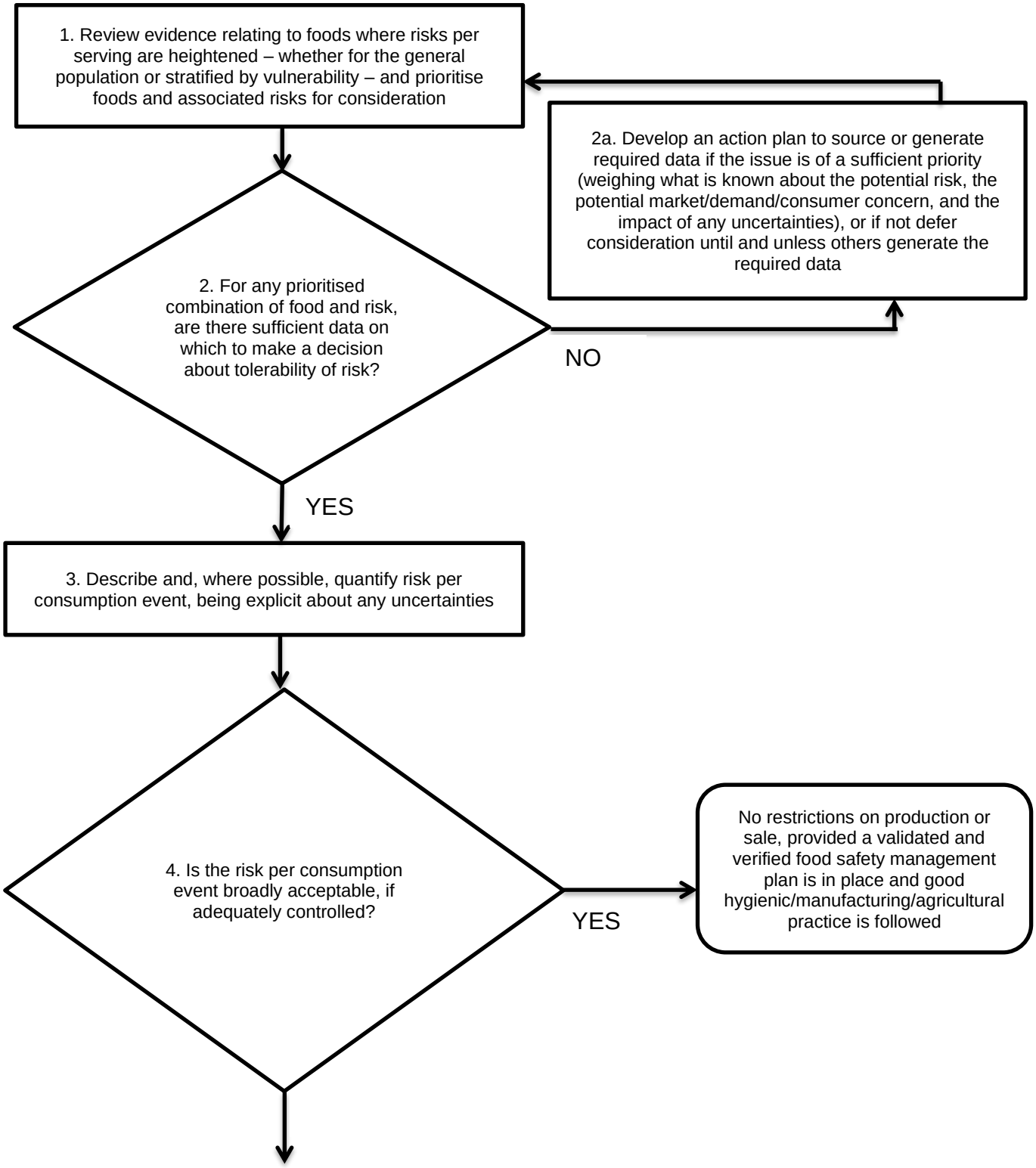
4.2 There is no evidence to suggest that the frequency of eating LTTC burgers has increased since 2016. Whilst the rate of foodborne illness associated with the consumption of burgers remains low, the risks associated with doing so remain the same as they did in 2016 when the Board agreed the service of LTTC burgers was unacceptable unless a variety of measures were taken that could demonstrate safety through the supply chain process.

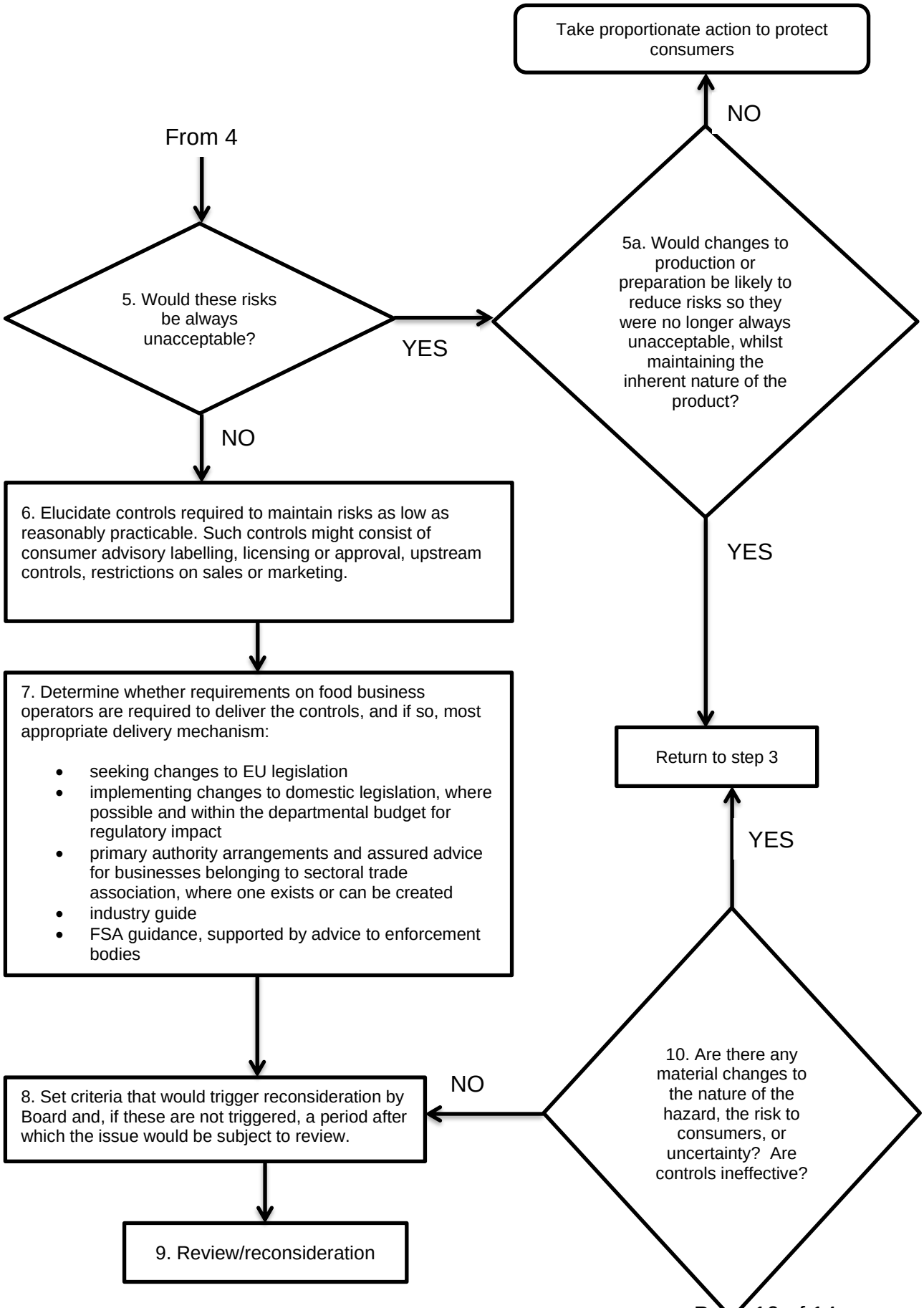
4.3 As there is no material change, the FSA should continue to review its guidance taking into account stakeholder feedback and, in due course, consultation responses so the revised guidance provides concise and clear advice to businesses wishing to offer LTTC burgers to consumers.

The Board is asked to:

- Agree there are no material changes that would give us cause to revisit our approach on LTTC burgers.
- Agree that proposed revisions of the guidance should now be subject to consultation.

Annex A – flow chart for application of the framework for controls relating to foods where risks per serving are significant




Take proportionate action to protect consumers
NO
From 4
5. Would these risks be always unacceptable?
YES
5a. Would changes to production or preparation be likely to reduce risks so they were no longer always unacceptable, whilst maintaining the inherent nature of the product?
NO
6. Elucidate controls required to maintain risks as low as reasonably practicable. Such controls might consist of consumer advisory labelling, licensing or approval, upstream controls, restrictions on sales or marketing.
YES
7. Determine whether requirements on food business operators are required to deliver the controls, and if so, most appropriate delivery mechanism:
• seeking changes to EU legislation
• implementing changes to domestic legislation, where possible and within the departmental budget for regulatory impact
• primary authority arrangements and assured advice for businesses belonging to sectoral trade association, where one exists or can be created
• industry guide
• FSA guidance, supported by advice to enforcement bodies
Return to step 3
YES
10. Are there any material changes to the nature of the hazard, the risk to consumers, or uncertainty? Are controls ineffective?
NO
8. Set criteria that would trigger reconsideration by Board and, if these are not triggered, a period after which the issue would be subject to review.
9. Review/reconsideration

Annex B - Evidence Package: Summary

Update on Science and Evidence Concerning Less than Thoroughly Cooked Beef Burgers

Key findings and uncertainties

Epidemiological update:

The number of cases due to STEC has remained fairly constant from 2012-2018. However, there have been localised peaks, which could be attributed to outbreaks or increased reporting of non-O157 STEC cases due to development of new diagnosis methods. Source attribution of cases to food is not available, however, the Burger Watch project set up by PHE did not find any association between sporadic STEC cases and above-average consumption of burgers. There have been six reported outbreaks of foodborne STEC linked to burgers between 2009-2018 in England and Northern Ireland, of which two occurred after the introduction of the LTTC burger guidance in 2015.

Table: Number of STEC reported outbreaks in England and Northern Ireland, 2009-2018. No outbreaks in Northern Ireland were linked back to a specific food commodity. Data provided by Public Health England and Public Health Agency (Northern Ireland).

Year	Number of outbreaks	Foodborne outbreaks	Foodborne outbreaks linked to burgers
2009	20	3	1
2010	16	2	0
2011	16	6	0
2012	16	4	2
2013	8	2	1
2014	14	6	0
2015	12	4	1
2016	6	3	0
2017	9	2	1
2018	4	2	0

Update on science:

- The ACMSF confirmed in June 2016 that various evidence presented to them was insufficient to lead them to change their previous recommendation of cooking at 70°C for 2 minutes or equivalent in order to deliver at least a 6-log reduction in *E. coli* O157.
- A review of the scientific literature since 2016 found little new relevant evidence that could inform a risk assessment.
- EFSA have published an updated opinion on STEC in 2019, which agrees that all STEC strains should be regarded as potentially pathogenic and the

serotype should not be considered a virulence criterion (all strains should be regarded as having the potential to cause illness in susceptible individuals) when assessing risk of STEC. This view is supported by work from Food Standards Scotland.

- A joint report from a study funded by the FSA and FSS suggests that vaccination could be used to reduce the prevalence of STEC in cattle.
- A 2018 review of various interventions for reducing the microbiological load on beef during primary production suggests that cattle hide interventions, carcass pasteurisation treatments and organic acid washes of beef carcasses showed reliable reductions. The sequential use of general hygiene practice and hazard-based interventions at the pre-slaughter, slaughter and post-slaughter stages, as an integral part of intervention-based HACCP, were found to have the highest impact on microbial load.

Uncertainties and evidence gaps:

- Due to the low numbers of cases of STEC in the UK, and the minimal metadata available on the links to food, notably LTTC beef burgers, there is a large level of uncertainty regarding the trends in STEC associated with LTTC beef burgers from 2009-2019.
- Uncertainty regarding underreporting factor for STEC.
- Gaps in the epidemiological data on number of outbreaks or cases or hospitalisation or deaths from STEC.
- Gaps on prevalence of STEC in cattle and in beef products.

Outline of any caveats to consider when using the information (other than the uncertainties described above)

It is not possible to link STEC cases to consumption of a particular food or a different transmission route. There are very few recorded foodborne STEC outbreaks associated with beef burgers, and therefore the numbers are too small to draw reliable conclusions from regarding the effect the guidance has had. For the outbreaks associated to beef burgers, it is not possible to say whether any of these were linked to LTTC burgers.

Consumer Research

In February 2020 the Social Science Team commissioned 11 questions on LTTC (rare or medium) beef burger consumption on Kantar's online omnibus survey. The survey was completed by 1,275 adults aged 16 and over in England, Wales and Northern Ireland between 30 January and 4 February 2020.

Key findings and uncertainties
The three strands of consumer research presented in this evidence package suggest that most consumers prefer beef burgers to be cooked well-done both when eating out and cooking at home. Key findings from each of the strands are presented below.

Consumer survey (Feb 2020)

- Overall, 78% of respondents reported eating beef burgers either that have been cooked at home or when eating out. Of those who eat beef burgers outside the home (n=887), the majority (73%) reported that they prefer beef burgers to be served well-done while 19% prefer them served rare or medium and 7% have no preference. Of those who eat beef burgers cooked at home (n=951), a slightly higher proportion of respondents (78%) reported that they preferred them to be cooked well-done (17% preferred them rare or medium and 6% had no preference).

- Of those who prefer beef burgers to be served well-done when eating out (n=704), 20% reported that they would be happy to eat a beef burger if it was served to them medium or rare; 14% would feel a bit concerned or unhappy but eat the burger as served; 43% would request that the burger was cooked until well-done; and 19% wouldn't eat a burger if it was served to them medium or rare.

- Frequency of rare or medium beef burger consumption varied; however, 29% of respondents who eat beef burgers outside of the home (n=887) reported eating rare or medium burgers outside of the home at least once a month compared to 58% who ate well-done burgers at least once a month. A higher proportion (39%) of respondents who eat beef burgers cooked at home (n=951) reported eating rare or medium beef burgers cooked at home at least once a month.

- There were gendered, aged, work, social grade and national differences in preferences for eating rare or medium burgers (in and out of the home) whereby men, young people, those in work, those from higher social grades and those from England were more likely to report eating rare or medium burgers, which for the most part is replicated in that these groups are more frequent consumers of rare or medium burgers.

Food and You (2016-2018)

- In 2018, 76% of respondents reported eating burgers (a slight increase from 71% in 2016). In 2018, 62% of respondents reported never eating burgers if the meat is pink or has pink or red juices (a slight increase from 60% in 2016) while 15% reported sometimes doing this, 4% never and 3% always.

Consumer research (2015-2016)

- The majority of respondents (64%) preferred burgers cooked well done and would reject a burger served rare or pink. Some respondents (12%) had a strong preference for burgers served rare, often preparing rare burgers at home as well as ordering them in restaurants. The remaining respondents

(24%) did not have a strong preference but tended to accept a burger however it was served.

Outline of any caveats to consider when using the information (other than the uncertainties described above)

These three strands of research provide a snapshot of consumer preferences and frequency of consumption of rare or medium beef burgers. They do not provide an estimate of the level of consumption (i.e. the number of beef burgers consumed).

These pieces of research are not directly comparable as they use different sampling approaches, questionnaire designs, and question wording which may influence responses. Therefore, it is not possible to accurately assess whether preferences and frequency of consumption of rare or medium burgers has changed over time.

Food and You provides some trend data, however the questions asked in Food and You do not ask specifically about beef burgers, but burgers more generally. The questions are also asked in the context of preparing and cooking food in the home therefore do not take into account eating burgers outside of the home.