

ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD
UPDATE ON THE AGENCY'S WORK IN RELATION TO RARE BURGERS

Introduction

1. At the last ACMSF meeting in October the committee were informed about the FSA Board's decision on serving rare burgers and in the wider context the approach to dealing with risky foods. The purpose of this paper is to keep ACMSF updated on developments in this area and where necessary seek the committee's input on key technical issues such as time/temperatures for reduction in Shiga toxin producing *Escherichia coli* (STEC) and modelling the impact of interventions to reduce STEC and other pathogens in the burger production chain.
2. Within the Agency a formal project team is co-ordinating implementation of the Board's decision in September 2015. The project has the following objectives:
 - To amplify our advice to consumers against consumption of burgers less than thoroughly cooked at home, to track penetration of the advice and claimed consumer behaviour, and keep our advice and its dissemination under review in the light of the tracker.
 - To ensure that consumers are made aware of the potential risks associated with burgers served rare in catering outlets and can make informed decisions when deciding on whether to consume or allow others to consume these products.
 - To ensure that those businesses that produce meat or minced meat preparations, which supply premises that serve burgers which are less than thoroughly cooked, are aware of, and apply, the requirements to have appropriate procedures in place to reduce risk (referred to as "source control" in the Board discussion).
 - To ensure that those businesses intending to serve burgers less than thoroughly cooked are aware of, and apply, the requirements to have appropriate procedures in place to reduce risk. This would include the specific identification of *Salmonella* and STEC among other pathogens, as particular hazards with evidence that controls for these organisms have been validated; sampling and testing regimes to verify controls; specific corrective action in the event of adverse results; an appropriate consumer advisory statement at the point of ordering food; and only serving burgers that are well-done to children).
 - To ensure that local authority regulators have the necessary information to enable them to make a decision on whether enforcement action is necessary when applied to the production or preparation of burgers in catering outlets that are intended to be consumed less than thoroughly cooked, with such enforcement action being at a level of the enforcement hierarchy that is

appropriate to the significance and severity of the hazard associated with STEC.

- Explore the effectiveness of combinations of source reduction and pathway options in delivering burgers equivalent in terms of microbiological safety to those achieved by subjecting burgers made from standard sourced mince to a 6-log reduction by thorough cooking. Seek expert assessment of any additional or innovative interventions that may be used in either source control or pathway management.
- To monitor impacts of the application of these controls, and set levels for each of these impact measures that would trigger referral of the issue back to the Board.

Timing

3. The FSA Board will receive a further update at their July 2016 meeting following which we plan to issue further comprehensive guidance to the industry and local authority regulators in autumn 2016. It is anticipated that ACMSF will receive further updates on progress at future meetings. It is anticipated that the following areas will be addressed over the next six months.

Guidance for industry, local authorities and consumers

- An FSA web based resource to consolidate existing advice, aimed at caterers, producers and local authorities - by March 2016.
- The further development and testing of consumer messaging for catering establishments, in conjunction with the industry - by April 2016.
- A consumer campaign to ensure that the advice to consumers against consumption of burgers less than thoroughly cooked in the home is restated, reinforced and understood - by July 2016.

Assessing the impact of interventions

- Development of statistical modelling to evaluate the effectiveness of interventions both individually and collectively throughout the food chain - by July 2016.

Epidemiology of foodborne pathogens

- Establishment of measurable triggers for foodborne pathogens to enable the Board to reconsider its position if necessary, supported by ongoing enhanced surveillance of STEC and other relevant pathogens – implemented by July 2016.

Specific issues for ACMSF

4. In addition to keeping ACMSF updated on developments in this area as a whole there are several technical areas where we would welcome the committee's views and input. These are in the area of time/temperatures for a 4 log reduction in STEC and in modelling of the impact of interventions in the burger production chain.

Time temperatures combinations for a 4 log reduction

5. As part of the work to develop guidance to the industry and local authority regulators the FSA would like to provide them with information on time/temperature combinations to achieve at least a 4 log reduction in STEC and other bacterial pathogens. There is an expectation that other interventions/controls would be in place to reduce contamination in the burger sourcing and production chain. Where this can be clearly demonstrated then there would no longer be a dependency on cooking to achieve a 6 log reduction to deliver a safe burger in catering outlets. There is already long standing FSA advice on the time/temperature combinations for achieving at least a 6 log reduction in foodborne pathogens (Table 1). This was discussed in the ACMSF reports on VTEC (1995) safe cooking of burgers (2007) and more recently in the paper on raw, rare and low temperature cooked foods (2014).

Table 1. Time temperature combinations for achieving at least a 6 log reduction in foodborne pathogens.

Temperature	Time
60	45 min
65	10 min
70	2 min
75	30 s
80	6 s

Source: ACMSF VTEC report (1995)

6. In 2014 the FSA commissioned RIVM and APHA to apply a thermal inactivation model to model risk to human health from consumption of STEC O157 in beef burgers. The report of this work has informed the development of the FSA Board paper and is presented in Annex 1. The RIVM report provides the predicted times required to achieve inactivation of STEC O157 in burgers of different thicknesses (1cm, 2.5cm, 5cm) and also the time required for the core to reach different temperatures and achieve different log reductions. More details on the specified cooking conditions are detailed in the report.

7. Information in the report including the graphs has provided an indication of the predicted time/temperature combinations in order to achieve a 6 log or 4 log reduction in STEC O157 in burgers of different thickness. This information is provided in Tables 2 and 3.

Table 2 shows the approx. time and temperature combinations required to achieve a **6 log reduction** from the RIVM/APHA report. Note that where time is '0 min' – this predicts that a 6 log reduction has been reached before the core of the burger reaches the stated temperature.

<u>Small (1 cm thick, 85g)</u>			<u>Standard (2.5 cm thick, 113g)</u>			<u>Gourmet (5 cm thick, 227g)</u>		
Temperature	Time	Time taken to reach temp	Temperature	Time	Time taken to reach temp	Temperature	Time	Time taken to reach temp
60	~ 2 mins	~ 30 s	60	~2 min	~ 3.5 mins	60	~ 5 mins	~ 17.5 mins
65	1 min to 2 min	~ 1 min	65	~ 1 min	~ 4.5 mins	65	0 min	~ 26 mins
70	~1 min	~ 1 min 15 s	70	0 min	~ 5.5 mins	70	0 min	~ 40 mins
75	30s to 1 min	~ 1.5 min	75	0 min	~ 7.5 mins	75	0 min	
80	~ 30 s	~ 2 min	80	0 min	~ 10 mins	80	0 min	

Table 3 shows the approx. time and temperature combinations required to achieve a **4 log reduction** from the RIVM/APHA report. Note that where time is '0 min' – this predicts that a 4 log reduction has been reached before the core of the burger reaches the stated temperature.

<u>Small (1 cm thick, 85g)</u>			<u>Standard (2.5 cm thick, 113g)</u>			<u>Gourmet (5 cm thick, 227g)</u>		
Temperature	Time	Time taken to reach temp	Temperature	Time	Time taken to reach temp	Temperature	Time	Time taken to reach temp
60	~ 2 mins	~ 30 s	60	~1 min to 2 min	~ 3.5 mins	60	~ 2.5 mins	~ 17.5 mins
65	1 min to 2 min	~ 1 min	65	~ 30 s to 1 min	~ 4.5 mins	65	0 min	~ 26 mins
70	~1 min	~ 1 min 15 s	70	0 min	~ 5.5 mins	70	0 min	~ 40 mins
75	30s to 1 min	~ 1.5 min	75	0 min	~ 7.5 mins	75	0 min	
80	~ 30 s	~ 2 min	80	0 min	~ 10 mins	80	0 min	

8. Table 2 for the 6 log reduction shows that the ACMSF guidelines are appropriate for all burger types for 70°C for 2 minutes. For small burgers cooked at 80°C for 6 seconds the study suggests that about 30 seconds may be required. The data also suggests that the guidelines might be over precautionary for the specified time/temperatures below 70°C. Table 3 suggests that to achieve a 4 log reduction, it is possible to cook all burger types for approximately 1 minute at a core temperature of 70°C. It also suggests that a 4 log reduction may be achieved by cooking (under the conditions specified) any of the 3 types of burgers for 2.5 minutes at a core temperature of 60°C.

Assessing the impact of interventions

9. A key part of the rationale for the Board approving the serving of rare burgers in catering settings was that appropriate measures would need to be put in place to mitigate or offset the increased risk associated with the serving of rare burgers. Quantitative microbiological risk assessments on the burger production chain conducted in the UK (Kosminder *et al.*, 2010), Canada (Smith *et al.*, 2013) and Argentina (Signorini and Talabra 2009) potentially allow the impact of intervention to be assessed from slaughterhouse through to catering and to the point of consumption. The FSA is anticipating using the model developed by Kosminder *et al.* (2010) to examine the impact of interventions in detail. Initial discussions have taken place concerning potential intervention steps and data sources and the FSA will be working with APHA to further develop the model over the next few months.

Action

10. ACMSF Members are invited to comment on progress with the taking forward the FSA Board's decision concerning the serving of rare burgers.
11. The FSA would specifically like the committee's views on two areas and would welcome the assistance of the committee in this work going forward.
 - a) The approach to developing time/temperature combinations for achieving a 4 log reduction in STEC and other key pathogens to inform advice to local authorities and food business operators.
 - b) Modelling the impact of interventions along the burger production chain.

Secretariat
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References

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Signorini M, Talabra H (2009). Quantitative risk assessment for verocytotoxigenic *Escherichia coli* in ground beef hamburgers in Argentina. *International Journal of Food Microbiology* **132**: 153–161.

Smith BA, Fazil A, Lammerding AM (2013). A risk assessment model for *Escherichia coli* O157:H7 in ground beef and beef cuts in Canada: Evaluating the effects of interventions. *Food Control* **29**: 369-384.

RIVM/APHA report