厚生労働省ホームページより

食肉の加熱条件に関するＱ＆Ａ

Ｑ．食肉による食中毒防止のための加熱条件として、中心部を 75℃で 1 分間加熱することが必要とされていますが、これと同等の加熱の条件はどのようなものがありますか？

Ａ.「75℃、1 分」と同等な加熱殺菌の条件として、「70℃、3 分」、「69℃、4 分」、「68℃、5 分」、「67℃、8 分」、「66℃、11 分」、「65℃、15 分」が妥当と考えられます。

また、調理の現場においては、中心温度計の適切な使用により、食肉の中心部の温度が目標とする温度を下回らないことを確認し、確実な加熱殺菌が行われるようにする必要があります。

食肉の加熱条件に係る補足資料

添付資料4

厚生労働省ホームページ
「食品衛生管理に関する技術検討会政省令に規定する事項の検討結果とりまとめ案」に関する意見の募集について寄せられたご意見について
（平成31年4月26日）より抜粋

118	HACCP制度化の要点は、危害要因を分析して適切な衛生管理を行うことにつきると思う。今回、技術検討会で確認され公表された手引書を見ると、肝心の危害要因の分析とその衛生管理方法については、画一的であるように感じられる。特に、食品の加熱殺菌の基準と指導方法について、下記の点について検討してもらいたい。 ① 食品衛生法の規格基準では、生乳、血液、牛レバー、豚肉については「中心部の温度を63℃で30分間以上加熱するか、又はこれと同等以上の殺菌効果を有する方法で加熱殺菌しなければならない」と規定されていますが、一般的な調理方法ではありません。食品事業者が解りやすく管理しやすい、また監視指導する食品衛生監視員が指導しやすい温度と時間等を提示されたい。 ② 挽肉や豚肉を原料に含む食品については、63℃30分間の加熱殺菌と同等と考えられる75℃1分間の加熱殺菌を指導していますが、その殺菌方法に関する科学的根拠（指標菌、D値やZ値など）について、科学的根拠を提示されたい。 ③ 真空低温調理など63℃以下の低温での真空調理に関して、食品事業者が解りやすく管理しやすい考え方や方法の提示を検討してもらいたい。 ④ 75℃1分間という加熱方法はかなり安全率を見込んだ画一的な殺菌方法であるため、食品事業者にとっては順守が難しく、行政からも指導しやすい殺菌方法を提示されたい。 ⑤ 豚内臓肉の生食を禁止するのであれば、他の肉類についても生食禁止又は届出制度を検討してもらいたい。	食肉による食中毒防止のための加熱条件としては、中心部を63℃で30分加熱殺菌する方法と同等以上の方法として75℃で1分間加熱する方法を示しています（平成27年6月2日付食安基発0602第3号「豚の食肉の基準に関するQ&Aについて」（厚生労働省医薬食品局食品安全部基準審査課長通知））。 また、厚生労働省のホームページに掲載している「食肉の加熱条件に関するQ&A」においては、75℃で1分間加熱する方法と同等な加熱殺菌の条件として、「70℃、3 分」、「69℃、4 分」、「68℃、5 分」、「67℃、8 分」、「66℃、11 分」、「65℃、15 分」が妥当と考えられることを示しています。 なお、食肉について、中心部を75℃で1分以上加熱殺菌する条件については、食品安全委員会の「微生物・ウイルス評価書生食用食肉(牛肉)における腸管出血性大腸菌及びサルモネラ属菌」（平成23年8月25日付け府食第691号食品安全委員会委員長通知）においても「O157 の殺菌については、我が国においては75℃1 分間以上の加熱によることとされている。これは、調理用オーブンによるハンバーグの調理加熱でのO157 の消長に関し、65℃1分間の加熱により10^8の接種菌量が死滅した報告で裏付けられている」とあり、また、食肉の加熱条件に関するQ&Aについては、ニュージーランド政府が公表している「Standardising D and Z values for cooking raw meat」（MPI TechnicalPaper No.2016/05）における知見を基に、専門家の意見を踏まえ作成しています。 牛の食肉(内蔵を除く)であって生食用として販売されるものには、食品・添加物等の規格基準（昭和34年厚生省告示第370号）において「生食用食肉」の規格基準を定めています。 また、食肉等の生食については、平成26年6月の乳肉水産食品部会食肉等の生食に関する調査会において「食肉等の生食に関する調査会報告書」が取りまとめられ、規制のあり方については①危害要因の性質、②流通量、③リスク低減策の有無の3点を踏まえて公衆衛生上のリスクの大きさを決定し検討することとされています。このため、規制の在り方については引き続き検討を進めると共に、生や加熱不十分な食肉の摂取は一般的に食中毒の危険性があることから、十分な加熱について周知に努めているところです（参考：厚生労働省ホームページ https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000049964.html） カンピロバクター食中毒対策としては、従前より食品等事業者及び消費者に対して、喫食前に十分に加熱するよう都道府県等を通じて指導するほか、厚生労働省ホームページへのQ&Aやリーフレットの掲載及びツイッター等を通じた注意喚起等を行ってきています。 また、HACCP制度化後は食鳥処理場や鶏肉を取り扱う飲食店等に対して、HACCPに沿った衛生管理を求めることでカンピロバクター等による食中毒の発生予防をより効果的に図ることが可能と考えています。
119	HACCP制度化10年経過したEUに見られる課題についての一層の配慮をEU委員会は2015年HACCP制度から現状までを振り返り、課題「鍵となる問題点」を整理している。日本において制度化にあたり十分配慮されていることとは思いますが、定期的に制度の課題を振り返り、中小事業者、自治体衛生監視員等への指導の継続をお願いする。 特に以下の点は現時点での十分な理解の共有化ができていない課題がある。 ① 法的な規制と業界団体等のガイドラインの関係 ② 一般的衛生管理とHACCPの役割の理解 ③ HACCP原則の実施、特に「ハザード分析」「CCPの設定」「検証」の理解 ④ 柔軟性の理解とHACCP制度化の目的の理解 ⑤ 規制機関による監視のレベル向上とばらつきの排除	今般の改正法の附則第14条で「政府は、この法律の施行後5年を目途として、この法律による改正後のそれぞれの法律の規定について、その施行の状況等を勘案しつつ検討を加え、必要があると認めるときは、その結果に基づいて必要な措置を講ずるものとする。」としています。したがって、御指摘の内容も含め、定期的に措置を検討することとしています。
120	食品の国際取引にあたってはHACCPの制度化は非常に意義のあるものと考える。一方で国際的整合性が取れていない課題も残されている。これらについて順次国際的整合性を図っていくことが求められると思うが、食品安全委員会等を通し順次検討されていくことを望む。 ① 食品の殺菌条件の規制（規格・基準）とその根拠、検証方法の提示 ② 高圧殺菌等新規技術の食品加工への採用についての許認可の方法の提示 ③ 放射線殺菌のように諸外国で認められている食品処理技術の許認可に向けての検討 （すでに承認されている国から「放射線殺菌された原材料」を使用した食品輸入の認可の方向性を含めて）	食をとりまく環境変化や国際化等に対応し、食品の安全を確保するため、食品の規格基準については、引き続き国際的な状況を踏まえつつ、日本国内での実態や有用性の観点からも情報を収集し、検討を進めてまいります。
121	施設の老朽化と狭小・資金難で新たなハード面での改善は難しいと考える。今後制度が進むにつれて交差汚染防止の人の動線等を求められると対応が困難になる。通路にテープを貼ればいいと言われるが、実際テープを貼ると通路幅が狭いため弊社工場では人がまっすぐ歩けなくなる。	HACCPに沿った衛生管理の内容については、これまで求められてきた衛生管理を、個々の事業者が使用する原材料、製造・調理の工程等に応じた衛生管理となるよう計画策定、記録保存を行い、「最適化」、「見える化」するものです。HACCPは工程管理、すなわち、ソフトの基準であり、必ずしも施設設備等ハードの整備を求めるものではありません。今回の制度化に当たっても現行の施設設備を前提とした対応が可能ですので、施設に応じた実効性のある対応をお願いします。

Standardising D and Z values for cooking raw meat

Final Report

MPI Technical Paper No: 2016/05

Prepared for the Ministry for Primary Industries by Dr Beverley Horn (ESR), Lisa Olsen, Dr Sally Hasell (MPI) and Dr Roger Cook (MPI)

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Scientific Interpretative Summary

This SIS is prepared by MPI risk assessors to provide context to the following report for MPI risk managers and external readers.

Standardisation of parameters for pathogen control in food:

D and *z* values for the heat inactivation of pathogens in raw meat

ESR Report FW 15001

Advice and requirements for thermal treatment times for raw meat are to be found in a number of MPI documents and have been based on the benchmark and universally accepted heat treatment parameters in a 1989 publication. This gives a 6D outcome at a core temperature of 70°C for 2 minutes for *L. monocytogenes,* derived from experiments with several matrices (chicken, beef steak and carrot).

This report analysed more recent data sets (1384 values) for raw meat with the intent of updating information for specific pathogen/meat combinations if appropriate. The analysis produced a higher 6D value at of 70°C of 2.4 minutes for *L. monocytogenes* for all meat types. For *Salmonella,* the 6D value range at 70°C is 1.8-2.2 minutes depending on meat types and values for *E.coli* are appreciably lower at 1.2 minutes for beef and 1.8 minutes for all meats. This confirms that a process that gives the required log reduction for *L. monocytogenes* will give at least the same log reduction for the other non-sporing pathogens.

At low temperatures the effects of the z value are very pronounced. Using the current MPI recommendations to achieve a 6D for *L. monocytogenes*, at 60°C and with z =7.5°C, the cooking time is 44 minutes. However when applying a z value of 6.25°C, the cook time is doubled to 91.2 minutes at 60°C.

While the study does not significantly challenge the 70°C for 2 minutes convention used to achieve a 6D reduction for *L. monocytogenes* in meat products, it is appropriate to extend the time to 2.4 minutes as the data used was all meat-based and should therefore be more relevant than values derived from a range of matrices.

For time/temperature combinations below 55°C, no recommendations can be made until further research is undertaken.

Where time/temperature combinations (and processing conditions e.g. vacuum packs) outside the range included in this report are intended to be taken up by by food processors or MPI, validation studies will need to be undertaken.

D and *z* values for the heat inactivation of pathogens in raw meat

December 2015

PREPARED FOR:	**Ministry for Primary Industries under project MFS/14/4 Microbiological Food Safety, as part of overall contract for scientific services**
CLIENT REPORT No:	**FW15001**
PREPARED BY:	**Dr Beverley Horn**
REVIEWED BY:	**Dr Lucia Rivas and Dr Stephen On**

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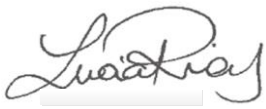
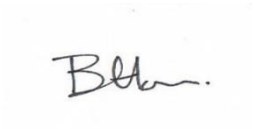
Dr Maurice Wilson, ESR, for microbiological support to this project and Dr Wendy Williamson with assistance in data collection and cleaning. The results in this report are partially based on earlier project for MPI conducted by Dr Lynn McIntyre, Dr Andrew Hudson, Dr Beverley Horn and Sue Gilbert.

Manager	Peer reviewer	Author
		
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EXECUTIVE SUMMARY

The objective of this project was to provide time-temperature combinations for industry, in the form of *D* and *z* values, for heat processing (cooking) of different meat types for inactivation of the pathogens: *Escherichia coli* including *E. coli* O157:H7 and other Shiga toxigenic *E. coli* serotypes, *Listeria monocytogenes*, *Salmonella* spp. and *Campylobacter jejuni/coli*.

Thermal inactivation data for pathogens in raw meat were located and compiled through searches of the scientific literature, up to and including October 2014. The *D* value database was initially filtered to extract the data which (i) had been determined by experiments specifically designed to estimate *D* values and (ii) were determined from the exponential inactivation phase.

Thermal inactivation can be affected by intrinsic properties of meat (e.g. meat type, fat, pH) as well as preliminary processing (which may include some heating). Consequently information on these factors was also collected alongside inactivation data when available. The proposed methodology, compiled data and supporting information (including that from a previous ESR project) were discussed with MPI in order to define the scope of meat types, intrinsic properties of the meat, preliminary and heating processes for which *D* and *z* values could be derived and that were supported by a substantial body of data. Finally the database was filtered to only include the data which fell within the agreed product scope, resulting in a data set of 1348 values.

For each pathogen-meat group combination, the reference *D* values are derived from a linear regression of the 95th percentile value of the available data at each temperature. This provides *D* values which take into account the variability of the heat resistance of pathogens due to the characteristics of the product and incorporates data from the most heat resistant strains of pathogens which are those most likely to survive cooking and present a risk of illness.

The scope of meat types for which D and z values were derived includes:

(i) Beef
(ii) Poultry
(iii) Pork
(iv) “All Meat”.

In addition to Beef, Poultry and Pork, the “All Meat” category also includes sheep meat, partially processed raw meat products such as sausages, and products containing a mix of meat types. Some exclusions to the scope (e.g. for high fat products) are described in Table 1.

The full dataset included *D* values ranging from 55°C to 74°C. Inspection of the data showed that for practical experimental reasons using a meat matrix, there were limited data above 70°C. Consequently *D* values in this report are given for meat types, pathogens and temperatures between 55°C and 70°C. Specifically, *D* and *z* values are given for; *E. coli* in Beef and “All Meat”, *L. monocytogenes* in “All Meat”, *Salmonella* spp. in Beef, Poultry and “All Meat”. There were insufficient data to provide Pork specific *D* values for any of the pathogens, but the Beef *D* values can be applied to this meat type.

The exception to the temperature range is *L. monocytogenes*, for which there were sufficient data from 70-74°C that a *D* value up to 75°C could be provided for “All Meat”. As *L. monocytogenes* was consistently more heat resistant than the *E. coli* and *Salmonella* spp. across the meat types, this D_{75} value can also be applied to *E. coli* and *Salmonella* spp..

The other exception is for *C. jejuni/coli*, for which there were insufficient data to derive *D* and *z* values for any meat type. However, *C. jejuni/coli* are more sensitive to heat than the other pathogens. Consequently cooking processes that inactivate the other named pathogens (calculated from *D* values) will provide at least the same reduction in *C. jejuni/coli* concentration.

1. INTRODUCTION

Raw meat is frequently contaminated with pathogenic bacteria. Cooking the meat will reduce the risk of illness from pathogens in foods through the heat inactivation of pathogen cells present while at the same time increasing the palatability and shelf life of the meat. However the times and temperatures required to achieve these different outcomes may not be the same. Cooking at too low a temperature or for insufficient time may mean the meat remains unsafe to be eaten.

Reduction of the pathogen concentration during heating can be defined in terms of *D* and *z* values. Knowledge of *D* and *z* values combined with the appropriate target reduction in pathogen concentration, allows target time-temperature combinations to be defined for the cooking process.

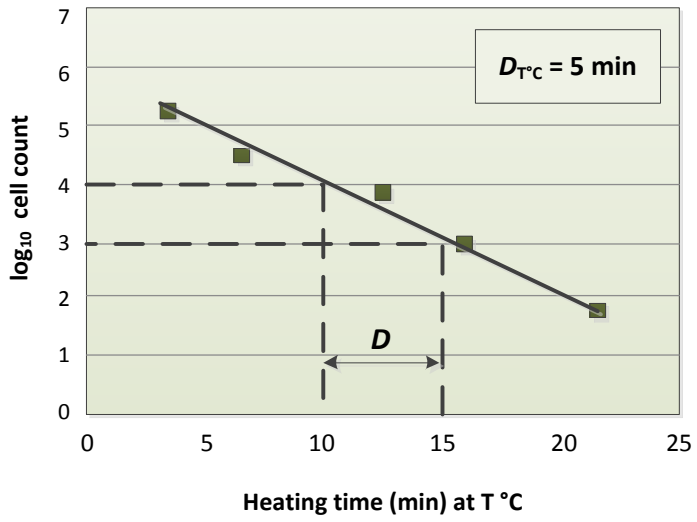
This report provides *D* and *z* values which can be applied to the heating of raw meat and the scope of the raw meat products the *D* and *z* values can be applied to.

1.1 *D* VALUE

1.1.1 Definition

In general terms, the *D* value is the time taken for a specific organism at a specified temperature and in a specified substrate to incur a 90% or 1 $\log_{10}$ reduction in its population as shown in Figure 1.

Figure 1: *D* value



1.1.2 Temperature

The specified temperature is the temperature that must be achieved and maintained at the slowest heating point of the product. The shape and size of the product will determine where in the product the temperature will need to be monitored. The temperature is given as a suffix to the *D* notation. For example D_{65} is the *D* value at 65°C.

1.1.3 Pathogens

For the purposes of this report, the *D* values stated are for the following pathogens;

- *Listeria monocytogenes,*
- *Salmonella* spp. and
- *Escherichia coli* including O157:H7 and other Shiga toxigenic *Escherichia coli* (STEC) serotypes
- *Campylobacter jejuni* and *coli*

These pathogens were chosen because of their public health significance in the New Zealand food safety context.

1.1.4 Raw meat products

The specified substrates are the raw meat products which fall within the scope of Table 1.

Table 1: Scope of products applicable to *D* and *z* values given in this report

	Animal products and processing for which the *D* and z values in this report can be used	Animal products and processing for which the *D* and *z* values in this report cannot be used without further verification.
Meat Types	• Raw beef • Raw pork • Raw lamb / mutton • Raw poultry	• Fish (insufficient data) • Seafood (insufficient data)
Pre-heating processing or formulation	• Intact meat • Minced • Mechanically tenderised • Meat bonding • Brine injection	• Heat treatment applied during a fermentation process • Preparations which cause the water activity to go below 0.95 • Product with a fat content greater than 30% • Product in which the pH is less than 5 • Heat shocked or sub-lethal heat treatment before main heat treatment.
Heat Processing	Heat treatment using: • Water • Steam • Dry heat The temperature at the slowest heating point of the product is maintainable at a temperature of 55°C or above.	Processes which involve: • Microwave heating • Smoking • High pressure treatment • Vacuum packing • Anaerobic atmosphere The temperature at the slowest heating point of the product stays below 55°C.

D values vary depending on the characteristics of the food (Table 2) and how the food is processed prior to heating (Table 3). As a consequence, a set of cooking conditions for one food may not necessarily be applicable to another. Factors influencing *D* values are discussed in more detail by Gilbert et. al. (2011)[1]. The comments in Table 2 and Table 3 apply to *E. coli*, *L. monocytogenes* and *Salmonella* spp. unless indicated otherwise.

Table 1 above defined the scope of meat products and processes applicable to the *D* and *z* values presented in section 2. Meat products and heating treatments outside this scope may need less or extra heating time to ensure adequate pathogen reduction. **It is not appropriate to use the *D* and *z* values in this report to predict behaviour in food types other than meat**.

Table 2: How food characteristics can influence *D* values

Factor	Influence on *D* value
Additives	Can be utilised to decrease *D* values.
Atmosphere	Anaerobic conditions during heat treatment may increase *D* values.
Competition from other bacteria present	May increase *D* values by altering the atmosphere, however unlikely in meat unless spoilage has occurred.
Fat	Increasing fat concentration may increase thermal stability, but this may be via a reduction in water activity. Localised areas of fat may be more protective than product where fat is uniformly blended throughout product.
pH	Optimum survival of *Salmonella* spp. and *E. coli* in the pH range 5 to 7. *Listeria* optimum survival close to neural pH. Lower and higher pH result in decreased *D* values. Type of acidulant may not influence *D* value.
Water activity	Decreasing a_w tends to increase the *D* value.

[1] Gilbert S, et al. (2011) Background document on factors influencing the heat inactivation of bacteria in foods. ESR Report FW10045

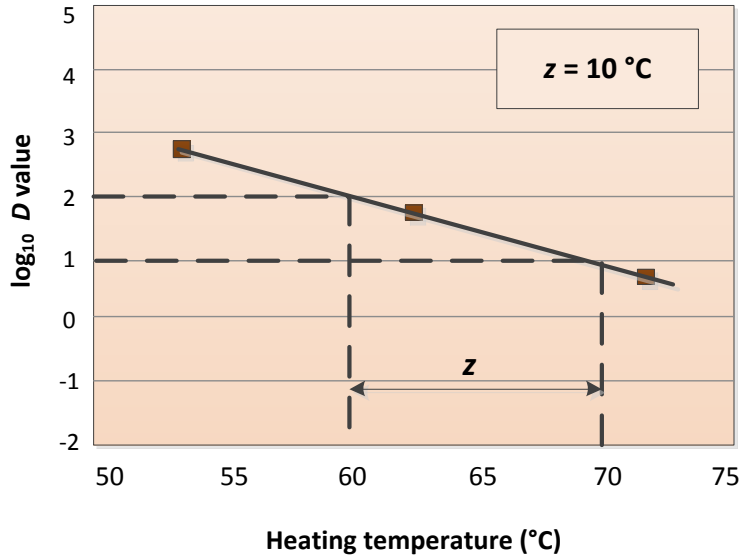
Table 3: Examples of how bacteria specific factors prior to cooking can influence *D* values

Factor	Influence on *D* value
Heat prior to cooking	Meat subjected to sub-lethal cooking temperatures prior to the main heating step increases *D* values.
Acid adaption	May increase *D* values. Acid adaption can occur with processing which increases the acidity of the meat product for a period of time before heating. E.g. using an acidic marinade.
Growth phase of cells	Heat resistance is greatest in stationary phase cells. Stationary cells exist in established populations which have a constant population density. Population density may be limited by depletion of key nutrients or the accumulation of metabolites. Pathogen cells may be in the stationary phase on the carcass, or pre-heating processing may allow enough cell growth for stationary phase to be reached.

1.2 *Z* VALUE

The *z* value is the increase in temperature needed to decrease the *D* value for a specific organism in a specific substrate by a factor of 10. A factor of 10 is equivalent to a one log reduction in the *D* value (Figure 2).

Figure 2: *z* value



1.3 MEAT TYPES

For the purposes of this report, meat satisfying the conditions in Table 1 have been separated into four different categories:

- Beef which is meat from cattle or calves.
- Poultry which is meat from chickens, ducks or turkeys.
- Pork which is meat from pigs.
- "All Meat" – this group includes meat in the beef, poultry and pork groups as well as other meat types and products which fit into the scope of Table 1. This includes types of sheep meat and raw products like sausages or products containing a mixture of meat types. This category incorporates the data from product – pathogen combinations with insufficient data to define product specific *D* and *z* values.

2. *D* VALUES

2.1 *D* VALUE REFERENCE TABLES

This section provides reference tables of D values in minutes by pathogen and meat type. A description of the method used to determine the D values is given in Appendix A and the experimental data used for the calculations is graphically presented in Appendix B.

There are insufficient data in the literature to define *D* values for *C. jejuni* or *C. coli* in meat. However, *Campylobacter* is more sensitive to heat than *L. monocytogenes, Salmonella* spp. and *E. coli.* Consequently, heat inactivation processes achieving a specified reduction in concentration for these three pathogens (calculated from *D* values) will provide at least the same reduction in *C. jejuni* or *C. coli* concentration.

A flowchart is given in Figure 3 to provide guidance on which D and z values should be used for different meat category / pathogen / target temperature combinations in order to calculate an appropriate heating process.

Figure 3: Flowchart for determining a *D* value for a given meat / pathogen / target temperature combination

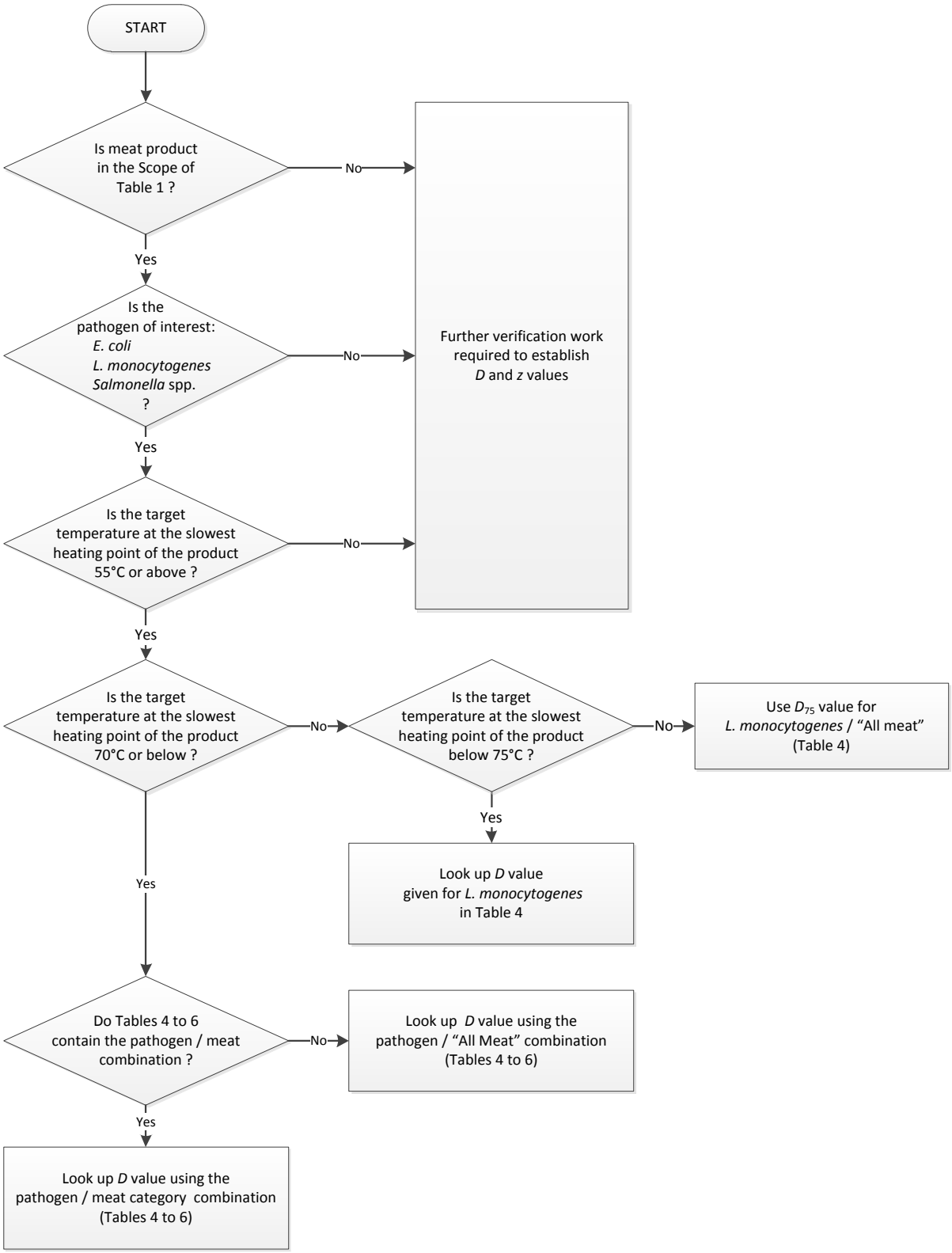


Table 4 *D* values for the inactivation of *L. monocytogenes*

Temperature (°C)	*D* value (minutes)[a]
	"All Meat"
55	95.6
56	66.2
57	45.8
58	31.7
59	21.9
60	15.2
61	10.5
62	7.3
63	5.1
64	3.5
65	2.4
66	1.7
67	1.2
68	0.8
69	0.6
70	0.4
71	0.3
72	0.2
73	0.2
74	0.1
75	0.1

a: D values rounded up to 1 decimal place

Table 5 *D* values for the inactivation of *Salmonella* spp.

Temperature (°C)	*D* value (minutes)[a]		
	Poultry	Beef / Pork	"All Meat"
55	47.4	49.2	69.9
56	34.2	34.7	49.3
57	24.7	24.5	34.7
58	17.8	17.3	24.5
59	12.9	12.2	17.2
60	9.3	8.6	12.2
61	6.7	6.1	8.6
62	4.9	4.3	6.1
63	3.5	3.1	4.3
64	2.5	2.2	3.0
65	1.8	1.5	2.1
66	1.3	1.1	1.5
67	1.0	0.8	1.1
68	0.7	0.6	0.8
69	0.5	0.4	0.6
70	0.4	0.3	0.4

a: D values rounded up to 1 decimal place

Table 6 *D* values for the inactivation of *E. coli* including O157:H7 and other STEC serotypes

Temperature (°C)	*D* value (minutes)[a]	
	Beef / Pork	"All Meat"
55	33.6	36.3
56	23.9	26.0
57	17.0	18.7
58	12.1	13.4
59	8.6	9.6
60	6.1	6.9
61	4.4	5.0
62	3.1	3.6
63	2.2	2.6
64	1.6	1.9
65	1.1	1.3
66	0.8	1.0
67	0.6	0.7
68	0.4	0.5
69	0.3	0.4
70	0.2	0.3

a: D values rounded up to 1 decimal place

2.2 HEAT INACTIVATION TIME-TEMPERATURE COMBINATIONS

2.2.1 Factors in setting a time-temperature combination

To decide on the appropriate time-temperature combination, the following must be considered:

- The relevant pathogens for the specific meat type as determined by hazard analysis
- The prevalence (frequency and numbers) of the pathogen in the meat.
- The reduction in pathogen concentration that is required. This will depend on factors such as;
    - initial pathogen concentration on the raw product ,
    - intended purpose, e.g. immediate consumption, extended shelf life chilled product , ready to eat product and,
    - the final concentration of pathogens required to meet regulatory or operator defined limits.
- Potential adverse effects on food quality brought about by the heat treatment.

The *D* value provides the target time at a specific temperature to ensure a 1 $\log_{10}$ reduction in pathogen cells. If a particular log reduction is required, the required time at the target temperature is calculated by multiplying the *D* value by the $\log_{10}$ reduction required.

2.2.2 Example

Table 7 outlines the time-temperature combinations required to ensure a 6 $\log_{10}$ reduction in pathogen cell count. A 6 $\log_{10}$ reduction is given as an example only, however reductions of 5-7 $\log_{10}$ are commonly applied. The desired pathogen reduction will depend on the factors given above.

Table 7: Time – temperature requirements to ensure a 6 $\log_{10}$ reduction in pathogen concentration is achieved

Pathogen	Meat	Time required to achieve 6 $\log_{10}$ pathogen reduction at given temperature (minutes)			
		60°C	65°C	70°C	75°C
E.coli	Beef / Pork	36.6	6.6	1.2	
	"All Meat"	41.4	7.8	1.8	
L. monocytogenes	"All Meat"	91.2	14.4	2.4	0.6
Salmonella spp.	Beef / Pork	51.6	9.0	1.8	
	Poultry	55.8	10.8	2.4	
	"All Meat"	73.2	12.6	2.4	

2.3 DISCUSSION

The quantity and type of experimental data available from the literature determined which combinations of meat and pathogen type are able to have specified *D* and *z* values. Where there was insufficient data to provide clear evidence for the *D* and *z* values for the specific meat group no values are given in the tables. In total, 1348 data points defined the *D* and *z* values given in the tables, which represent data across a range of pathogen strains, cooking methods and meat preparations.

D values are not given for target temperatures below 55°C. There are not enough data to define a *D* and *z* relationship and the data that are available do not show the linear relationship, observed at temperatures of 55°C and above, between $\log_{10} D$ and the target temperature. This may be due to temperatures below 55°C being close to the maximum observed growth temperatures for the pathogens (45°C for *L. monocytogenes* to 49°C for *Salmonella* spp.[2]).

There is also very limited data for temperatures above 70°C. The inactivation rate of the considered pathogens at temperatures above 70°C is high, resulting in *D* values which are numbers of seconds. This makes it practically difficult to accurately calculate *D* values in the meat food matrix.

The *D* values listed for *L. monocytogenes* are higher than the *D* values given for *Salmonella* spp. and *E. coli*. This may be due to differences in heat resistance of the varieties of pathogen strains that were available from the literature or due to differences in cell type. In general Gram-positive cells (*L. monocytogenes*) are more heat resistant than Gram-negative (*Salmonella* spp. and *E. coli)* due to differences in the cell construction[3].

[2] http://www.foodsafety.govt.nz/science-risk/hazard-data-sheets/pathogen-data-sheets.htm
[3] Adams MR and Moss MO (2000) Food Microbiology: Chapter 4. The Royal Society of Chemistry. ISBN 0-85404-611-9.

3. CONCLUSIONS

This report presents *D* and *z* values that can be applied to heating meat products in which *E. coli*, *L. monocytogenes*, *Salmonella* spp. and *Campylobacter jejuni/coli* may be present. The characteristics of meat products, e.g. fat content and processing of the product prior to heating, may influence the thermal inactivation of these pathogens. Hence the *D* and *z* values in this report may only be appropriate, without further verification, to products identified within the scope of Table 1.

Using data from the literature up to and including October 2014, thermal inactivation data relating to meat have been extracted. From these data, 1348 points were found to fit the scope of Table 1 as well as the experimental procedure being appropriate for calculating *D* values. The *D* values for a given temperature were highly variable due to the intrinsic properties of meat, pathogen strains, cooking and experimental processes.

For each pathogen-meat group combination, the presented *D* values were derived from a linear regression of the 95th percentile value of the available data at each temperature. This approach takes into account the most heat resistant strains which are those most likely to survive cooking and present a risk of illness.

Where there is insufficient data to perform a linear regression for a given meat type, the “All Meat” regression line for the pathogen is used.

APPENDIX A: METHOD

A.1 DATA COLLECTION AND EXPLORATORY DATA ANALYSIS

Thermal inactivation data of pathogens in meat were collected from the scientific published literature up to October 2014. When review papers were located, the data were not considered unless the primary publications containing the relevant data for meat could be obtained. The references are included in Appendix C.

Only data meeting the conditions below were included in the project:

- Raw meat products defined in the scope for this report as given in Table 1.
- Test product was of a form that allowed rapid heating throughout the sample to the target temperature, such as thin patties or in small glass tubes.
- Test product was held at a constant internal temperature once at the target temperature.
- Test product that was rapidly cooled after the designated heating time to prevent further decline in viable cell concentrations.
- A linear relationship existed between the base 10 logarithm of the cell count and the time at temperature.

The resulting dataset contained 1348 *D* values. There were 526 *E. coli D* values including 418 relating to beef, 448 *L. monocytogenes D* values and 374 *Salmonella* spp. *D* values including 94 relating to beef and 212 relating to poultry.

The data were collated for each combination of pathogen and meat category and plotted for visual inspection. Any outlying values were first checked for transcription errors and then checked to determine possible reasons for the data being inconsistent with other collected data. Possible reasons include strain-to-strain variability in heat resistance, heating methodology, cell history prior to heating or choice of enumeration method for the cells which could be damaged/changed by the heat treatment. No reason was found to exclude any data in the dataset of 1348 values.

A.2 CALCULATION OF *D* AND *z* VALUES

For each combination of pathogen and meat type, the following process was used to calculate the associated reference *D* and *z* value:

1. For each temperature greater or equal to 55°C, which had more than 10 data points, the 95th percentile of the experimental *D* values was calculated (blue diamonds in Figure 4).
2. A linear regression of the logarithm of the 95th percentile *D* values against temperature was then conducted using least squares fitting in Excel (solid line in Figure 4).
3. *z* was calculated to two decimal places from the inverse of the slope of the regression function.
4. A reference *D* value at 65 °C was calculated (rounding up to one decimal place) from the linear regression function.

The resulting *D* and *z* values are given in Table 8, Table 9 and Table 10

Figure 4 Data analysis example

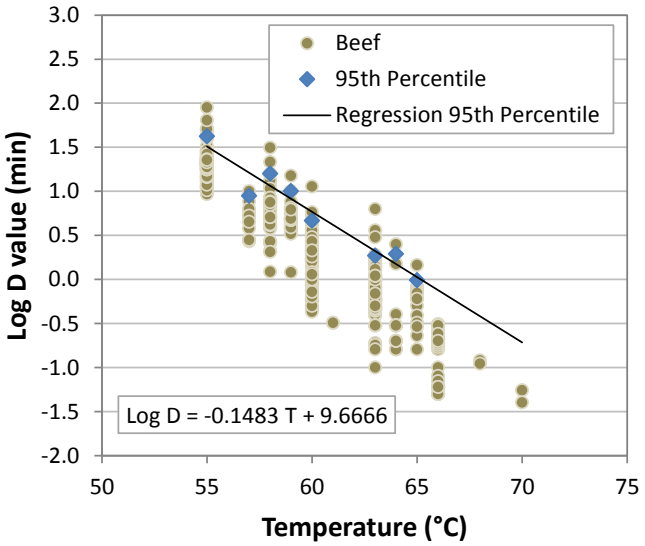


Table 8: *D* and *z* values for the inactivation of *E. coli* including O157:H7 and other STEC serotypes

Meat Category	Number of Data Points	Temperature Range (°C)	*z* (°C)	D_{65} (minutes)
Beef	418	55-70	6.74	1.1
"All Meat"	526	55-70	6.92	1.3

Table 9: *D* and *z* values for the inactivation of *L. monocytogenes*

Meat Category	Number of Data Points	Temperature Range (°C)	*z* (°C)	D_{65} (minutes)
"All Meat"	448	55-74	6.25	2.4

Table 10: *D* and *z* values for the inactivation of *Salmonella* spp.

Meat Category	Number of Data Points	Temperature Range (°C)	*z* (°C)	D_{65} (minutes)
Beef	94	55-70	6.60	1.5
Poultry	212	55-70	7.04	1.8
"All Meat"	374	55-70	6.57	2.1

A.3 CALCULATION OF NON-REFERENCE *D* VALUES.

A.3.1 Formula

Once a *D* value at a specific temperature (D_{ref}) and a *z* value have been established, a *D* value at any temperature (*T*) in the experimental data range can be calculated using the following relationship.

$$\log_{10}(D) = \log_{10}(D_{ref}) - \frac{T - T_{ref}}{z} \quad \text{(Equation 1)}$$

This relationship should not be extended beyond the range of the experimental data used to calculate the *z* value.

In this report, all *D* values were calculated using a single reference temperature of 65°C. This temperature was chosen as 65°C is always within the temperature range of the 95th percentile data used to calculate the *z* values. A single reference temperature was chosen through the report to ensure consistency in the calculation of *D* values at given temperatures.

A.3.2 Example

To calculate the *D* value to reduce *Salmonella* spp. on poultry using a target temperature of 68°C:

i. From Table 10 extract the reference *D* value and the *z* value. D_{65} in poultry is 1.8 minutes and the *z* value is 7.04°C.

ii. Use Equation 1 to calculate the logarithm of the *D* value,

$$\log_{10}(D_{68}) = \log_{10}(1.8) - \frac{68 - 65}{7.04} = -0.171 .$$

iii. Calculate the *D* value by taking the inverse of the base 10 logarithm,

$$D_{68} = 10^{-0.171} = 0.7 \text{ minutes} = 42 \text{ seconds.}$$

A.4 VARIABILITY AND METHOD SELECTION

For each pathogen and meat category combination, plots of $\log_{10}$ *D* value against temperature are given in Appendix B. The variability observed in these plots for the *D* values at a given temperature are due to differences in the design of the studies from which the data was obtained and include differences in; pathogen strains, meat samples properties, cooking process and experimental design.

While, processors may be able to reduce the variability in thermal inactivation due to cooking processes and the characteristics of the meat in their products. The strains of the pathogens presenting on the raw meat are unlikely to be known before heat treatment commences. Therefore, it is important to heat products to time temperature combinations which will take into account the possible variation in *D* values.

The *D* and *z* values in this report take into account the likely variability of pathogen thermal inactivation in meat products by using data which includes a range of pathogen strains and meat sources for each of the pathogens. The variability is incorporated into the calculation methodology to ensure safety in two ways:

1. For each pathogen/ meat category/ temperature combination the 95th percentile *D* value was calculated. This approach takes into account the most heat resistant strains which are those most likely to survive cooking and present a risk of illness.

2. The number of data points for each pathogen/ meat group/ temperature combination was determined. Only combinations with ten or more data points were used in further calculations. Ten was chosen to ensure incorporation of data from a range of studies and from the visual inspection of 95th percentile points at each temperature compared to the overall dataset. This approach avoids biasing the regression line towards data points which do not represent the variability seen in the dataset overall.

APPENDIX B: DATA PLOTS

This appendix provides plots of the data used to generate the *D* values in this report for the meat categories; “All Meat”, Beef, Poultry and Pork. Where appropriate the plot also indicates the 95th percentile points (solid diamond) at temperatures where there are more than 10 data points and the points are used in the regression analysis.

The solid line is the linear regression line through the 95th percentile points when there is sufficient data to perform the regression. To explore the possibility of having a red meat category, the pork data is compared to the beef regression line for *Escherichia coli* and *Salmonella* spp.. For other meat categories which did not have sufficient data, *D* values are based on the “All Meat” category and the “All Meat” regression line is plotted.

Figure 5: *Escherichia coli* – Experimental *D* value data by meat type with the appropriate 95th percentile linear regression lines.

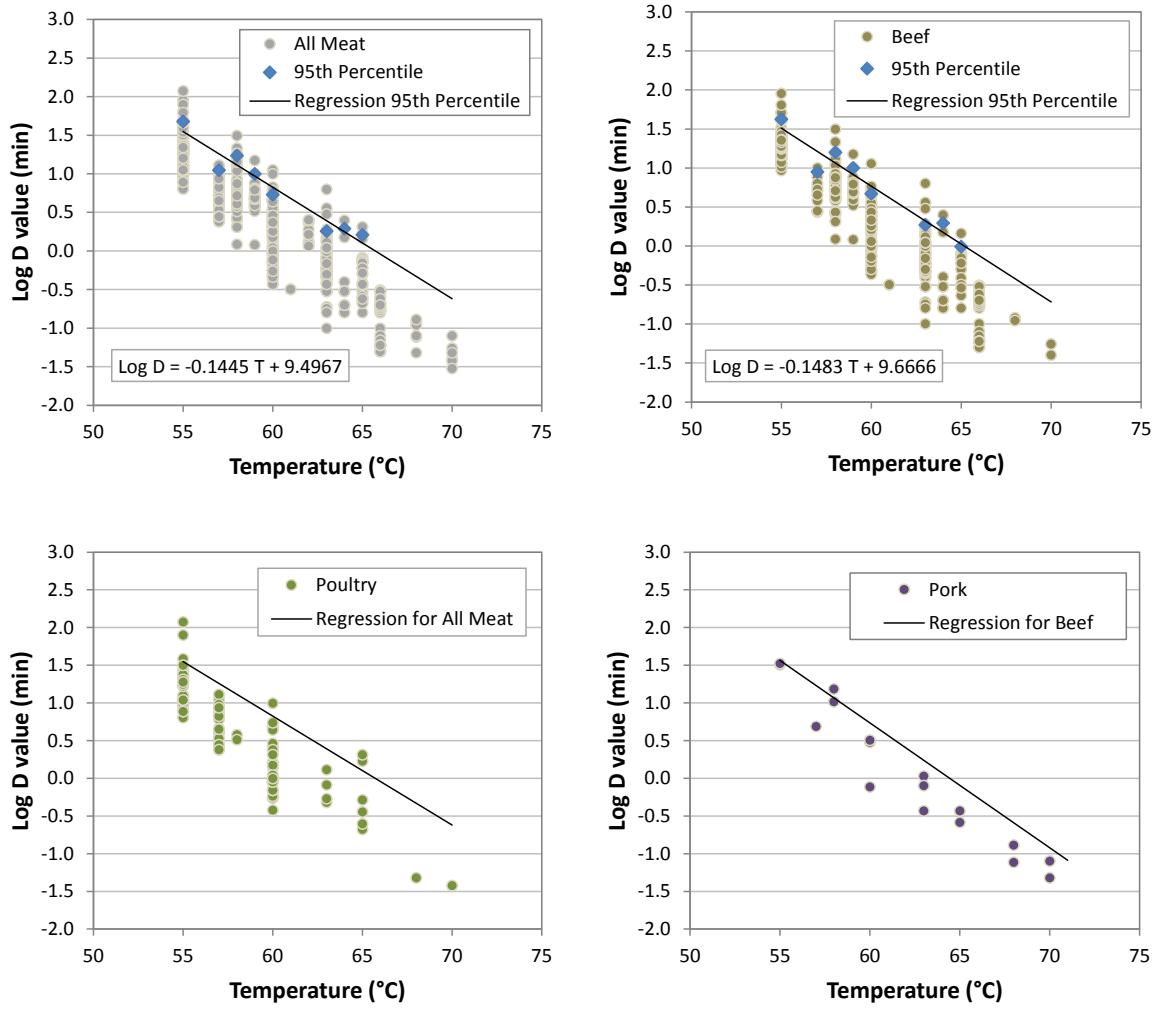
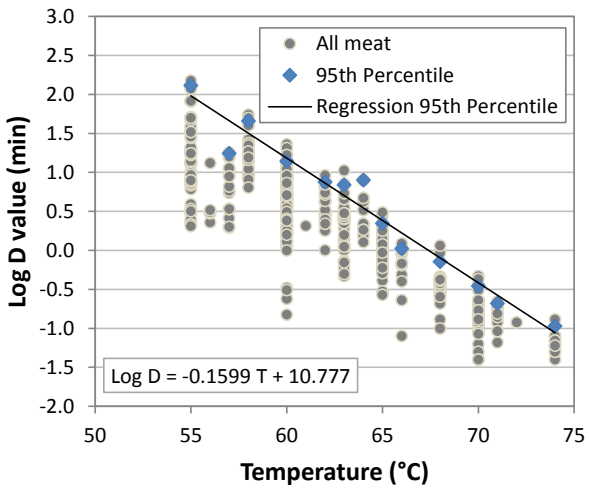
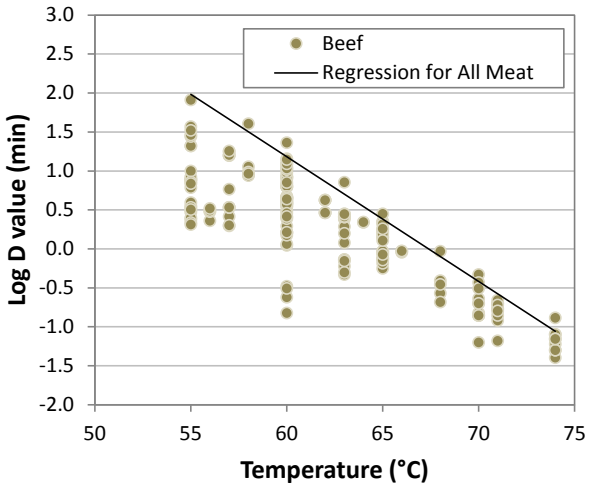
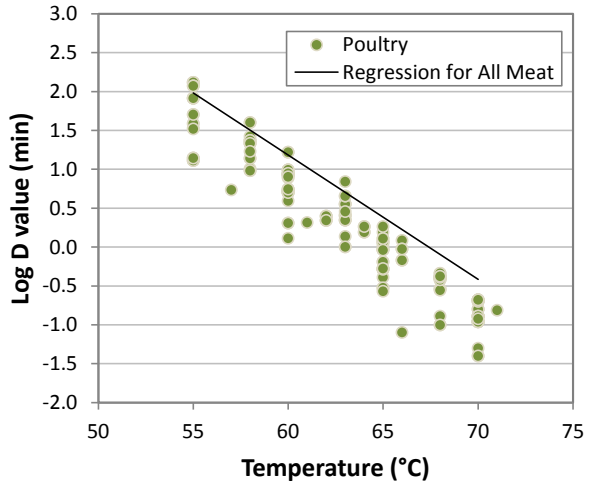


Figure 6: *Listeria monocytogenes* – Experimental *D* value data by meat type with the appropriate 95th percentile linear regression lines.


All meat
95th Percentile
Regression 95th Percentile
Log D = -0.1599 T + 10.777
Log D value (min)
Temperature (°C)


Beef
Regression for All Meat
Log D value (min)
Temperature (°C)


Poultry
Regression for All Meat
Log D value (min)
Temperature (°C)

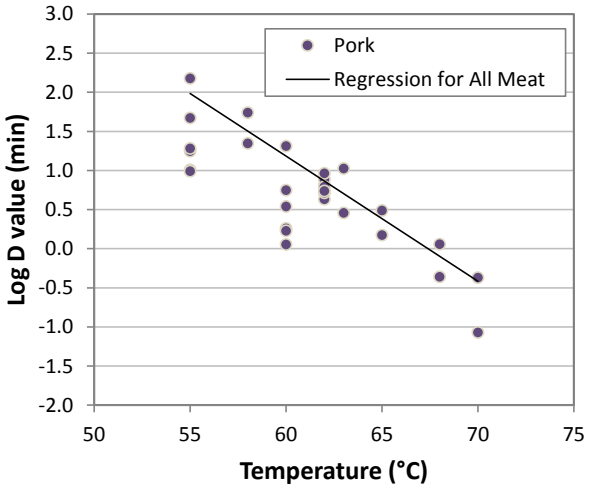
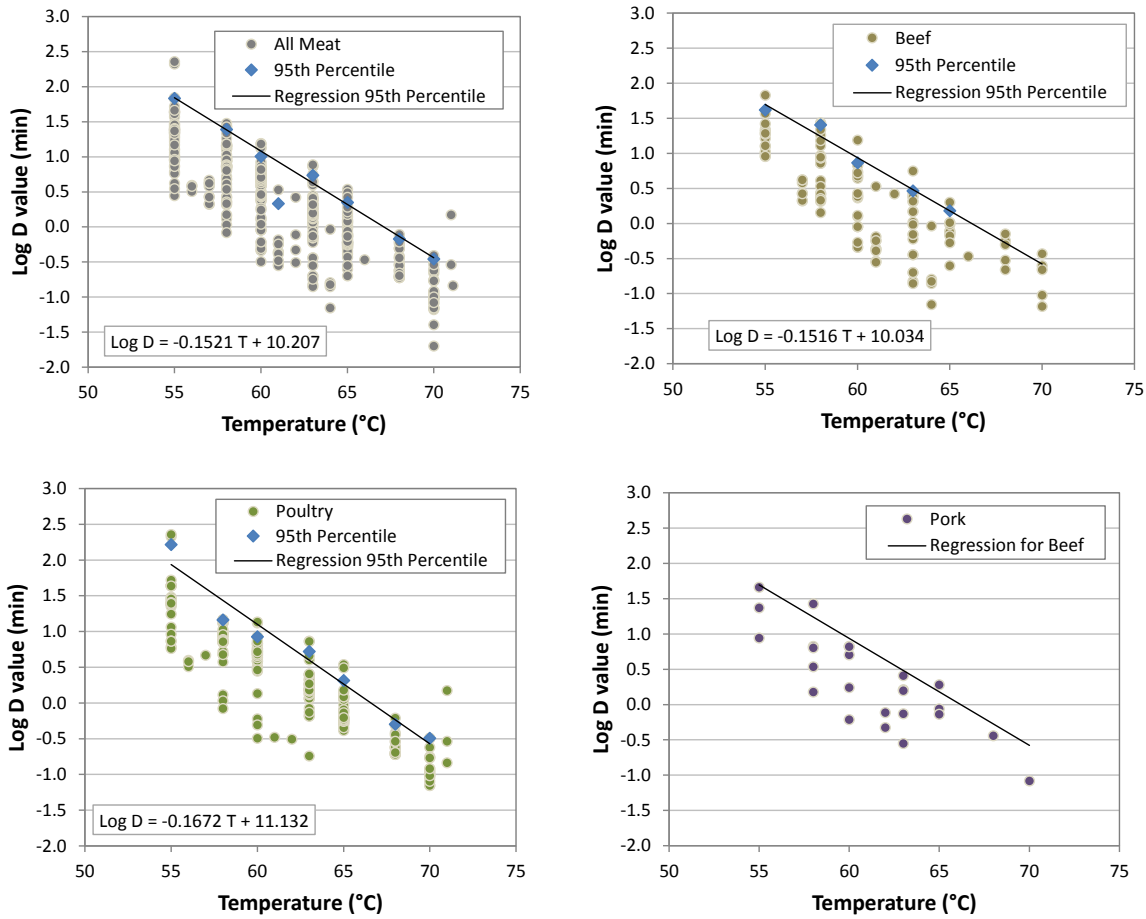

Pork
Regression for All Meat
Log D value (min)
Temperature (°C)

Figure 7: *Salmonella* spp. – Experimental *D* value data by meat type with the appropriate 95th percentile linear regression lines.



Note: For the "All Meat" category, the regression of 95th percentile points did not include the data point at 61°C. Temperatures above and below this value suggested the 95th percentile value at 61°C was not consistent with the general trend and so the data point was removed to avoid biasing the regression line to shorter *D* times.

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添付資料５

食安基発０６０２第３号
平成２７年６月２日

各 (都道府県 / 保健所設置市 / 特別区) 衛生主管部（局）長　殿

厚生労働省医薬食品局食品安全部基準審査課長
（　公　印　省　略　）

豚の食肉の基準に関するＱ＆Ａについて

豚の食肉の基準に係る取扱いについては、平成 27 年６月２日付け食安発 0602 第１号により通知され、その詳細について別添の「豚の食肉の基準に関するＱ＆Ａ」を作成しましたので、業務の参考とするとともに関係事業者への周知をお願いします。

別添

豚の食肉の基準に関するＱ＆Ａ

（経緯、全般的事項）

Ｑ１　なぜ、豚の食肉の基準を設けることにしたのですか。

Ｑ２　豚の食肉の基準はどのような内容ですか。

Ｑ３　本基準の対象となる豚の食肉とはどのようなものですか。また、どの時点で加熱しなければいけないのでしょうか。

Ｑ４　豚の食肉の中心部の温度を 63℃で 30 分間以上加熱するかこれと同等以上とされていますが、どのように調理すればいいのですか。

（製造・加工・調理基準）

Ｑ５　食肉販売店、小売店等で、未加熱や中心部まで十分な加熱を行っていない豚の食肉を加熱用として販売する場合はどうしたらいいですか。

Ｑ６　飲食店で、未加熱や中心部まで十分な加熱を行っていない豚の食肉を加熱用として販売する場合はどうしたらいいですか。

Ｑ７　飲食店等で消費者が生で食べていた場合、事業者はどうすればいいですか。

Ｑ８　本基準についての監視指導はどのように行われますか。

Ｑ９　適用日（平成 27 年６月 12 日）より前に本基準を満たさない方法で豚の食肉を製造、加工及び調理した食品であれば、本基準の適用日以降であっても従来どおり販売・提供してもいいのですか。

Q10　本基準は、海外から輸入される豚の食肉についても適用されるのですか。

（その他）

Q11　豚以外の動物の肉や内臓については、生食しても大丈夫ですか。

Q12　SPF 豚の食肉についても本基準が適用されるのですか。

（経緯、全般的事項）

Ｑ１　なぜ、豚の食肉の基準を設けることにしたのですか。

（Ａ）

１　平成 23 年４月に発生した飲食チェーン店での腸管出血性大腸菌による食中毒事件で５名の方が亡くなられ、重症者も多数出たことを受け、平成 23 年 10 月から、牛の食肉の規格基準が適用されるとともに、平成 24 年７月から、牛のレバーを生食として販売・提供することを禁止しました。

２　その後、豚レバーを生食用として提供している実態があることから平成 25 年８月から薬事・食品衛生審議会において食品衛生法に基づく規格基準やガイドラインの対象となっていない食肉について、科学的見地に加えて、消費者の認識や食肉等の関連事業者の取組等も踏まえつつ、公衆衛生上のリスクの大きさに応じた規制のあり方等について検討してきました。

３　その結果、豚については、飲食店等において生食用としての提供実態があること、Ｅ型肝炎ウイルス※（以下「ＨＥＶ」という。）、食中毒菌及び寄生虫が豚の血液やレバー等から検出されていること及びＨＥＶや寄生虫は内部汚染であるため内部までの加熱以外のリスク低減策が考えられないこと等を踏まえ、公衆衛生上のリスクが大きいと結論づけられたことから、今般、法的に生食用としての提供を禁止することにしました。

※　これまでの研究結果から、豚はその成育中に HEV に高率に感染し、一部の個体では６ヶ月齢時においても糞便と肝臓に HEV がなお残存しているとの報告がなされています（平成 15 年度厚生労働科学研究事業「本邦に於けるＥ型肝炎の診断・予防・疫学に関する研究」）。

ヒトが HEV 感染した場合、不顕性感染が多いとされています（特に若年者）。肝炎を発症した場合の臨床症状はＡ型肝炎に類似し、高率に黄疸を伴います。平均６週間の潜伏期の後に（稀に数日の倦怠感、食欲不振等の症状が先行することもあります。）、発熱、悪心・腹痛等の消化器症状、肝腫大、肝機能の悪化（トランスアミナーゼ上昇・黄疸）が現れ、大半の症例では安静臥床（ベッドの上で動かずに安静を保つこと。）により治癒しますが、稀に劇症化するケースもあります。

Ｑ２　豚の食肉の基準はどのような内容ですか。

（Ａ）

豚の食肉の基準の主な内容としては、以下のように規定されています。

①　未加熱や中心部まで十分な加熱を行っていない豚の食肉は、加熱用として販売しなければならないこと。

②　未加熱や中心部まで十分な加熱を行っていない豚の食肉を、直接消費者に販売する場合は、中心部まで十分に加熱してから食べること等を消費者に伝えなければならないこと。

③　豚の食肉を、調理等を行い直接消費者に販売する場合は、豚の食肉の中心部の温度を 63℃で 30 分間以上加熱するか、これと同等以上の殺菌効果がある方法で加熱殺菌しなければならないこと。

④　消費者が加熱してから食べることを前提として、豚の食肉を使用した食品を販売する場合は、その時点では中心部までの十分な加熱は必要ないが、中心部まで十分な加熱をしてから食べること等を消費者に伝えなければならないこと。

⑤　食肉製品（乾燥食肉製品、非加熱食肉製品、特定加熱食肉製品及び加熱食肉製品）に該当する食品は別途規格基準が定められていることから、本基準の規制の対象外であること。

Ｑ３　本基準の対象となる豚の食肉とはどのようなものですか。また、どの時点で加熱しなければいけないのでしょうか。

（Ａ）

１　本基準は、食用にする全ての豚の食肉（内臓を含む）が対象です（ただし、食肉製品（乾燥食肉製品、非加熱食肉製品、特定加熱食肉製品及び加熱食肉製品）は除く）。

２　業者間で加熱用として未加熱や中心部まで十分な加熱を行っていない豚の食肉を流通させることは可能ですが、消費者が食べる前までに中心部まで十分な加熱を行って下さい。

Ｑ４　豚の食肉の中心部の温度を 63℃で 30 分間以上加熱するかこれと同等以上とされていますが、どのように調理すればいいのですか。

（Ａ）

１　63℃で 30 分間以上加熱するかこれと同等以上の殺菌効果を有する方法とは、加熱温度が高くなれば加熱時間が短くなることから、例えば、75℃１分間以上の加熱でも差し支えありません。

２　中心部の温度が 75℃に達してから１分間以上の加熱の目安は、豚の食肉等の中心部の色が白っぽく変化することです。

（参考ＵＲＬ：http://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000049964.html）

（製造・加工・調理基準）

Ｑ５　食肉販売店、小売店等で、未加熱や中心部まで十分な加熱を行っていない豚の食肉を加熱用として販売する場合はどうしたらいいですか。

（Ａ）

１　食肉販売店、小売店等で、加熱用として未加熱や中心部まで十分な加熱を行っていない豚の食肉を直接消費者に販売する場合は、消費者が豚の食肉を中心部まで十分に加熱して飲食するように、例えば

「加熱用です」

「調理の際に中心部まで加熱してください」

「食中毒の危険性があるため生では食べられません」

等を掲示するなどの対応が必要です。

２　インターネット等で直接消費者に販売する場合も、事業者は消費者が豚の食肉を中心部まで十分に加熱して飲食するよう上記の内容を伝えることが必要です。

Ｑ６　飲食店で、未加熱や中心部まで十分な加熱を行っていない豚の食肉を加熱用として販売する場合はどうしたらいいですか。

（Ａ）

１　飲食店で消費者が調理し、喫食する場合には、飲食店は消費者に対しコンロ等加熱設備（一定の火力を持続的に保てるもの）を提供しなければなりません。焼き石などの場合は、提供した豚の食肉を中心部まで十分に加熱できるものを提供する必要があります。

２　また、飲食に供する際に豚の食肉の中心部まで十分に加熱して喫食するように、例えば
「加熱用です」
「調理の際に中心部まで加熱してください」
「食中毒の危険性があるため生では食べられません」
等をメニューに記載するなどの対応が必要です。

３　なお、上記の情報提供を行ったにもかかわらず、消費者が生で喫食している場合等には、豚の食肉の中心部まで十分に加熱して食べるように重ねて注意をして下さい。

４　消費者に生で豚の食肉を食べられると思わせるような表示（「生で食べられる程新鮮」等）をすることはできません。

Ｑ７　飲食店等で消費者が生で食べていた場合、事業者はどうすればいいですか。

（Ａ）

飲食店等で消費者が十分に加熱することなく豚の食肉を食べている場合等には、事業者は消費者に対し中心部まで十分に加熱して食べるように注意をして下さい。

Ｑ８　本基準についての監視指導はどのように行われますか。

（Ａ）

１　食肉販売店、小売店、飲食店等の事業者は、食品衛生法に基づく規格基準を守り、提供する食品の安全性を確保する責務があります。

２　これらの事業者への監視指導としては、都道府県等が毎年度作成する監視指導計画等に基づき立入調査、指導等が行われます。

３　今回設定した基準では、豚の食肉を生食用として提供することの禁止と、中心部まで十分加熱する必要があるなどの情報を消費者に提供することを規定したことから、豚の食肉を生食用として提供していないか、掲示やメニュー等により適切に情報提供されているかを確認することになります（情報提供の内容はＱ５の１及び６の２参照）。

Ｑ９　適用日（平成27年６月12日）より前に本基準を満たさない方法で豚の食肉を製造、加工及び調理した食品であれば、本基準の適用日以降であっても従来どおり販売・提供してもいいのですか。

（Ａ）

平成27年６月12日より前に本基準を満たさない方法で豚の食肉等を製造、加工及び調理した食品であっても、本基準が適用される同日以降は、本基準を満たさなければ販売等を行うことはできません。

Q10　本基準は、海外から輸入される豚の食肉についても適用されるのですか。

（Ａ）

本基準は、海外から輸入される豚の食肉についても適用されます。

（その他）

Q11　豚以外の動物の肉や内臓については、生食しても大丈夫ですか。

（Ａ）

１　食肉や内臓の生食については、食中毒の原因となる菌やウイルス等が付着している可能性があり食中毒の危険性が高いことから基本的に避けるべきであり、食中毒を防止するためには十分に加熱することが必要です。

２　生食用の牛の肉については、平成 23 年 10 月に生食用食肉の規格基準が定められています。また、馬の肉については、平成 10 年に生食用食肉の衛生基準が定められています。しかしながら、これらに適合したものであっても、食中毒菌を完全に除去することは困難なため、特に子ども、高齢者などの抵抗力の弱い方は生肉を控える必要があります。

（注：牛の肝臓については、肝臓の内部より腸管出血性大腸菌が検出されたことを踏まえ、生食用としての提供は禁止されています。）

３　テンダライズ処理（刃を用いてその原形を保ったまま筋及び繊維を短く切断する処理）やタンブリング処理（調味液に浸潤させる処理）した肉、結着・成形肉、挽肉調理品等の病原微生物による汚染が内部に拡大するおそれがある肉については、中心部の色が変化するまで、十分に加熱してください。

４　また、箸、トング等を介して、加熱前の食肉からサラダや他の食材へ食中毒菌の汚染が起こる可能性があることから、加熱前後で調理器具は使い分けるようにしましょう。

Q12　SPF 豚の食肉についても本基準が適用されるのですか。

（Ａ）

SPF 豚であっても本基準が適用されます。

（参考）

SPF（Specific Pathogen Free：特定病原菌不在）とは、無菌ではなく、豚の発育に大きな影響を及ぼす病気（オーエスキー病、トキソプラズマ感染症、マイコプラズマ性肺炎、萎縮性鼻炎など）にかかっていない健康豚であることが証明された豚のことです。ヒトの健康に影響を与える細菌やウイルスを全く保有していないという意味ではありません。

したがって、ブタの品種や育て方等に関わらず、豚の食肉を食べる時には、ヒトの健康を考えるのであれば十分に加熱することが重要です。SPF 豚であっても、血清中に抗 HEV 抗体が検出され、過去に感染したことを示唆する調査事例もあります。

●生食用食肉※の規格基準（※生食用として販売される牛の食肉（内臓除く））

成分規格	(1) 生食用食肉は、腸内細菌科菌群が陰性でなければならない。 (2) (1)に係る記録は、１年間保存しなければならない。	
加工基準	一般規格 （設備の衛生）	(1) 加工は、他の設備と区分され、器具及び手指の洗浄及び消毒に必要な専用の設備を備えた衛生的な場所で行わなければならない。また、肉塊（食肉の単一の塊をいう）が接触する設備は専用のものを用い、一つの肉塊の加工ごとに洗浄及び消毒を行わなければならない。
	一般規定 （器具の衛生）	(2) 加工に使用する器具は、清潔で衛生的かつ洗浄及び消毒の容易な不浸透性の材質であって、専用のものを用いなければならない。また、その使用に当たっては、一つの肉塊の加工ごとに（病原微生物により汚染された場合は、その都度）、83° 以上の温湯で洗浄及び消毒をしなければならない。
	一般規定 （食品取扱者）	(3) 加工は､法第 48 条第６項第１号から第３号までのいずれかに該当する者、同項第４号に該当する者のうち食品衛生法施行令（昭和 28 年政令第 229 号）第 35 条第 13 項に規定する食肉製品製造業（法第 48 条第７項に規定する製造業に限る。）に従事する者又は都道府県知事若しくは地域保健法（昭和 22 年法律第 101 号）第５条第１項の規定に基づく政令で定める市及び特別区の長が生食用食肉を取り扱う者として適切と認める者が行わなければならない。ただし、その者の監督の下に行われる場合は、この限りでない。
	一般規定 （衛生的取扱い、温度管理）	(4) 加工は、肉塊が病原微生物により汚染しないよう衛生的に行わなければならない。 また、加工は、加熱殺菌をする場合を除き、肉塊の表面の温度が 10° を超えることのないようにして行わなければならない。
	一般規定 （汚染の内部拡大防止）	(5) 加工に当たっては、刃を用いてその原形を保ったまま筋及び繊維を短く切断する処理、調味料に浸潤させる処理、他の食肉の断片を結着させ成形する処理その他病原微生物による汚染が内部に拡大するおそれのある処理をしてはならない。
	加工基準 （原料肉の取扱い）	(6) 加工に使用する肉塊は、凍結させていないものであって、衛生的に枝肉から切り出されたものでなければならない。
	加工基準（加熱又は同等の措置）	(7) (6)の処理を行った肉塊は、処理後速やかに、気密性のある清潔で衛生的な容器包装に入れ、密封し、肉塊の表面から深さ１cm以上の部分までを 60° で２分間以上加熱する方法又はこれと同等以上の殺菌効果を有する方法で加熱殺菌を行った後、速やかに４° 以下に冷却しなければならない。
	加工基準 （加熱の記録）	(8) (7)の加熱殺菌に係る温度及び時間の記録は、１年間保存しなければならない。
保存基準	(1) 生食用食肉は、４° 以下で保存しなければならない。ただし、生食用食肉を凍結させたものにあっては、これを－15° 以下で保存しなければならない。 (2) 生食用食肉は、清潔で衛生的な容器包装に入れ、保存しなければならない。	
調理基準	(1) ２の(1)から(5)までの基準は、生食用食肉の調理について準用する。 (2) 調理に使用する肉塊は、２の(6)及び(7)の処理を経たものでなければならない。 (3) 調理を行った生食用食肉は、速やかに提供しなければならない。	