

Chapter 13 Microbiological Criteria

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13. Introduction

The aim of the hygiene legislation is to ensure that food is produced safely. This is achieved through the identification and effective control of food-borne hazards. In order to contribute to the protection of public health and to prevent differing interpretations, the legislation establishes harmonised safety criteria on the acceptability of food, in particular as regards the presence of certain pathogenic micro-organisms. It is generally recognised that the most significant food-borne hazards from fresh meat are bacteria which can cause disease in humans (pathogenic bacteria), such as Salmonella, Campylobacter, Listeria and human pathogenic E.coli such as E.coli O157. Some of these, particularly E.coli O157, require only a few bacteria to cause food poisoning in humans - see Chapter 1 section 1.3 'Hazards in meat production' and Chapter 13 section '13.1 Meat category micro-organisms'.

Bacteria cannot be seen by the naked eye. They cannot be detected at post-mortem inspection. The production of visually clean meat, monitored by visual inspection, is an important starting point for meat safety, but visual inspection can detect only gross faecal and other contamination. Although this gives a useful indication of the microbiological status of fresh meat, it is only by undertaking further testing that the presence and / or number of bacteria present on the surface of carcass meat or in processed meat can be assessed objectively.

Testing against microbiological criteria provides a way of measuring how well the operator has controlled the slaughter, dressing and production processes to avoid and control contamination. The results of testing can be used to validate whether the operator's HACCP-based procedures are controlling food safety and food quality and verify they are being correctly applied.

Examples demonstrating the importance of microbiological criteria procedures:

Problem	Effect	Possible outcome
Inadequate slaughter and dressing operations leading to increased carcass contamination in the process	Increased risk due to bacteria contaminating carcasses	A source of microbiological contamination resulting in a serious food safety hazard
Introduction of microbiological contamination from equipment, handling, working environment due to inadequate hygiene procedures and bacterial growth due to poor temperature control	The increased risk of spoilage and pathogenic bacteria being present and/or growing in carcasses	

13.1. Meat category micro-organisms

Micro-organisms	Description	Test indication
Enterobacteriaceae (ENT)	The name given to a group of bacteria that live predominantly in the intestines of animals. The group includes most of the major food-borne pathogens of animal origin such as Salmonella, Campylobacter and E.coli O157.	The presence of these organisms on the surface of carcasses is an indicator of faecal and environmental contamination.
Generic E.coli (EC)	A group of bacteria that live in the intestines and are shed in the faeces of humans and food producing animals. Presence of E.coli is an indicator of faecal contamination.	The test procedure does not specifically recover E.coli O157 but does indicate the risk of contamination with this and other dangerous faecally-derived bacteria.
Salmonella species (Sal)	A group of bacteria that includes several pathogens of significance in human food poisoning disease. They mainly arise from faecal contamination but can also arise from the processing environment.	Further analysis of the type of Salmonella can be useful in investigating and preventing the reoccurrence of positive results as well as providing information that can be used in a risk analysis.
Salmonella Typhimurium Salmonella Enteritidis	Types of Salmonella that have been associated with frequently causing disease in humans. Known as salmonella with public health significance (SPHS or highly pathogenic serovars). Also includes monophasic Salmonella typhimurium with the antigenic formula 4 5 12 i.	
Campylobacter species (Campy)	A bacterium that typically affects the bowels and is the most common bacterial cause of human gastroenteritis. Campylobacter is most often spread by contact with raw or undercooked poultry.	The presence of these organisms on the surface of poultry carcasses is an indicator of faecal and environmental contamination.
Listeria Monocytogenes (LM)	A pathogenic bacterium that occurs in the environment. Able to survive and grow at chill temperatures.	The presence of the bacteria in ready to eat food that can support the growth can lead to a food safety problem.

13.2. Food safety and process hygiene criteria

Legal basis for microbiological criteria

The Microbiological Criteria Regulation 2073/2005 (as amended) establishes microbiological criteria for certain micro-organisms and provides rules to be complied with by Food Business Operators (FBOs) when implementing the general and specific hygiene measures referred to in Article 4 of Regulation (EC) 852/2004. Article 4(3) and (4) of Regulation 852/2004 provides the legal basis for Regulation 2073/2005. Relevant definitions are set out at Article 2 of 2073/2005.

Two different types of criteria are established in Regulation 2073/2005, namely food safety criteria and process hygiene criteria. The main difference between them is the additional action required when the results are not within limits. When a food safety criterion is not met, the batch of food in question should be removed from or not placed on the market. Failure to meet either class of criteria should always result in an investigation to find the root cause of the contamination and action should be taken to regain control and to prevent contamination of future production.

Microbiological criteria should be used in validation and verification of procedures based on HACCP principles and failure of meeting the limit of a criterion indicates that the HACCP based procedures have failed.

Food safety criteria

Food safety criteria have been set for fresh poultry meat, minced meat, meat preparations, meat products, mechanically separated meat and ready to eat food and, if exceeded, indicate that the batch tested is unsatisfactory and should be removed from or not placed on the market.

Demonstration of compliance with food safety criteria for meat and processed meat is required as follows:

- Absence of **Salmonella spp** in:
 - minced meat and meat preparations intended to be eaten raw
 - minced meat and meat preparations intended to be eaten cooked
 - mechanically separated meat (MSM)
 - meat products intended to be eaten raw
 - meat products made from poultry meat intended to be eaten cooked
 - fresh poultry meat (except for whole carcasses where this is applicable only if *Salmonella Typhimurium* or *Salmonella Enteritidis* are identified)
- *Listeria Monocytogenes* less than 100cfu/g in ready to eat meats that either do not support the growth of *Listeria* or have evidence that *Listeria* will not reach levels greater than 100cfu/g during shelf life.
- Absence of *Listeria Monocytogenes* before the food is placed on the market for foods that support growth and do not have shelf life assessment data.

Process hygiene criteria

It is important to note that the purpose of testing against the process hygiene criteria that have been set for carcasses and certain processed meat is not to assess the fitness of individual carcasses or processed meat for human consumption. The results provide an indication of performance and control of the slaughter, dressing and production process at the time of sampling, and must be used accordingly.

If the criteria are exceeded corrective action to improve future production must be initiated but there is no requirement to remove product from the market. Trend analysis of the results from testing against process hygiene criteria should be undertaken and corrective actions will include for example improvements in slaughter hygiene, improvements on biosecurity controls in the farms of origin, improvements in cleaning procedures, etc.

Demonstration of compliance with process hygiene criteria for meat and processed meat is required as follows:

- **Aerobic Colony Count and Enterobacteriaceae** – on cattle, sheep, goats, horses and pig carcasses (below specified limits).
- **Salmonella spp** – on cattle, sheep, goats, horses, pig, broiler and turkey carcasses (absence from a specified number of samples per 50 samples examined).
- **Campylobacter spp** – on broiler carcasses (below specific limits from a specified number of samples per 50 samples examined).
- **Aerobic colony count and E.coli** – in minced meat and mechanically separated meat (below specified limits).
- **E.coli** – in meat preparations (below specified limits).

13.3. Sources of micro-organisms

Livestock

All animals carry a very large number of bacteria in their stomachs and intestines, which are excreted in their faeces. Bacteria are also present on the skin, hide, fleeces and feathers of animals, including those from direct contact with faeces or from indirect contact with the environment of the farm, transport vehicles or lairage.

The bacteria in or on animals may include those which can cause food poisoning in humans and which are recognised hazards from meat. Most of these bacteria do not cause illness in meat producing animals, which will appear healthy. Although ante-mortem inspection will enable clinically ill animals to be detected, it is not possible to identify healthy carriers of pathogenic organisms. It must, therefore, be assumed that all animals entering the slaughterhouse have the potential to carry pathogenic organisms in or on them.

Carcasses

Bacteria from the surface or digestive tract of an animal may be transferred onto the carcass or onto other carcasses during slaughter and dressing. This transfer may be caused by direct contact or through cross-contamination by slaughterhouse staff, equipment, surfaces, water or aerosols.

The correct application of HACCP-based principles to the process aims to ensure that such transfer is minimised.

Scientific research has shown that the cleanliness of animals at slaughter is an important control to minimise the risk of transfer of pathogens from the hide, fleece, skin or feathers to the carcass.

Processed meat

The further processing of meat into minced meat, meat preparations and meat products provides an opportunity for any dangerous bacteria on the surface of the carcass meat to be spread throughout the product and also for new bacteria to be introduced from the environment, handling and processing.

In particular, bacteria will be spread into the centre of the food, where they will be less easily destroyed on cooking. If the production process does not contain a pathogen reduction step such as cooking then any bacteria on the carcass meat will be present in the processed meat.

If the product is intended as a ready to eat food such as steak tartare then special care will need to be taken to ensure absence of Salmonella, E.coli, etc and the safety of the food.

The criteria in the regulation for Salmonella in raw processed meat intended to be eaten cooked are food safety criteria. Failure to meet these means the meat must be removed from the market.

13.4. Testing for micro-organisms

Aerobic Colony Count (ACC) is also known as Aerobic Plate Count (APC) and Total Viable Count (TVC). It describes a measure of bacteria in the sample that can survive in the conditions on the surface of carcasses or in processed meat, be harvested by the sampling procedure used and grow in the presence of air on an agar plate. These bacteria include those arising both from animals and from the slaughterhouse or meat processing environment.

ACC is a general measure of the background microbiological status of meat, but ACC results and the number of pathogens present may not always be related.

Because the ACC includes the organisms responsible for spoilage of meat, it will also give an indication of the keeping quality of the meat.

Indicator organisms are larger groups of bacteria, including certain pathogenic bacteria, which are relatively easy to measure as a group and whose presence is likely to indicate an increased risk of the presence of pathogenic bacteria.

When pathogenic bacteria are transferred to carcasses they are usually present in only small numbers and on a small area of the carcass. This means that a negative result from microbiological testing for pathogenic bacteria will not guarantee the absence of such organisms.

A large surface area of a high proportion of carcasses needs to be tested to obtain a statistically valid result for many pathogenic bacteria. This is neither practical or economically feasible and is why E coli O157 on beef and sheep carcasses or in processed meat is not currently included in Regulation 2073/2005. This does not mean that this organism is unimportant but that process

control is best achieved by setting a criterion for an indicator group of micro-organisms such as Enterobacteriaceae or generic E.coli.

Testing for Enterobacteriaceae, a group of indicator organisms that live in the intestines of animals and the environment, will give a better indication of the risk of pathogenic organisms being present. Control measures that reduce the number of Enterobacteriaceae, E.coli and the ACC will reduce the risk of the presence of pathogenic bacteria being present on meat carcasses and processed meat.

If animals enter the slaughter process carrying **Salmonella** on their feathers, hide or fleece, there is a risk that their carcasses will be contaminated after dressing. Although the Salmonella group of organisms does contain bacteria of significance in terms of human disease, there are also many Salmonellae that may occur in animal production that are rarely associated with human disease.

For these reasons the Salmonella spp. criteria set for carcasses are, like Enterobacteriaceae and ACC, process hygiene criteria. Failure to meet these does not in itself indicate the meat from the carcass tested or batch of carcasses tested will be unfit for human consumption but it does mean that investigations to find the cause of contamination to prevent a reoccurrence should take place.

The UK results of the Salmonella National Control Programmes (SNCP) in the breeding chicken, laying chicken, broiler, and turkey sectors showed prevalence levels well below the EU reduction target levels. Food safety criteria for Salmonella Typhimurium and Salmonella Enteritidis in fresh chicken and turkey meat are also in place. Failure to meet the criteria means the meat from the tested batch must be removed from the market.

Campylobacter is present in a high percentage of chicken and turkey flocks and on carcasses from birds slaughtered from those flocks. Action is being taken at many levels to try and address Campylobacter, from Governments to farmers and producers, processors, caterers, local authorities and right down to consumer awareness. On top of that, from 1 January 2018, testing broiler carcasses for Campylobacter spp. in the slaughterhouse is a legal requirement.

Testing for Campylobacter spp. on broiler carcasses as a process hygiene criteria is intended to reduce human Campylobacteriosis attributed to the consumption of broiler meat. This process hygiene criterion aims at keeping under control contamination of carcasses during the slaughter process.

When Salmonella or Campylobacter process hygiene criterion are not met both, improvements in slaughter hygiene/review of process controls and of the biosecurity measures at farms of origin are required.

13.5. Sources of advice and information

Additional guidance may be found in:

- General Guidance for Food Business Operators on Regulation (EC) No. 2073/2005 on Microbiological Criteria for Foodstuffs: <http://www.food.gov.uk/business-industry/guidancenotes/hygguid/microbiolreg>

- BRC/CFA Guidance on the Practical Implementation of the EC Regulation on Microbiological Criteria for Foodstuffs: https://www.chilledfood.org/wp-content/uploads/2015/07/BRC_CFA_Micro_Criteria_Guidance_Ed_1.2.pdf
- Guidelines for the Microbiological Quality of Some Ready-to-eat Food Sampled at the Point of Sale from the Public Health Laboratory Service (PHLS): <https://www.gov.uk/government/collections/public-health-laboratories>
- Development and Use of Microbiological Criteria for Foods ISBN 0 905367 16 2 from the Institute of Food Science and Technology (IFST): www.ifst.org

13.6. Legal requirements for microbiological criteria

The following sections set out the microbiological criteria requirements of the regulations that apply to carcasses after slaughter and further processed meat.

A. Demonstration of compliance

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Legal requirement

2073/2005 Article 3 point 1

A1. Food business operators shall ensure that foodstuffs comply with the relevant microbiological criteria set out in Annex I.

The food business operator at each stage of food production, processing and distribution, including retail, shall take measures, as part of their procedures based on HACCP principles together with the implementation of good hygiene practices to ensure the following:

- that the supply, handling and processing of raw materials and foodstuffs under their control are carried out in such a way that the process hygiene criteria are met
- that the food safety criteria applicable throughout the shelf life of the products can be met under reasonably foreseeable conditions of distribution, storage and use

A1. Compliance regarding microbiological criteria for meat

- Demonstrate compliance with the criteria at Annex I of 2073/2005 Article 3 for meat and processed meat.

A1. Good practice

The Regulation establishes two types of microbiological criteria and requires that food business operators take corrective action when these criteria are not met. These two types are:

- **food safety criteria** – which should be used to assess the safety of a product or batch of foodstuffs; and
- **process hygiene criteria** – which should be used to ensure the production processes are operating properly

Note: A batch is defined as a group or set of identifiable products obtained from a given process under practically identical circumstances and produced in a given place within one defined production period

Food safety criteria

The food safety criteria are absence of Salmonella in the samples as specified in the sub-sections 1.4 to 1.9 of Annex I of 2073/2005 Article 3 and absence of Salmonella Typhimurium and Salmonella Enteritidis in the samples of fresh poultry meat as specified in sub-section 1.28 of

Annex I. For any ready-to-eat meat the *Listeria Monocytogenes* criteria on subsections 1.1 to 1.3 of Annex I apply.

Sampling criteria

- **Ready-to-eat meat** - For ready to eat foods that are able to support the growth of *L. monocytogenes* 5 x 25 g samples from a batch should be taken and there are two criteria: not exceeding 100 cfu/g for the duration of the shelf life of the product; and, if the FBO cannot demonstrate this, absence in 25g before the food has left the control of the FBO.

Result In foods that do not support the growth of *Listeria monocytogenes*: less than 100 cfu/g throughout shelf life.

The following are considered to fall into this category:

- meat products which have received heat treatment or other processing effective to eliminate *L. monocytogenes*, when recontamination is not possible after this treatment (for example, products heat treated in their final package)
 - products with pH ≤ 4,4
 - products with aw ≤ 0,92
 - products with pH ≤ 5,0 and aw ≤ 0,94
 - products with a shelf-life of less than five days s for 5 x 25g samples from a batch must not exceed 100 cfu/g for the duration of the shelf life.
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- **Minced meat and meat preparations intended to be eaten raw** – Salmonella should be absent on 5 x 25g samples from a batch of minced meat or meat preparations intended to be eaten raw made from any species of meat, for example, steak tartare.
 - **Minced meat and meat preparations from poultry meat intended to be eaten cooked** – Salmonella should be absent 5 x 25 samples from a batch of minced meat or meat preparations made from poultry meat intended to be eaten cooked. This applies to poultry meat of all species including ducks, geese, turkeys spent hens and broilers, for example, minced chicken, turkey burgers, chicken sausages chicken and turkey escalopes.
 - **Minced meat and meat preparations from red meat intended to be eaten cooked** – Salmonella should be absent 5 x 10g samples from a batch of minced meat or meat preparations made from other species than poultry intended to be eaten cooked. This applies to all species of red meat including game, for example, minced meat for bolognaise sauce or shepherd's pie, sausages, burgers.
 - **Mechanically separated meat** – Salmonella should be absent 5 x 10g samples from a batch of mechanically separated meat (MSM) when produced with the techniques referred to in paragraph 3 of Chapter III of Section V of Annex III to Regulation (EC) No 853/2004 of the European Parliament and of the Council.
 - **Meat products intended to be eaten raw** – Salmonella should be absent 5 x 25g samples from a batch of meat products intended to be eaten raw, for example, air dried smoked duck, partially fermented sausages. This does not apply to products where the manufacturing process or the composition of the product will eliminate the Salmonella risk such as certain

types of salami, nor does it apply to fully cooked ready to eat meat products such as cooked ham.

- **Meat products from poultry meat intended to be eaten cooked** – Salmonella should be absent 5 x 25g samples from a batch of meat products made from poultry meat intended to be eaten cooked, for example, turkey bacon and chicken nuggets¹. This does not apply to meat products made from meat other than poultry meat intended to be eaten cooked such as bacon and gammon streaks.
- **Fresh poultry meat** – absence of Salmonella Enteritidis and Salmonella Typhimurium from 25g fresh poultry meat samples from a batch including meat from hens, broilers and turkeys (including breeders). Samples taken in slaughterhouses when checking against the process hygiene criteria (sub-section 2.15 of Annex I) if positive for Salmonella spp, must be serotyped to check compliance with the food safety criterion.

When and how often to sample is covered in section 'B' below.

If a food safety criterion is not met, this means the food business operator will not be able to place the foodstuff on the market or will need to remove the food from the market (as required by Regulation 178/2002) and take steps to ensure future production meets the criterion. If the food is intended to be cooked a withdrawal is required, however in certain circumstances, such as if the food is ready to eat, a recall of the food may also be required. Enforcement authorities will require sufficient evidence that the food business operator has taken the appropriate corrective action in a timely manner – see section 'D1.'

Process hygiene criteria

The process hygiene criteria are detailed below:

- **Carcases of cattle, sheep, goats and horses** – five carcasses of each species are required to be sampled per sampling session. One sample is from one carcass.
 - For **Aerobic Colony Count (ACC) and Enterobacteriaceae (ENT)**, use the specified mean log level below for the five samples. The limits given in the regulation are for an excision method, the limits for the swab or sponge method are lower and are given in () below after the figures for excision.
 - For **Salmonella (Sal)**, the criterion is equal to or below a specified number of positives in 10 consecutive sampling sessions (that is 50 samples) using a sponge method.

	ACC cfu/cm²	ENT cfu/cm²	Sal
Unacceptable - mean log /number of positives is above	5.0 (4.3)	2.5 (1.8)	>2/50
Acceptable - mean log below	5.0 (4.3)	2.5 (1.8)	<2/50
Satisfactory - mean log / number of positives is equal to or below	3.5 (2.8)	1.5 (0.8)	absence

¹ Some nuggets may be a meat preparation.

- **Carcases of pigs** – five carcasses are required to be sampled per sampling session. One sample is from one carcass.
 - For **Aerobic Colony Count (ACC) and Enterobacteriaceae (ENT)**, use the specified mean log level below for the five samples. The figures given are for the excision method, the figures for the swab or sponge method are lower and are given in () after the figures for excision.
 - For **Salmonella (Sal)**, the criterion is equal to or below a specified number of positives in 10 consecutive sampling sessions (that is 50 samples) using a sponge method.

	ACC cfu/cm²	ENT cfu/cm²	Sal
Unacceptable - mean log /number of positives is above	5.0 (4.3)	3.0 (2.3)	>3/50
Acceptable - mean log below	5.0 (4.3)	3.0 (2.3)	<3/50
Satisfactory - mean log / number of positives is equal to or below	4.0 (3.3)	2.0 (1.3)	absence

- **Carcases of broilers and turkeys** – 15 carcasses (neck skins) are required to be sampled per sampling session. One sample is composed of three pooled neck skins. The 15 carcasses sampled result in five samples for testing. The same samples can be used for testing Salmonella and Campylobacter in broilers if tested in the same laboratory (see note below if not processed at the same laboratory).
 - For **Salmonella (Sal), in broilers and turkeys** the criterion is equal to or below a specified number of positives (presence) in 10 consecutive sampling sessions (that is 50 samples). The current criterion accepts up to 5/50 positive samples to be in compliance. If a sample tests positive for Salmonella spp in any sampling session it must be serotyped to check compliance with the food safety criteria.
 - For **Campylobacter (Campy), only in broilers**, the criterion is equal or below a specified number of positives (more than 1000 cfu/g) in 10 consecutive sampling sessions (that is 50 samples). The current criterion accepts up to 20/50 positive samples to be in compliance. The number of positives accepted will decrease gradually to 15/50 from 1 January 2020 and to 10/50 from 1 January 2025.

	Sal	Campy
Unacceptable - presence / number of positives is above	5/50	20/50
Satisfactory – absence / number of positives is equal to or below	5/50	20/50

Note: when Salmonella and Campylobacter testing in broilers is carried out in two different laboratories, neck skins from a minimum of 20 carcasses shall be sampled at random after chilling during each sampling session to produce 5 samples. One sample is composed of four pooled neck skins of at least 35g. Each sample will be then split in two to be tested for Salmonella and for Campylobacter separately (25g for Salmonella testing and 10g for Campylobacter testing).

Note: For reduced sampling frequency please refer to the tables in Annexes 1 and 2 at the end of this Chapter. For guidance on Campylobacter testing requirements, please refer to Annex 3 at the end of this Chapter.

- **Minced meat and mechanically separated meat** – five samples must be taken from one batch per sampling session:
 - For **Aerobic Colony Count (ACC)** – all five samples must be less than 5×10^6 cfu/g of which at least three samples must be less than 5×10^5 cfu/g.
 - For **E.coli (EC)** – all five samples must be less than 500 cfu/g of which at least three samples must be less than 50 cfu/g.
- **Meat preparations** – five samples must be taken from one batch per sampling session:
 - For **E.coli (EC)** – all five samples must be less than 5000cfu/g and three samples must be less than 500cfu/g.

Species for which criteria are not specified, for example, game, rabbits, ducks and geese carcasses, are not required to be sampled. Turkey carcasses are not required to be sampled for Campylobacter.

If a process hygiene criterion is not met, the meat can be placed or remain on the market, but the food business operator must review the production processes and improve process hygiene to ensure future production will meet the criteria. The actions should be included in the food safety management procedures, which should also include relevant actions specified in Annex I (Chapter 2) of the Regulation. Enforcement authorities will require sufficient evidence that the food business operator has taken the appropriate corrective action – see section 'D1.'

When and how often to take samples is covered in section 'B'. Sampling methods are fully described at sub-section 'B7', Samples of processed meat.

B. Microbiological testing against the criteria

L

Legal requirement

2073/2005 Article 4

B1. Food business operators shall perform testing as appropriate against the microbiological criteria set out in Annex I when they are validating or verifying the correct functioning of their procedures based on HACCP principles and good hygiene practice.

B2. Food business operators shall decide the appropriate sampling frequencies except where Annex I provides for specific frequencies ... the sampling frequency shall be at least that provided for in Annex I.

B1. and B2. Compliance regarding when and how often to take samples

- Carry out testing against the food safety and process hygiene criteria.
- Follow the specified sampling frequency for carcasses, minced meat, meat preparations and MSM.
- Determine a sampling frequency for ready to eat meat based on risk.

B1. and B2. Good practice

Frequency of testing – testing is one of the ways to demonstrate compliance with the criteria. It should be undertaken as part of the process of validating and verifying procedures based on HACCP.

The Regulation requires weekly sampling at slaughterhouses producing meat carcasses, and establishments producing minced meat, meat preparations and mechanically separated meat.

However, the weekly sampling specified in the Regulation does not apply to small slaughterhouses (with the exception of testing for *Campylobacter* for broilers which currently applies to slaughterhouses of any size) and establishments producing minced meat and meat preparations in small quantities. The exemption criteria are detailed in Annex 1 at the end of this Chapter.

The frequency for sampling for ready to eat meat, using the *Listeria* criteria, has not been specified in the Regulations and should be decided by the FBO based on risk.

B2. Compliance regarding establishments producing meat products

- The FBO must decide an appropriate sampling frequency for meat products.

B2. Good practice

The Regulation does not stipulate how often to take samples from an establishment producing meat products to demonstrate compliance with the criteria for Salmonella or Listeria Monocytogenes (if RTE). Therefore, the FBO shall determine the frequency of sampling and testing according to the specific risk for each product.

HACCP principles must be applied when manufacturing all products. The management of the microbiological risks at each stage of manufacturing process must be considered.

Key stages of the manufacturing process include:

- ingredients/raw material
- factory – design, hygiene of equipment and people
- manufacturing process targeting appropriate organism/s
- packaging
- storage temperature and shelf life
- intended use
- food safety studies related to similar products

Microbiological testing may be appropriate at certain stages to validate/verify that the procedures based on HACCP principles are adequate, operational and effectively in control. Monitoring raw materials and factory hygiene is also important. Final product microbiological testing against the criteria can be used to verify that the overall process is in control.

As the HACCP based procedures become more established and more satisfactory test results are obtained the frequency of testing may be reduced based on the trends obtained.

If anything significant is changed in the production of the product such as the raw material source, the formulation or the type of processing, the HACCP based procedures must be reviewed and it may be appropriate to increase test frequency.

Example: raw materials

When deciding the frequency of microbiological tests required against the criteria the following should be considered for raw materials:

- the microbiological hazards and risks associated with the raw material
- knowledge and confidence in the supplier/ producer of the raw material. The more confidence you have in the raw material supplier/ producer the less testing is required. Confidence can be achieved by:
 - auditing the supplier/ producer and their HACCP procedures including their microbiological checks and results / or
 - increasing the frequency of checks until sufficient historical data is available
- the risk associated with the volume of the raw material used

- historical data

A similar approach should be taken for all the other key stages.

L

Legal requirement

2073/2005 Annex I Chapter 3.2

B3. The food business operators of slaughterhouses or establishments producing minced meat, meat preparations or mechanically separated meat shall take samples for microbiological analysis at least once a week. The day of sampling shall be changed each week to ensure that each day of the week is covered.

B4. As regards the sampling of minced meat and meat preparations for *E. coli* and aerobic colony count analyses and the sampling of carcasses for Enterobacteriaceae and aerobic colony count analyses, the frequency may be reduced to fortnightly testing if satisfactory results are obtained for six consecutive weeks.

B5. In the case of sampling for *Salmonella* analyses of minced meat, meat preparations and carcasses, the frequency can be reduced to fortnightly if satisfactory results have been obtained for 30 consecutive weeks. The *Salmonella* sampling frequency may also be reduced if there is a national or regional salmonella control programme in place and if this programme includes testing that replaces the above-described sampling. The sampling frequency may be further reduced if the national or regional *Salmonella* control programme demonstrates that the *Salmonella* prevalence is low in animals purchased by the slaughterhouse.

B6. In the case of sampling for *Campylobacter* analysis of broiler carcasses, the frequency may be reduced to fortnightly if satisfactory results have been obtained for 52 consecutive weeks. The *Campylobacter* sampling frequency may also be reduced, when authorisation by the competent authority where a national or regional *Campylobacter* control programme is in place. Currently there is no such programme recognised by the competent authorities.

B7. However, when justified on the basis of a risk analysis and consequently authorised by the competent authority, small slaughterhouses and establishments producing minced meat and meat preparations in small quantities may be exempted from these sampling frequencies.

B3. to B7. Compliance regarding red meat slaughterhouses

- Take weekly samples at slaughterhouses producing red meat carcasses.

B3. to B6. Good practice

Take five samples once a week for all specified species in a sampling session.

- **Specified species** – are cattle, sheep, goats, pigs and horses of all ages – see ‘Annex 1.’. The day of the week that sampling is carried out must be alternated. Sampling frequency can be reduced following satisfactory results as detailed in ‘Annex 1.’.

- **Small quantities of the specified species** – the weekly frequency does not apply to small quantities. See 'Annex 1.' for the throughput for small quantities on a per species basis and the sampling frequencies to be followed.

B3. to B7. Compliance regarding poultry slaughterhouses

- Take weekly samples at slaughterhouses producing poultry carcasses.

B3. to B7. Good practice

Take samples once a week for all specified species in a sampling session.

- **Specified species** – for the process hygiene criteria broilers and turkeys are to be tested for *Salmonella* spp. and broilers (only) are to be tested for *Campylobacter* spp. – see 'Annex 2'. The day of the week that sampling is carried out must be alternated. Sampling frequency can be reduced following satisfactory results as detailed in 'Annex 2'.

The specified species for the salmonella food safety criteria are laying hens, broilers and turkeys and breeding birds.

The specified species for the *Campylobacter* food safety criteria are only broilers.

- **Small quantities of the specified species** – the weekly frequency does not apply to small quantities in the case of *Salmonella* testing. See 'Annex 2.' for the throughput for small quantities on a per species basis and the sampling frequencies to be followed. However, *Campylobacter* testing for broilers applies currently to slaughterhouses of any size.

B3. to B7. Compliance regarding establishments producing processed meat

- Take weekly samples at establishments producing minced meat, meat preparations and mechanically separated meat.

B3. to B6. Good practice

Take samples from one batch of minced meat or meat preparations or mechanically separated meat per producing establishment per week.

All species of meat minced or processed into meat preparations or mechanically separated meat are included.

- **Small quantities** – the weekly frequency does not apply to small quantities. An average combined volume of less than two tonnes a week of minced meat and meat preparations intended to be eaten cooked is considered to be a small quantity and establishments regularly producing less than this volume are not currently required to undertake testing. If production increases over 2 tonnes during short periods of time (e.g. summer or Christmas seasonal production peaks) the FBO shall test during any period exceeding the 2 tonnes.

All establishments producing minced meat and meat preparations intended to be eaten raw or undercooked and or MSM irrespective of production volume must undertake weekly testing.

See – 'B8. Samples of processed meat'.



Legal requirement

2073/2005 Article 5

B8. The analytical methods and the sampling plans and methods in Annex I shall be applied as reference methods.

B8. Compliance regarding sampling of carcasses

- Follow the sampling plans in Annex I of 2073/2005, Article 3, Chapters 1 and 2 and the sampling rules in Chapter 3 for slaughterhouses.

B8. Good practice

Take five samples per sampling session from each of the specified species per slaughterhouse once a week and send to a testing laboratory. The day of the week should be alternated for each sampling session. For species and when to take samples – see ‘Annex 1.’ and ‘Annex 2’.

Training – the person undertaking the sampling needs to be trained in microbiological sampling. The testing laboratory or the OV can provide training.

Supplies – the testing laboratory will be able to supply the equipment and consumables necessary for sampling.

B8. Compliance regarding samples of processed meat

- Take and send to the testing laboratory samples from establishments producing minced meat, meat preparations, MSM and meat products.

B8. Good practice

Take a sufficient sample to enable the laboratory to take 5 x 10g or 5 x 25g test portions for Salmonella 5 x 25g for Listeria Monocytogenes and 5 x 25g test portions for EC and ACC from one batch per producing establishment of²:

- minced meat or meat preparations – once a week
- mechanically separated meat – once a week
- meat products – at the frequency decided and recorded by the producer as part of the HACCP- based plan

² Minced meat and meat preparation establishments producing on average less than 2 metric tonnes per week of product (minced meat and meat preparations combined production) intended to be eaten cooked are not required to take sample.. If production increases over 2 tonnes during short periods of time (e.g. summer or Christmas seasonal production peaks) the FBO shall test during the period exceeding the 2 tonnes.

Batches

A batch is defined in 2073/2005 as a group or set of identifiable products obtained from a given process under practically identical circumstances and produced in a given place within one defined production period.

The product in the batch must be able to be identified and located and the information on how to do this must be recorded. It is the ability to describe and identify batches of production that will determine the batch size and this will differ under different production conditions.

The following information is provided to assist food business operators in identifying a batch and how to take the five samples.

- **Minced meat** – a batch could be one hopper load of meat after mincing. If the meat is then packed into retail packs, five packs should be selected throughout the batch of packs produced from the hopper and either sent to the laboratory or a sample may be taken from each pack. Samples may also be taken from the hopper attempting to sample as randomly as possible or from one large pack if the meat is stored in bulk.
- **Meat preparations/meat products** – for comminuted products such as burgers, sausages or salami, a similar approach should be taken as for minced meat.

For meat preparations/products made with large pieces of meat then the description of batch will determine when and how five units to sample are selected.

- **Mechanically separated meat** – the production process will influence the definition of batch. This must be recorded and the product in a batch must be able to be identified and differentiated from product in other batches.

Sample information

Information about the batch of processed meat samples must be recorded on a sample form. This should include:

- name and species of product, for example, beef burger, turkey mince, pork kebabs
- pack description, for example, retail 500g pack
- physical state, for example, fresh or frozen
- details of any modified atmosphere packaging (MAP)
- date of production
- source of meat (slaughterhouse, farm), traceability code

B8. Compliance regarding laboratory practice

- The laboratory testing the samples must use the specified ISO methods, alternative methods or modifications agreed with the CA.

B8. Good practice

The laboratory undertaking testing for the food business operator should use the organism-specific method:

- for Salmonella this is EN/ISO 6579
- for Listeria Monocytogenes this is EN/ISO 11290 -1 and 2
- for Enterobacteriaceae this is ISO 21528-2
- for E.coli this is ISO 16649-1
- for Aerobic Colony count this is ISO 4833
- for Campylobacter this is ISO10272-2

Modifications to the methods such as the use of single plates for ACC can be used as long as the laboratory is accredited for the modified procedure.

Official controls – if the testing is undertaken under official control procedures the laboratories must be accredited by UKAS – see www.ukas.com.

Laboratory test portions – processed meat

The test portion size for minced meat, mechanically separated meat, meat preparations and meat products is specified in the Regulation for Salmonella as either 25g or 10g and for Listeria Monocytogenes in ready to eat meat as 25g.

The laboratory test portion weight for minced meat, mechanically separated meat or meat preparations for ACC and EC examination is not specified in the Regulation so the ISO standard (6887-2) that establishes specific rules for the preparation of meat and meat products samples should be followed which specifies a 25g sample.

The laboratory must be able to obtain both test portions from each sample it receives. Test portions should be taken from throughout the sample including the surface and the interior. Preparation of the initial suspension for meat and meat products is described in ISO 6887-2.

Laboratory methods

Ideally, the laboratory undertaking testing for the food business operator should be accredited by UKAS for the examinations required in meat samples.

As a minimum, the laboratory should take part in a recognised proficiency testing scheme for the examinations required, for example, FAPAS proficiency testing:
<https://fapas.com/shop/browse/1>.

If contracting a laboratory to undertake microbiological testing, ask to see the accreditation schedule and the proficiency test results ideally for the two previous years.

The use of alternative analytical methods is acceptable when the methods are validated against the reference method in Annex I of Regulation (EC) No 2073/2005 and if a

proprietary method, certified by a third party in accordance with the protocol set out in EN/ISO standard 16140 or other internationally accepted similar protocols, is used.

Pooling of samples

For Salmonella examinations the five test portions can be pooled *in the lab* to give one 50g test portion (5 x 10g) or one 125g test portion (5 x 25g) saving on examination costs. These test portions must then be enriched in a 10 fold dilution of BPW. The laboratory must demonstrate that there is no major loss of sensitivity by pooling.

Samples from cattle, sheep, horses, pigs and goats

Further information on taking samples is included in the ISO standard 17604 that is the International Standard that specifies sampling methods for the detection and enumeration of microorganisms on the surface of carcasses or parts of carcasses of slaughtered meat animals.

Sponges from red meat carcasses are to be examined for Salmonella, ENT and ACC:

- Add 90mls of Buffered Peptone Water (BPW) to the swab to make a total of 100mls (taking into account the 10mls added previously).
- Agitate the sample using a peristaltic homogeniser taking care to minimise foaming.
- Remove 10mls of BPW for ACC and ENT enumeration and follow the ISO method incubate the remainder with the sponge for 16-20 hours at 37°C and proceed with salmonella determination as per the ISO method.

Samples from spent hens, turkeys and breeding birds

Neck skins are to be examined for Salmonella.

Compose a 25g sample from 3 approximately 10g neck skins. Aim to include material from all three skins avoiding fat. Take neck skins after chilling from 15 carcasses forming 5 x 25g final samples.

Follow the ISO method for Salmonella by adding the 25g neck skin sample to 225ml Buffered Petone Water (BPW).

Samples from broiler carcasses

Necks skins are to be examined for Salmonella and Campylobacter. There are three different possibilities:

- If the tests for Salmonella and Campylobacter are carried out in the same laboratory, neck skins from a minimum of 15 broiler carcasses are required. Compose a 26g sample from 3 approximately 10g skins from the same flock forming 5 x 26g final samples. The 26g neck skin sample shall be transferred to 234 ml BPW.
- If the tests for Salmonella and Campylobacter are carried out in two different laboratories, neck skins from a minimum of 20 broiler carcasses are required. Compose a 35g sample

from 4 neck skins from the same flock forming 5 x 35g samples which will be split to obtain 5 x 25g final samples to be tested for Salmonella and 5 x 10g samples to be tested for Campylobacter.

- If only Campylobacter is tested (small size slaughterhouses), neck skins from a minimum of 15 broiler carcasses are required. Compose a 10g sample from 3 skins from the same flock forming 5 x 10g final samples.

B1. and B8. Compliance regarding reporting results

- Report results for ENT, ACC, Salmonella and Campylobacter in accordance with the relevant regulations.

B1. and B8 Good practice

Results for red meat carcasses for ENT and ACC must be calculated as the log number of organisms per area of carcass tested. Results must be reported as cfu/cm².

The mean log value of the 5 carcasses sponged per sampling session can then be calculated by adding the five individual log results together and dividing by five. The mean log is then compared with the criteria.

Results for Salmonella for red meat carcasses must be reported as absence or presence in the area sponged.

Results for Salmonella on poultry carcasses must be reported as absence or presence in 25g of neck skin sample.

Results for Campylobacter on broiler carcasses must be reported as above or equal /below 1000 cfu/g.

L

Legal requirement

2073/2005 Annex I Chapter 3 (as amended by 1441/2007)

B9. The destructive and non-destructive sampling methods, the selection of the sampling sites and the rules for storage and transport of samples are described in standard ISO 17604.

B10. Five carcasses shall be sampled at random during each sampling session. Sample sites should be selected taking into account the slaughter technology used in each plant.

B11. When sampling for analyses of Enterobacteriaceae and Aerobic Colony Counts, four sites of each carcass shall be sampled. Four tissue samples representing a total of 20 cm² shall be obtained by the destructive method. When using the non-destructive method for this purpose, the sampling area shall cover a minimum of 100 cm² (50 cm² for small ruminant carcasses) per sampling site.

B12. When sampling for Salmonella analyses, an abrasive sponge sampling method shall be used. The sampling area shall cover a minimum of 400 cm².

B13. When samples are taken from the different sampling sites on the carcass, they shall be pooled before examination.

B9. to B13. Compliance regarding sampling of red meat

- Take samples from red meat carcasses.

B9. to B13. Good practice

Take five sponge samples per sampling session from carcasses after dressing but before chilling. One sponge sample is from one carcass.

The reference sampling method for Salmonella on red meat carcasses is using an abrasive swab covering a minimum of 400 cm².

For ENT and ACC four sites of the carcass should be sampled using excision or a non-destructive method, with 100cm² being swabbed.

The carcass sponge swab method can be used for all three tests if:

- is an abrasive sponge
- is a non-destructive method
- covers four sites
- covers a minimum of 400cm²

Wet and dry swabbing or excision can be used for ENT and ACC³ but not for Salmonella testing.

Operators are encouraged to use the simple sponge sampling method for all three tests.

Apparatus

Use sterile dry abrasive sponge swabs (10 x 10 cm or 5 x 10 cm, folded in half) in sterile plastic sample bags (waffle style cellulose sponge dishcloths and stomacher bags).

Diluent sterile 0.9% unbuffered sodium chloride solution.



Sampling method

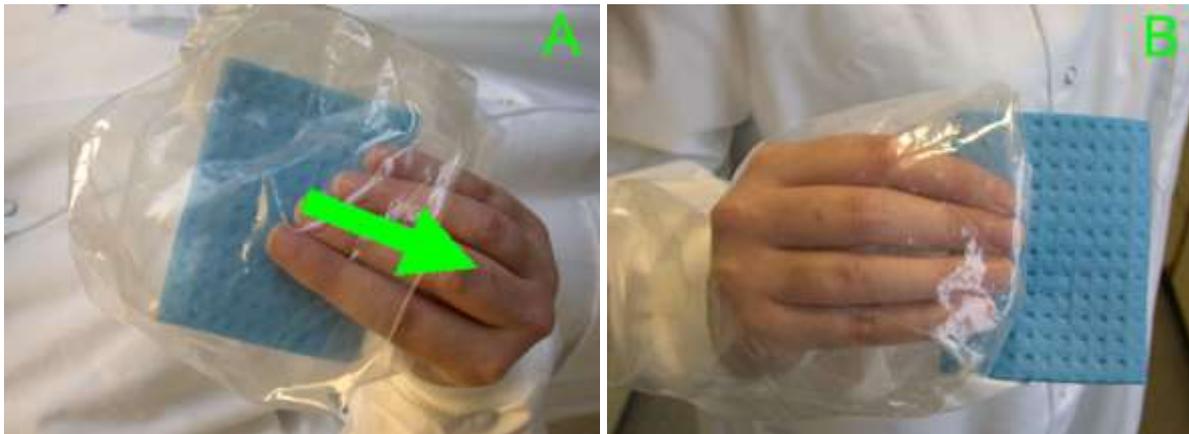
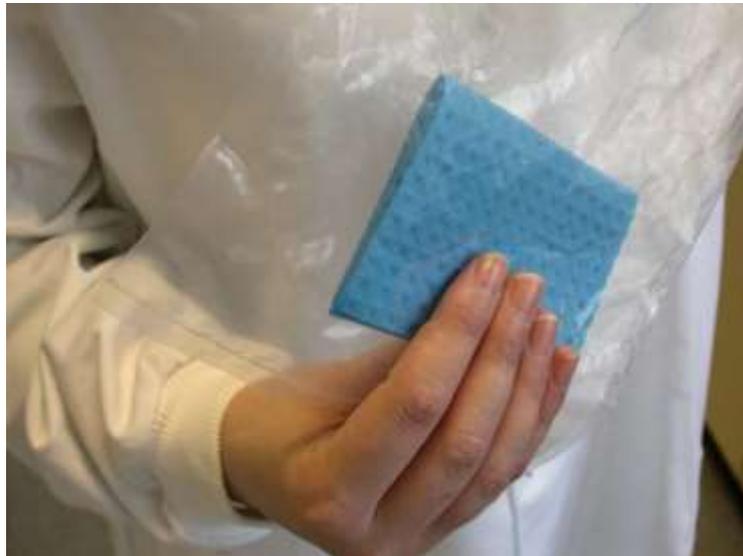
Rehydrate the sponge in the sample bag with approximately 10ml diluent. The sponges should be damp without excess diluent in the bag. Alternatively, sponges can be rehydrated, stored frozen and defrosted prior to use.



³ This method is not described in this guidance.

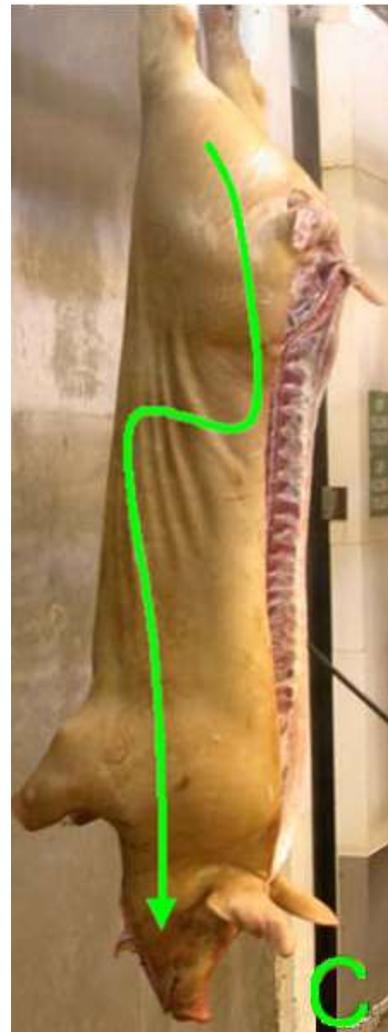
Grasp the sponge through the bag folding the bag back over the hand.

Avoid allowing the sponge, diluent, or the internal surface of the bag to come into contact with other surfaces.



Randomly choose one side of a randomly chosen carcass after inspection and before chilling.

Wipe the sponge with firm pressure and a slight side to side movement down one side of the carcass starting at the back leg and moving across the carcass. Use a firm consistent pressure. The length of the wipe should be approximately 100 cm for adult sheep, goats and pigs and 150 cm for adult cattle and horses.



Refold the bag over the sponge and secure the bag with a closure.

Labelling of carcass samples

Label the bag and record the following information:

- date of sampling
- species
- origin of animal (farm postcode, slaughtering reference)
- length of wipe for red meat: an estimate is sufficient
- width of wipe for red meat (normally 10cm)

Temperature control during storage and transport

- Sponge samples should be kept cool and delivered to the laboratory within 2 hours. If longer than two hours the samples should be placed into an insulated coolbox containing frozen freezer blocks or crushed ice. Keep the samples cold but do not allow them to freeze.
- Sample testing should commence within 24 hours of sampling.



Legal requirement

2073/2005 Annex I Chapter 3 (as amended by 1441/2007)

B14. For the Salmonella analyses, a minimum of 15 carcasses shall be sampled at random during each sampling session and after chilling. A piece of approximately 10g from neck skin shall be obtained from each carcass. On each occasion the neck skin samples from three carcasses shall be pooled before examination in order to form 5 x 25g final samples.

For the Salmonella and Campylobacter analyses, if carried out in the same laboratory, a minimum of 15 carcasses shall be sampled at random during each sampling session after chilling. A piece of approximately 10g from neck skin shall be obtained from each carcass. On each occasion the neck skin samples from the three carcasses shall be pooled before examination in order to form 5 x 26g final samples.

If Salmonella and Campylobacter analyses are carried out in different laboratories, a minimum of 20 carcasses shall be sampled at random during each sampling session and after chilling. A piece of approximately 10g from neck skin shall be obtained from each carcass. On each occasion the neck skin samples from four carcasses shall be pooled before examination in order to form 5 x 35g final samples which will then be split to form 5 x 25g final samples to be tested for Salmonella and 5 x 10g final samples to be tested for Campylobacter.

If the slaughterhouse is exempt from carrying out Salmonella testing and only Campylobacter testing is required, a minimum of 15 carcasses shall be sampled at random during each sampling session and after chilling. On each occasion the neck skin samples from three carcasses shall be pooled before examination in order to form 5 x 10g final samples.

B14. Compliance regarding sampling of poultry

- Take samples from poultry carcasses.
- Take samples from cut poultry meat.

B14. Good practice

For testing Salmonella take five samples from spent hens, turkeys and breeding birds. One sample is three neck skins, so 15 carcasses are required to be sampled (5 x 25g final samples). Collect samples from carcasses after chilling.

For testing for Salmonella and Campylobacter in broilers take five samples from neck skins after chilling. The same samples can be used for testing for both microorganisms. There are two options:

- If tested in the same laboratory, one sample is three neck skins, so 15 carcasses are required to be sampled (5 x 25g final samples).
- If tested in separate laboratories, one sample is four neck skins, so 20 carcasses are required to be sampled to obtain 5 x 35g final samples that then will be divided in 5 x 25g samples to be tested for Salmonella and 5 x 10g samples to be tested for Campylobacter.

For testing for Campylobacter only, take five samples from broiler carcasses. One sample is three skin necks so 15 carcasses are required to be sampled (5 x 10g final samples). Collect samples from carcasses after chilling.

For fresh poultry meat other than carcasses take 5 x 25g samples from pieces of poultry meat (spent hens, broilers, turkeys and breeding birds) from the same batch. Take samples on a risk basis including pieces with skin as a priority. Samples without skin or with only a small amount of skin shall contain a thin surface muscle slide added to any skin present to make a sufficient sample unit. The slices shall be cut in a way that includes as much as possible of the surface of the meat.

Apparatus

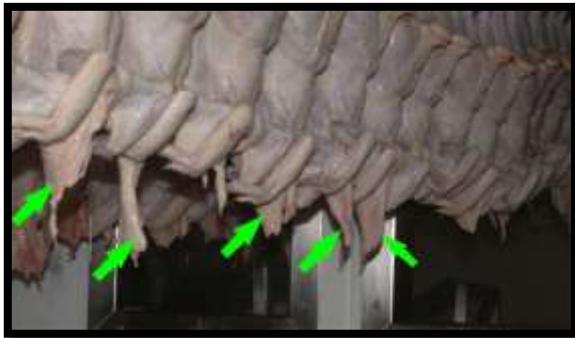
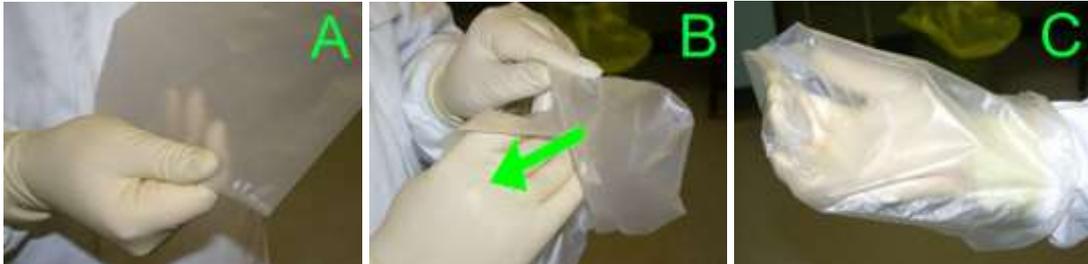
Use gloves, clean sharp scissors, alcohol wipes, sample bags, labels.

Sampling method

- **For carcasses:**
 - Put on pair of gloves then wipe the surfaces of the gloves with alcohol wipes to kill any bacteria that may be present.
 - Wipe the scissors with an alcohol wipe.
 - Grip the plastic bag at the bottom and fold back over the gloved hand. Avoid the internal surface of the bag or the scissors contacting other surfaces.
 - Grasp the neck skin through the bag and cut off approximately 10g with the clean

scissors, repeat with two further neck skins to make a total of three (four in the case of broilers when Salmonella and Campylobacter are going to be tested in separate laboratories) in one bag.

- Fold the bag back over the sample and tie to secure the neck skin samples inside.
- Clean gloves and scissors with alcohol wipes and repeat.



10g of broiler neck skin

- **For pieces of poultry meat:**

- Aseptically remove 25g taking any skin as a priority and supplementing with surface muscle slices. Whole pieces can be taken and sent to the laboratory for skin and muscle slice removal.

Labelling of carcass samples

Label the bag and record the following information:

- date of sampling

- species
- origin of birds (farm postcode, slaughtering reference)

Temperature control during storage and transport

Sponge and neck skin samples should be kept cool and delivered to the laboratory within 2 hours. If longer than two hours the samples should be placed into an insulated coolbox containing frozen freezer blocks or crushed ice. Keep the samples cold but do not allow them to freeze.

Sample testing should commence within 24 hours of sampling.

Salmonella and Campylobacter samples shall be transported to the laboratory at a temperature not lower than 1°C and not higher than 8°C. The time between the sampling and the testing for Campylobacter shall be of less than 48 hours to ensure the integrity of the sample is maintained. Samples that have reached a temperature of 0°C shall not be used to verify compliance with the Campylobacter criterion.

Further information on taking samples is included in the ISO standard 17604, Carcase sampling for microbiological analysis– see Section 'B8. Laboratory practice'.

L

Legal requirement

2073/2005 Article 5 point 2

B15. Samples shall be taken from processing areas and equipment used in food production when such sampling is necessary for ensuring the criteria are met. In that sampling the ISO standard 18593 shall be used as a reference method.

B14. Compliance regarding the processing environment

- Undertake sampling and testing of the processing environment.

B14. Good practice

Sampling the process environment can be useful to validate and verify the cleaning procedures.

When the criteria for carcasses or processed meat are not met, sampling of the processing environment must be considered as part of your investigatory action.

The ISO standard 18593 provides useful information and should be used as the reference method.

Food Business Operators manufacturing ready to eat foods, which may pose a *Listeria monocytogenes* risk for public health, shall sample the processing areas and equipment for *Listeria monocytogenes* as part of their sampling scheme. 2073/2005 does not establish a sampling frequency but this should be based on risk and trends analysis should be followed.

Rapid methods – can also provide valuable information on the effectiveness of cleaning.

C. Labelling requirements

L

Legal requirement

2073/2005 Article 6

C1. When the requirements for Salmonella in minced meat, meat preparations and meat products intended to be eaten cooked of all species set down in Annex I are fulfilled, the batches of those products placed on the market must be clearly labelled by the manufacturer in order to inform the consumer of the need for thorough cooking prior to consumption.

C1. Compliance regarding cooking information

- Label minced meat, meat preparations and meat products from species other than poultry intended to be eaten cooked, to inform the consumer of the need for thorough cooking prior to consumption.

C1. Good practice

Food business operators responsible for the production of raw minced meat, meat preparations and meat products intended to be cooked before consumption, for which there is a Salmonella criterion, must label products to be sold at retail with cooking information.

The Agency has taken advice from the advisory committee on the microbiological safety of food, and considers that it will be sufficient to indicate clearly that the food requires cooking aided by cooking times and temperatures where appropriate, for example, for burgers and sausages.

Best practice

The wording should not include internal temperatures, as these are not easily measured by the consumer. Symbols can be used, as long as they are used in conjunction with appropriate wording.

The FSA's 'Safer food better business' advice pack provides guidance: see <https://www.food.gov.uk/business-guidance/safer-food-better-business>

Examples of good practice including:

- Cook in a hot (x °C) oven for x minutes until piping hot in the centre.
- Grill for x minutes per side until piping hot in the centre.
- Raw meat requires cooking.

Safe handling

In addition to cooking information, label raw meat and products containing raw meat appropriately to give the following safe handling advice:

- Store raw meat separately from cooked meat and other ready to eat foods.

- Wash hands and preparation utensils after handling raw meat.
- Keep refrigerated until use.

Guidance for caterers

Guidance produced for caterers may be helpful:

- See 'Food Standards Agency - Safer food, better business' produced by FSA.
<https://www.food.gov.uk/business-guidance/safer-food-better-business>
- See 'Food Standards Scotland – CookSafe' produced by FSS.
<https://www.foodstandards.gov.scot/publications-and-research/publications/cooksafe-manual>
- For information about 'Safe catering' contact FSA Northern Ireland.
<https://www.food.gov.uk/business-guidance/safe-catering>
- For information about guidance materials in Wales, contact the Environmental Health Department of the local county borough council or FSA Wales.

D. Unsatisfactory results

L

Legal requirement

2073/2005 Article 7

D1. When the results of testing against the criteria set out in 'Annex 1.' are unsatisfactory the food business operator shall take the measures laid down in paragraphs 2 to 4 of this article together with other corrective actions defined in their HACCP based procedures and other actions necessary to protect the health of consumers. In addition they shall take measures to find the cause of the unsatisfactory results in order to prevent the recurrence of the unacceptable microbiological contamination.

When testing against food safety criteria provides unsatisfactory results the product or batch of foodstuffs shall be withdrawn or recalled from the market in accordance with Article 19 of Regulation (EC) No 178/2002. However, products that are not yet at retail may be subject to further processing by a treatment eliminating the hazard.

In the event of unsatisfactory results as regards process hygiene criteria the actions laid down in Annex I, Chapter 2 shall be taken.

218/2014 Article 2.4

D2. In relation to carcasses of pigs, if the Salmonella process hygiene criterion is not complied with at several occasions, the competent authority shall require an action plan from the food business operator concerned and strictly supervise its outcome.

D1. Compliance regarding unmet food safety criteria

- Take the action specified in the last column of 'Annex I.' together with other actions specified in a food safety management plan when the criteria have not been met.

D1. Good practice

Test for unsatisfactory results of Salmonella in minced meat, meat preparations MSM and meat products.

The batch tested must be removed from the market if one or more of the five samples is positive for Salmonella. If the test portions have been combined into a single test portion for examination then this action is triggered if the combined test portion is positive – see 'B7, Samples of processed meat'.

If the product is at retail and intended to be cooked it must be withdrawn. If the product is ready to eat a recall is required. Regulation 178/2002 provides the legal basis for these actions and the requirements for providing point of sale notices and informing the FSA / FSS must be followed. For product intended to be cooked, the Agency would not normally place this information on its website. However, in appropriate circumstances (such as an ineffective withdrawal) the Agency may decide to inform consumers.

In all cases when the criteria have not been met and Salmonella has been detected in one or more of the five samples, action should be taken to improve future production and improve consumer protection. This should include a review of the source of meat and on-farm action plans for control of Salmonella.

D1 and D2. Compliance regarding unmet process criteria

- Take the action specified in the last column of 'Annex I' of 2073/2005, Article 3 tables together with other actions specified in a food safety management plan when the criteria have not been met.
- Draw up an action plan to address repeated unsatisfactory Salmonella testing results (pig carcasses).

D1 and D2. Good practice

When the process criteria have not been met, Annex I to the Regulation requires that a review of the hygiene of production is undertaken. Additionally, for Salmonella and Campylobacter on poultry and for Salmonella on pig meat carcasses, review the biosecurity procedures of the farm of origin.

In case of repeated failure to obtain satisfactory results against the Salmonella process hygiene criterion for pig carcasses, the food business operator is required to produce an action plan to address the unsatisfactory results.

Salmonella typing and anti-microbial resistance

Where Salmonella spp. is found in poultry carcasses, the isolates shall be further **serotyped** for Salmonella typhimurium and Salmonella enteritidis in order to verify compliance with the food safety criteria. The FBO should instruct the lab to send the samples for serotyping, if they do not have facilities on site.

Serotyping Salmonella isolates will provide information that can be useful in pinpointing the source and also provide information on the significance of the Salmonella detected in terms of human disease.

The FBO should instruct the testing laboratory to retain the records of Salmonella isolates at the end of the ISO procedure and follow the procedure for arranging typing.

As part of the EU harmonised AMR monitoring, FBOs and their associated laboratories are requested to forward any Salmonella isolate obtained under the microbiological criteria to APHA for **antibiotic sensitivity** testing. Veterinary Medicines Directorate (VMD) funds the testing.

Corrective action

Useful information for producers can be found in:

- Defra codes of practice for producing poultry and pigs
- ZAP 13 point action plan for pig producers
- FSA guidance on biosecurity for poultry production

- FSA red meat safety information booklet
- FSA producing beef for slaughter a guide for producers

L

Legal requirement

2073/2005 Article 7

D3. Food business operators shall analyse trends in test results.

D3. Compliance regarding analysis of trends

- Use trends in results to inform future production. FBOs shall analyse trends in the test results. When they observe a trend towards unsatisfactory results, they shall take appropriate actions without undue delay to remedy the situation in order to prevent the occurrence of microbiological risks, and to bring back the process under control.

D3. Good practice

Trends in results may reveal unwanted developments in the manufacturing process enabling the food business operator to take corrective actions before the process is out of control.

Results must be expressed in a format that allows trends to be seen.

13.7. Official control requirements

L

Legal requirement

2073/2005 Article 1

The competent authority shall verify compliance with the rules and criteria laid down in this Regulation in accordance with Regulation EC No 882/2004.

218/2014 Article 2

The competent authority shall verify the correct implementation by food business operators of the point 2.1.4 (process hygiene criterion for Salmonella on pig carcasses) of Annex I to Regulation (EC) 2073/2005 by applying the following measures: (...) (b) collecting all information on the total number and the number of Salmonella positive samples taken by food business operators in accordance with Article 5(5) of Regulation (EC) 2073/2005, within the frame of point 2.1.4 of Annex I thereof.

854/2004 Article 4 point 5a

Audits of HACCP-based procedures shall verify that food business operators apply such procedures continuously and properly, having particular regard to ensuring that the procedures provide the guarantees specified in Section II of Annex II to Regulation (EC) 2004. They shall, in particular, determine whether the procedures guarantee, to the extent possible, that products of animal origin: (a) comply with microbiological criteria laid down under Community legislation.

13.8. Applying procedures continuously and properly

L

Legal requirement

852/2004 Article 1 point 1a

The operator is responsible for food safety in the food business.

178/2002 Article 17

Food ... business operators at all stages of production, processing, and distribution within the businesses under their control shall ensure that foods () satisfy the requirements of food law which are relevant to their activities and shall verify that such requirements are met.

13.8. Compliance regarding operator responsibilities for microbiological criteria

- Operator responsibility includes applying and verifying the company's procedures for complying with microbiological criteria. This will include any microbiological sampling and testing procedures, keeping relevant records and the taking of corrective action if those procedures fail.

13.8. Good practice

Operator responsibility – includes maintaining and monitoring procedures for complying with microbiological criteria and taking corrective action if there is a failure. These procedures should be based on HACCP principles – see Chapter 9 on ‘HACCP principles’.

Delegation – responsibility for applying and verifying the company’s products comply with microbiological criteria may be delegated to a nominated person. The HACCP based procedures would require microbiological problems to be reported to that person, who must have authority to ensure that corrective action is taken when necessary.

Verification – undertake regular management checks to check if company procedures are being followed regarding the compliance with microbiological criteria.

Frequency of verification – this will depend on the likelihood of a problem being found. Once a month may be sufficient for checking experienced staff who are following established procedures and if microbiological test results are generally acceptable/satisfactory and corrective action has not been required. The work of new or temporary people who are less familiar with the procedures and premises may need to be monitored more frequently.

Records – keep an accurate, dated account (for example, in the food safety management diary) of the date and result of the periodic verification checks, test results and of any corrective action taken.

Corrective action – take action when there is evidence of non-compliance with criteria. Further action may be necessary if there has been a failure to initiate corrective action or the planned corrective action fails to prevent a reoccurrence, this may include:

- investigating the hygiene of slaughter, dressing and or processing
- investigations in relation to the laboratory service; and
- improving staff instructions and training
- review process controls of animals’ origin (where applicable)
- review biosecurity measures in the farms of origin (where applicable)

Annex 1. Sampling frequency for red meat carcasses

Category		Annual throughput per species	Sampling frequencies	
			Initial frequency	Reduced frequency if results are satisfactory
Standard	1	<ul style="list-style-type: none"> Over 20,000 cattle or horses; Over 100,000 pigs or sheep or goats. (>400 or 2,000/week)	<u>Enteros and ACC:</u> 5 carcasses once a week for six weeks for each species. (6 x 5 = 30 samples / species)	<u>Enteros and ACC:</u> 5 carcasses once every 2 weeks for each species.
			<u>Salmonella:</u> 5 carcasses once a week for 30 weeks for each species. (30 x 5 = 150 samples / species)	<u>Salmonella:</u> 5 carcasses once every 2 weeks for each species.
Small	2	<ul style="list-style-type: none"> Below 20,000 but over 7,500 cattle or horses; Below 100,000 but over 37,500 pigs or sheep or goats. (>150 or 750/week)	<u>Enteros and ACC:</u> 5 carcasses once a week for 2 weeks for each species. (5 x 2 = 10 samples / species)	<u>Enteros and ACC:</u> 5 carcasses once every 4 weeks for each species.
			<u>Salmonella:</u> 5 carcasses once every 4 weeks for each species	<u>Salmonella:</u> No reduction
	3	<ul style="list-style-type: none"> Below 7,500 but over 1,500 cattle or horses; Below 37,500 but over 7,500 pigs or sheep or goats. (>30 or 150/week)	<u>Enteros and ACC:</u> 5 carcasses once a week for 2 weeks for each species. (5 x 2 = 10 samples/ species)	<u>Enteros and ACC:</u> 5 carcasses on one day every 12 weeks for each species.
			<u>Salmonella:</u> not required	
4	<ul style="list-style-type: none"> Below 1,500 but over 500 cattle or horses; Below 7,500 but over 2,500 pigs or sheep or goats. (>10 or 50/week)	<u>Enteros and ACC:</u> 5 consecutive carcasses for each species. (5 samples/ species)	<u>Enteros and ACC:</u> 5 consecutive carcasses 1 year after last satisfactory series for each species.	
		<u>Salmonella:</u> Not required		
5	<ul style="list-style-type: none"> Below 500 cattle or Horses or 2,500 pigs, sheep or goats. (<10 or 50/week)	<u>Enteros and ACC:</u> Not required		
		<u>Salmonella:</u> Not required		

Annex 2. Sampling frequency for poultry meat carcasses

Category		Annual throughput of turkeys or broilers	Sampling frequencies (One sample is three neck skins)	
			Initial frequency	Reduced frequency if results are satisfactory
Standard	1	Over 7,500,000 (>150,000/week)	<u>Salmonella:</u> 5 samples once a week for 30 weeks for each species. (30 x 5 = 150 samples) <u>Campylobacter:</u> 5 samples once a week for 52 weeks -only for broilers- (52 x 5 = 260 samples)	<u>Salmonella:</u> 5 samples once every 2 weeks for each species. <u>Campylobacter:</u> 5 samples once every 2 weeks – only for broilers
	2	Below 7,500,000 but over 1,000,000 (>20,000/week)	<u>Salmonella:</u> 5 samples once every 4 weeks for each species. <u>Campylobacter:</u> 5 samples once a week for 52 weeks -only for broilers- (52 x 5 = 260 samples)	<u>Salmonella:</u> No reduction <u>Campylobacter:</u> 5 samples once every 2 weeks – only for broilers
Small	3	Below 1,000,000 (<20,000/week)	<u>Salmonella:</u> Not required <u>Campylobacter:</u> 5 samples once a week for 52 weeks -only for broilers- (52 x 5 = 260 samples)	<u>Salmonella:</u> Not required <u>Campylobacter:</u> 5 samples once every 2 weeks – only for broilers-

Note: in relation to small establishments, sampling criteria for *Campylobacter* are being discussed. While a decision is made FBOs are encouraged to take samples as required by the Regulations to build up data to support any potential future exemption.

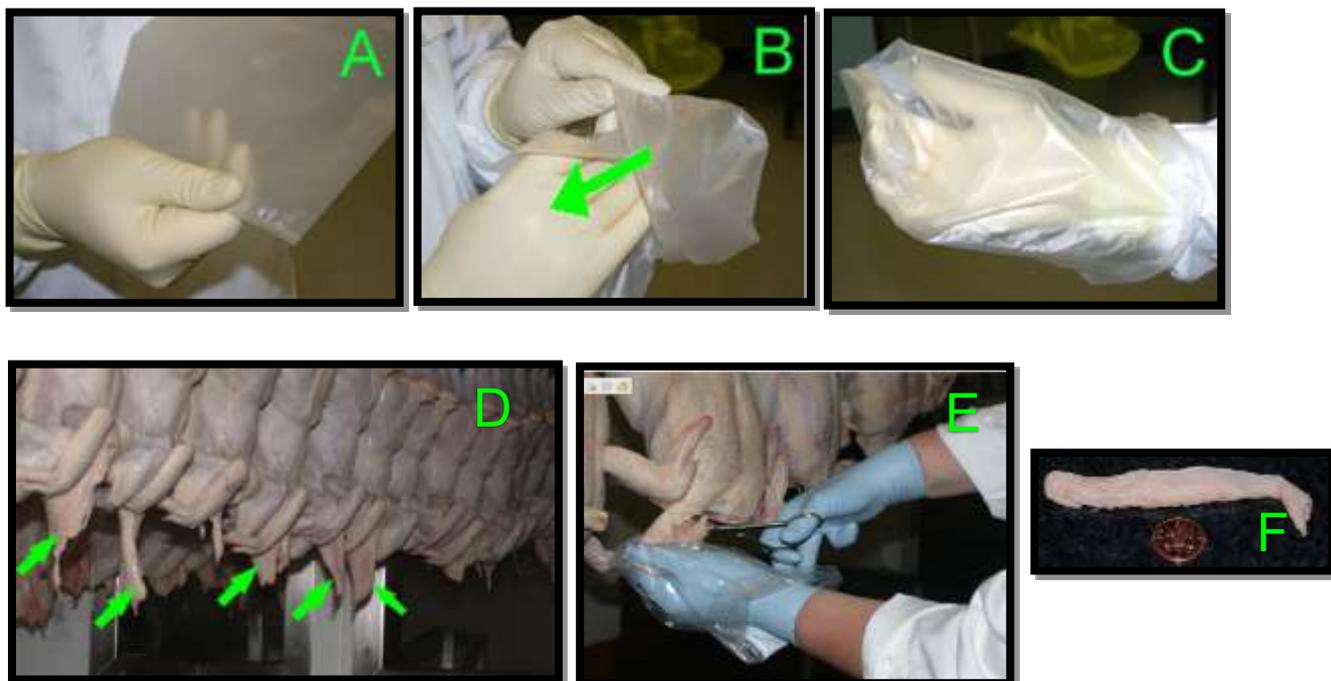
Note: For FBOs to apply a reduced frequency to the statutory microbiological sampling, they should present the evidence to support the requirements have been met; to the OV in the case of slaughterhouses or the VA in stand-alone establishments. There is no need to issue any official document for this, but the verification checks need to be captured in the FSA daybook or the audit report, respectively. Sampling should return to the default frequency when the required microbiological levels are exceeded.

Annex 3. *Campylobacter* testing requirements

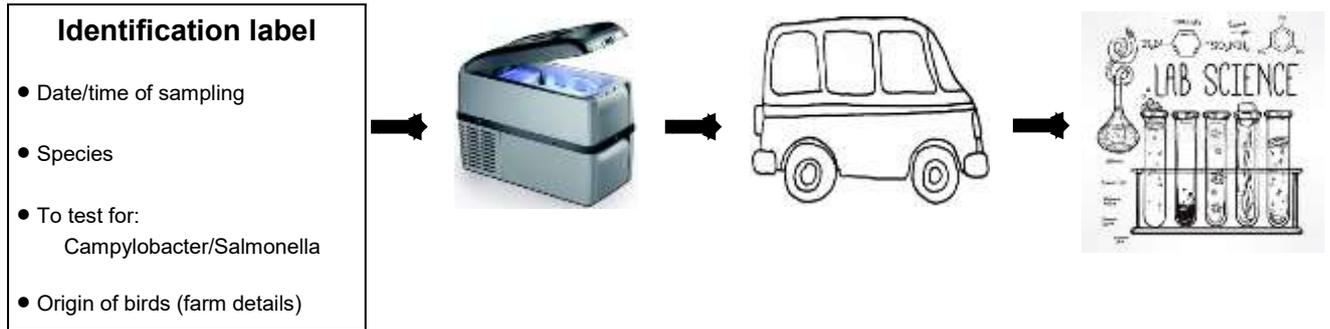
***Campylobacter* sampling in broiler carcasses under the Food Process Hygiene Criteria**

Regulation (EC) 2073/2005 (as amended)

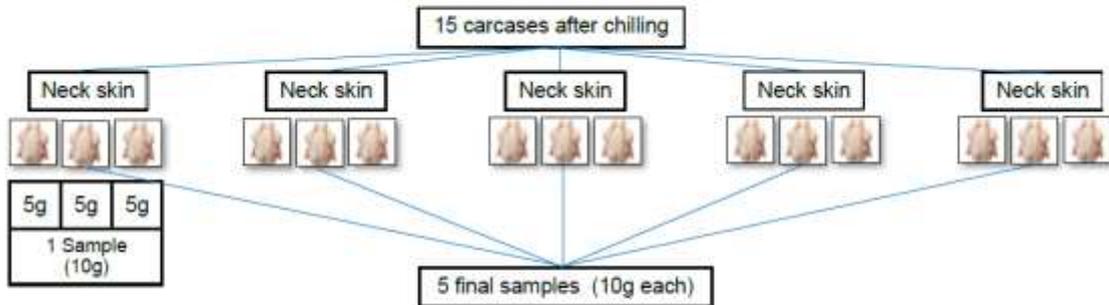
Sampling method



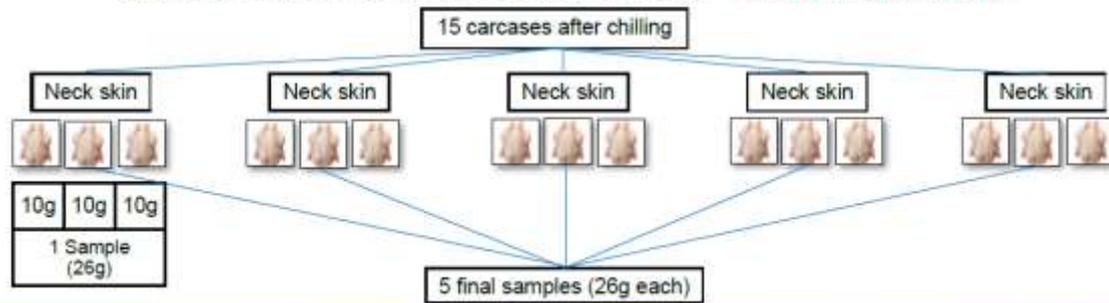
1. Put on pair of gloves then wipe the surfaces of the gloves with alcohol wipes to kill any bacteria that may be present.
2. Wipe the scissors with an alcohol wipe.
3. Grip the plastic bag at the bottom and fold back over the gloved hand. Avoid the internal surface of the bag or the scissors contacting other surfaces.
4. Grasp the neck skin through the bag and cut off the required amount (see charts on next page for sizes, numbers and handling of the samples).
5. Fold the bag back over the sample and tie to secure the neck skin samples inside.
6. Clean gloves and scissors with alcohol wipes and repeat.
7. Apply identification label to the pack.
8. Refrigerate if not transferred to the lab within 2 hours at a temperature between 1°C and 8°C (not freezing as this kills *Campylobacter*).
9. Testing to commence within 48 hours of sampling.



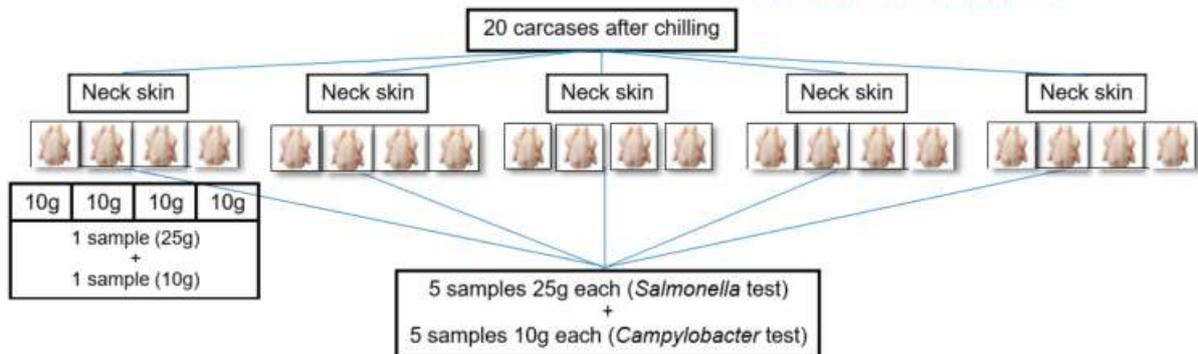
Option 1. Campylobacter testing only



Option 2. Salmonella and Campylobacter testing - in the same laboratory



Option 3. Salmonella and Campylobacter testing - in different laboratories



Result analysis and sampling frequencies

Sampling	Satisfactory results (moving windows 50 samples on 10 continuous weeks)	Sampling frequencies	
		Initial frequency	Reduced frequency <i>(if results are satisfactory. If unsatisfactory revert to initial frequency)</i>
All abattoirs	<p>From 1st January 2018 >1000cfu/g in no more of 20 out of 50 samples</p> <p>From 1st January 2020 >1000cfu/g in no more of 15 out of 50 samples</p> <p>From 1st January 2025 >1000cfu/g in no more of 10 out of 50 samples</p>	<p>Campylobacter <i>(only for broilers):</i> 5 samples once a week for 52 weeks (52 x 5 = 260 samples)</p>	<p>Campylobacter <i>(only for broilers):</i> 5 samples once every 2 weeks</p>