

SHARING GOOD PRACTICES IN SLAUGHTER HYGIENE

Version 1
29th March 2022



Reference UECBV n°20462

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I. Preface

Objective

The European slaughterhouse industry, represented by UECBV, has decided to share some of the good practices in slaughter hygiene that are currently employed effectively in some EU slaughterhouses.

This guidance document focuses on preventing and minimising contamination of fresh meat with faecal or ingesta material during slaughter by effective means.

The guidance is not intended to be comprehensive and slaughterhouse operators are not obliged to follow the advice in this guide, as there may be other means of achieving the same objective.

There will be other procedures and tools/equipment not included that may be of benefit and these should not be neglected.

The guidance may assist slaughterhouse operators to create and develop their own effective measures and practices.

It's important to emphasize that this guidance document is for inspiration and focus on practices, where the Industry decided to share experience. A guideline provides information and advice regarding an issue on how to get started, for inspiration, tools for improvement etc. This guidance document is thereby not an instructive manual, that aims at describe how everything works exactly.

These practices are dependent on primary producers presenting clean animals, or sufficiently clean animals, such that the slaughterhouse operator's food safety management system and procedures can process them hygienically so as to achieve compliance with the microbiological criteria as required by regulation (Regulation EC 2073/2005)

Legal Framework

The legal framework is the EU Hygiene rules (Regulations EC 852/2004 and 853/2004; Regulations EU 625/2017 and 627/2019), Regulation EC 2073/2005 on microbiological criteria for foodstuffs and the EU General food law Regulation (EC) 178/2002.

In addition, the European Commission guidance document on the implementation certain provisions of Regulation 853/2004 advises that it is the food business operator who is responsible to develop the means to avoid contamination of the meat so as to ensure compliance with the microbiological criteria required by EU Regulation.

The above mentioned guidance suggests that guides of good practice may be an appropriate tool to assist slaughterhouse operators to define the means to achieve this objective.

This guidance document aims to share available good practices in slaughter hygiene. It is not HACCP guide, but reference is made to the slaughterhouse operator's own HACCP based food safety management system.

This document should be used in conjunction with the slaughterhouse operator's HACCP based food safety management system.

How to use the Guide

The guide contains:

1. a general section with good practices related to the four species (pigs, bovine, ovine/caprine)
2. some species-specific sections emphasizing both preventative and corrective measures.

The intention is to provide information on the good practices both as text and images as the issues may possibly happen along the slaughter production line.

This guideline focuses on best practices from a food safety perspective, and it remains a prerequisite to comply with the existent legislation.

II. General approach

The general approach is based on contamination prevention:

PREVENTION IS BETTERTHAN CURE, MINIMISE CONTAMINATION

In slaughter establishments, faecal/ingesta contamination of carcasses is the primary means of contamination with pathogens. Pathogens may reside in faecal/ingesta material, as well as in the gastrointestinal tract and on the exterior surfaces of the animal sent for slaughter. If little attention is given to the handling and dressing procedures during slaughter and processing, the edible portions of the carcass can become contaminated with bacteria capable of causing illness in humans. The microorganisms may be spread directly or indirectly from carcass to carcass.

Therefore, it is important to prevent and minimise visible faecal or ingesta contamination on carcasses including head, tail and toes, and, if contamination occurs, to remove such contamination.

Primary producers must present clean animals, or sufficiently clean animals, such that the slaughterhouse operator's food safety management system and procedures can process them hygienically verified by the microbiological criteria required by Regulation.



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1. The Regulations require that the animals be clean

Food business operators rearing (...) animals have to take adequate measures, as appropriate, as far as possible to ensure the cleanliness of animals going to slaughter (Regulation EC 852/2004 - annex I, part A, point II.4c)

Food business operators operating slaughterhouses in which domestic ungulates are slaughtered must ensure compliance with the following requirement: Animals must be clean (Regulation EC 853/2004 – annex II, section II, point 2d; annex III, section I, chapter IV, point 4)

Ante-mortem inspection shall include verification of food business operators' compliance with their obligation to ensure that animals have a clean hide, skin or fleece, so as to avoid any unacceptable risk of contamination of the fresh meat during slaughter (Regulation EU 627/2019 – article 11.4)

The EU guidance document on the implementation of certain provisions of Regulation (EC) No 853/2004 on the hygiene of food animal origin addresses clean animals states at point 5.2:

“The requirement for animals to be clean is referred to in several parts of the new Hygiene rules:

- *Farmers must take adequate measures, as far as possible, to ensure the cleanliness of the animals going to slaughter (Annex I, Part A, point II. 4(c) of Regulation (EC) No 852/2004);*
- *Slaughterhouse operators must ensure that animals are clean (Annex III, Section I, Chapter IV, point 4 of Regulation (EC) No 853/2004);*
- *The official veterinarian is to verify compliance with the requirement to ensure that animals that have such hide, skin or fleece conditions that there is an unacceptable risk of contamination of the meat during slaughter are not slaughtered unless they are cleaned beforehand (Annex I, Section II, Chapter III, point 3 of Regulation (EC) No 854/2004)*

The background for this requirement is that there is substantial proof that unclean animals have been at the source of carcase contamination and subsequent food poisoning. Animals that are sent for slaughter must therefore be clean enough not to present an unacceptable risk for slaughter and dressing operations.

The objective of the requirement is indeed to avoid contamination of the meat during slaughter so as to ensure that the microbiological quality required by Community law is achieved.

Developing the means for reaching the objective is a task to be achieved by the food business operators concerned. There are different means of reaching the objective, including:

- *The effective cleaning of animals, or*
- *The sorting of the animals in accordance with cleanliness and developing an appropriate slaughter scheme, or*
- *Developing procedures for the hygienic dressing of animals that must protect carcasses from unnecessary contamination, or*
- *Other appropriate procedures.*

Guides to good practice may be an appropriate tool to assist slaughterhouse operators in defining these means”.

2. Bovine and Ovine

2.1. National strategy on the cleanliness of animals sent to slaughterhouse: a major challenge

These sector strategies, thought at the national level, contribute strongly to the improvement of the state of cleanliness of the animals which arrive at the slaughterhouse. The implementation of these strategies should be encouraged in countries that do not have any.

Existing cattle sector strategies have similarities; they are often based on the following main principles

- Commitment of the sector, supported by the authorities
- Animal cleanliness rating grid (photos and scoring)
- Individual and systematic recording of the animal's cleanliness
- Feedback to the producer

2.2. Preparation of animals before leaving the farm

The cleanliness of livestock that are sent to slaughter is influenced by a variety of factors including diet, housing, bedding, clipping, feeding and transport. To ensure livestock arrive clean to the slaughterhouse attention should be given to the preparation of animals before leaving the farm. The aim should be to prevent animals from becoming dirty in the first place, but some degree of cleaning may be necessary.

Every animal should be regularly inspected during finishing and before leaving the farm, and appropriate corrective actions should be taken if necessary.

The following procedures are examples of good practice during finishing of livestock. Farmers should use these and other methods to ensure that they only deliver sufficiently clean animals.

Livestock may self-clean sufficiently if moved to a suitable area with adequate bedding. Sufficient time for animals to clean up should be allowed within this area. Animals should be housed at the correct stocking density. Ideally, such conditions should exist in the usual finishing pens. Animals that are simply wet or slightly dirty may then be fit for slaughter within a day or so, but if animals are very dirty, they may require up to 3 to 4 weeks to clean up.

Consideration should be given to the finishing diet. It has been shown that animals fed on straw and water only 1-2 days prior to transport have reduced dung contamination during transport.

Farmers must achieve dry hides (fleeces) and must avoid washing finished animals before slaughter as the hide must be completely dry before the animal leaves the farm.

2.3. The slaughterhouse uses certain control measures based on the cleanliness of the animals

Measures to limit the contamination of animals during their time in the lairage

The following recommendations can contribute to limiting the contamination of animals during their time in the lairage:

- 1) Limiting waiting time in the lairage:** The arrival times of the animals are optimised to limit the waiting time.
- 2) On arrival:** Separate dirty animals.
- 3) During the lairage:** Detect and manage animals that have become dirty while waiting.
- 4) Clean (and dry) waiting areas:** Throughout the day, preference should be given to the use of unused areas (Otherwise, scrape and/or rinse off faeces-covered areas) and the removal of animals from the pen if it becomes too dirty. A dry bedding area is preferable where possible. The use of straw-bedded pens may be considered.

Slaughter of animals according to the hide cleanliness condition

The FBO must classify the animals presented for slaughter according to the hide cleanliness condition. The FBO can use the national rating grid when it exists, or may have implemented its own system

Dirty animals cannot be slaughtered; cleaning or clipping the standing animal, even dry the animal when contaminations are wet, are corrective actions that can be put in place to improve the cleanliness condition of the hide (fleece) so that the animal is clean enough for slaughter. The use of these corrective actions should not replace the collective will of the livestock sector not to send dirty animals to the slaughterhouse; it should also bear in mind that actions on live animals involve issues of animal welfare and operator's safety.

Insufficiently clean animals shall be slaughtered in accordance with control measures aiming in reducing the risk of cross-contamination. Slaughtering these animals during the same sequence facilitates the implementation of specific control measures. The food business operators have to describe in a procedure these measures and the internal controls which make it possible to guarantee their proper implementation.

Case of online clipping, after the death of the animal

Online clipping may be recommended to reduce the level of hide contamination and thus reduce the risk of contamination from the hide to the carcass at the time of hide cutting.

The food business operator sets out the procedures for the implementation and verification of effectiveness. Examples of good implementation practices are described in section IV.2.6 of this guidance.

3. Porcine

Regarding porcine, this guidance document addresses slaughtering operations using scalding, dehairing and singeing/flaming. The slaughterhouse must demonstrate that these process steps are effective in removing faecal contamination from the rind, also taking into account the different conditions of cleanliness of the animals. It is recalled that, as required by the regulation, animals must be clean enough not to present an unacceptable risk for slaughter and dressing operations.

4. Transporting animals to slaughter

Vehicles should be thoroughly cleaned and disinfected between transport loads. Stocking rates should follow recommendations and partitions should be used to prevent injuries caused by under-stocking.

It is advisable to modify the diet or withdraw food for a short time before transport to reduce faecal contamination.

Bedding on the lorry may be considered as a way of reducing the chances of animals becoming soiled during transport.



IV. DESCRIPTION OF CONTAMINATION AND GENERAL PREREQUISITES FOR ALL SPECIES



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1. Description of contamination

1.1. Faecal/ingesta contamination

Adequate line speed and lighting levels should be put in place to assist operators in identifying the contamination visible to the human eye.

Contamination should be identified on the basis of both colour and texture (visual inspection) as either faecal or ingesta.

The sensitivity of visual inspection never reaches 100%, especially for micro particles. Contamination can be missed, even by staff that is well trained and rested.

That is why prevention is better than cure to minimise contamination.

1.2. Characteristics

Livestock faeces and ingesta contamination identification chart:

	Beef		Pigs	Sheep
	Cattle	Calves		
Colour	Yellow, green, or brown	White, yellow, tan	Yellow, tan, brown, or green	Green, brown, to black
Texture	Fibrous or plant-like texture; may include grain particles depending on diet		May include identifiable grain particles or fibrous plant material	Fibrous or plant-like, faeces or ingesta may also be tarry

2. Examples of general prerequisites for all species

2.1. Operators' training

Appropriate training of slaughterhouse personnel is a major factor in achieving good carcass hygiene. The level of food safety risk associated with different operations will vary and the training should reflect the risk associated with the operation. The staff working in the lairage play a crucial role and they must also be suitably trained and supervised.

Initial training relating to good practice in general hygiene, and the necessity of its implementation to guarantee food safety are a prerequisite.

Further, training prerequisite is an explanation of the job description and any practical training that should ensure that the operators have understood their duties and their role in fulfilling meat safety requirements, so that the job will be well performed.

2.2. Job descriptions

The job description is essential because it is the basis for the training and the evaluation of personnel.

A job description for example can include the following details:

1. Detailed operating procedure

All steps should be specified in chronological order.

2. Operator hygiene

Hygiene procedures should be specified, depending on operation, species etc. and reflect the risk associated with the specific operation.

3. Recommendations in the presence of contamination

This part should explain what action is to be taken with any contamination, no matter its origin, including incidents during the operating procedure at the workstation or at a previous workstation.

All recommendations for workstations should be included in a standardised procedure for the management of contamination.

2.3. Importance of management / supervision

Management will designate a suitably qualified person to be responsible for supervising operations to ensure that operators are adhering to their job descriptions and Standing Operating Procedures (SOPs) (for example, a line manager). This person has a crucial role for the smooth running of the slaughter hall.

During slaughter operations, the designated person must ensure the implementation of working instructions and good hygiene practices, thereby preventing, and minimising any contamination.

Regular evaluations of all the steps (lairage and slaughter) and regular evaluations of cleanliness of carcasses before entering the chill can fulfil this obligation.

Relevant documented procedures should allow the prompt detection and appropriate response based on the food safety risk to any deviation from the standard.

2.4. HACCP-based system

Ownership and maintenance of the HACCP-based system should be developed by an internal team. This is a good way for the HACCP-based system to be tailored to the needs of the slaughterhouse and be understood and applied by staff.

The HACCP principles are applied according to the description in Regulation EC 852/2004, Article 5.

Objectives of HACCP based procedures in slaughterhouses are specified in Regulation EC 853/2004 annex II section II.

These procedures should mean that the necessary action is taken, with a focus on actions that not only address the problem but prevent it from reoccurring.

It is essential to point out that it is not so important whether or not process steps are called Critical Control Points (CCPs); Critical Points (CPs) or similar, as long as they are appropriately controlled by the Food Business Operator (FBO abbreviation) by applying general Hazard Analysis and Critical Control Point (HACCP abbreviation) based procedures.

Recording is as mentioned above essential for the FBO to document that the procedure has been correctly followed.

2.5. Health mark application

The FBO is responsible for preventing contamination to the extent possible. Any contamination must be removed without delay to prevent cross contamination according to the Regulation EC 853/2004.

The choice of methods used to satisfy this obligation is up to the FBO within the framework of the legislation.

The FBO must have an internal procedure of management of contamination which is relevant, and which ensures the cleanliness of the carcasses. Finishing operators are often located at the very end of the slaughter line to detect and/or remove contamination that may have occurred upstream. This location is relevant for food safety; however, it implies, in the case of contamination, that the inspection of the carcass in question is deferred and the health mark is applied after removal of the contamination by the FBO, and in the framework of a procedure agreed upon jointly by the FBO and the competent authorities (CA abbreviation). The removal of contamination after derailing does not necessarily imply a detainment of carcasses; on the contrary, an almost immediate trimming should be preferred to limit cross-contaminations.

2.6. Control Measures according to the cleanliness of the hide (fleece)

Slaughtered animals must be clean enough so as not to present an unacceptable risk for slaughter and dressing operations. The objective is to avoid contamination of the meat during slaughter and dressing so as to ensure that the required microbiological quality is achieved.

On arrival at the slaughterhouse, the slaughterhouse operator should assess and categorise the animals (bovine, ovine), as follows:

- Animals that have been assessed as being clean enough to be slaughtered using routine standard hygienic dressing procedures;
- Animals that can only be slaughtered by using extra defined appropriate controls;
- Animals unfit for slaughter as they are too dirty, particularly if wet. These animals should not be presented for ante mortem and the slaughterhouse operator must take the required remedial action.



Photo: dirty and damp fleece

Post slaughter clipping (e.g. bovines), or other post-mortem cleaning methods, can be used at the abattoir providing the operator can demonstrate that the clipping or cleaning procedure effectively controls any food safety risks that may arise. Hide clipping, both ante and post-mortem, have been shown to be an effective intervention.

On-line clipping facilitates the removal of adherent material, including faecal material, prior to the commencement of carcass dressing.

Its use, in conjunction with good hygiene practice during dressing, can contribute significantly to a reduction carcass contamination.

Taking into account on-line clipping, consideration should be given to the following points:

- The ambient air extraction systems allow air flows to be directed in such a way as to avoid dust contamination of skinned carcasses.
- The on-line clipping workstation should be positioned between the bleeding and first legging stands.

- A rise and fall stand should be provided to allow ease of access to areas of the hide that require clipping.
- On-line clippers should incorporate suction at the clipping head (or similar system) for the removal of clipped and other material.
- On-line clipping is recommended particularly for the area near the incision line, e.g. the hind quarter, including the tendon region and the midline belly, 15 cm on either side of the intended incision line, down to and including the brisket if the brisket is to be opened.

Dirtier animals particularly in a wet condition should not be slaughtered until the hide has dried, and the possibility of cross contamination is significantly reduced.

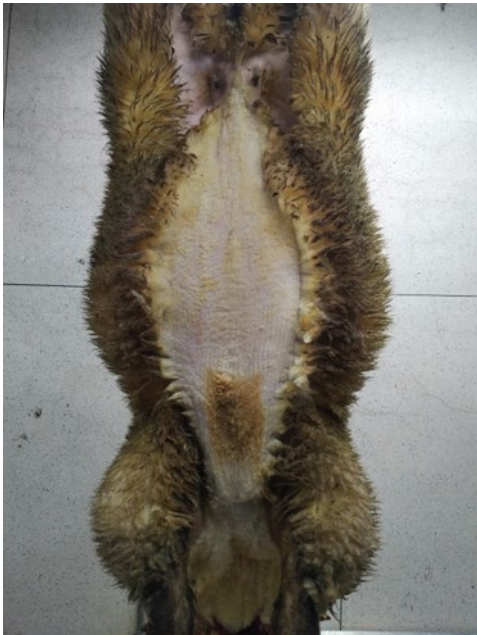


Photo: Example of midline clipping of insufficiently clean fleece

2.7 Prevention of cross-contamination from equipment

The prevention of cross-contamination from equipment and structures is an essential control measure.

The following recommendations permit to prevent cross-contamination from equipment and structures.

List small equipment that needs to be sterilised during slaughter and define sterilisation procedures for each equipment (method and frequency)

Examples of small equipment: pneumatic circular cutter, knife, saw, clip rodder, belly spreader, thoracic spreader...

Method: *“hot water supplied at not less than 82 °C, or an alternative system having an equivalent effect”* - Regulation EC 853/2004 annex III, section I, chapter II, point 3c

Frequency: also consider contaminating operations, slaughter sequence of insufficiently clean animals...

Set up hand cleaning procedures

Method: rinsing, thorough clean with soap + rinsing

Frequency: also consider contaminating operations, slaughter sequence of insufficiently clean animals...)

Identifying contact points between the skinned carcass and equipment (also consider the special case of large animals, in length or width)

AND: Avoid contact (modify the line configuration if possible; use disposable protection) **or implement measures to reduce surface contamination** (systematic use of steam vacuum system, trimming, etc).



V. SPECIFIC GOOD PRACTICES FOR BOVINE ANIMALS



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1. Photos illustrating contamination

The colour of faecal or ingesta bovine contamination is: green, yellow, or brown/black.

In general, faecal or ingesta contamination has a fibrous or plant-like texture.

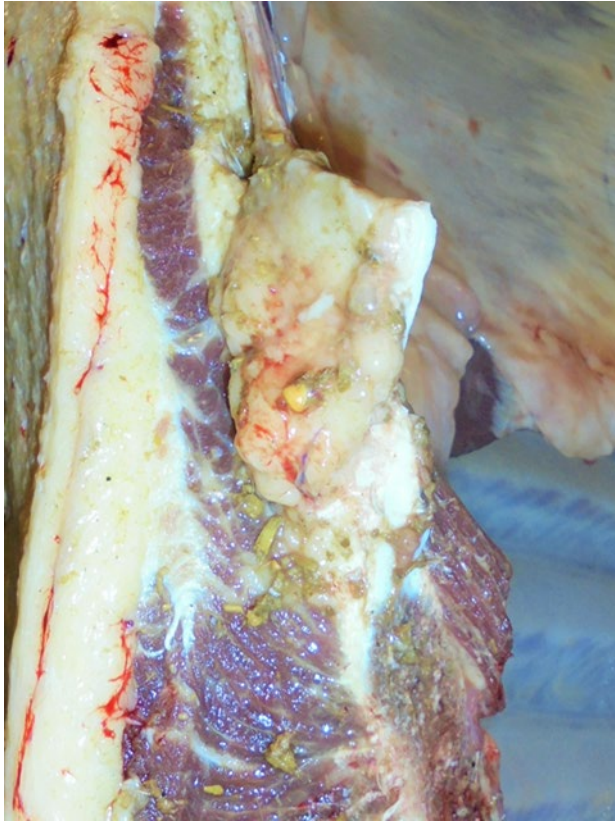


Photo: Green bovine contamination: fibrous particles and corn



Photo: yellow contamination



Photo: brown/black contamination

Contamination may be minor or major, well-defined or diffuse.



Photo: Minor contamination from the hide during pre-dehiding of the flanks

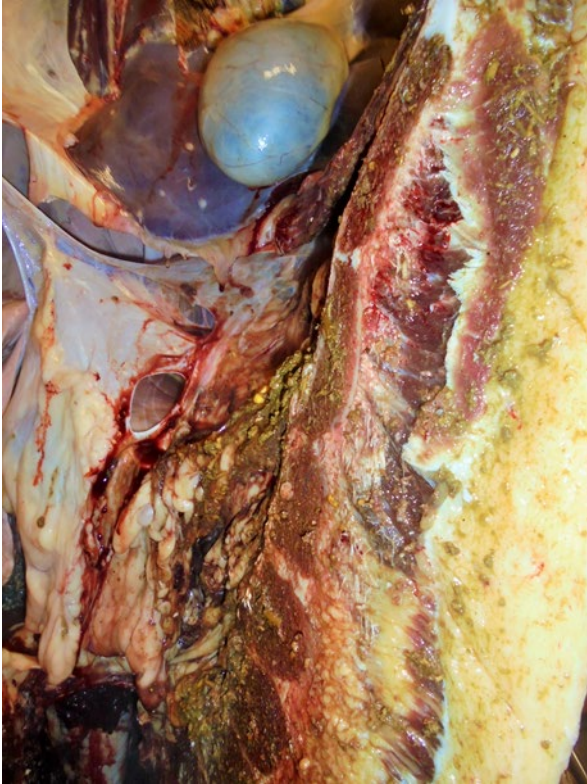


Photo: Contamination from a rupture of the stomach during evisceration (cause identified in this case: inflammatory adhesions from an abscess have glued the stomachs together)

The sources of contamination of the carcass are: the hide, the digestive tract and cross-contaminations (see IV 2.7)

This guidance addresses these 3 sources of contamination separately because prevention, management and correction measures are different.

2. Prevention and management of contamination from the digestive tract

“Measures must be taken to prevent the spillage of digestive tract content during and after evisceration”. Regulation EC 853/2004 – annex III, section I, chapter IV, point 7c

2.1. Workstations at risk on the slaughter line

Actions taken by the slaughterhouse staff working at 4 specific workstations can cause contamination from the digestive tract: “bunging of the rectum”, “brisket opening”, “weasand closure” and “evisceration”.

In this part, for each at-risk workstation, specified good slaughter practices and events which can lead to a deviation from the operating procedure are described.

2.2 Bunging of the rectum

Specific good slaughter practices

It is possible to rinse the anus in case of abundant faeces: it has not been proven that such a practice decreases cross contamination from the hide to the carcass, but it offers a better working environment to the operator.



Photo: Clean anus of a bovine animal (view from the operator “bunging of the rectum”)



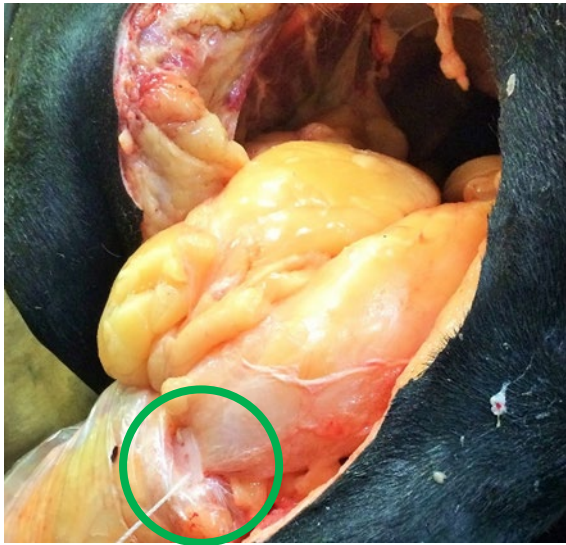
The dirty hand (with the mesh glove covered by the bag) grasps the anus and the clean hand cuts around the rectum with a knife. The cutting allows to go far enough into the pelvis to cut through the peritoneum and free the rectum from the membrane. During this operation, care must be taken not to perforate the rectum or the vagina (females).



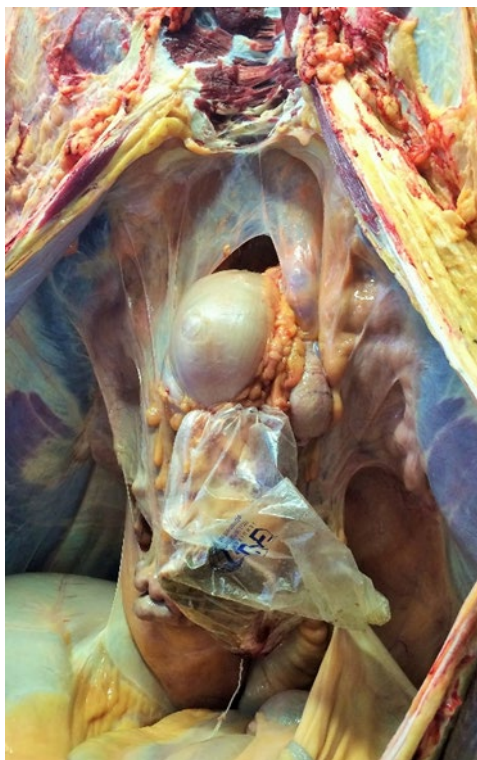
The bag is put up on the rectum as high as possible; the bag covers the urethra section of males.

Be careful, once the bag on the rectum, the outer side of the bag (clean) must not touch the hide: this side of the bag will then slide down the pelvis into the abdominal cavity.

Photo: bad practice to avoid (contact bag/hide)



The rectum bag is closed with a link to tighten



The operator pushes his arm into the pelvis as far as possible (at least to the elbow) to replace deep the rectum in the abdominal cavity (view from the operator's "abdominal evisceration")

Operating procedure (alternative)

It is possible to cut around and to bung the rectum after the skinning of the carcass. At the hide puller workstation, the operator must cut the hide between the anus and the tail when the hide descends.

Then, the operating procedure to cut around and to bung the rectum is the same as previously described.



Photo: cutting of the hide between the anus and the tail



Photo: at the hide puller workstation, the rectum is not yet cut around or bunged.



Photo: anus after the skinning of the carcass, view from the operator's "bunging of the rectum"



Photo: the "dirty" hand grips the anus and the "clean" hand cuts around the anus

Events which can lead to a deviation from the operating procedure

Cross-contamination via the bag

Cause	Contact between the hide and the bag before going inside
Presence of faecal contamination	Possible, not systematic
Type of contamination	Localised
Possible places of contamination	Rump

Knife Cut and clear perforation of the rectum

Cause	Knife cut
Presence of faecal contamination	Systematic
Type of contamination	Diffuse and extended
Possible places of contamination	Rump, abdominal cavity

Knife Cut and light perforation of the rectum

Cause	Knife cut
Presence of faecal contamination	Possible, not systematic. The bag can cover the perforation of the rectum and contain some spillage (when the bag is well back on the rectum, the bagging area covers the cropping area)
Type of contamination	Diffuse
Possible places of contamination	Rump, abdominal cavity

Removal of the bungbag during the evisceration operation

Probable causes	Bag not tied high enough over the rectum; rectum not replaced deep enough in the abdominal cavity; bag with an elastic which does not hold well; bag with a loose tie (bad handling of the operator or bag manufacture defect).
Presence of faecal contamination	Possible, not systematic. If, at the moment of the removal of the bag, the rectum is already well separated, eventual spillage can fall on the visceral mass, without contact with the carcass
Type of contamination	Diffuse
Possible places of contamination	Abdominal cavity

Sliding of the bungbag during the evisceration operation

Probable causes	Bag not tied high enough over the rectum; rectum not replaced deep enough in the abdominal cavity; bag with an elastic which does not hold well; bag with a loose tie (bad handling of the operator or bag manufacture defect).
Presence of faecal contamination	Possible, not systematic. The risk emerges if there has been a perforation and if the perforation is now uncovered: there is a risk of spillage on the carcass. The risk is less if the separated rectum falls on the visceral mass, without contact with the carcass.
Type of contamination	Diffuse
Possible places of contamination	Abdominal cavity

2.3. Weasand closure

Specific good slaughter practices - Use of a clip.



The weasand is slightly to the left of the trachea, so the operator takes it with his left hand and, with the knife in his right hand, cuts the connections between the weasand and the trachea.



The operator first uses the clip rodder to free the weasand from its connections with the trachea along its entire length, up to the diaphragm.



The clip is put in place on the extricated weasand with **the teeth downwards**. The operator uses then the clip rodder a second time to put in place the clip high on the weasand, close to the stomachs.

The correct positioning of the clip is important.

Adjusting the length of the weasand clip rodder: the clip must be pushed along the weasand up to the very end. If the pressure is manual, the operator will feel the stop against the stomachs. If the pressure is pneumatic, controls should be done at the installation, then periodically, thereafter.

The visual mark is that the clip must be close to the stomachs; this can be checked after the evisceration.



Photo: the “digestive mass” after evisceration: the clip must be close to the stomachs

If the clip is high, it means that it crossed the diaphragm; so, there will be no barrier during the evisceration; the weasand will slide and follow the descent of the stomachs.

If the clip is not high enough, it will be trapped under the diaphragm and it will prevent the weasand from sliding and following the descent of the stomachs during evisceration: there will be a tearing of the weasand and a risk of contamination.



Photo: view from the operator's "abdominal evisceration"

ZOOM



The clip is high: the weasand slides and follows the descent of the stomachs

Extra attention to be paid when a pneumatic weasand clip rodder is used: the length must not be set too high to avoid impacting the stomachs; the risk is to tear the reticulum.

Events which can lead to a deviation from the operating procedure

Extraction of the weasand during the evisceration operation	
Probable causes	Clip not raised high enough and remained under the diaphragm Clip too high and perforated the reticulum (bad adjustment of the length of the stroke of the pneumatic clip rodder)
Presence of faecal contamination	Possible, not systematic
Type of contamination	Diffuse
Possible places of contamination	Abdominal cavity, thoracic cavity

Absence of clip on the weasand during the evisceration operation	
Probable causes	Weasand cut too high and not prehensile (ritual slaughter) Weasand too dilated due to pre-slaughter feeding The clip has slipped because it has been put in the wrong direction (teeth upwards, not downwards).
Presence of faecal contamination	Possible, not systematic
Type of contamination	Diffuse
Possible places of contamination	Thoracic cavity Forelegs

Use of a plug /Operating procedure

A weasand plug system enables the sealing of the oesophagus through the animal's mouth without entering the hide cut.

The operator holds the applicator that is connected to the machine with a high tech multi hose. The machine delivers vacuum, hydraulic force and water to the applicator.

The operator places an oesophagus plug onto the applicator. By using a remote control, the operator activates the machine. The system is now inserted into the animal's mouth.

The applicator passes through the gullet pushing any accumulation of feed towards the rumen. The operator inserts the multi hose further into the carcass. The insertion is done manually in order for the operator to feel its way towards the rumen entrance and stop when this point is reached. By applying vacuum in the centre of the plug the oesophagus is instantly sucked into the plug. The plug now acts as a watertight seal, preventing any leakage from the rumen. The plug is left attached to the entrance to the stomach sealing the weasand.

The applicator automatically disconnects from the plug and sprays rinsing water into the oesophagus, just below the plug. Any remaining content is rinsed out while the applicator is retracted from the carcass. The procedure of sealing the oesophagus is now complete.

Further on the slaughter line, the operator at the evisceration workstation cuts the weasand just below the plug. As the lower part of the weasand has been rinsed beforehand, this cut can be undertaken without any adverse effects or contamination.



Photo: The operator inserts the applicator in the animal's mouth and he goes up into the weasand; the water pushes any accumulation of feed towards the rumen and rinses the weasand

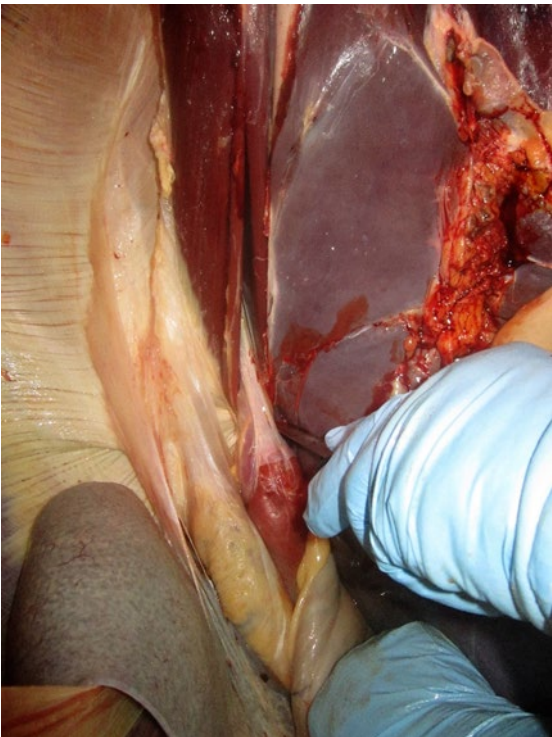


Photo: during the evisceration, the operator cuts the weasand just below the plug

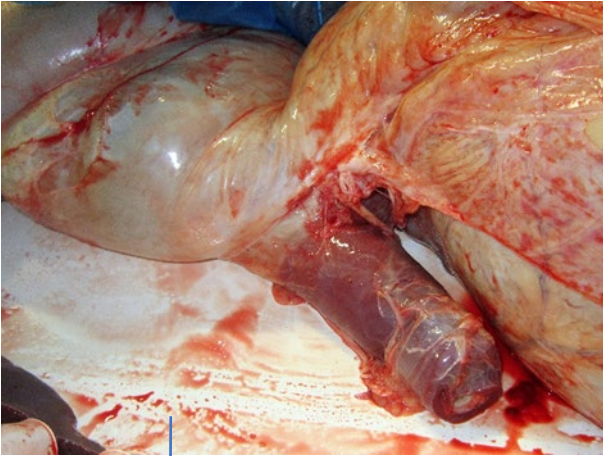


Photo: the “digestive mass” after evisceration: the plug is at the entrance of the rumen and the weasand is cut below the plug

View into the plug

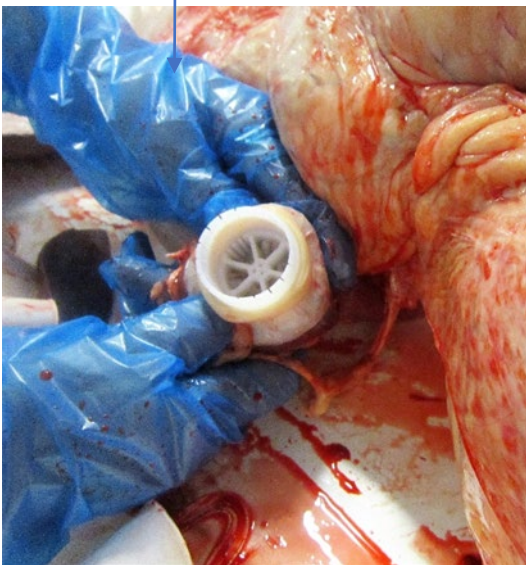


Photo: the weasand was sucked and blocked into the windows of the plug

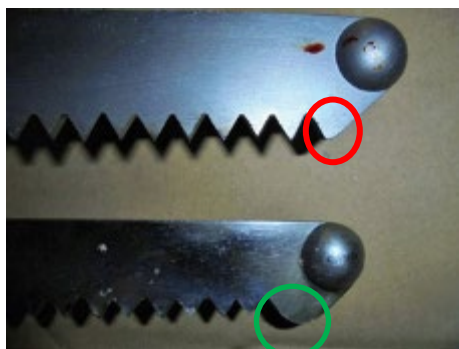
2.4. Brisket opening

Specific good slaughter practices



The operator uses the brisket opener saw respecting angle (45°C) and depth recommendations

It is advised to blunt the tip of the saw blade to avoid gripping the abomasum.



New saw blade: not blunt first teeth equipment to be modified

Used saw blade: blunt first teeth → OK

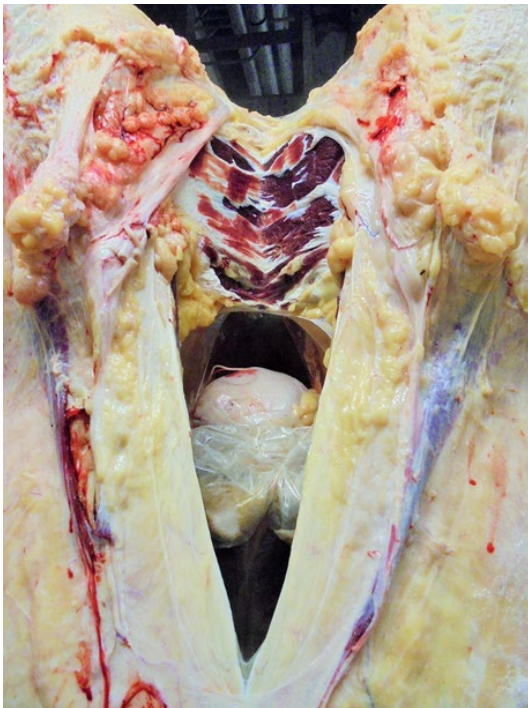
Events which can lead to a deviation from the operating procedure.

Clear perforation of abomasum with the brisket opener saw	
Probable causes	Inappropriate use of brisket opener saw (angle, depth) Not blunt first teeth Stomachs too full
Presence of faecal contamination	Systematic
Type of contamination	Diffuse and extended
Possible places of contamination	Breast Thoracic cavity

Light perforation of abomasum with the brisket opener saw	
Probable causes	Inappropriate use of brisket opener saw (angle, depth) Not blunt first teeth Stomachs too full
Presence of faecal contamination	Systematic
Type of contamination	Diffuse, but very localised
Possible places of contamination	Breast

2.5. Abdominal evisceration

Specific good slaughter practices



The operator cuts the sinews above the sacrum in the median plane and begins cutting the white line



The operator cuts the white line from top to bottom, keeping the point and edge of the knife outside the carcass



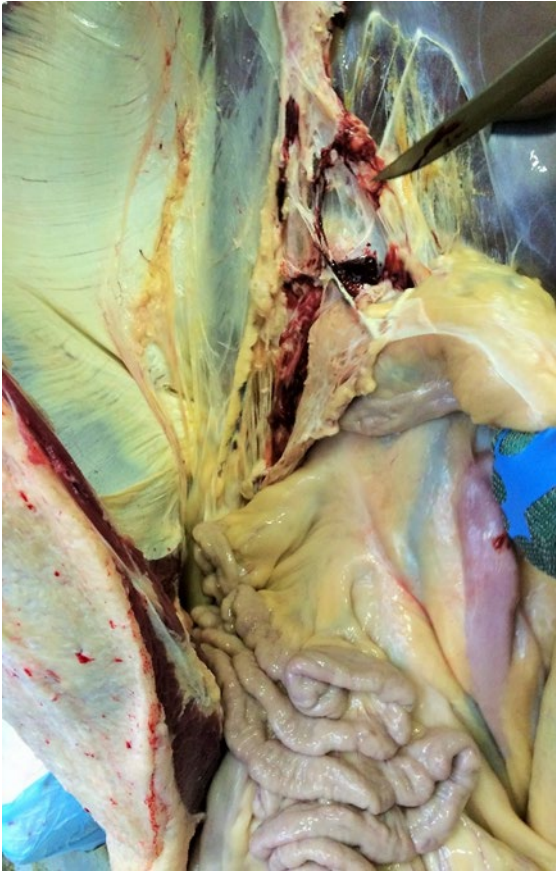
It is advised to put in place a “belly spreader” to open the abdominal cavity



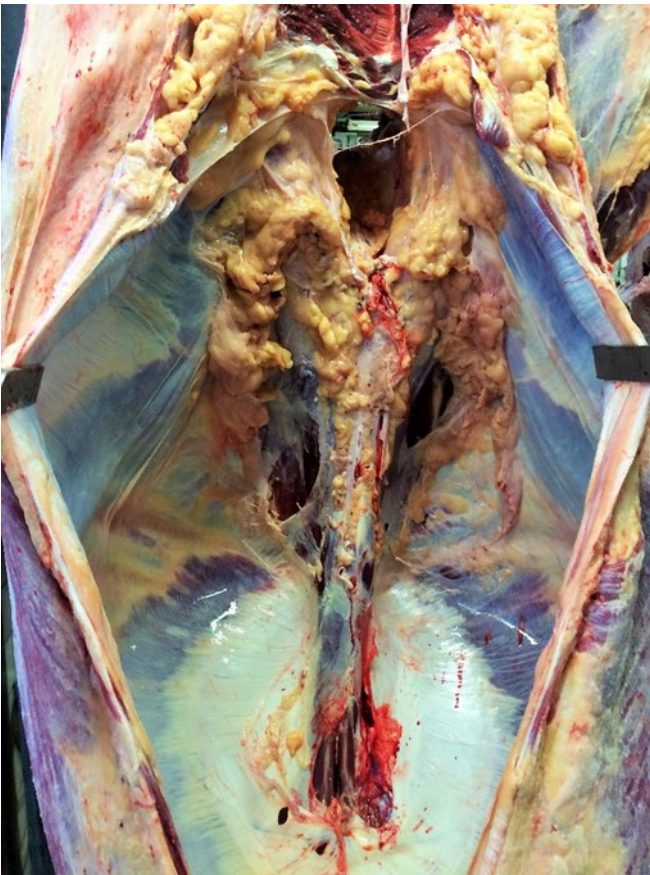
The operator extricates the colon towards himself by cutting the membranes.



The operator cuts the membranes with the peritoneum



The operator cuts the membranes with the liver and cuts into the pancreas



The abdominal cavity after abdominal evisceration (view from the operator's "abdominal evisceration")

Events which can lead to a deviation from the operating procedure

Stomachs too full are problematic

If the stomachs are full (problem of animals eating before being slaughtered), they are heavy and they fall fast. So, the operator does not have the time to accompany the descent; particularly, he does not have the time to cut the membranes at the right places and there is a serious risk of tearing the weasand, stomachs or intestines.

The presence of inflammatory adhesions, an abscess or a tumour is also problematic

In the three cases, the operating procedure is more difficult, particularly because it can be impossible to cut the membranes at the right places. So, there is a risk of contamination.

Concerning abscesses, there is an additional risk of perforation of the abscess and contamination of the carcass by pus.

Perforation des estomacs ou des intestins pendant l'éviscération	
Probable causes	Stomachs too full Presence of inflammatory adhesions, an abscess or a tumour Inappropriate actions of the operator
Presence of faecal contamination	Possible, not systematic
Type of contamination	Diffuse and extended
Possible places of contamination	Abdominal cavity Thoracic cavity Forelegs

2.6. Procedure for managing contamination from the digestive tract

Objective

The purpose of the internal procedure is to specify the methods for identifying contaminated carcasses, the methods for removing contamination and the methods for detecting deviation.

Carcass identification procedures

Distinctive signs should make it possible to identify carcasses according to “the workstation” (more specifically, according to actions taken by the slaughterhouse staff working at the workstation) applicable to origin of the contamination: “bunging of the rectum”, “brisket opening”, “weasand closure” and “evisceration”; concerning the origin of evisceration, they should make it possible to distinguish between an animal origin (full stomachs, inflammatory adhesions...) and an operator origin (inappropriate actions...).

This approach is detailed as example below, but other approaches are possible regarding the nature of the information to be collected in order to react to and correct the deviation: for example, recording the location of the contamination and not the workstation at the origin of contamination.

These physical signs can be marked with a food grade pencil (for example, a “B” means a contamination from the Brisket opening).

Operators must be trained to identify a carcass on the basis of distinctive signs, whether the contamination is their own doing or that of an upstream operator.

Trimming procedures

Contamination should be removed while hot to make the trimming easier (soft fat) and to avoid cross-contamination.

Trimming is performed with a knife or a circular cutter.

Steam-vacuum systems (Vapovac) may be used in addition to knife (circular cutter) trimming to remove contamination (see IX).

Contamination from digestive tract is diffuse and there is a risk of splashing. It is often located on concave areas. Therefore, the technical act of removal generally requires time and expertise.

Only minor contamination on flat muscle areas should be removed in real time on the line (for example: front legs, bleeding wound area).

For extended or multiple contaminations, real time corrective action (i.e. on the line) is not recommended. But a shunt system can allow immediate treatment for this type of contamination.

In all cases:

Removal of contamination may require some technical skill: concave areas, removal of pleura, removal of peritoneum, sawing of breast bones (sternum).

It is necessary to trim wider than the contaminated area as there is a risk of splashing during the evisceration accident.

Operators should be specifically trained, and regularly supervised while performing their task.

The internal procedure should specify the following elements:

“what, who, when, how” about identification and management of contamination

The sterilisation of small equipment

The cleaning of hands and forearms with soap

And, in the event of contamination on the workstation, the rinsing and decontamination (for example, with a disinfectant approved for use without rinsing in food establishments) of the workstation (with particular attention paid to the risk of splashes on the carcasses).

Spillage of bile and urine should be avoided.

Reaction procedures

Detecting a significant deviation during slaughter

The slaughter numbers of the contaminated carcasses are recorded according to the origin of the contamination. The recording of this information over time will enable the operator, who records the information, to detect any significant deviation in slaughter hygiene and to alert the supervisor.

For this purpose, the internal procedure must set the alert thresholds. For example, two “rectum” accidents in half a day require that corrective actions be put in place without delay because, in a controlled slaughter process, these accidents are considered uncommon. On the contrary, several “evisceration” accidents due to an “animal” cause would not require an alert (too full stomachs, inflammatory adhesions etc....).

The following table is an example of record:

	Rectum*	Weasand*	Brisket*	Evisceration	
				Operator*	Animal*
Operator name**					
Carcass number					
Percentage/total number of slaughtered animals					

The record should be completed by an operator at the end of the line who has the ability to write down (example: the operator of the tax weighing).

* Each contamination origin is identified by a physical distinguishing sign on the carcass.

** Information is collected to help analyse the causes if necessary (operator new on a workstation for example).

Detecting deviation over time

In an ideal slaughter, no “evisceration incident” (in the broadest sense of the term) should happen. In reality, “evisceration incidents” happen; the objective is, therefore, to implement the best prevention. It is necessary to monitor and, to the extent possible, prevent accidents, no matter the type of contamination.

Each slaughterhouse should define a target range for the percentage of carcasses with contaminations from the digestive tract. The target range, set for one day of slaughter, is specific to each slaughterhouse, in particular because the type of animals slaughtered has an influence. In any case, the slaughterhouse must be committed to continuous improvement and the range must be as low as possible.

As described previously, significant deviations in slaughter hygiene must be detected in real time (alert thresholds).

In addition, the target range, set for one day of slaughter, will help the slaughterhouse detect moderate deviation in the hygiene of the day’s slaughter. It can also help the slaughterhouse detect deviation over time by using a mobile average on a rolling window.

Above this target range, actions should be taken on controllable factors (training of operators, equipment...).

Below this range, slaughter hygiene may be improved but, when contamination levels are very low, a failure to identify evisceration accidents may also be suspected.

Analysis situation and implementation of the necessary actions

The record allows identifying the “problematic workstation”. Events which can lead to contamination at the slaughter step (previously described in this guidance) are then reviewed, the problematic event is identified, and the appropriate corrective measure is put in place.

The cause of a moderate one-off deviation is not always identifiable. It is therefore important to record useful information on the day's slaughter (type of animals...) to assist in the analysis of causes if the deviation were to be repeated.

The involvement of the supervisor is crucial to react in real time if necessary. It is also crucial to analyse the situation after each slaughter: assessment of the percentage of “evisceration accidents” in relation to the origin of contamination and implementation of actions if necessary, as part of a continuous improvement approach.

3. Prevention and management of contamination from the hide

The control of hide removal is one of the major challenge in slaughtering to ensure food safety. The hide is considered the one of main source of contamination of the carcass and dressing operations are essential steps in controlling the microbiological quality of the carcass.

“During the removal of hides and fleece, contact between the outside of the skin and the carcass must be prevented”. Regulation EC 853/2004 – annex III, section I, chapter IV, point 7bi

3.1. Specific good hygiene practices

At-risk workstations

The parts of the carcass particularly exposed to hide contamination are the cutting lines (hind shanks, front shanks, abdomen, flank, head/neck area) and the areas where, during the skinning process, the hide can turn over and touch the carcass.

At-risk workstations are:

- Skinning of the first hind shank
- Skinning of the second hind shank
- Transfer
- Skinning of flanks
- Hide puller workstation (a downward puller is preferable to an upward one to limit the contamination of the carcass).

The risk lies in the contact between the hide and the carcass.

Specific good hygiene practices

Specialisation of hands

A “dirty” hand which grips the hide, a “clean” hand which holds the knife or the pneumatic circular cutter.

Careful to keep the clean hand clean because it often enters in contact with the carcass when using the pneumatic circular cutter.

When changing hand specialisation (e.g. flank skinning or gripping transfer hooks), hands must be washed thoroughly.

Use of utensils

The use must respect the two-knife technique: a “dirty” knife to cut, a “clean” knife (or a pneumatic circular cutter) to free the hide.



The knife is used to cut the hide, with the point and edge of the knife outside the carcass. A scraper can be used prior to cutting when there is wet contamination or spillage on the cutting lines.



The pneumatic circular cutter is preferably used to cut membranes between the internal (=clean) side of the hide and carcass.



It is preferable to use a pneumatic circular cutter rather than a knife to accompany the descent of the hide at the hide puller workstation (the use of a pneumatic circular cutter reduces the intervention during the dressing procedure).

Clean outward opening of the hide

During pre-skinning operations, the hide must be sufficiently open to avoid its falling back on the carcass. Then the mechanised hide puller chains must be put in place with care to avoid contact of the hide with the carcass.

When the hide puller operates from top to bottom, the height of the rail must be sufficient to allow the front parts to be skinned without human intervention.



It is necessary to sufficiently open the hide to avoid its falling back on the carcass.

Management of neighbouring carcasses

Care must be taken when carcasses are close to each other, particularly in the buffer zone before the transfer workstation: contact between a skinned part and a not-skinned part must be avoided.

Cut of metacarpus

If the metacarpus is cut before being skinned, it is advised to dislocate the carpus when the carcass is skinned in order to clean up the section.



Photo: contaminated section of the metacarpus because it was cut before being skinned

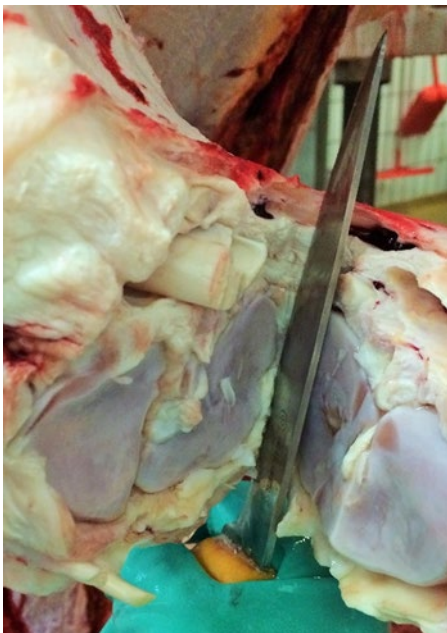


Photo: dislocation of the carpus



Photo: clean section of the carpus

Cut of metatarsus

The cut must be performed on a skinned shank.



Photo: cut of the metatarsus on a skinned shank

Cut of ears

If the traceability system allows it, the best practice is to cut the ears no later than at the hide puller workstation.

If the ears remain on the carcass and are removed further along the slaughter line, it is advised to slow down the hide puller at the end to avoid cross-contamination between the ears and the neck, and then to bag them. The bag should be placed high, and the elastic should allow it to remain so until the ears are removed.

Skinning of the tail

The longitudinal incision must be made along the tail up to the very end to ensure complete skinning.

Corrective action should be taken immediately in case of incomplete skinning to avoid contamination of the carcass (back). The tail tuft should be removed before the hide puller is used.



Photo: the tail must be skinned over its entire length in order to avoid contaminating the carcass

Removal of the head

The mouth is a contaminated area.

Particular attention should be paid to the risk of cross-contamination between the oral cavity and the carcass via the operator's hands.

3.2. Procedure for managing contamination from the hide

Objective

The objective of the internal procedure is to specify the methods of detection and trimming of contamination from the hide; it must also specify the means of communication put in place internally to detect any deviation during the slaughtering process and to take rapid corrective action.

Detection methods

An effective strategy is the systematic visual control of all parts of the carcass by the finishing operators. For this purpose, a carcass map should allow the finishing operators to be allocated the parts of the carcass to be systematically checked.

Selection criteria for the finishing operators could be:

- Available time to observe and trim, if necessary
- Preferably, after the split of the carcass into two parts, for the operator to be able to look all around the carcass;
- Preferably, a circular cutter is available, as this tool allows for easily trimming at the surface, without excavating in depth.

Example: visual control assigned to two operators

Finishing operator 1:

Checking of each half-carcass, interior and exterior, above the level of the shoulder

Finishing operator 2:

Checking of each half-carcass, interior and exterior, below the level of the shoulder



Trimming procedures

Contamination must be removed while hot. Indeed, immediate trimming is much easier technically (soft fat) and avoids cross-contamination.

Contamination from hide is contact contamination, i.e. localised and circumscribed. There is no splashing. Moreover, contamination from hide is located on the outside of the carcass, on flat or convex areas, so the technical procedure is easier. On-line removal is appropriate and desirable.

Consequently, when trimming has not been performed upstream on the line, finishing operators must trim the contamination they detect as they carry out their visual inspection.

The slaughterhouse must foresee the case where the finishing operator does not have the time to finish his visual control and/or the removal of contamination (equipment problems, extensive or multiple contamination, etc.): stop of the slaughter line or derailing of the carcass.

Knife trimming is the standard method of treating localised contamination. However, the circular cutter is a particularly suitable tool as it allows trimming without digging and without damaging the muscle.

Steam-vacuum systems may be used in addition to knife (circular cutter) trimming to remove contamination (see IX). They can also be used as a replacement for knife (circular cutter) trimming to remove minor contamination under strict conditions (see IX).

Surface flaming can be a tool, used additionally, to reduce surface contamination locally. In this case, the methods of use are detailed, and the effectiveness of the system has been demonstrated (initial qualification, then regular checks).

Reaction/communication procedures

The finishing operators must alert the supervisor when there is a deviation, i.e. when the same area of the carcass is contaminated on several carcasses to follow. In this case, one can indeed suspect a bad gesture of the upstream operator that should be corrected.

Checking whether the work instructions have been respected

The most effective action for the management of contamination from hide remains a systematic visual control of the entire carcass, coupled with immediate trimming. It is recommended that the supervisor carries out regular checks on the cleanliness of the carcasses: he stands at the very end of the line and checks for the absence of contamination. In the presence of contamination, he takes immediate corrective action on the product (trimming) and on the process (reminding operators of instructions). These controls should be recorded.

These controls on the cleanliness of the carcasses attest to the proper implementation of the work instructions and are an essential guarantee of proper management of contamination from hide.

4. Additional records as part of the implementation of good practices (example)

4.1. Recording of actions by the supervisor during the slaughter

The supervisor is responsible for the smooth running of the slaughter. He must intervene when needed and provide proof of his daily actions based also on what is prescribed in the internal procedures.

That is why it is advised to add another field at the bottom of the daily record proposed previously in this document. The objective would be to centralise, in one document, all the important events of the day (to limit paperwork).

Via this field, the supervisor could record everything that has impacted the slaughter (breakdown, bad performing operator or defective equipment, repeated contamination from the hide, etc....) and could specify what corrective actions have been put in place.

An example of the daily record could be:

Date of slaughter	
Number of slaughtered animals	

Identification of carcasses with contaminations from the digestive tract					
	Rectum	Weasand	Brisket	Evisceration	
				Operator	Animal
Operator name					
Carcass number					
Percentage/total number of slaughtered animals					

Comments

4.2. Checking that work instructions have been respected.

For a lot of slaughter steps, good practices are pointed out to justify the control of dangers; the record here after allows for the justification of the proper implementation of good practices.

The slaughterhouse identifies the work instructions/good hygiene practices for each workstation that are essential for food safety.

All workstations should be reviewed, not only the workstations at risk for contamination from the hide or the digestive tract. Process steps in lairage areas must be covered.

Sterilisation of small equipment (knives, saws) during slaughter is an essential good practice that should be checked in the same way as other good hygiene practices.

This results in a record for the verification of essential items (idea of order of quantity: 3-4 items per workstation).

The verification should be carried out by the supervisor or by a trained person, at a frequency defined by the slaughterhouse.

The record should also foresee the check of absence of contamination on a percentage of carcasses before entering the chiller. In the presence of contamination, corrective action is taken on the product (trimming) and on the process (reminding operators of instructions).

These controls must be recorded to attest the proper implementation of the work instructions and the cleanliness of the carcasses.

An example of record could be:

Checking that the work instructions have ben respected				
Date(s)				
Workstations	Name of operator	Items	Conform	Non conform = Immediate corrective action
Workstation 1		1		
		2		
		3		
Workstation 2 (...)		1		
		2		
		3		
Cleanliness of carcasses		N°1		
		N°2		
			



VI. SPECIFIC GOOD PRACTICES FOR OVINE ANIMALS



1. Photos picturing contamination	p53
2. Prevention of contamination from the fleece	p54
3. Prevention of contamination from the digestive tract	p58
4. Management of contamination	p59

1. Picturing contamination

The colour of ovine faecal contamination is generally brown/black and may be tarry in texture.



Photo: brown/black faecal contamination

The colour of ovine ingesta contamination is generally green/brown and may be looser in texture.



Photo: Intestinal content contamination

The sources of contamination of the carcass are: the fleece, the digestive tract and cross-contaminations (see IV 2.7).

This guidance addresses these 3 sources of contamination separately because prevention, management and correction measures are different.

2. Prevention of contamination from the fleece

There are many different methods of fleece removal.

But fleece removal can be considered as a two-stage operation, first working with knives to split the pelt and remove from extremities, followed by mechanical pulling away from the carcass.

The next section provides a non-exhaustive list of examples of good practices. The examples displayed below are not necessarily in chronological order.

Good hygiene practices common to all workstations of fleece removal

Procedures must prevent contact between the outside of the skin and the carcass.

Operators and equipment that have come into contact with the outer surface of fleece must not touch the carcass.

Specialisation/assignment of hands: a “dirty” hand, which holds and grips the fleece, and a “clean” hand, which holds the inner face of the fleece and/or the carcass. The hand that touches the fleece should never touch the carcass without washing first. The operators situated on the workstations at risk must be careful to keep the clean hand clean.

Mechanical methods (e.g. crocodile clips and papers) may be used to reduce the risk of the carcass being contaminated from the in-rolling of the fleece during its removal.

After the initial cut through the skin, a second clean knife should be used for further skinning.

Whenever the knife cuts through the skin, there is a risk of contamination from the fleece to the carcass. To minimise contamination, all fleece cuts should be “in out” or spear cut, where the blade cuts from the inside of the fleece away from carcass to ensure that the fleece does not touch the carcass, with the exceptions of the initial opening at the hock. Spear cutting is generally considered as superior to incising from the outside.

The fleece must never touch the exposed carcass and the operator must never touch the carcass with a hand that has touched the fleece.

Any contamination that occurs at a workstation should be removed by the operator at that station, by trimming or alternative means having an equivalent effect.

Specific good hygiene practices for head removal/tail docking

The head may be removed before or after fleece removal. Heads can be partially removed by using a sterilised ‘head chopper’. Complete head removal is carried out using sterilised two-knives systems.

Tail is removed using sterilised two-knives systems.

Specific good hygiene practices for leg/feet removal

Leg removal before fleece removal should be considered as a dirty cut. Once the fleece is removed, a second clean cut should be carried out.

Specific good hygiene practices for insufflation

If air or gas is used as an aid to facilitate fleece removal, the process needs to be carried out hygienically.

This should consider preventing contamination at the injection site, sanitising needles to prevent contamination between carcasses, the type of gas, which must either be food grade or filtered compressed air.

If air is used, it should not be drawn directly from the abattoir environment.

Specific good hygiene practices for legging/cutting of carpus/tarsus

In this procedure, the operator holds the leg with one, dirty hand and with the clean hand and/or knife he separates the skin from the carcass.

This cut must be performed with the edge of the knife turned away from the carcass.

The operator should be aware all the time whether his hands are clean or not, and when it is necessary to wash them before touching the clean surface of the carcass. In many cases, the operator could need to touch clean and dirty surfaces of the carcass with the same hand, and then he would need to wash hands very often.

Specific good hygiene practices for skin cutting along the midline

This cut must be performed with the edge of the knife away from the carcass.



Photo: the cut must be performed with the blade of the knife turned away from the carcass

Specific good hygiene practices for Y cut/patching

The operator removes a patch of fleece from the sternum using a sterilised two knives system.

Using a different blunt knife located at the incision of either side of the brisket, the operator grips the fleece and applies downward pressure in order to remove a 'patch' of fleece.

The operator using a clean sterilised knife from the two-knives system makes an upward incision in order to remove a piece of fleece from the right foreleg.

Using a different sterilised knife, the operator repeats the procedure for the left foreleg.

Specific good hygiene practices for breast roll

The operator using a clean sterilised knife from the two-knives system makes an opening incision down the neck area. Using a different sterilised knife, the operator joins the incision at the leg opening with the incision made in the neck area using an 'in to out' action.

The fleece is worked away from the carcass avoiding cross-contamination. The operator places blue greaseproof paper along the shoulder fleece junction on the right-hand side, neck fleece junction of the right-hand side and the neck fleece junction of the left-hand side and the shoulder fleece junction of the left-hand side.



Photo: Mechanical rollers can roll the breast pack hygienically

Specific good hygiene practices for fleece punching

The operator partially removes the fleece from the carcass.

The operator uses a pneumatic flanker in downward movement to remove the skin from either side of the carcass.

Greaseproof paper may be placed between the carcass and the skin to prevent any contamination.

Specific good hygiene practices for pelt puller

The operator removes the fleece from the back of the carcass using an automatic shoulder puller.

Greaseproof paper may be applied to the flank regions in order to minimise contamination from any in-rolling of the fleece.

The operator places the fleece from the shoulder area into the jaws of the machine which is then activated by the operator.

The shoulder puller moves backwards removing the fleece from the back of the carcass.

Specific good hygiene practices for manual punching

During manual punching, one hand grips the skin while the other fist is used to punch and separate the fleece from the carcass.

It is important that operators are provided with sufficient time and hand-wash facilities to clean their hands and arms between carcasses.

In case the fleece removal of a carcass is done by only one operator, the operator needs to wash hands when the hand gripping the fleece on one side of the carcass is then used to 'punch' the other side.

The use of a cut resistant glove, covered by a latex glove, should be considered for operators involved in punching.

3. Prevention of contamination from the digestive tract

The risk of contamination from the digestive tract may be reduced by rodding and/or bunging.

Specific good hygiene practices weasand closure/rodding

The oesophagus/weasand can be sealed by mechanical methods, such as tying, elastic/rubber rings, plastic clips or starch cones.

Rodding is usually carried out before fleece removal to prevent the escape of ruminal fluid or contents, which would contaminate the tissues of the head and neck.

Alternatively, this may be carried out after hide/fleece removal to minimise contamination of the throat.

Brisket cut

Brisket sawing generally performed on adult sheep only.

Specific good hygiene practices for bunging

For sheep, the rectum can be:

- Bunged with a plastic bag and elastic band;
- Milked/not milked and the anus closed with a cone;
- Milked and tied;
- Milked and clipped;

The practice of milking, stretching and cutting the rectum requires vigilance to avoid contamination of the carcass by the mucosal side of the rectum or by faeces.

In any case, whatever the method chosen, it must be very controlled (in particular by calling on the most skilled operators). The FBO has an obligation of performance.

Specific good hygiene practices for removal of green offal

The anus is drooped into the body cavity.

The body cavity is opened to facilitate total withdrawal of rumen and intestines.



The operator first cuts and opens the white line from top to bottom, putting the finger of the left hand inside the abdominal cavity, protecting the digestive organs from the knife. It is advisable to wear a knife-proof glove on the hand that does not hold the knife.

The operator then extricates the colon towards himself, by cutting the membranes, and releases the digestive mass.



It is important to accompany the descent with one hand to avoid tearing

At the same workstation it is possible to open the brisket and remove heart, lungs and thymus.

4. Management of contamination

Contamination comes mainly from the fleece and ovine carcasses are contaminated in a general way.

That is why the management of contamination should be based on a systematic visual control, an immediate detection of contamination and an immediate trimming.

The systematic visual control could be focused on the most common places for contamination.

A second-level control can be put in place according to a frequency defined by the slaughterhouse: the supervisor stands at the very end of the line and checks for the absence of contamination. In the presence of contamination, corrective action is taken on the product (trimming) and on the process (reminding operators of instructions). These controls should be recorded.



VII. SPECIFIC GOOD PRACTICES FOR PORCINE ANIMALS



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3.2 Causes and action taken	

1. Introduction

In Europe, dehiding is rare when slaughtering pigs; therefore, the following only addresses slaughtering employing scalding, dehairing and singeing/flaming.

Practices regarding how operations are carried out and the degree of automation vary a lot between slaughterhouses. Therefore, the descriptions below are on an overall level, and it is important that each establishment evaluates the risks associated with the specific setup.

2. Specific pre-requisites and Standard Operating Procedures (SOPs)

2.1 Description of contamination

The colour of faecal or ingesta contamination is grey/tan to dark brown.

In general, faecal or ingesta contamination has a fibrous or plant-like texture.

Swine faeces and ingesta may include identifiable grain particles.

2.2. Pre-requisites

Carcasses should be without visible faecal contamination after the processes in the unclean area (scalding, dehairing, singeing/flaming and polishing).

This is possible to achieve by controlling the physical parameters associated with the processes in the unclean area.

It is important that each establishment verifies the effect of processes in the dirty area as one whole process, since the specific operations will vary between establishments and the overall effect will depend on the interaction between the specific processes.

The effectiveness verification should take account of the different conditions of cleanliness of the animals.

A monitoring system should be in place giving the management detailed knowledge about how often faecal contamination occurs and how efficiently it is removed. Furthermore, the results from the monitoring system should be used to define acceptable limits regarding the frequency of faecal contamination. The FBO should be involved in a continuous improvement process to reduce levels to the extent possible.

2.3. SOPs

The nature and number of SOPs will highly depend on the size of the operation and to which degree it has been automated. Regarding the dirty area, SOPs must deal with how bristles/hair and dirt are efficiently removed without unnecessary contamination of the rind.

Regarding manual operations, SOPs should deal with how faecal contamination is removed and how the processes are brought back into control in the cases where the frequency of faecal contamination is unacceptably high. Furthermore, it must be clear who inspects the carcasses, and who has the responsibility to react if faecal contamination is out of control.

In those cases where contamination is unavoidable, e.g. adherent intestines, a procedure should be in place to prevent cross-contamination to other carcasses.

If critical operations are automated, SOPs should also deal with the maintenance and supervision of equipment during operations.

Automatic equipment is characterised by carrying out operations in a uniform way. If equipment fails, it can be expected that a high frequency of the carcasses passing the equipment will be affected. Therefore, the function of automatic equipment should be supervised, and it should be clear who has the responsibility to deal with malfunctions.

3. Risk events

The risk events on the clean line are bunging, midline opening and evisceration.

3.1. Bunging, midline opening and evisceration

Bunging

The rectum can be loosened from the surrounding tissue manually using a common knife, manually using special tools consisting of a circular knife with a vacuum system attached to it (bung dropper), and automatically.

A very efficient way to prevent visible faecal contamination is to prevent the bung (rectum) from touching the carcass, until it is wrapped in a bag (or until the intestines have been removed). In those cases where the operation is carried out automatically, the bung can be positioned in a rail until an operator can wrap the bung in a bag.

Midline opening and evisceration

The midline opening is to be made with great care in order to avoid puncture of the guts. When removing the stomach and intestines, 2 cm of the oesophagus should be left on the stomach to minimise the spilling of the stomach content.



3.2. Causes and action taken

When faecal contamination occurs, necessary actions should be taken to prevent contamination from spreading to other carcasses until contamination has been removed.

The nature of the actions will depend on the setup (degree of automation, space along the slaughter line etc.), the line speed and the actual contamination (size and distribution). Some slaughterhouses will be able to remove some or all contaminations on the slaughter line, some will have to rail some or all the carcasses off the slaughter line. The aim is to remove contamination in an effective and hygienic way.

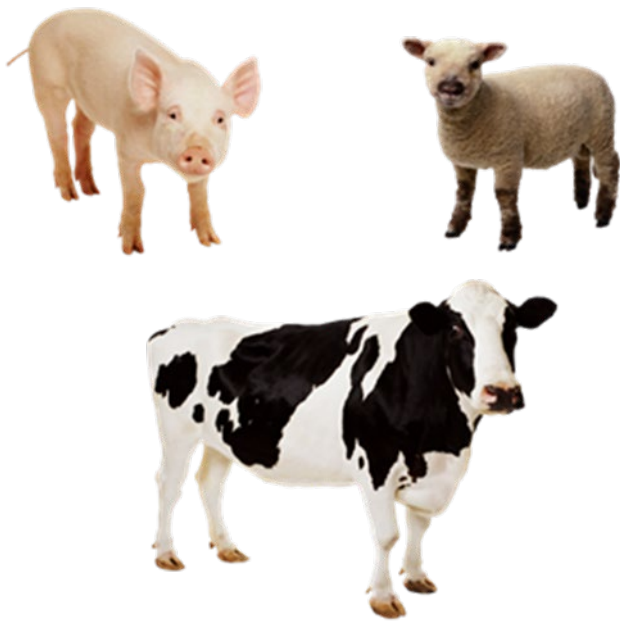


Contaminations can be removed either with a knife or by the use of steam vacuum systems (*see IX.3 special use of steam vacuum to remove visual contamination*).

Studies have shown that steam vacuum systems can be equal to or better than trimming measured on the numbers of *E. coli* left after removal of faecal contaminations. Layout of steam vacuum systems differs between suppliers. And, as the effect depends both on the layout and on the operating conditions (treatment time, type/power of vacuum pump, amount/pressure of steam), the effect under the operation conditions used should be verified by the user or the supplier (see section IX on additional hygiene tools). Furthermore, care must be taken to avoid irreversible colour changes on the treated areas.

If the frequency of contaminated carcasses is above the acceptable (frequency to be defined by the slaughterhouse), actions should be taken to find the cause and correct it. An example could be an increased frequency of contaminated carcasses, where the contaminations are on the cutline above the sternum, which is found to be due to an operator not being sufficiently trained. In that case, a corrective action would consist in retraining the operator.

The FBO should be involved in a continuous improvement process to reduce levels to the extent possible.



VIII. TRACKS AND TRENDS



1. Introduction	p67
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4. Trend analysis (assessing deviations and verification based on statistical approach)	p69

1. Introduction

Track and trending are tools that can be used to assess whether the frequency of faecal and ingesta contamination is under control.

These tools support a system-based approach. Such tools can also be used in collaboration and regular communication between FBO and the Competent Authority, and raise awareness of contamination levels over time.

2. Recording

Where records of contaminations are used for control purposes by the slaughterhouse, it is important that there is a standardised recording of contaminations based on the definitions given in this Guide. (colour and texture).

Visual inspection is recorded manually or electronically along the slaughter line, where it is most practical. Recording can be performed as a 100% recording or by collecting representative samples to calculate the prevalence of contamination.

In case a selected sample size is used, this must be verified and validated when the system is operating. Furthermore, each individual slaughterhouse must assess and, based on the assessment, possibly, verify and / or validate the sample size in connection with changes, own findings and / or authority findings and in connection with the implementation of corrective actions. This must be documented. If the sample size is changed, it must be explained in writing that the new sample size in combination with prerequisite programs with sufficient certainty prevent the occurrence of faecal contamination. The background to the sample size can be e.g. historical data, legislation, statistical calculation.

3. Baseline

A baseline consists of recordings of faecal/ingesta contaminations in a defined time period. A baseline is a useful tool for monitoring slaughter hygiene. In particular, it allows the detection of drift over time and the verification of the effectiveness of corrective actions.

When using interventions to reduce and minimise the faecal/ingesta contamination, it will be useful to know the level of contaminations before the interventions are implemented or to know the level, for example, at the post-mortem inspection.

This is where a baseline can be useful. A baseline can be used as a standard against which all subsequent changes are measured.

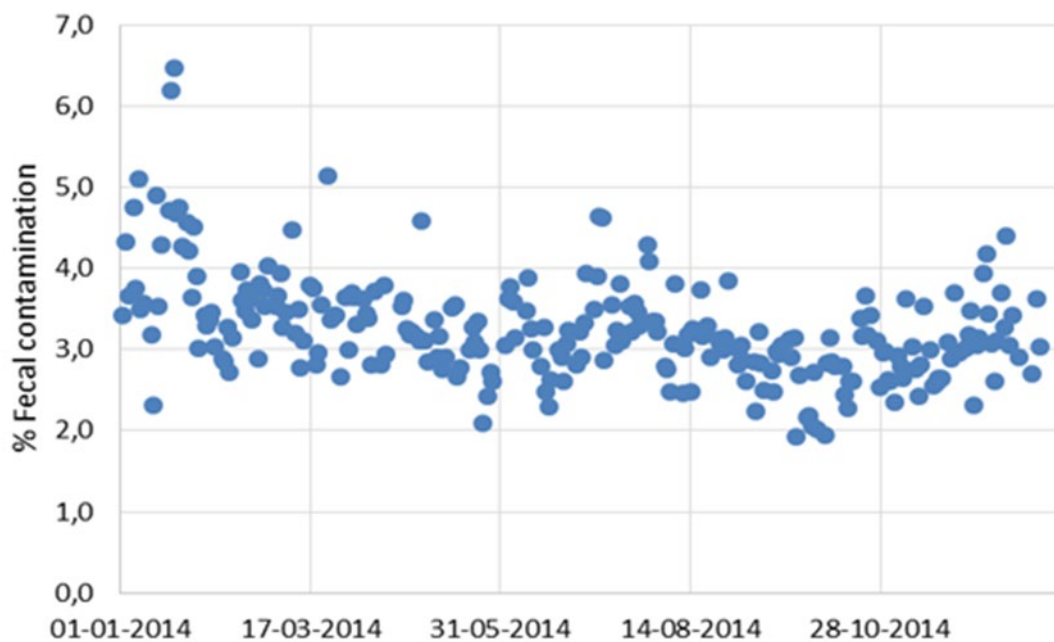
Baselines are often shown as lines in graph form to easily show changes over time. In some cases, depending on species and methods of slaughter, it can be beneficial to have separate baselines for the origin of the contamination (for example, faecal and ingesta).

Experience has shown that, even though most contaminations are found and removed, the sensitivity of visual inspection does not reach 100%. In particular, small particles can be overlooked. Also experience from well performing slaughterhouses shows that faecal and ingesta can be missed even by well-trained staff.

Experience also shows that the efficiency of the staff regarding finding faecal/ingesta contamination varies a lot on a day-to-day basis and between slaughterhouses. This implies that findings from different slaughterhouses should be compared with caution.

Example

Below, an example is shown based on data from an average performing pig slaughterhouse covering one year (2014). Each dot represents % faecal/ingesta contamination for one day. Average for the entire year +/- standard deviation was 3.25 +/- 0.64%. Inspection for faecal/ingesta contamination was carried out by the competent authority. No faecal/ingesta contamination had been removed prior to inspection (and recording).



A relatively big variation between days is to be expected.

The variation arises from i.e.:

- Differences between the condition of the incoming animals (e.g. adherent intestines),
- Differences regarding operators and official authorities inspecting the carcasses, and
- Deviations due to malfunctions on the production line that are corrected during the day.

It is not realistic to fully avoid contamination; however, experience shows that the overall prevalence of contaminations can be reduced by using good practices.

4. Trend analysis (assessing deviations and verification based on statistical approach)

As already mentioned, trend analysis is a tool that can be used to assess whether the frequency of faecal and ingesta contamination is under control. Typically, a company will keep records showing the frequency of contamination from the digestive tract or hide, i.e. before measures have been taken to remove the faecal and ingesta contamination.

EXAMPLE

An example of how trend analysis can be used is shown below using data from a European pig slaughterhouse. % faecal denotes the percentage of carcasses with faecal contamination per day and it is assumed that % faecal contamination is normally distributed.

The average for % faecal at the pig slaughterhouse X has been 3.25 % with a standard deviation of 0.64 % during the last year.

Slaughterhouse X has decided to evaluate the results from its daily recording on two levels, where the first level deals with the average contamination from one day and the second level deals with the average contamination over a number of days:

1. Evaluation of the daily average

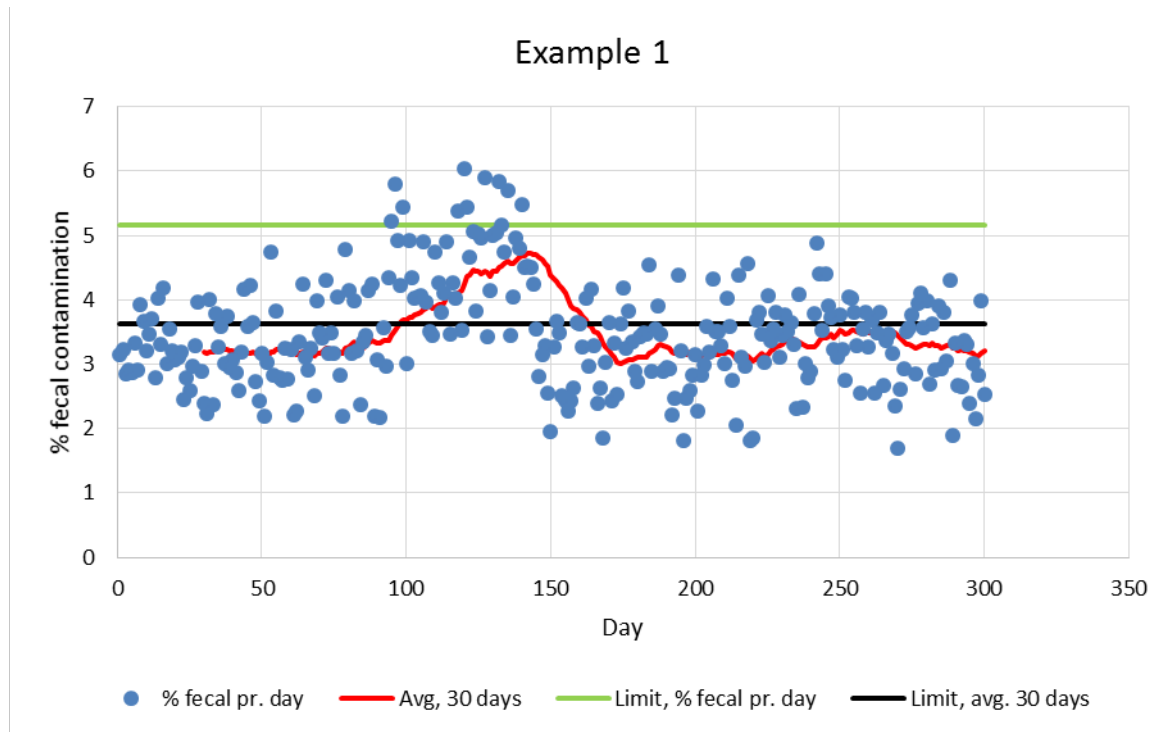
On a daily basis, Slaughterhouse X calculates % faecal in order to evaluate whether the parameter evaluated on a day-to-day basis is deviating from last year's average. The % faecal for a single day should be within the 99.74% interval i.e. $3.25 \pm 1.92\%$. If % faecal is above the upper limit, i.e. 5.17%, actions are taken to lower the percentage of faecal contamination. If % faecal is below the lower limit, i.e. 1.33%, it should be ensured that the systems for detection and registering of faecal contamination are in place and working.

2. Evaluation of the average faecal contamination for the last 30 working days

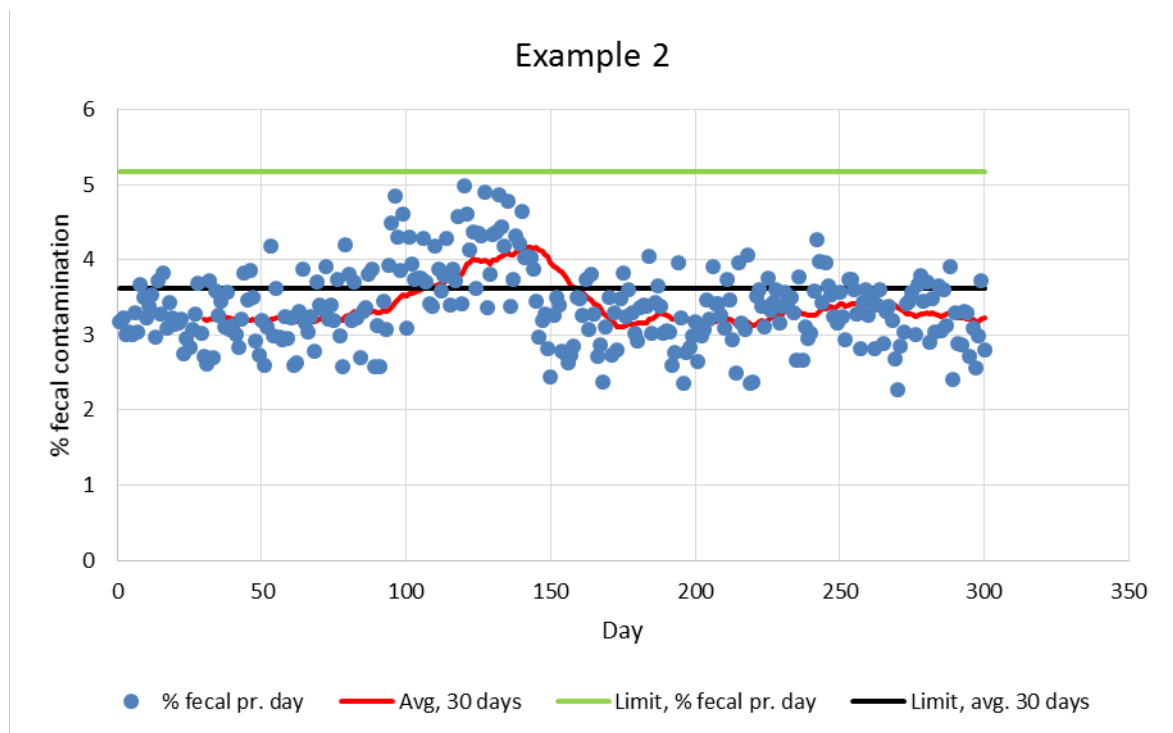
Slaughterhouse X also calculates the average % faecal on a continuous basis covering the last 30 working days. Assuming a standard deviation of 1, the 95% confidence limit for an average (avg.) calculated on the basis of 30 observations is average ± 0.361 . If the average calculated on the basis of the last 30 days is 3.0, and the contamination exceeds 3.36, then actions are taken to lower the faecal contamination. This is to ensure that the % faecal is not following an upward trend, that the % faecal is below 3% on average, and that the standard deviation is $\leq 1\%$. Using 30 working days is a choice which balances considerations regarding the precision for the estimate of the average, the period passing before an upward trend is found, and the risk of making corrective actions due to random events.

Examples

Below are the two above-mentioned examples shown graphically, where corrective actions are initiated by either the daily average exceeding the limit or the average for the last 30 working days exceeding the limit.



¹ $(1,96 \cdot 1/\sqrt{30})$





IX. USE OF ADDITIONAL HYGIENE TOOLS



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1. Introduction

The compliance with good hygienic slaughtering practices is a pre-requisite to the production of safe meat. To assist in producing a clean carcass, there are additional hygiene tools available to the industry. These tools are used to reduce the surface contamination on visually clean carcasses. They are complementary to the good hygiene practices and not a substitute for them.

The sanitary added value of these tools is proved, it is limited but it can be improved by a multi-hurdle approach at several points of the slaughter line.

At date, the only authorised substances are potable water (allowed use for all species) and lactic acid (allowed use only when slaughtering bovine animals).

The end of this section provides a reminder of the possibility to use steam vacuum to remove visual contamination.

The operators are therefore called upon to exercise vigilance in order to make the difference between the tools used to decrease the surface contamination on visually clean carcasses and this special use of steam vacuum to remove visual contamination.

2. Systems to reduce the surface contamination on visually clean carcasses

2.1. Steam vacuum system

Steam vacuum principle

A steam vacuum system is an equipment designed to reduce the surface contamination of carcasses.

It combines two principles of action:

1. the mechanical aspiration of contamination by vacuum, and
2. the thermal destruction of the microorganisms by using a hot steam jet.

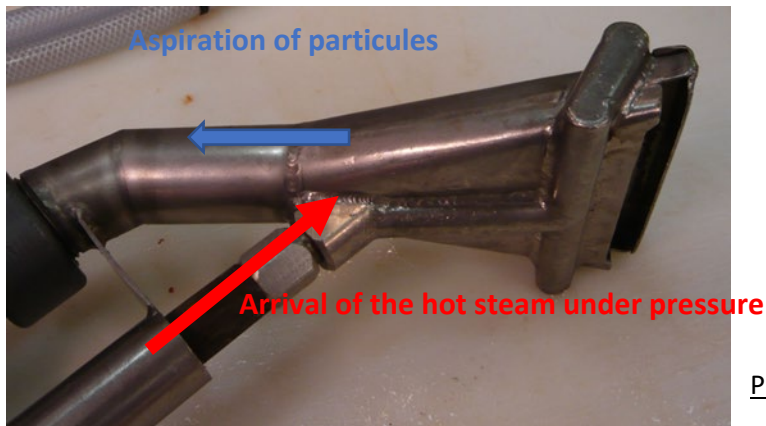


Photo: features of the cleaning head

(Source: Bieche, IDELE-INTERBEV, 2014)

Grooming of carcasses

The use of the steam vacuum system to reduce the surface contamination on visually clean carcasses is called “grooming”.

The use on the slaughter line allows to ensure that carcasses are all susceptible of undergoing grooming if necessary (based on risk analysis)

The use is more or less extensive on the carcasses, and priority is given to those areas known to be most susceptible to contamination during slaughter. These areas are defined by each slaughterhouse.

The steam vacuum system can also be used outside the slaughter line. This use aims then to perfect the compliance of certain carcasses, for example after removal of visual contamination by trimming.

Effects of treatment on the microbial load

Several studies on the effect of using steam vacuum systems have shown reductions in bacteriological load (aerobic colony count) in the range of 0.3 to 1 log (grooming of bovine carcasses), and up to 2 logs (grooming of ovine carcasses). Source: Bieche, IDELE-INTERBEV, 2014

These expected results are conditional on the compliance with good use practices in terms of the device's settings and the operator's gestures.

Attention is drawn to two key elements of the operator's gestures:

- To ensure effective vacuuming, it is important to keep the cleaning head in contact with the carcass over the target area;

- The speed of the cleaning head is a good balance to ensure a reduction of microbial contamination without leaving permanent discolorations on the carcass. An indicative speed is 20 centimetres per second in the context of grooming.

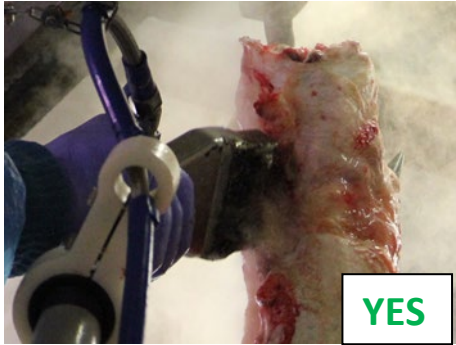


Photo: Proper positioning of the cleaning head, properly adhering to the surface of the carcass



Photo: direct the carcass and hold it to stabilise it during treatment

Cleaning the steam vacuum equipment cleaning head during production

The cleaning head is heated by the means of steam and any residual particles are immediately removed; therefore, there is no risk of cross-contamination between carcasses via the steam vacuum system.

It is not necessary to disinfect the steam vacuum system between two carcasses, but the operator must regularly monitor the visual cleanliness of the cleaning head during production; if necessary, any agglutinated particles are removed with a hard brush. The cleaning head can be immersed in hot water to facilitate the removal of particles.



Photo: brushing the cleaning head with hot water

System qualification and monitoring

Initial qualification of the system

When installing any new equipment aimed at reducing the bacterial load of carcasses, as part of the application of HACCP principles, the slaughterhouse must carry out an initial qualification to evaluate the effectiveness of the tool under the conditions of its installation and to verify the absence of any adverse consequences.

The qualification considers the following parameters:

- Steam pressure; an indicative open circuit pressure (steam production) is about 1.2 bar
- Temperature of the steam leaving the cleaning head; a temperature of $82^{\circ}\text{C} \pm 2^{\circ}\text{C}$ is recommended to reduce the bacterial load, without risking cooking the surface
- Target areas and time spent
- Evaluation of the effect of the system on carcasses: quantify the effect of reducing the bacterial contamination obtained under the real conditions; and check that the treatment conditions (temperature and pressure of steam, action of the operator) do not alter the carcasses permanently (risk of cooking).

Monitoring

Control of physical parameters of steam

Temperature and pressure of the steam: the values set by the initial qualification must remain constant over time.

Monitoring of good practices of use of the steam vacuum system

The operator must follow the internal procedure, in particular for what regards the following points:

1. Compliance with the areas to be treated on the carcass, as defined by the company.
2. Proper positioning of the cleaning head, properly adhered to the surface of the carcass.
3. The fact that the operator does not leave the cleaning head stationary on the carcass, because this could scald the surface of the carcass at this point.
4. Regular cleaning of the cleaning head with a hard brush to ensure the effectiveness of the treatment.

These checks are visual.

In addition to these monitoring elements, the internal procedure should describe how the performance of the system is checked.

2.2. Lactic acid

FBOs can use lactic acid to reduce microbiological surface contamination on bovine carcasses or half carcasses or quarters at the level of the slaughterhouse, in compliance with the conditions set out in Regulation (EU) No 101/2013.

Each FBO should define the best combination of parameters necessary to ensure a good efficiency, without bringing any irreversible physical modification to the meat.

These parameters are: concentration (between 2% and 5%), temperature (up to 55°C), and applying (spraying or misting).

The efficiency of the lactic acid treatment can be assessed on the decrease of hygiene indicator bacteria or on the decrease of pathogen bacteria.

2.3. Hot water washing

High-temperature water (>74°C) is sprayed onto the entire carcass as the last step prior to chilling.

It is authorised to use recycled hot water [in compliance with the conditions set out in Regulation (EU) No 1474/2015], which improves the economic profitability of the treatment.

The level of reduction of surface contamination depends on the characteristics of the cabin (nozzle type, in particular) and especially on the conditions of use (spraying time, pressure and water temperature).

This technology is routinely used in many Australian, Canadian, American and, more recently, European slaughterhouses.



2.4. Steam Pasteurisation System (SPS)

(Source: ANSES' opinion of December 10th, 2010)

This process, located at the end of the slaughter line, is fully automated. The treatment of carcasses is carried out in three steps.

As a first step, the surface of the carcasses is dried with pressurised air. The objective of this operation is to increase the decontaminating effect of steam which will then be applied. Under the conditions of slaughter in the United States, the necessity of drying is probably amplified by the fact that, up the chain, the carcasses are generally showered.

The second step consists in exposing the carcass to steam at 105°C for a period of 6 to 8 seconds in a completely hermetic cabin. The surface temperature of the carcass is instantly increased to 91-94°C.

During the third step, the surface temperature of the carcass is lowered to a temperature inferior to 20°C by sprinkling ice water ("eau glacée" in French). The objective of this cooling is to prevent the surface cooking of the meat from causing irreversible alterations in the appearance of the carcasses (mainly the colour).

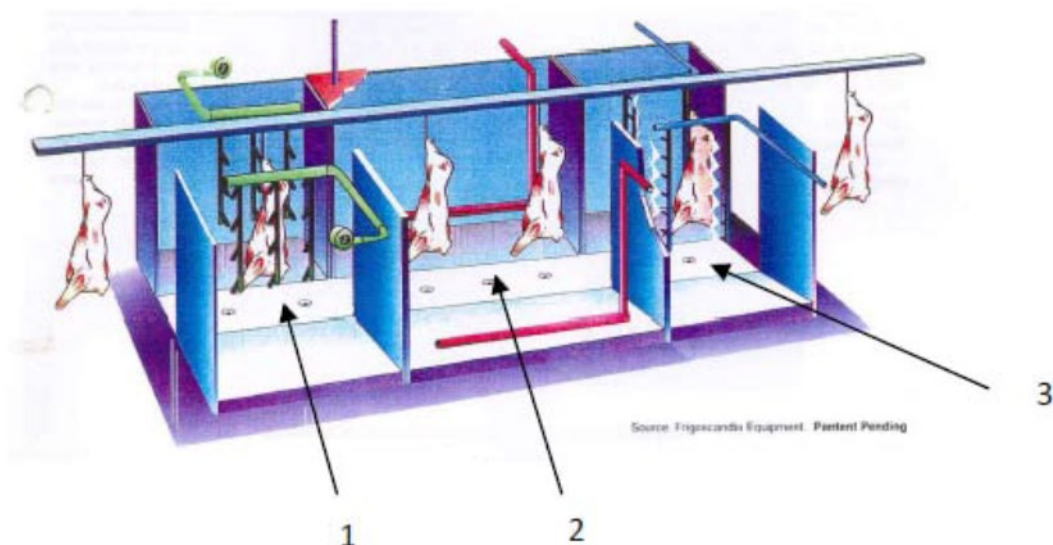


Illustration: Principle of the SPS cabin, based on the spraying of carcasses with steam:

- 1: drying of the carcass (air under pressure)
- 2: steam treatment (6-8 seconds)
- 3: cold shock (sprinkling of ice water)

The installation of SPS cabins requires space and facilities (entry and exit water, etc.). It is easier to put in place when the slaughter line is designed for this equipment.

SPS designed cabins have been integrated into many U.S. and Canadian slaughter chains. However, to our knowledge, these cabins are not marketed in Europe (although their use is allowed by European regulation).

3. Special use of steam vacuum to remove visual contamination

Knife (circular cutter) trimming is the standard method for treating localised contamination.

A steam vacuum system may also be used as a replacement for knife (circular cutter) trimming to remove minor contamination if and only if the following two conditions are met:

- The internal procedure describes which contaminations are eligible for removal by steam vacuum (size, depth, etc.)

It is recommended to apply the cleaning head over the entire contamination, protruding at least 10 cm beyond the contamination and ensuring at least one passage at any point of the treated area.

- The system has been initially qualified by the slaughterhouse for this specific use and its performance is monitored.