

The Development of Ante Mortem and Post Mortem Meat Inspection as a Diagnostic Tool for Pig Health and Welfare

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Table of Contents

Chapter 1: Introduction	5
Context	5
Objectives:	5
Research Team:	6
Chapter 2: The Use of Meat Inspection as a Diagnostic Tool for Pig Health and Welfare	7
Context	7
Further Reading	8
Chapter 3: Engaging with Industry - Stakeholder Interviews and Workshop	9
Context	9
Key Findings.	10
Stakeholder Interviews	10
Stakeholder Workshop 2015	10
Methodology & Further Reading.	12
Chapter 4: Recommendations	13
Context	13
PIGWELFIND Meat Inspection Protocol	14
Ante Mortem Inspection	14
Post Mortem Inspection	17
Appendix	22
Methodology and Further Reading.	22
Bibliography	24
Acknowledgements	25

Chapter 1: Introduction

This report presents a key research outcome of PIGWELFIND, a three year interdisciplinary research programme to investigate the development of meat inspection (MI) as a diagnostic tool for pig welfare. PIGWELFIND is an acronym for 'PIG WELFAre INDicators' (or 'Finding Pigs Well'!) a project funded by the Department of Agriculture Food and the Marine's (DAFM) Research Stimulus Fund.

Context

Pig production in Ireland is caught in a dilemma which is driven by narrow profit margins and the demand for cheap food on one side and regulatory requirements for food safety, animal welfare and environmental protection on the other. High feed prices combined with poor pig prices means that good herd management has never been more important to maximise efficiency and profitability of pig units. Suboptimal housing, management and stockmanship are associated with poor welfare in pigs and are reflected in disease, abnormal



behaviour, injury, reduced longevity and productivity and contribute to an overuse of antibiotics. Although maintaining high standards of animal welfare undoubtedly costs money, there are also financial costs associated with poor pig welfare. Ante mortem and post mortem MI could be developed as a welfare diagnostic tool and thereby act as an aid to improving pig welfare on farm, reducing carcass losses and ultimately improving profitability of the Irish pig industry.

Objectives:

The objectives of PIGWELFIND were:

- » *To validate on-line MI as a pig welfare diagnostic tool*
- » *To determine the relationship between welfare problems detected at MI and disease and carcass condemnations*
- » *To establish protocols for extending on-line MI to include welfare indicators*
- » *To establish the cost/benefit of this strategy*
- » *To implement and disseminate findings*

Research Team:

This was a collaborative project involving a team of researchers from Teagasc, University College Dublin, Queen's University Belfast and CAFRE.

- Dr. Laura Boyle - Teagasc
- Dr. Niamh O' Connell - Queens University Belfast (QUB)
- Dr. Alison Hanlon - UCD School of Veterinary Medicine
- Dr. James Gibbons - UCD School of Veterinary Medicine
- Dr. Dayane Teixeira -Teagasc Research Officer (2013-2015)
- Bernadette Doyle - Teagasc Research Officer (2015-2016)
- Nienke van Staaveren - PhD Student Teagasc/UCD
- Grace Carroll - PhD Student QUB
- Mark Hawe - CAFRE
- Catherine Devitt - Private Consultant

This report consists of four chapters. Chapter 2 investigates the potential of using MI as a diagnostic tool for pig health and welfare by reviewing the legislation, existing literature and current practices in other EU countries. The third chapter outlines the valuable contribution pig industry stakeholders made to the PIGWELFIND project. Finally, chapter 4 summarises, in the form of a protocol, the key health and welfare lesions, identified by stakeholders, that should be included as standard checks should current MI procedures be extended to include welfare and health lesion recording.

Chapter 2: The Use of Meat Inspection as a Diagnostic Tool for Pig Health and Welfare

Context

Originally, the primary objective of MI was to detect conditions of risk to public health. Pig carcasses are partially or fully condemned upon detection of diseases that pose a risk to public health, or welfare conditions that cause animal suffering e.g. fractures. This incurs direct financial losses for producers and processors. Relatively recently, MI have been extended by a number of EU member states to encompass disease surveillance and prevention for conditions that pose negligible risks to public health. Additionally MI data has been used in epidemiological studies investigating the occurrence of common lesions found at slaughter such as pneumonia, pleurisy, abscessation, ascariasis and tail-biting injuries. Since animal health is a component of animal welfare, these lesions represent a clear link between suboptimal pig welfare and financial losses to the pig industry.

- According to the European Food Safety Authority, MI data is under-utilised in the EU, even as a means of informing herd health programmes
- The presence of disease and injury at MI may be used to assess animal welfare at farm level
- There are many advantages to assessing animal health and welfare during MI (Figure 1)

Figure 1: Using MI to measure animal health and welfare has many advantages



Across the EU, the European Commission's Food and Veterinary Office have reported a significant variation in implementation of legislation regulating MI. Inconsistencies also exist between member states with respect to data capture and utilisation, with Northern Ireland, Denmark and the Netherlands setting a high standard with respect to standardisation, recording, communication and storage of MI data, enabling its effective utilisation by various industry stakeholders for surveillance and improvement of public and animal health.

- Regulation (EC) 854/2004 demands significant findings from MI affecting public and animal health to be supplied to the producer and where necessary their PVP
- The regulation allows flexibility in implementation by member states, and as a result some variation exists
- Training requirements for meat inspectors differ across the EU
- There is no legal requirement to employ a standardised recording system

Suboptimal housing and management practices can result in economic losses. In a market-driven industry with a small margin of profit and no stabilization by EU or national subsidies, MI information has the power to support producers to improve production efficiency by targeting herd health and welfare planning on-farm.

Further Reading

Harley, S., More, S., Boyle, L.A., O'Connell, N.E., Hanlon, A. (2012a) Good animal welfare makes economic sense: potential of pig abattoir meat inspection as a welfare surveillance tool. *Irish Veterinary Journal* 65:11

Chapter 3: Engaging with Industry - Stakeholder Interviews and Workshop

Context

There is valuable collective knowledge and expertise about pig health and welfare among stakeholders within the Irish pig production industry. Putting into practice the use of MI data as a diagnostic tool for pig health and welfare depends on stakeholder communication and engagement. At the outset of the project, social science research techniques were used to obtain the different perspectives from pig industry stakeholders, on the current contribution and the potential evolution of MI as a diagnostic tool for pig health and welfare (Figure 2). Additionally, towards the end of the project, a stakeholder workshop was held to disseminate research findings and consider practical perspectives on the indicators of pig health and welfare evaluated, to identify training needs should MI be developed further and to gain valuable insight from “on the ground” stakeholders.

Figure 2: Qualitative research approach with pig industry stakeholders from the Republic of Ireland (ROI) and Northern Ireland (NI)



Key Findings

Stakeholder Interviews

Producer Interviews 2013

- Producers recognised the benefit of using MI as a tool to improve pig health and welfare
- Some producers are dissatisfied with the current system of MI
- There are concerns over how MI data will be used if developed further
- Producers reported positive relationships with their Private Veterinary Practitioner (PVP)
- Producer's tolerance of certain animal welfare issues may limit the usefulness of MI data feedback to inform planning for pig health and welfare

Other stakeholder interviews 2013

- Communication and relationship difficulties are present within the pig industry
- Ante mortem data recording is achievable
- Post mortem data recording will be challenging

The core finding of the stakeholder interviews was that any development and utilisation of MI data as a diagnostic tool for pig health and welfare must be supported by the implementation of a communication strategy that will help to build trust and positive relations between all stakeholders in the pig industry. Such a strategy will provide real-time data to support producers to improve pig health and welfare and thereby improve farm profitability.

Stakeholder Workshop 2015

The stakeholder workshop provided a valuable opportunity to disseminate key findings from PIGWELFIND, and capture feedback from pig industry stakeholders to refine the list of best indicators of pig welfare for inclusion in a proposed protocol for the development MI as a welfare (and health) diagnostic tool.

Common Themes:

- All stakeholders see the benefit of MI data collection and feedback, with certain conditions of high priority
- A centralised system could also serve as national disease surveillance tool/early warning system
- Ideally, all participants would like an all-island approach, achieving a "biosecure zone"
- Positive marketing potential if implemented
- Potential for more targeted prophylaxis and possibly reduced antibiotic use
- Improved health and welfare of national herd

Despite a diverse range of participants, plenty of commonality emerged regarding criteria to be recorded.

Criteria to be recorded during ante mortem inspection:

- Lameness (record presence and type)
- “Down” pigs (record presence)
- Transport injury (record presence)
- Abscess (record presence & location)
- Poor livestock hygiene (record presence)

Criteria to be recorded using severity scale during post mortem inspection:

- Pleurisy
- Skin lesions
- Tail bite lesions

According to stakeholders, severity scales should be used to record these lesions

Criteria to be recorded without a severity scale during post mortem inspection:

- Ascariasis
- Carcass abscess
- Contamination (carcass and viscera)
- Enzootic pneumonia
- Hind limb bursitis
- Loin bruising
- Pericarditis
- Peritonitis
- Pleuropneumonia
- Poor slap marking
- Viscera abscess/pyaemia

According to stakeholders, severity scales are not required for these lesions- recording presence or absence is sufficient

According to participants, the main challenges facing the development of MI as a diagnostic tool for pig health and welfare are:

- » Time constraints on temporary veterinary inspectors (TVIs) to record additional MI data
- » Initial investment in hardware/software
- » Batch ‘v’ individual level recording
- » Data protection issues
- » Training for TVIs
- » Uncertainty about visual only inspection

Stakeholders had the following recommendations regarding training requirements for those involved in MI:

- Initial and ongoing training required for TVIs as well as for Official Veterinarians (OVs)
 - » Theory and practical training on criteria to be recorded
 - » IT/end-user training
- Standardised terminology to be incorporated into the recording system
- Visual guidelines should be used as much as possible

There was general agreement on method of reporting MI data to producers:

- Web-based, with benchmarking capability
- Graphical
- Selectable time-frames to assess management/prophylaxis changes
- Ideally “live” access, but weekly/monthly would be adequate
- Batch level reporting adequate

Methodology & Further Reading

A series of telephone and face-to-face interviews, as well as focus groups and stakeholder workshops were held. Stakeholders were all actively engaged with the pig production industry, forming a valuable group of diverse participants.

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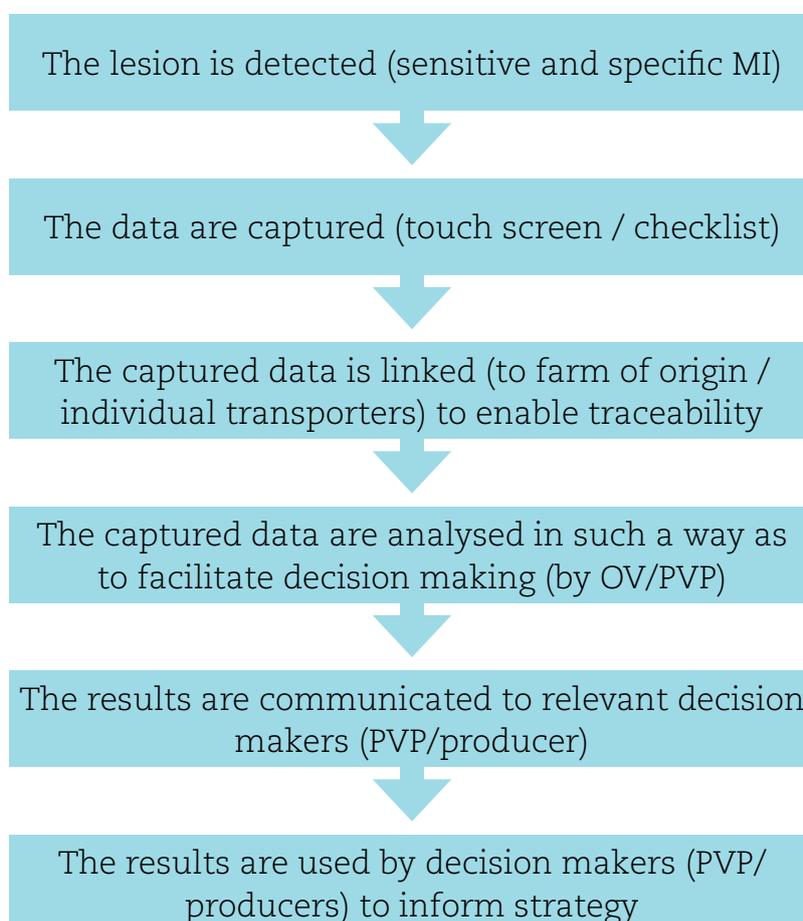
Chapter 4: Recommendations

Context

Key findings from PIGWELFIND have provided an evidence base to support the development of an ante mortem and post mortem protocol to capture MI data on pig health and welfare. The protocols outline an ideal set of criteria and scoring systems which address all of the major health and welfare concerns of the Irish pig industry. Information will provide real-time data to pig producers and their PVPs and also link to a centralised database for monitoring the health and welfare of the national pig herd.

Although the use of MI data as a tool to improve animal health and welfare has many advantages, it is not without its limitations and challenges. Such systems rely on data collected from slaughter pigs which may not be representative of the entire national herd and particularly excludes animals which die or are euthanised on-farm. As such, it is possible that the data collected may underestimate the true prevalence of health and welfare issues. Variation may exist between abattoirs in the sensitivity and specificity of lesion detection as a result of differences in throughput, line-speed, intensity of working conditions and recording methods employed. The use of standardised terminology, recording methods and training of meat inspectors is vital to the success of any such system which relies on the quality of the input data. Validation of results is imperative to ensure the reliability of the system and, ultimately, the relevant information must be made available to decision-makers if change is to be effected. The key requirements of any MI data collection system are outlined in Figure 3.

Figure 3: Requirements of a MI data collection system



PIGWELFIND Meat Inspection Protocol

This protocol is intended to operate in a computerised meat inspection data recording system.

Ante Mortem Inspection

During ante mortem inspection, a recording is made only if a pig is detained for “special attention” (SA) by the veterinary inspector on duty. It is assumed that if no recording is made that the pig passed ante mortem inspection without requiring “special attention”.

Ante mortem TVI Point

Ante Mortem Observation	Description	Scoring System
Lameness	<p>Difficulty walking due to pain arising from lack of ability to use one or more limbs in the normal way</p> <p>Types of lameness recorded:</p> <ul style="list-style-type: none"> • Weight bearing lame: the pig bears weight on all limbs but a limp is detected during locomotion • Non-weight bearing lame: one (or more) of the pigs limbs is elevated above the ground (i.e. no contact is made with the ground) • Claw injury: injury or amputation of an accessory digit or weight bearing claw • Stiffness: pig demonstrates short rigid steps, often bilaterally • Swelling: the affected limb or part of limb is swollen • Other: this includes externally obvious though rare causes of lameness such as an open fracture or dislocated shoulder • Unknown: there is no obvious external cause of the lameness 	Presence with type of lameness and location
‘Downer’ pig	<p>Complete inability to stand. Pigs that are ‘down behind’ may be able to get upright on their front limbs but remain in a ‘dog sitting’ position</p> <p>Types of recumbency recorded:</p> <ul style="list-style-type: none"> • Fully recumbent (sternal or lateral) • Partially recumbent (down behind) 	Presence with type of recumbency
Panting/Stress	Breathing through the mouth using short gasps, often refusing to move; may or may not be associated with skin discolouration.	Presence only

Ante Mortem Observation	Description	Scoring System
'Sick' pig	<p>Indicators of sick pigs recorded:</p> <ul style="list-style-type: none"> • 'Pumping' (laboured breathing) • Unsteady gait (exhaustion, muscle tremors, swaying or circling) • Pale colouration • Dull pigs <p><i>*Downer pigs are not considered here (see Downer)</i></p>	Presence with type of sickness indicator
Hernia	<p>An abnormal swelling caused by a defect in a section of the body wall allowing protrusion of internal tissues or organs</p> <p>Types of hernia recorded:</p> <ul style="list-style-type: none"> • Umbilical • Abdominal • Inguinal • Scrotal 	Presence with type of hernia
Tail lesion	<p>Tail lesions may present as puncture wounds, bleeding or abscessed tail/tail stumps</p> <p>Type of tail lesion recorded:</p> <ul style="list-style-type: none"> • Lesion with abscess • Lesion without abscess 	Presence with type of lesion
Rectal prolapse	The abnormal protrusion of internal rectal tissue, visible at the anal passage	Presence only
Abscess/Swelling	<p>Localised/discrete swellings or abscesses on head, body or limb surfaces*</p> <p>Types of lesion recorded:</p> <ul style="list-style-type: none"> • Localised swellings containing purulent material (abscess) • Localised swellings not containing purulent material (swelling) <p><i>*Tail lesions are not considered here (see Tail Lesion)</i></p>	Presence with type of lesion and location

Ante Mortem Observation	Description	Scoring System
Wounds/Injury	<p>Types of lesion recorded:</p> <ul style="list-style-type: none"> • Fresh wounds, often with bleeding • Old wounds; with scarring and scab formation • Ulcers/pressure sores: open/unhealed wound involving several layers of epidermis <p><i>*Claw injuries and open fractures are not considered here (see Lameness)</i></p>	Presence with type of lesion and location
Oedema	<p>Abnormal accumulation of fluid in body tissues resulting in diffuse swelling of tissue</p> <p>Types of oedema recorded:</p> <ul style="list-style-type: none"> • Generalised • Localised <p><i>*Abdominal distension and limb swelling are not considered here (see Abdominal distension/Lameness).</i></p>	Presence with type and location
Abdominal distension	Abnormal appearance of the abdomen, giving a pot-bellied appearance.	Presence only
Dead on arrival/Euthanised	<p>Deceased, moribund or pigs not fit for slaughter due to severe health and welfare compromises are considered here.</p> <p>Type recorded:</p> <ul style="list-style-type: none"> • Dead on arrival • Euthanised 	Presence with type
Other	Lesions not fitting in the above categories should be recorded using this option	Presence and description

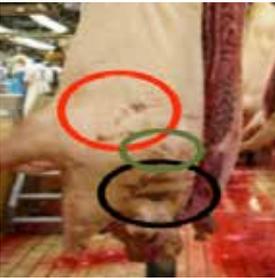
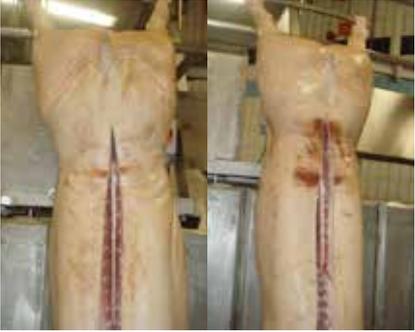
Post Mortem Inspection

During post mortem inspection, a recording is made for every pig regardless of whether the specified lesion is present or absent.

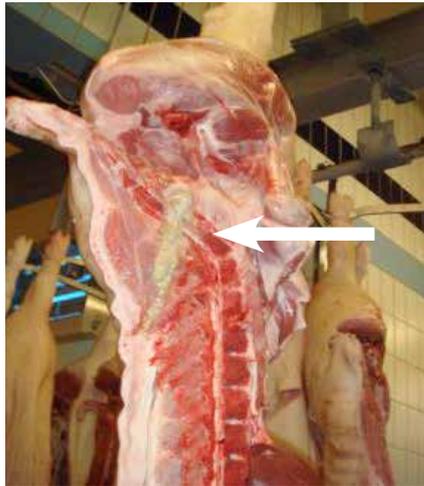
Carcass TVI Point

All observations on carcass are made by visual inspection after scalding and dehairing at the point of carcass inspection.

Post Mortem Carcass Lesion	Description	Scoring System		
Tail bite lesion	<p>Tail damage ranges from superficial bite wounds to complete loss of the tail</p> <p>Severity scale of lesions:</p> <ul style="list-style-type: none"> • No lesion: no evidence of tail damage • Mild: Evidence of disruption of the epidermis and/or bruising likely relating to healed or mild lesions • Moderate: Evidence of chewing or puncture wounds, but no evidence of swelling • Severe: Evidence of chewing or puncture wounds with severe swelling, infection, abscess or open gaping wound in cases of complete tail amputation • No tail/No lesion: Complete loss of tail stump, but no external signs of infection 	Presence with severity scale or absence		
				
No lesion	Mild lesion	Moderate lesion	Severe lesion	No tail/No lesion

Post Mortem Carcass Lesion	Description	Scoring System		
<p>Skin lesions</p>	<p>Aggression induced skin lesions are described as the surface penetration of the epidermis of the skin by pigs teeth during the performance of aggressive/fighting behaviour</p> <p>Severity scale of lesion:</p> <ul style="list-style-type: none"> • No lesion • Mild lesion: Some superficial damage, clearly marked or up to three short (2-3cm) and deep • Moderate lesion: Clear deep and/or long damage (> 3cm) including much superficial damage or circular areas • Severe lesion: Much deep damage over a large area <p><i>Colour/Age of lesion</i></p> <ul style="list-style-type: none"> • Fresh/Red: Skin lesions appear bright red in colour • Old/Brown: Skin lesions appear dull (healed) and brown 	<p>Presence with severity scale and colour/age of lesion , or absence</p>		
				
<p>Mild lesion</p>	<p>Moderate lesion</p>	<p>Severe lesion</p>	<p>Fresh/red lesion</p>	<p>Old/brown lesion</p>
<p><i>*Photo credits: Aaslyng et al (2013) and Michael O’Leary, VI DAFM, used with permission</i></p>				
<p>Loin bruising</p>	<p>Loin bruising is an injury to the loin area suggestive of mounting behaviour</p>		<p>Presence or Absence</p>	

Post Mortem Carcass Lesion	Description	Scoring System
Hind limb bursitis	Swelling at metatarsal region of the hind limbs of pigs	Presence or absence
Carcass abscess	Focal, circular, encapsulated yellow-green lesion Severity scale: <ul style="list-style-type: none"> • Single abscess • Multiple <i>*Tail abscesses are not considered here (see Tail bite lesions)</i>	Presence with severity scale and location, or absence
Arthritis	Inflammation of one or more joints Type of lesion recorded: <ul style="list-style-type: none"> • Septic arthritis • Non-septic arthritis 	Presence with type and location, or absence



Viscera TVI Point

All observations on viscera are made by visual inspection after evisceration at the point of viscera inspection before any incisions are made and before separation of the heart, liver and lungs takes place.

Post Mortem Viscera Lesion	Description	Scoring System
Pleurisy	<p>Inflammation of the pleurae with fibrinous pleural adhesions</p> <p>Severity scale of lesions:</p> <ul style="list-style-type: none"> Limited - small area of lung tissue affected Extensive** - all/ majority of lung tissue affected <p><i>*Evidence of pleurisy on the carcass is not recorded</i></p> <p><i>**If no lungs are present, they are considered to be “in the chest” and pleurisy is automatically classed as “extensive”</i></p>	Presence with severity scale, or absence
Pneumonia	<p>Inflammation of the lung tissue with or without an overlying pleurisy.</p> <p>Enzootic pneumonia usually presents as a purple-grey discolouration of the lungs with a collapsed, consolidated rubbery appearance of the apical and cardiac lung lobes. Chronic lesions become organised and clearly demarcated.</p> <p>Pleuropneumonia usually presents as a bilateral pneumonia with large red-blue areas in the caudal lobes with an overlying pleurisy.</p> <p>Severity scale of lesions:</p> <ul style="list-style-type: none"> Localised - one lung lobe affected Diffuse - all/ majority of lungs affected <p>Location of lesions if localised:</p> <ul style="list-style-type: none"> Cranial Caudal 	Presence with severity scale and location, or absence
Pericarditis	<p>Fibrosis of pericardial sac, with or without the presence of fluid</p>  <p><i>*Photo credit; Michael O'Leary, VI DAFM</i></p>	Presence or absence

Post Mortem Viscera Lesion	Description	Scoring System
<p>Peritonitis</p>	<p>Inflammation of the serous membranes of the peritoneal cavity with the presence of fibrin tags on surface of viscera</p> <p>Severity scale of lesion:</p> <ul style="list-style-type: none"> • Limited- isolated abdominal organ/ area affected • Extensive-entire abdominal cavity affected <p><i>*Evidence of peritonitis on the carcass is not recorded</i></p> <p><i>*Photo credit; Michael O'Leary, VI DAFM</i></p> 	<p>Presence with severity scale, or absence</p>
<p>Ascariasis</p>	<p>Presence of multifocal fibrotic lesions in liver tissue due to parasitic infection giving a 'milk spot' appearance.</p> <p><i>*Photo credit; Michael O'Leary, VI DAFM</i></p> 	<p>Presence or absence</p>
<p>Viscera abscess</p>	<p>Focal, circular, encapsulated yellow-green lesion protruding from surface of visceral parenchyma</p> <p>Severity scale:</p> <ul style="list-style-type: none"> • Single abscess • Multiple abscesses 	<p>Presence with severity scale and location, or absence</p>

Appendix

Ante Mortem Observation	Description	Scoring System
Poor livestock hygiene	Excessive quantities of faeces on pig's body	Presence only

Post Mortem Carcass Lesion	Description	Scoring System
Poor slap marking	The application of illegible or multiple slap numbers, hindering identification and causing pain and bruising to the pig Type of error: <ul style="list-style-type: none"> • Illegible slap mark • Multiple slap marks 	Presence and type of error, or absence
Carcass contamination	The presence of visible material from the environment, gastrointestinal tract and/or other sources on carcass surfaces	Presence with location, or absence

Post Mortem Viscera Lesion	Description	Scoring System
Viscera contamination	The presence of visible material from the environment, gastrointestinal tract and/or other sources on the surface of internal organs <i>*Photo credit; Michael O'Leary, VI DAFM</i>	Presence with location, or absence



Methodology and Further Reading

A review of the studies carried out during PIGWELFIND, research visits to view existing slaughter plant data collection systems, as well as feedback from the project's stakeholder workshop were used to develop the final protocol proposed by PIGWELFIND.

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