Surveillance for AMR in food-producing animals

Photo: Peter Barrow,28th November 2005, Tel:0872-559638

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1. AMR in zoonotic and indicator bacteria isolated from animals and food (pigs & poultry)

2. Evidence to support disease prevention and prudent use of antimicrobials
    - Patterns and frequency of diseases in farmed animals
    - Mastitis in dairy cattle and milk quality
    - Infectious diseases in intensively-managed pigs

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1. AMR in zoonotic and indicator bacteria isolated from animals and food

2013/652/EU

- Isolates from Salmonella NCP
- Caeca from pigs or poultry
- Pig or poultry meat

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Bacteria

- *Salmonella* – 170 isolates
- *Campylobacter jejuni* – 170 isolates
- Indicator commensal *E. coli* – 170 isolates
- ESBL/Amp-C/Carbapenamase-producing *E. coli* - 300 meat samples

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2014

- Caeca from broilers (Campy, E coli)
- Salmonella - NCP

2015

- Caeca from pigs (E coli, ESBL)
- Salmonella
- Pork and Beef

2016

- Caeca from broilers (Campy, E coli)
- Salmonella- NCP
- Chicken meat

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Bacterial Culture

Isolation

Identification

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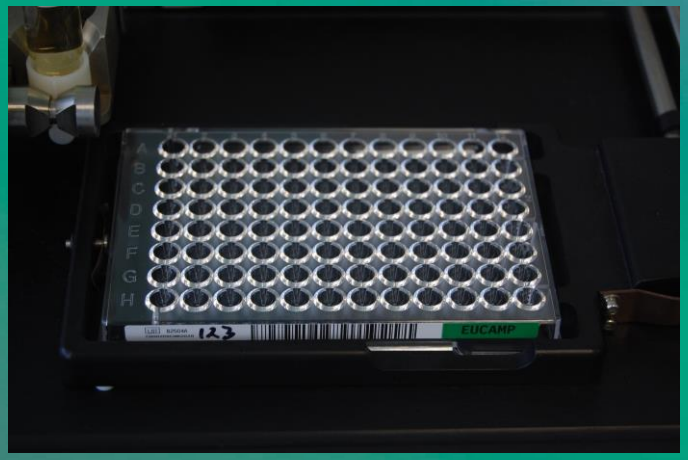
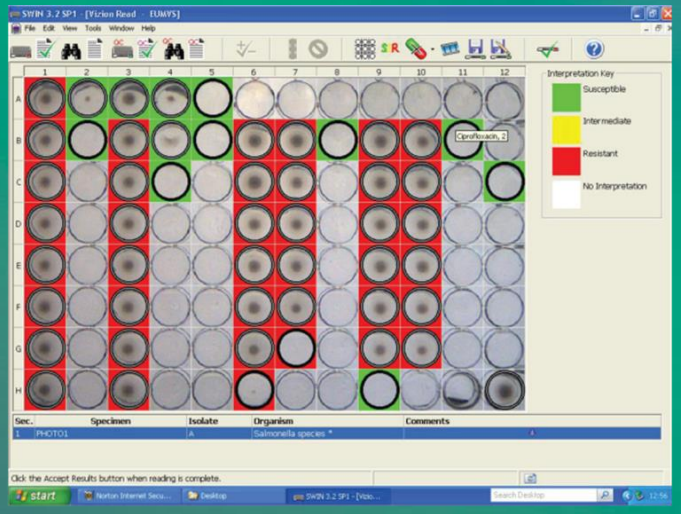
Susceptibility Testing



Inoculation



Reading

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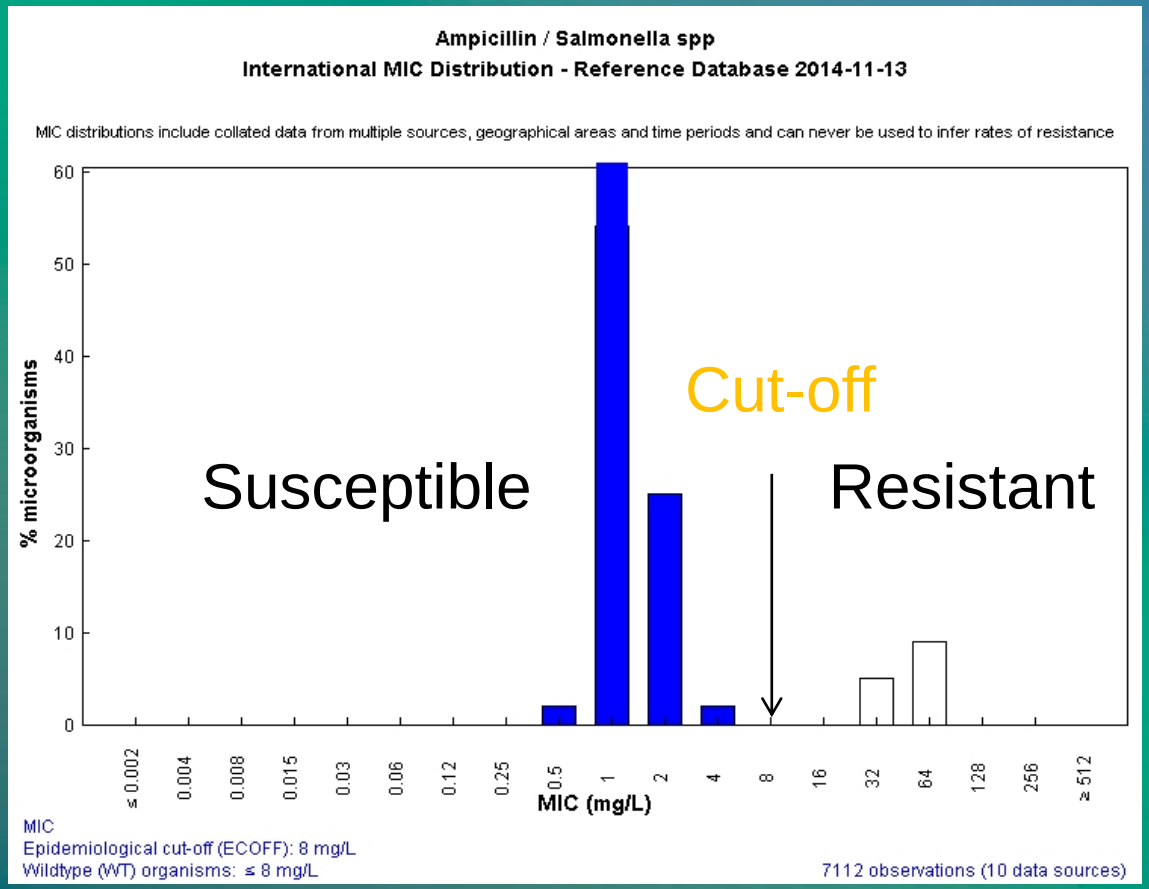
Interpretation



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2014 survey data

SCIENTIFIC REPORT

ADOPTED: 9 February 2016 PUBLISHED: 11 February 2016 AMENDED: 11 March 2016

doi:10.2903/j.efsa.2016.4380

The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2014

European Food Safety Authority
European Centre for Disease Prevention and Control

- *Salmonella*: low levels of resistance in broiler flocks and carcases
- No CIP/ CTX resistance

IRL

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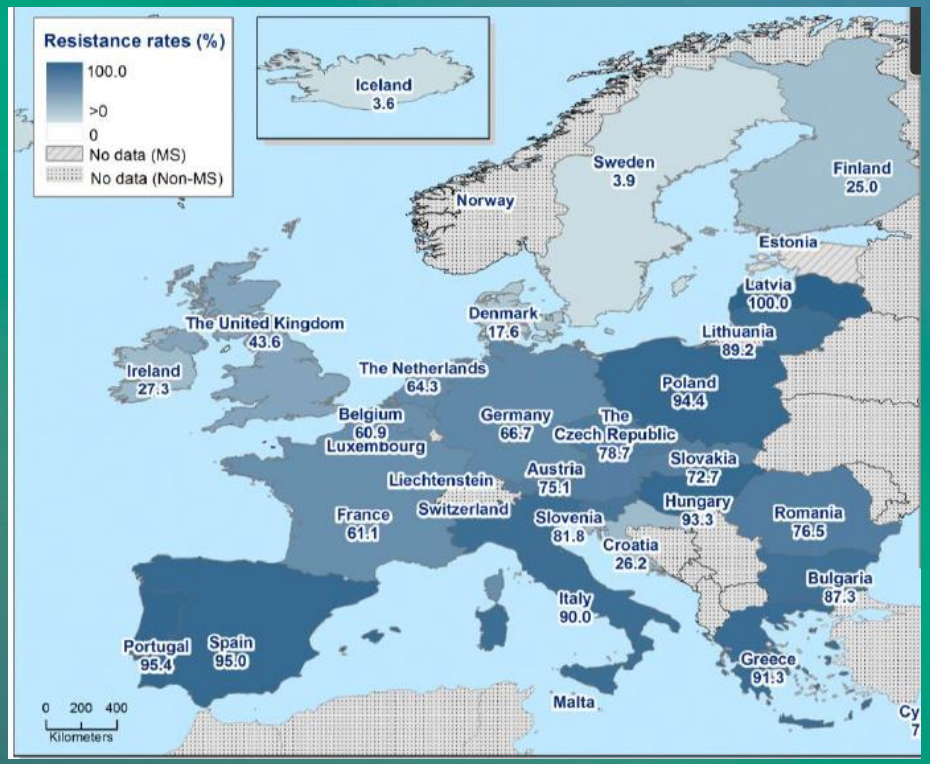
2014 survey data

Campylobacter

- CIP resistance 27%
- ERY 1%



Campylobacter / CIP 2014

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2014 survey data

E. Coli

- 4.2% resistant to 3º Cephalosporins
- EU average- 5.1%

- 41.3% CIP resistant
- EU average 65.7%

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2015 survey data

- Levels of resistance much higher
- No 3º Cephalosporin resistance in porcine Salmonella
- Nearly 30% porcine caeca ESBL/AMP-C positive

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Screening *Salmonella* and *E. coli* isolates from animals in Ireland for Colistin resistance

Rosemarie Slowey, Tony O' Brien, Gillian Madigan, Deirdre Prendergast, Eadaoin Ni Ghallchóir, Margaret Griffin, Anthony McAuliffe, Anne Murphy, Annette Deane and John Egan

National Reference Laboratory for Antimicrobial Resistance (Food, Feed and Animal Health) , Backweston Complex, Celbridge, Co. Kildare.

Introduction

Antimicrobial resistance is now recognised as one of the most serious global threats to human health in the 21st century. Colistin is an antimicrobial drug belonging to the family of polymyxins, with broad-spectrum activity against Gram-negative bacteria, including most species of the family Enterobacteriaceae. The global increase in carbapenemase-producing Enterobacteriaceae has resulted in increased use of colistin in humans with the inevitable risk of emerging resistance. As colistin is occasionally used in the treatment of animal infections there is a need to regularly screen for resistance in animal isolates.

Colistin resistance had been attributed to mutations on the bacterial chromosome that allowed vertical transfer of resistance to occur. In November 2015, Liu et al. first described plasmid- mediated colistin resistance (*mcr*-1) which can be horizontally transferred between bacteria. They identified the gene in *E. coli* isolates from animals, meat and people with the highest prevalence found in the animal isolates. They postulated that the emergence and dissemination of this gene was linked to the selective pressure effects of colistin use in agriculture. Since then, *mcr*-1 gene has been identified in *Salmonella* and *E. coli* from humans and animals in multiple countries, including the UK, Denmark, France and Canada.

Methods

Salmonella and *E. coli* isolates received at the Irish NRL for Antimicrobial Resistance (Backweston), were screened for AMR using the broth dilution method to determine Minimum Inhibitory Concentration (MIC). An epidemiolocical cut-off (ECOFF) >2 (mg/L) was used to classify resistance in *Salmonella* and *E. coli* isolates as specified in EU Commission decision 2013/652/EU which aims to harmonise monitoring in EU Member States. A total of 543 *Salmonella* and 453 *E. coli* isolates recovered from various animal species during 2014 and 2015 were available for testing (Table 1). The MICs for 34 isolates of *Salmonella* isolates were in excess of the ECOFF. None of the *E. coli* isolates were resistant. The resistant *Salmonella* isolates were screened for the presence of the *mcr*-1 gene using a PCR protocol issued by the EU Reference Laboratory for Antimicrobial Resistance. None were found to be positive. Further studies are underway to investigate any chromosomal mutations present in

Results

A total of 543 *Salmonella* and 453 *E. coli* isolates recovered from various animal species during 2014 and 2015 were available for testing (Table 1). The MICs for 34 isolates of *Salmonella* isolates were in excess of the ECOFF. None of the *E. coli* isolates were resistant. The resistant *Salmonella* isolates were screened for the presence of the *mcr*-1 gene using a PCR protocol issued by the EU Reference Laboratory for Antimicrobial Resistance. None were found to be positive. Further studies are underway to investigate any

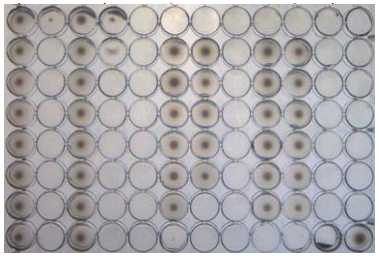

Table 1. *Salmonella* and *E. coli* isolates tested

Animal Species	*Salmonella*		*E. coli*	
	No. tested	No. resistant	No. tested	No. resistant
Avian	255	3	208	0
Porcine	211	2	239	0
Bovine	52	23	6	0
Equine	15	2	-	-
Canine	5	1	-	-
Ovine	2	0	-	-
Duck	1	0	-	-
Reptile	2	0	-	-

Discussion

Colistin use in animals is increasing in some countries. Liu et al. (2016) expressed concern that in the absence of new agents

mcr-1 screening of Colistin resistant isolates

Yi-Yun Liu et al. (2016). Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study. Lancet Infect Dis, 16, 161-168.

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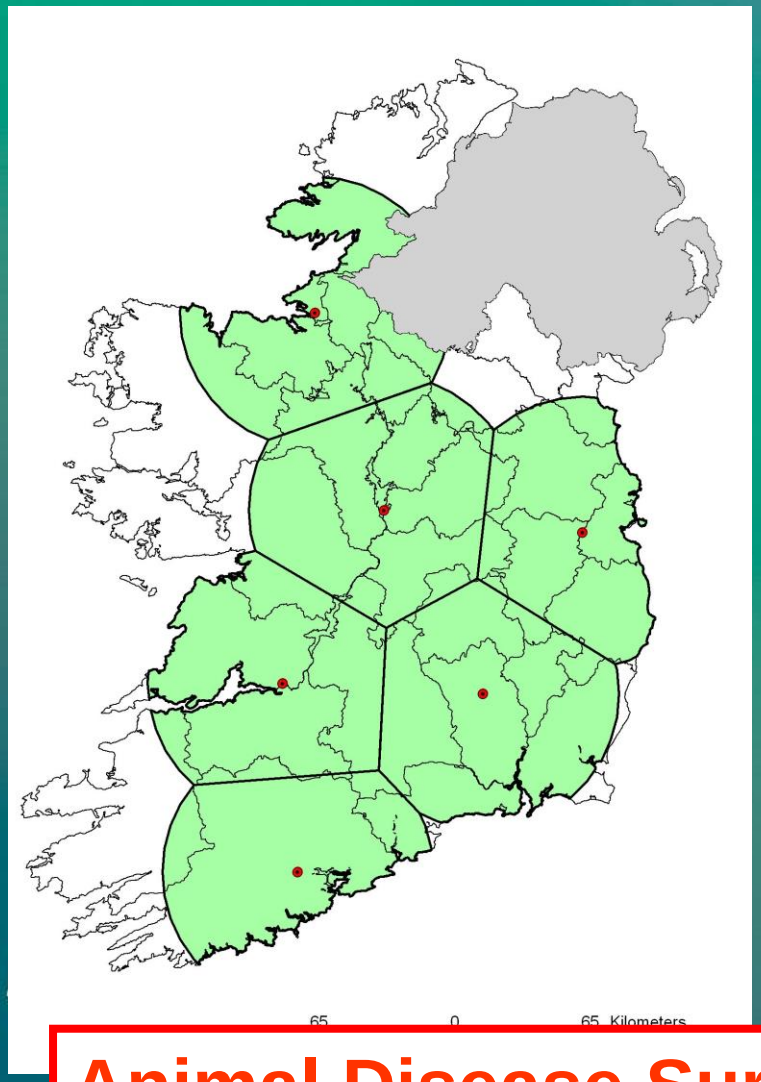
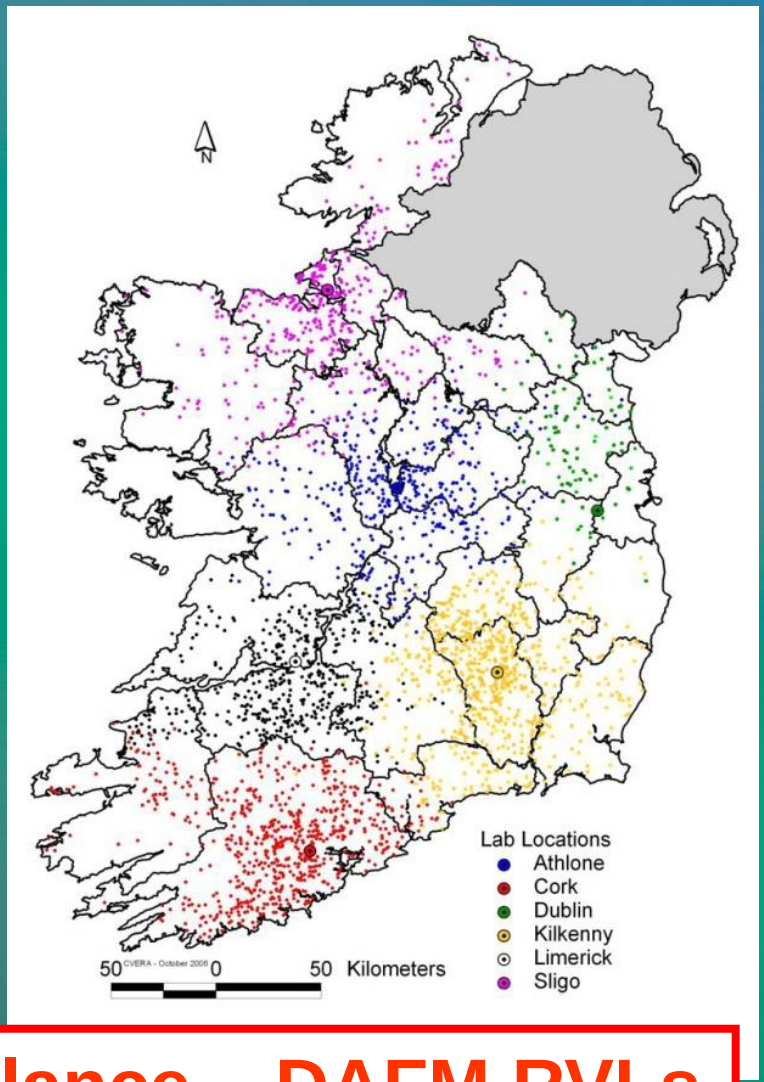
2. Evidence to support disease prevention and prudent use of antimicrobials





Animal Disease Surveillance – DAFM RVLs

Animal Disease Surveillance – DAFM RVLs

- Caseload referred by PVPs
- Voluntary submission
- Necropsy
- Clinical pathology – blood, swabs, faeces, milk, etc.
- Bacteriological culture and Sensitivity testing – disc diffusion

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All-island Animal Disease Surveillance Report 2014

A joint AFBI / DAFM Veterinary Laboratories publication

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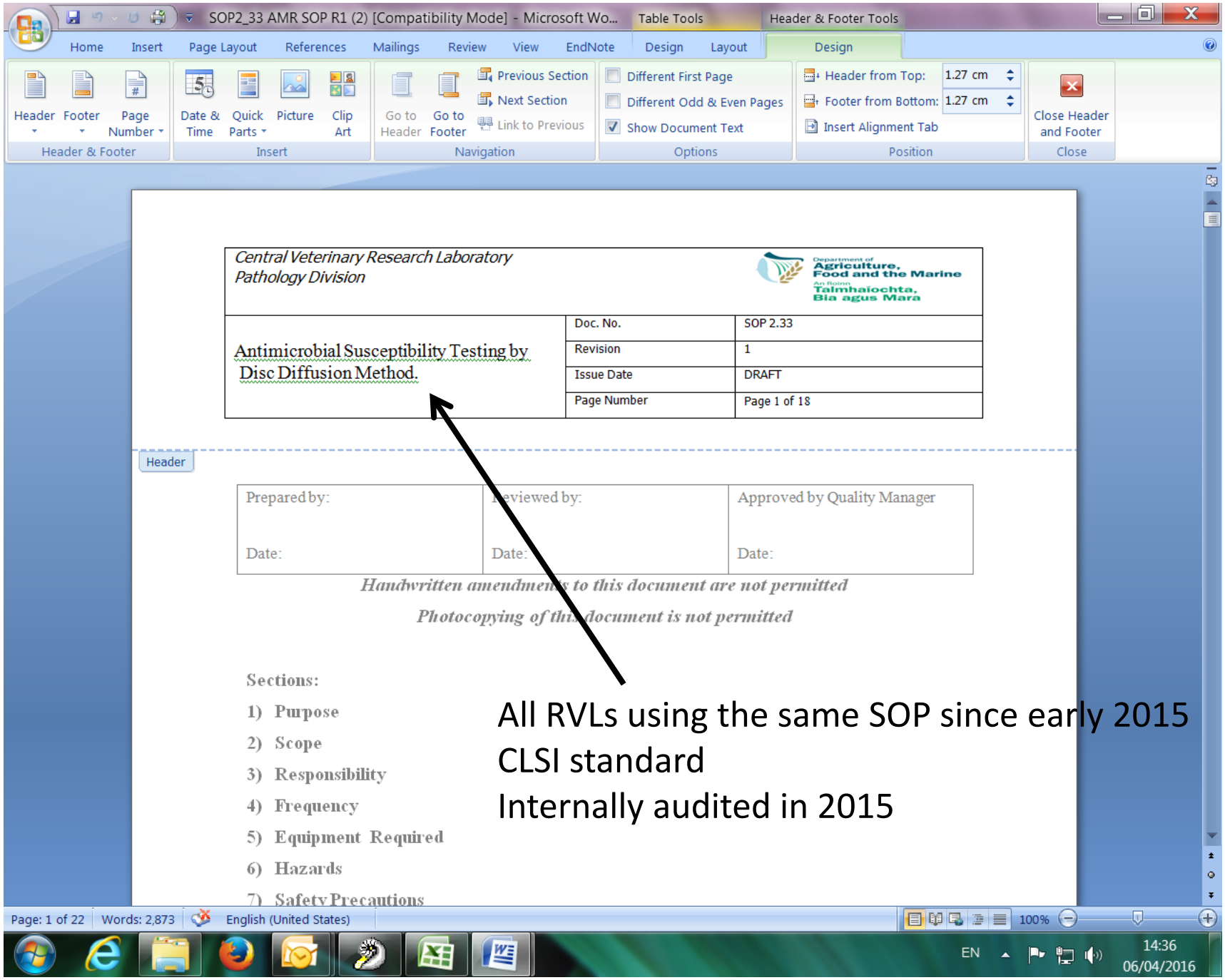
afbi Agri-Food and Biosciences Institute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Central Veterinary Research Laboratory
Pathology Division
Department of Agriculture, Food and the Marine
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Antimicrobial Susceptibility Testing by Disc Diffusion Method.
Doc. No. SOP 2.33
Revision 1
Issue Date DRAFT
Page Number Page 1 of 18
Header
Prepared by: Date:
Reviewed by: Date:
Approved by Quality Manager Date:
Handwritten amendments to this document are not permitted
Photocopying of this document is not permitted
Sections:
1) Purpose
2) Scope
3) Responsibility
4) Frequency
5) Equipment Required
6) Hazards
7) Safety Precautions
All RVLs using the same SOP since early 2015
CLSI standard
Internally audited in 2015
Page: 1 of 22
Words: 2,873
English (United States)
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06/04/2016

Significant AMR patterns in clinical isolates

Staphylococcus aureus isolates resistant to cefoxitin

- >800 isolates in 2015
- 378 isolates tested (350 from milk)
- 1 suspected of being resistant to cefoxitin

Pasteurella multocida and *Mannheimia haemolytica* isolates resistant to enrofloxacin, ceftiofur, tilmocosin or tulathromycin

- 150 isolates tested
- 2 isolates resistant to enrofloxacin

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Significant AMR patterns in clinical isolates

(Enterobacteria - isolates resistant to cefpodoxime)

Salmonella typhimurium – all isolates (n = 5 in 2015) referred to NRL

Salmonella Dublin - any resistant isolates

- 105 isolates tested; 1 resistant to cefpodoxime

Escherichia coli - isolates resistant to ceftiofur

- 284 isolates tested
- 8 resistant to cefpodoxime; 1 also resistant to ceftiofur
- 4 resistant isolates referred to NRL - 3 presumptive ESBL

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Mastitis in Dairy Cattle

- Clinical and subclinical mastitis
- Impact on milk quality and milk yield
- *Staph. aureus* and *Streptococcus* spp.
- Intramammary antimicrobial treatment
- DAFM-RVL AM sensitivity testing indicates that most mastitis-causing pathogens are sensitive to 1º & 2º penicillins

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Mastitis in Dairy Cattle

- Industry-led disease control - AHI
- “CellCheck” – subclinical mastitis/milk quality

- Private commercial laboratories (n = 8) provide culture & sensitivity testing of milk

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Infectious diseases in intensively-managed pigs

- Integrated systems – housed pigs
- Enteric and respiratory infections (viral/bacterial)
- Animal health, animal welfare and production efficiency objectives are not mutually exclusive
- Alternative approaches to preventing infectious disease – biosecurity protocols, hygienic measures, vaccines, targeted treatment
- Provide baseline data and monitor effectiveness of different intervention strategies
- DAFM-funded R&D projects

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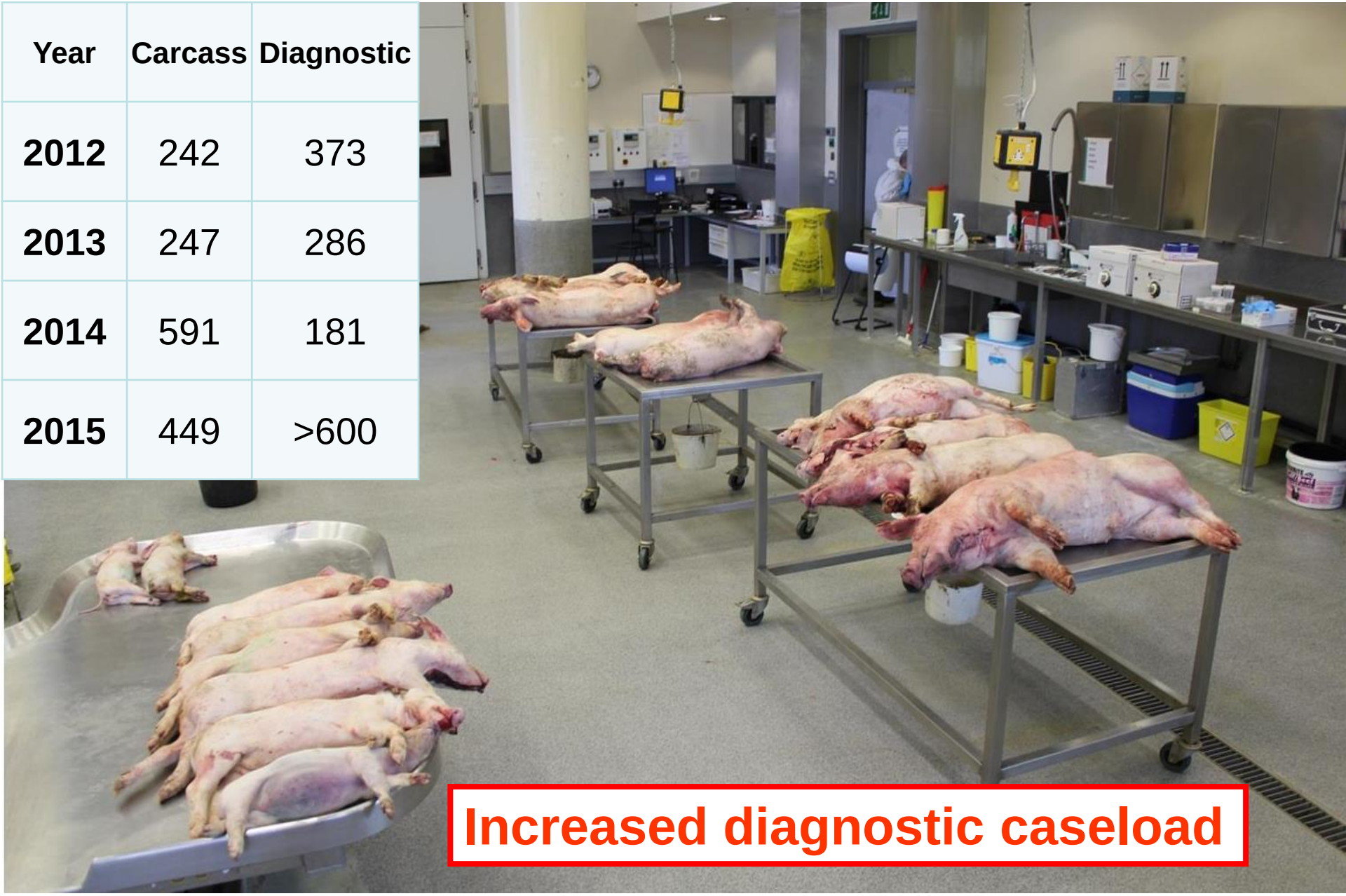
Investigation of respiratory disease on Irish pig farms, associated risk factors, and the relationship with performance, welfare and antimicrobial use.

(Pathsurvpigs)

€740,000 Research Stimulus Fund

Year	Carcass	Diagnostic
2012	242	373
2013	247	286
2014	591	181
2015	449	>600

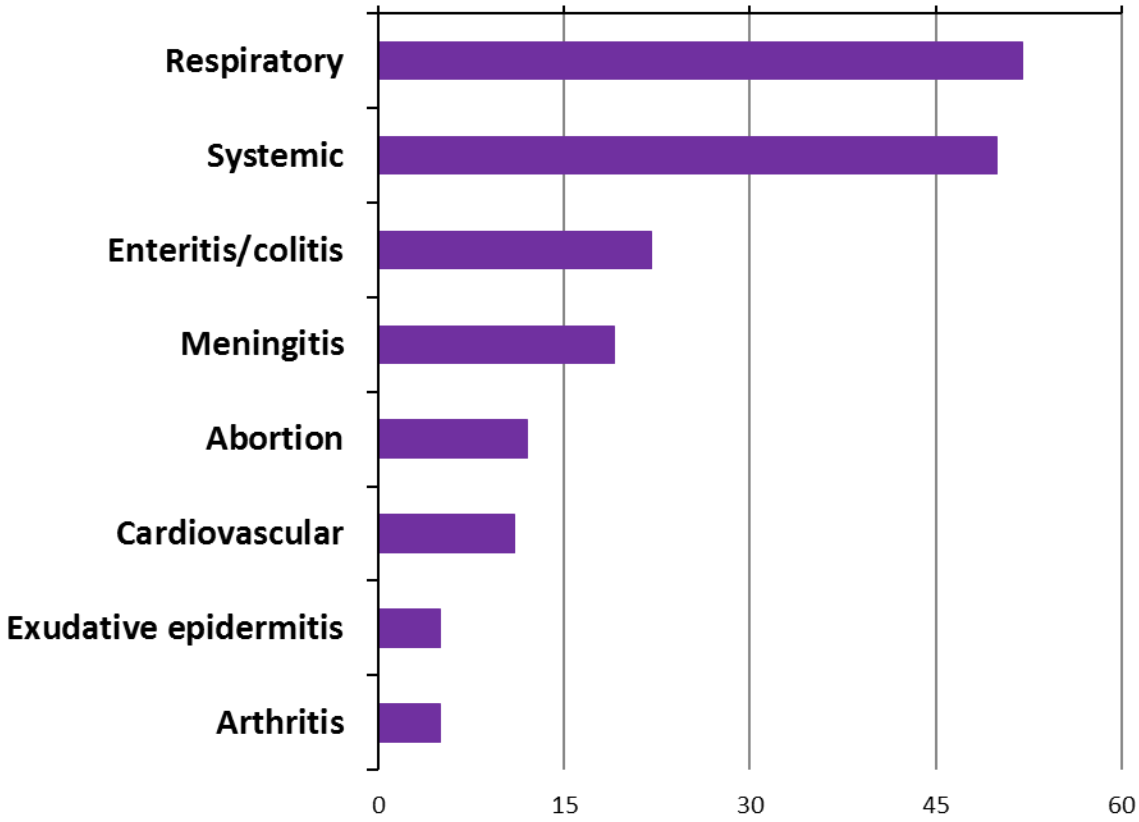


Increased diagnostic caseload

- Pattern & frequency of disease
- Prevalence of infection

→

- Disease Prevention strategies

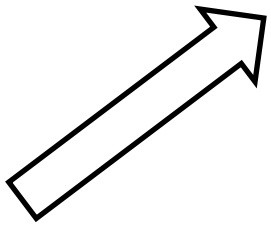


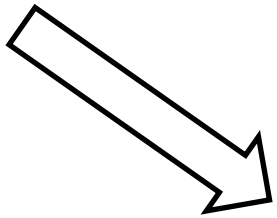
reduced use

Focus on:

- biosecurity and management
- Diagnostics and vaccination
- Quantification of AM use

→ Tailor made herd advice



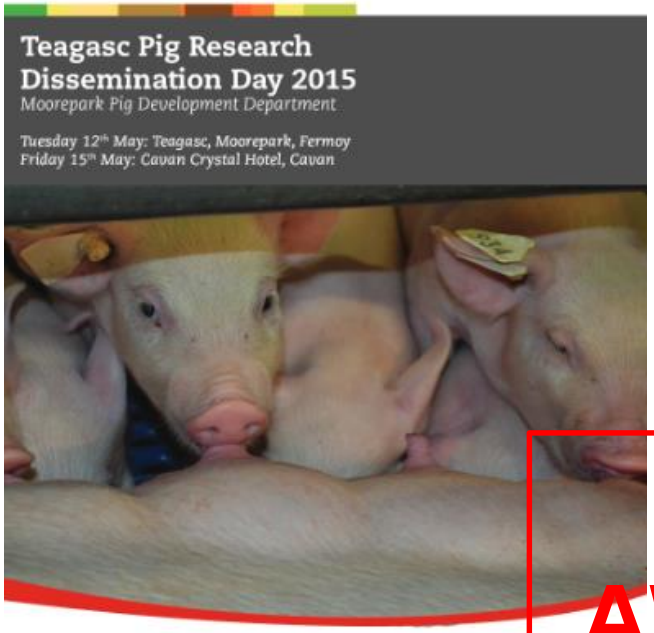


WELPIG
Teagasc GIA VCI

BIOCHECK
Teagasc

PIGWELFIND
RSF 2012

PathSurvPigs
RSF 2014



RAISE AWARENESS

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Biosecurity as a tool towards reduced antimicrobial consumption

Prof. Dr. Jeroen Dewulf
Jeroen.Dewulf@UGent.be

iPad 22:4

National effort to improve biosecurity on pig farms

Edgar Garcia Manzanilla, Teagasc Moorepark, gives details of a new biosecurity initiative

Biosecurity is a key issue that needs to be continually reinforced to avoid the entrance of new diseases at country and farm level.

The volume of international livestock trade increases every year, leading also to higher rates of disease. In the pig sector, the most recent examples of diseases rapidly spreading and affecting a number of countries are African swine fever (ASF), which is still prevalent in eastern Europe, or porcine epidemic diarrhoea virus (PEDv), which moved fast through Canada and large areas of the US.

In this context, biosecurity (the protection of agricultural animals from any type of infectious agent) becomes a key issue and has to be constantly reinforced to avoid the entrance of new diseases at country level and at farm level. This is called external biosecurity. However, diseases sometiems enter farms, as happened with Porcine Reproductive & Respiratory Syndrome (PRRS) in 2013, and there should be protocols in place to minimise the spread within farms. Biosecurity within the farm is called internal biosecurity. With the right biosecurity protocols, eradication of existing diseases is also possible.

The Irish pig sector has a geographical advantage compared with other EU and Teagasc advisers participating in the questionnaires have already pointed out how useful they are to find out critical issues on the farms. Once the initial 60 questionnaires are completed, reports will be sent to the farmers and particular actions will be proposed for each farm.

Preliminary results of the questionnaire show that external biosecurity is reasonably good in Ireland compared with other countries in the EU. Many of the herds in Ireland are integrated and this minimises the movement of animals among farms. However, a point that needs to be improved for external biosecurity is the control of personnel and equipment entering the farms by the use of more showering and cleaning facilities.