CA18105

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Risk-based meat inspection and integrated meat safety assurance

Mapping ways of detecting and handling antimicrobial residues in pigs and pig meat in- and outside Europe

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Introduction

In EU, antimicrobials (AM) are prescribed by vets, and prescriptions contain information about withdrawal periods before animals can be sent for slaughter

- Compliance with withdrawal periods required
- These may vary between countries

Procedures in place to help avoiding delivery of animals to abattoir prior to end of withdrawal period

- Still, human errors occur
- E.g., due to inadequate marking and registration, wrong use of medicine mixer, or miscommunication between personnel

Findings may have potential consequences along entire meat chain

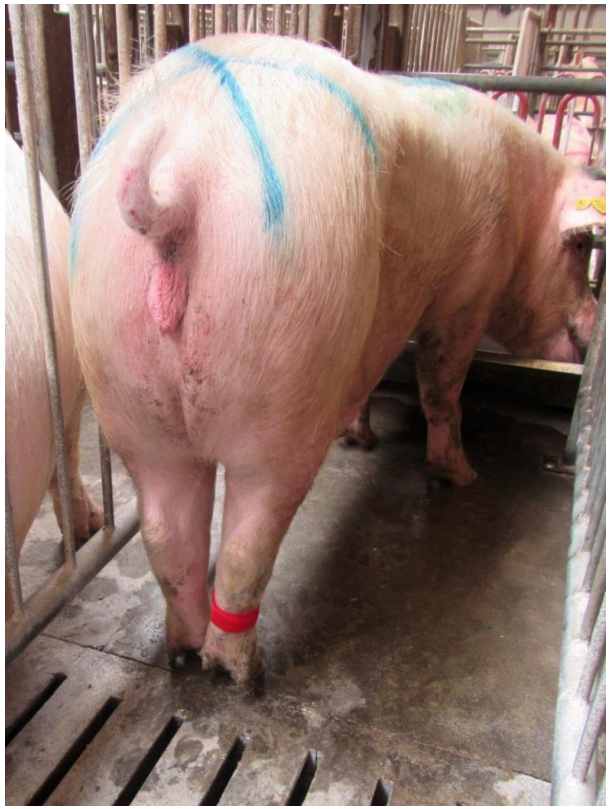

Photo: EO Nielsen

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EU Legislation

The EU General Food Law states that meat should not contain residues

- To document compliance, monitoring should be conducted

Monitoring programmes are established and run by CA for verification

- Minimum 0.02% tested for legal antimicrobials in official programme
- Additional activities by FBOs in form of own check programmes

Some parts of programme can be run as surveillance

- e.g., when release of tested carcass is pending negative test result

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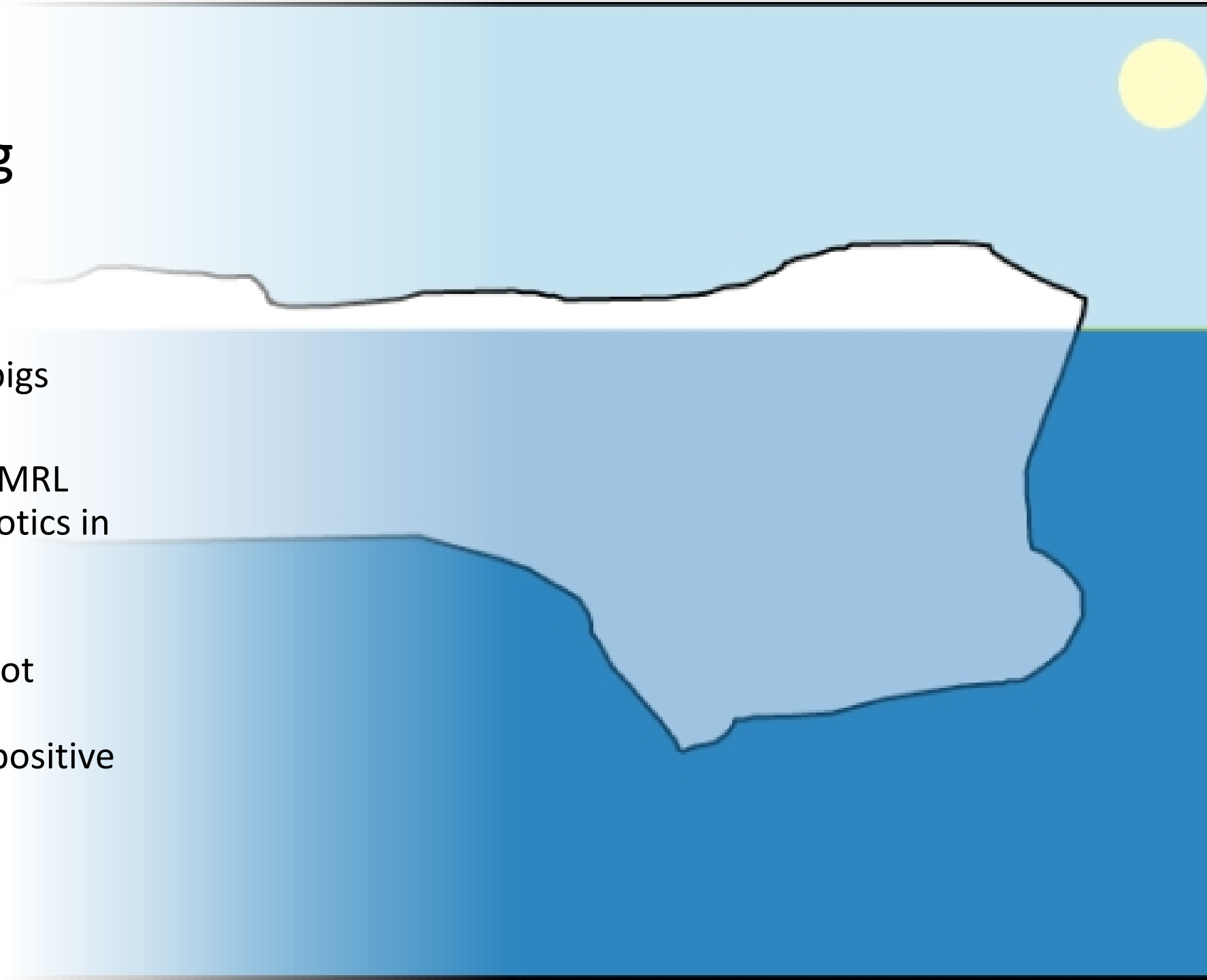
Tip-of-the-iceberg problem

- Minute proportion of pigs tested
- Very low prevalence > MRL (0.12%) for legal antibiotics in 2020
- Risk management on a positive sample does not resolve the population problem of which the positive sample is indicative



Aims

The question is how monitoring and handling can be done?

- In a cost-effective and harmonised way

Can we identify a best practice for detection and handling?

- To address this, survey undertaken

Based on survey results, development of models for best practice

- Considering objective of detection and handling in each country

Pigs chosen as livestock species of interest

- Antimicrobial use in sows and finishers could lead to presence of residues in meat

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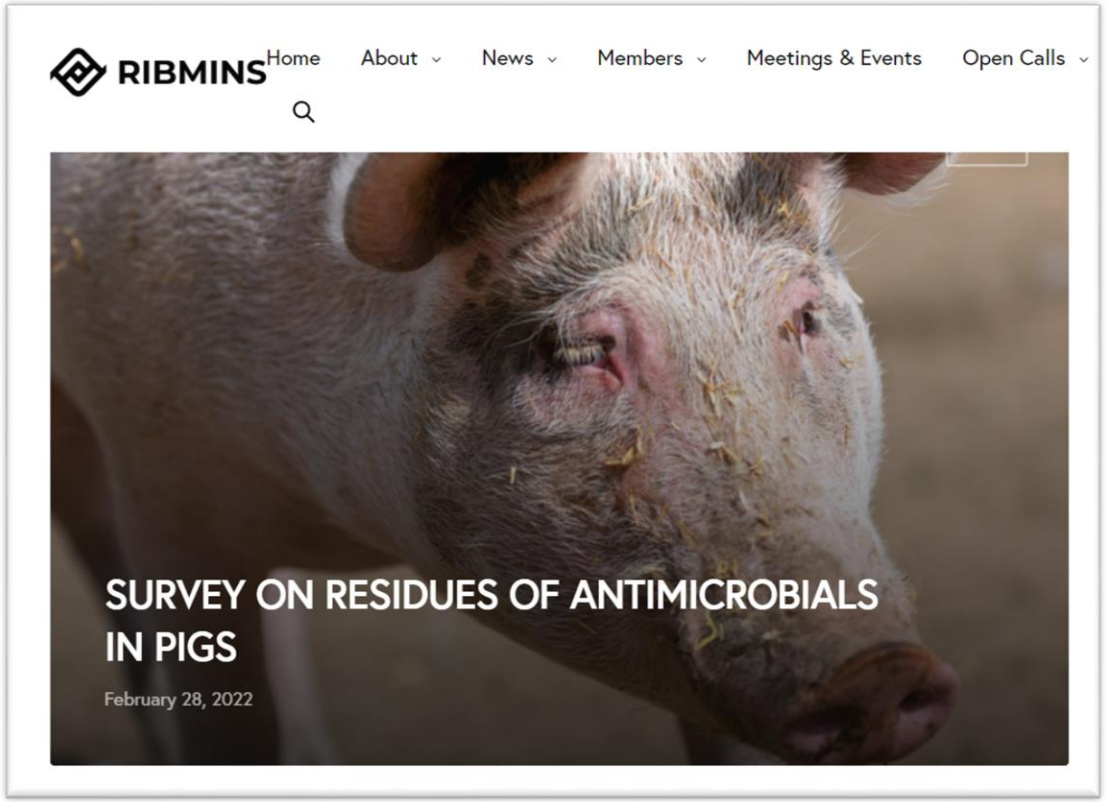
Materials

Two questionnaires developed

- One for competent authorities (CAs)
- One for Food Business Operators (FBOs)

Access to questionnaires

- Made possible through link on RIBMINS website (https://ribmins.com/survey-on-residues-of-antimicrobials-in-pigs/)
- Link open from 29 March to 5 July 2022



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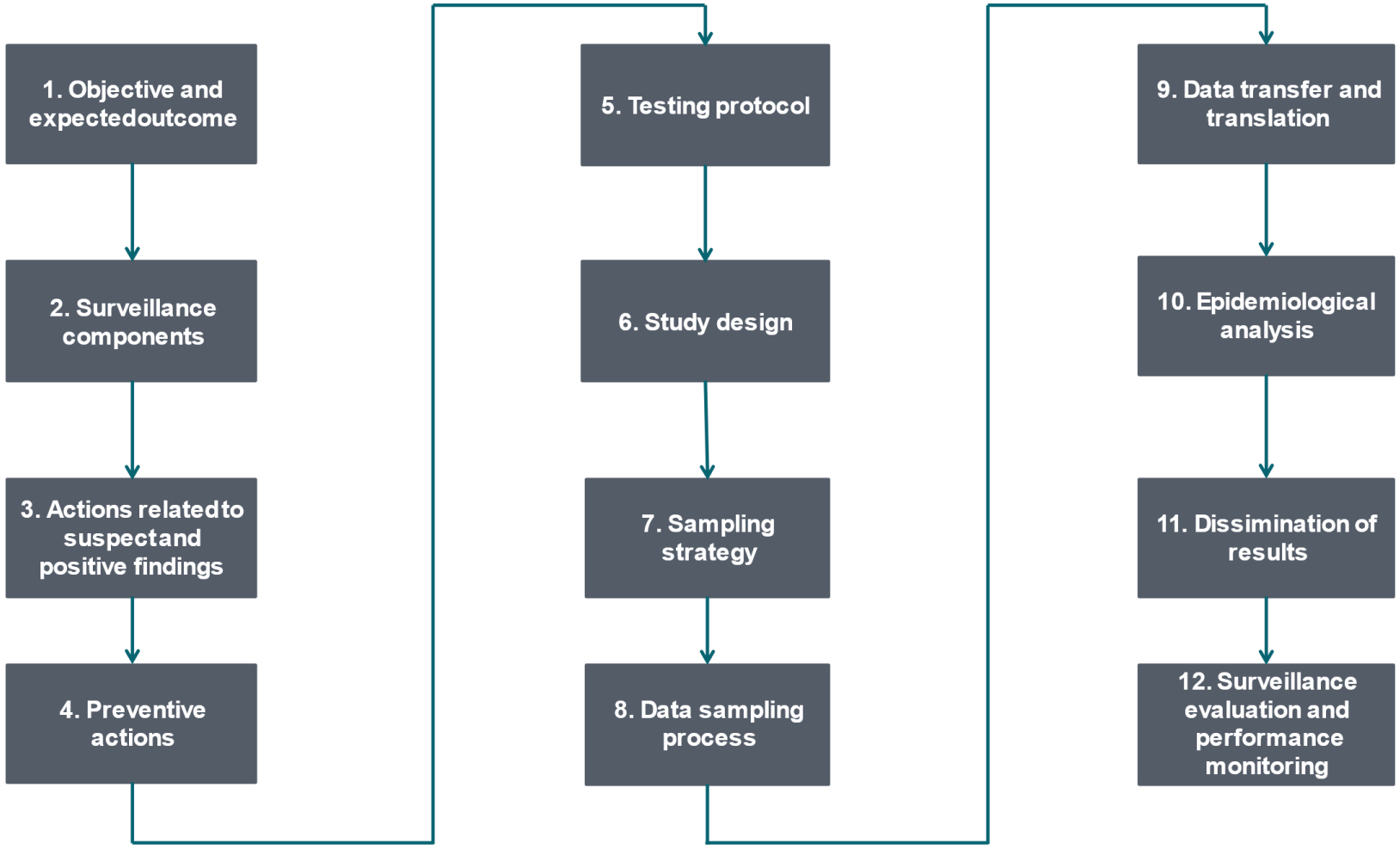
Elements of the questionnaires

Questions followed the elements that form part of risk-based surveillance as described in RISKSUR and SANTERO projects



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Methods – Statistical methods

Quantitative analyses

- Carried out using SAS version 9.4
- Chi-square test used to determine statistical differences between CA and FBO
- Fisher's exact test used, if ≥1 of the cells in contingency table had expected cell count of <5

Qualitative data

- Text condensed to produce short summary using grounded theory

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Methods – Development of Best Practice Models

Inspired by approach used for EU Regulation 2073/2005 dealing with microbiological criteria, which operates with two kinds of criteria

- While considering the tip-of-the-iceberg problem

Model A - Process hygiene criterion

- Detection of residues >MRL requires on-farm inspection
- But does not require tested carcass to be detained

Model B - Food safety criterion

Detection of residues requires on-farm inspection

- Tested carcass is detained to avoid expensive call-backs in case residues >MRL are found

Model C – Discussed and rejected due to lack of need and feasibility

- All animals in batch detained, until negative test results become available

Results

78 answers, CA: 46 & FBO: 32

27 countries, mainly in Europe

Answers show a plethora of ways of detection and handling

Ranked list of objectives for monitoring, where 5 = the most important objective, and 1 = the least important, divided into CA and FBO, and sorted by average value

Objective of monitoring	Average value CA	No. of answers	Average value FBO	No. of answers
Detect and handle positive samples	4.3	42	3.7	34
Show compliance with legislation	4.1	41	3.6	34
Assess prevalence of residues in pig meat	3.6	42	3.4	34
Show pig producers that monitoring is in place on abattoir	2.9	41	3.4	34
Other objectives	2.1	22	3.2	23

Handling of the tested carcass

When a sample is taken from pig carcass, how is the carcass handled?

	Carcass detained, until result* becomes available	Carcass not detained	Other handling	I do not know	Total No. of answers	No. of responders
CA	5 (12%)	28 (67%)	7 (17%)	2 (5%)	42 (100%)	42 (100%)
FBO	9 (24%)	19 (51%)	8 (22%)	1 (3%)	37 (106%)	35 (100%)

If carcass is detained until result below MRL becomes available

	To avoid corrective measures imposed by CA in case sample is positive	Due to export requirements	Other reasons	Not relevant* because tested carcasses not detained	I do not know	Total No. of answers	No. of responders
CA	13 (46%)	5 (18%)	3 (11%)	14 (50%)	2 (7%)	37 (132%)	28 (100%)
FBO	12 (41%)	8 (28%)	1 (3%)	13 (45%)	2 (7%)	36 (124%)	29 (100%)

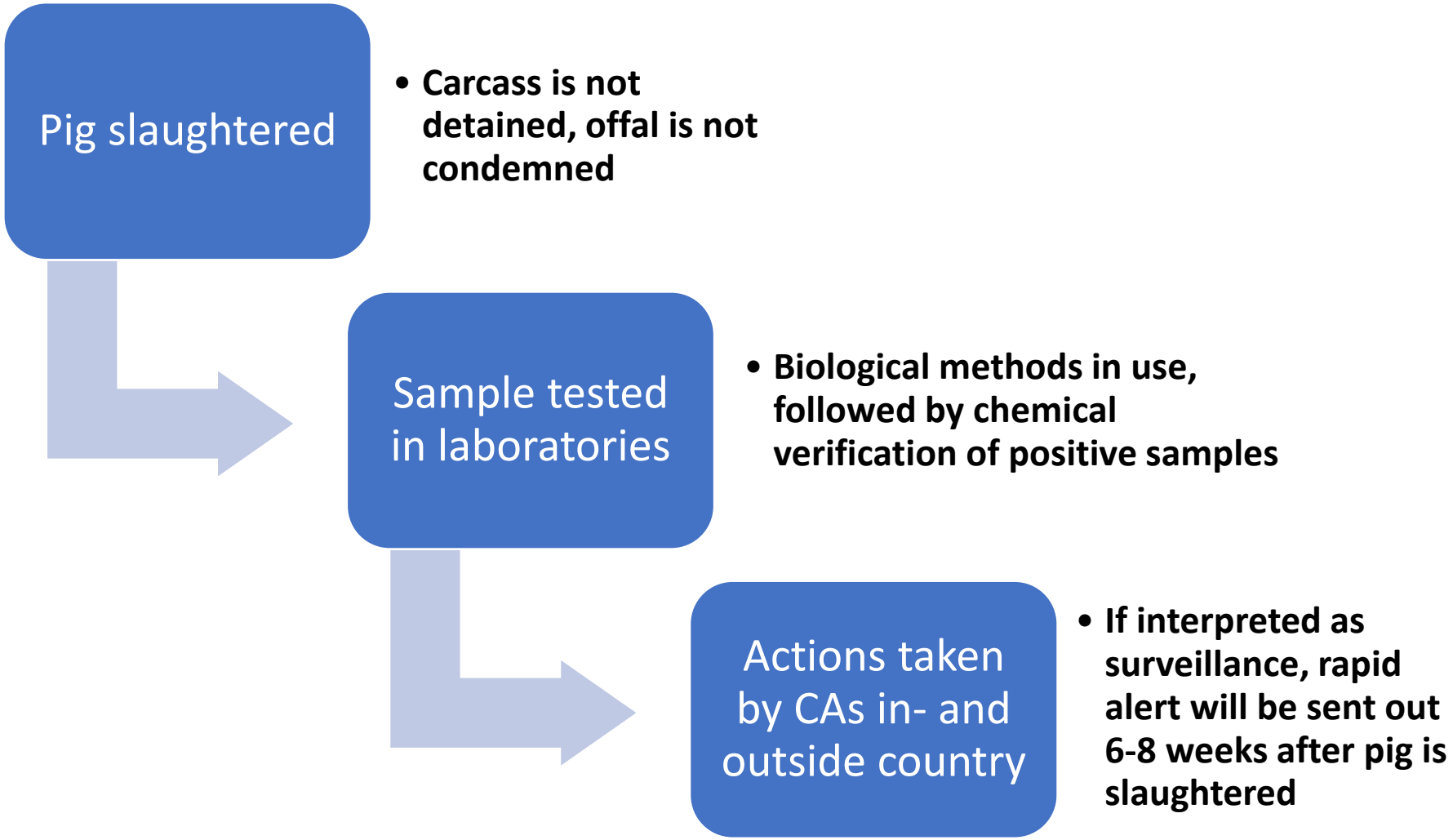
*** Test result showing concentrations <MRL**

Summarised results of survey

>27 different interpretations of the EU Residue Directive

- Leading to different ways of detecting and handling
  - Varying numbers of surveillance components
  - Some use risk-based approaches, others do not
  - Results in huge variation in sampling frequencies
  - Matrix is mostly muscle, kidney or kidney fluid
  - Detection methods vary from cheap biological (agar plates) to more expensive direct chemical verification using HPLC LS-MS/MS
  - Some set up the system as monitoring and others as surveillance
  - Difference in intensity may partly be ascribed to importance of meat export

Monitoring or surveillance? – a mix can create problems



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Description of Best Practice models

Element of surveillance	Model A – Monitoring ≈ Process criterion	Model B – Surveillance ≈ Food safety criterion
Objective and expected outcome	Could be for small abattoirs only placing meat on own market	Could be for all other abattoirs
Surveillance components		
Actions related to suspect and positive findings		
Testing protocol	Minimum sampling frequency is 2/10,000 => few sampled to act upon	Here, more than a few samples are tested
Study design, sampling strategy		

Discussion - 1

Recent EFSA survey shows that residues in in food are in the top of food safety-related concerns among European consumers

- Despite low prevalences in meat

Overarching aim of EU legislation to keep residue prevalence in meat low

- However, risk management on a positive sample, does not resolve population problem of which the positive sample is indicative

Non-compliance can lead to carcass condemnation and allocation of meat to animal by-product category 2 (=pressure sterilisation)

- Contradicts European Green Deal that contributes to UN sustainable development goals by reducing food losses and waste without impairing food safety

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Discussion - 2

Tip-of-the-iceberg problem

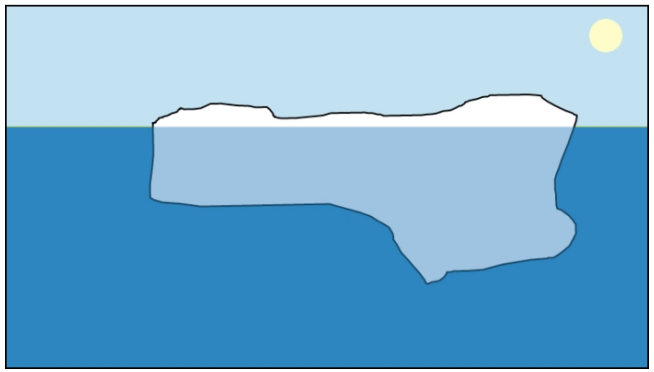
- Even the best surveillance system currently in force involves <0.1% of produced pigs
- Legal AM residues at levels >MRLs will be found occasionally on market
- But only causing few documented human cases of illness

CA and FBO must take this into consideration

- Prevention should take place on-farm
- Monitoring results should be interpreted as verification of actions taken on-farm

Balance between prevention and action should be sought

- As reflected in our Best Practice models



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Conclusion

There is a plethora of ways to detect and handle AM residues

Two Best Practice models developed

- Model A - Process criterion – for small abattoirs only placing meat on own market
- Model B - Food safety criterion – for all other abattoirs

Based on approach used in EU Regulation on microbiological criteria

- Could act as basis for future evidence-based and harmonised procedures to improve decision-making regarding condemnation of carcasses and by-products that contain (or might contain) AM residues >MRLs

Will reduce food waste without jeopardizing consumer safety

- In line with EU ambition to ensure more sustainable and climate friendly food production

On-going activities

We are continuing with Part 2 of the project:

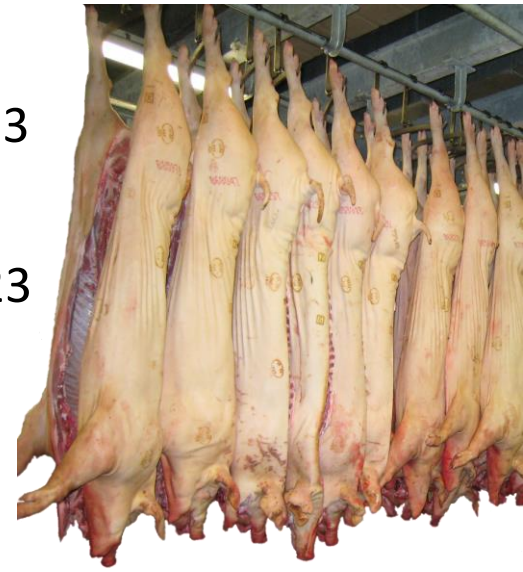
- How to handle situation, where pig producer contacts abattoir regarding premature delivery of one or more pigs for slaughter

Exposure risk assessment model suggested, aiming at estimating

- Concentration of residues at time of slaughter compared to MRL
- Amount of residues in 300 g serving in comparison with allowed daily intake (ADI) values

WG1 work will be presented at RIBMINS Stakeholder meeting in Brussels in April 2023

- To get feedback from CA and FBO representatives on our Best Practice models
- Work will also be presented at SafePork Conference in New Orleans, USA, May 2023



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Acknowledgements

All responders, who answered questionnaire, are acknowledged for their input

Publications

- A full manuscript has been submitted to Food Control
- Another manuscript dealing with “Pig producer contacts abattoir” will soon be submitted

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