

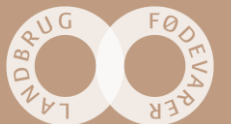
# Prudent use of antimicrobials - Workshop 2

**Lis Alban**

DVM, Ph.D. DipECVPH  
Chief Scientist, Danish Agric. & Food Council  
Adjunct Professor, University of Copenhagen



RIBMINS Virtual training school, 21 June 2022



## Concern about use of antimicrobials (AM)



**Risk mitigation needed**

- In livestock, pets and humans

**In this presentation, focus will be on livestock**

# Actions are taken in most countries

Movement in the same direction - prudent use

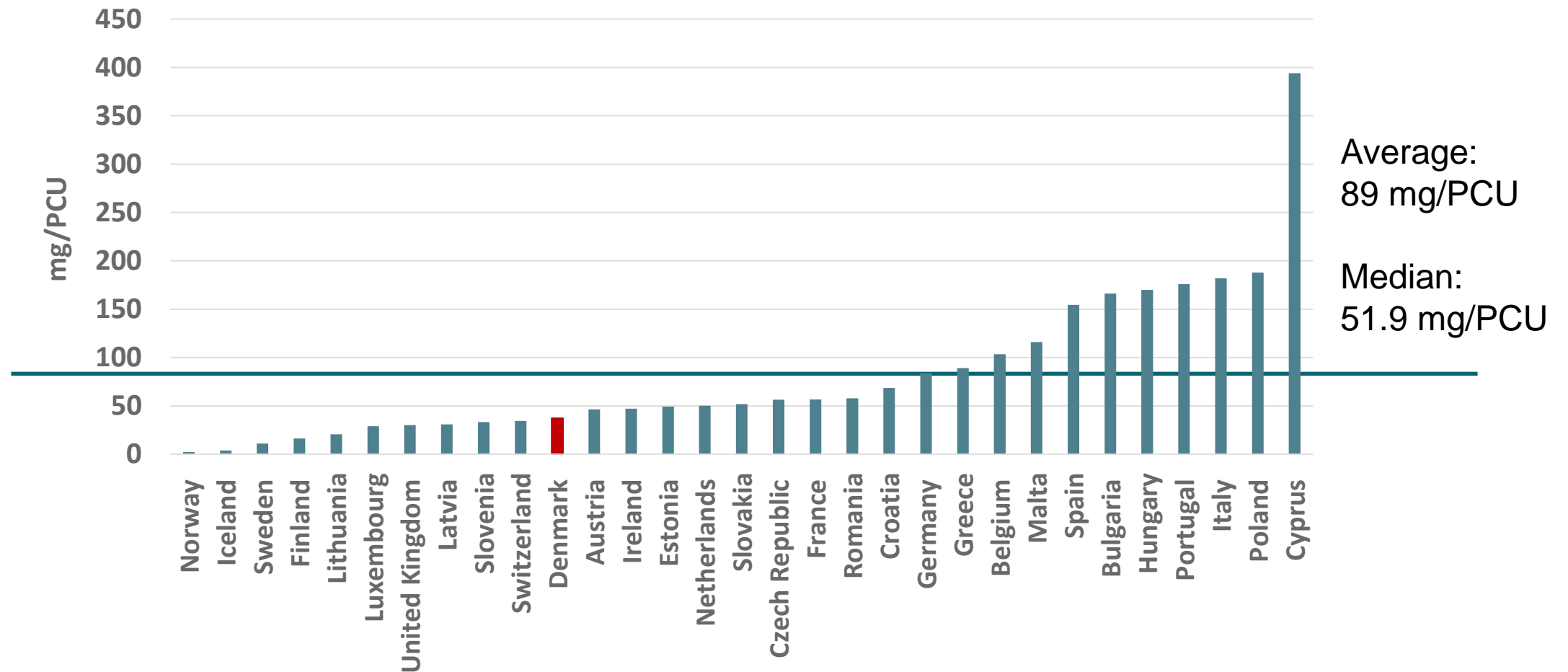
- Not allowing use of AM as growth promoter
- Limiting/prohibiting preventive use
- Restricting access to highly critical AM
  - Such as 3rd and 4th generation cephalosporins and fluoroquinolones
- Lowering use for treatment with other AM

Some began earlier than others

- Reflected in large variation in use of AM between countries
- See next slide, showing the ESVAC report results for 2019-2020
  - AM consumption relative to animal production in each country
  - Measured as mg per population correction units (mg/PCU)



## AM consumption relative to animal production in European countries, 2019-2020 (mg/PCU)



Source: [https://www.ema.europa.eu/en/documents/report/sales-veterinary-antimicrobial-agents-31-european-countries-2019-2020-trends-2010-2020-eleventh\\_en.pdf](https://www.ema.europa.eu/en/documents/report/sales-veterinary-antimicrobial-agents-31-european-countries-2019-2020-trends-2010-2020-eleventh_en.pdf)

# Responsibility?

Unrealistic to expect that farmers or vets will change habits, unless regulation of AM area takes place

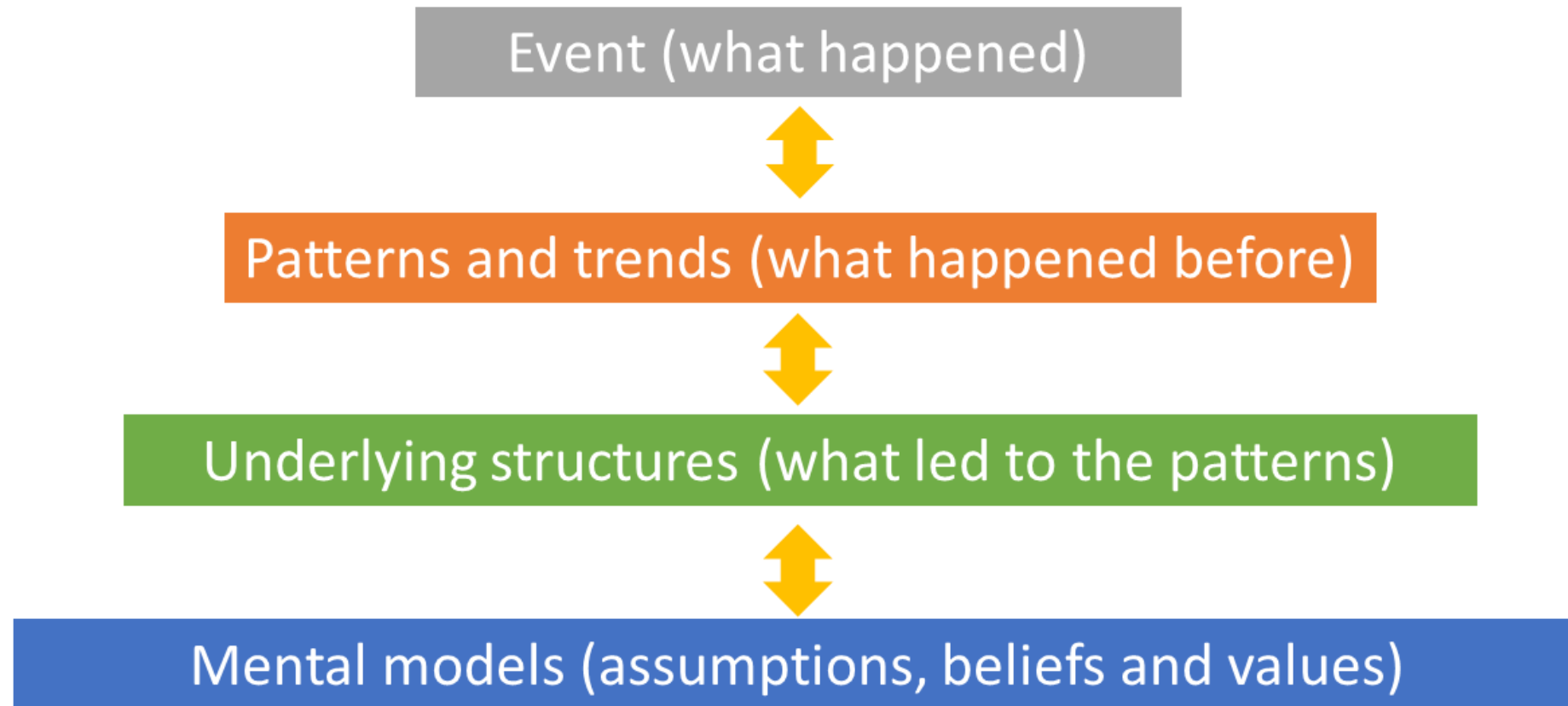
- Because of difficulty in "feeling" responsibility for society
- Moreover, legislative conditions should be equal for all producers
  - If not, problems with competitiveness may arise
  - Important to inform the animal sector about usefulness of legislation

Necessary to ensure productivity, if we want livestock producers and their vets to comply with legislation

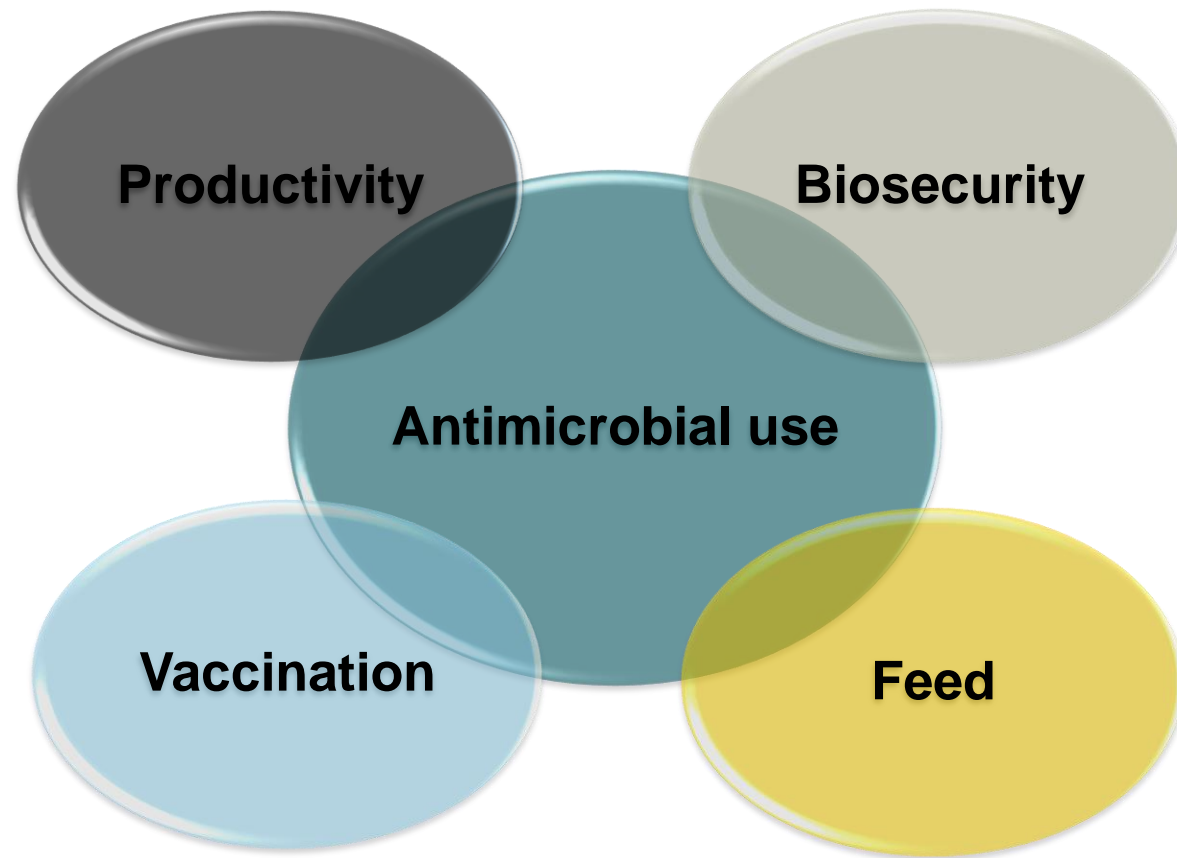
- Identify cost-effective measures to apply to ensure responsible use at different levels
    - Herd level
    - Sector level
    - National level
- Be inspired by what works in other countries, while adapting to own country



# Systems Thinking – to understand which measures will work at which level and how

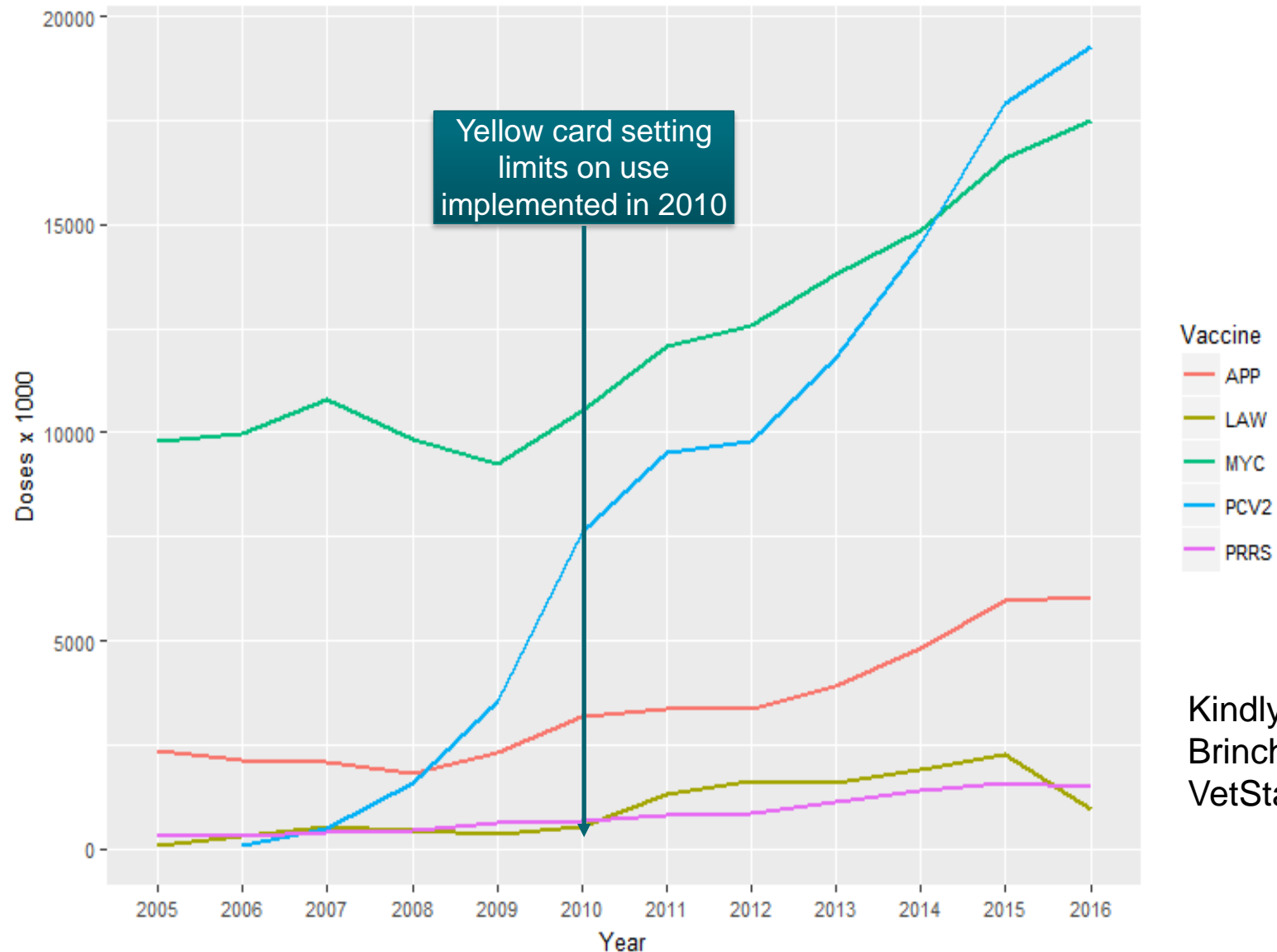


## HERD LEVEL - What can the livestock producers do to lower their consumption of antimicrobials?



**Get assistance  
from the vet!**

# Prevention through use of vaccines - on the increase in Denmark



Kindly provided by Amanda Brinch Kruse - based upon VetStat data

# DK experience

## Vaccines work

- But mandatory vaccination for production diseases will not necessarily lower use of AM
  - Because vaccines are used in herds with infections
- = Reverse causality


## Use vaccines where needed

- Vaccines against E. coli, PRRS, mycoplasma, and Lawsonia may in many cases help to improve health in the herd
- However, if infection is not present – effect of a vaccine cannot be expected

Temtem et al. *Porcine Health Management* (2016) 2:23  
DOI 10.1186/s40813-016-0042-1

Porcine Health Management

RESEARCH Open Access


 CrossMark

### Comparison of the antimicrobial consumption in weaning pigs in Danish sow herds with different vaccine purchase patterns during 2013


Carolina Temtem<sup>1</sup>, Amanda Brinch Kruse<sup>2</sup>, Liza Rosenbaum Nielsen<sup>2</sup>, Ken Steen Pedersen<sup>3</sup> and Lis Alban<sup>3\*</sup>

**Abstract**  
**Background:** There is growing concern about development of antimicrobial resistance due to use of antimicrobials (AMs) in livestock production. Identifying efficient alternatives, including vaccination, is a priority. The objective of this study was to compare the herd-level amount of AMs prescribed for weaner pigs, between Danish sow herds using varying combinations of vaccines against Porcine Circovirus Type 2 (PCV2), *Mycoplasma hyopneumoniae* (MYC) and *Lawsonia intracellularis* (LAW). It was hypothesised that herds purchasing vaccines, use these to prevent disease, and hence reduce their AM consumption, compared to herds purchasing fewer or no vaccines against these pathogens.

Data  
VetSt  
and  
divid  
base  
vacci  
num  
**Resu**  
respi  
herd  
vacci  
**Con**  
vacci  
just t  
prob  
appli  
vacci  
requi  
confi  
**Keyw**

 **frontiers**  
in Veterinary Science

ORIGINAL RESEARCH  
published: 16 January 2017  
doi: 10.3389/fvets.2016.00120

 Check for updates

### No Clear Effect of Initiating Vaccination against Common Endemic Infections on the Amounts of Prescribed Antimicrobials for Danish Weaner and Finishing Pigs during 2007–2013

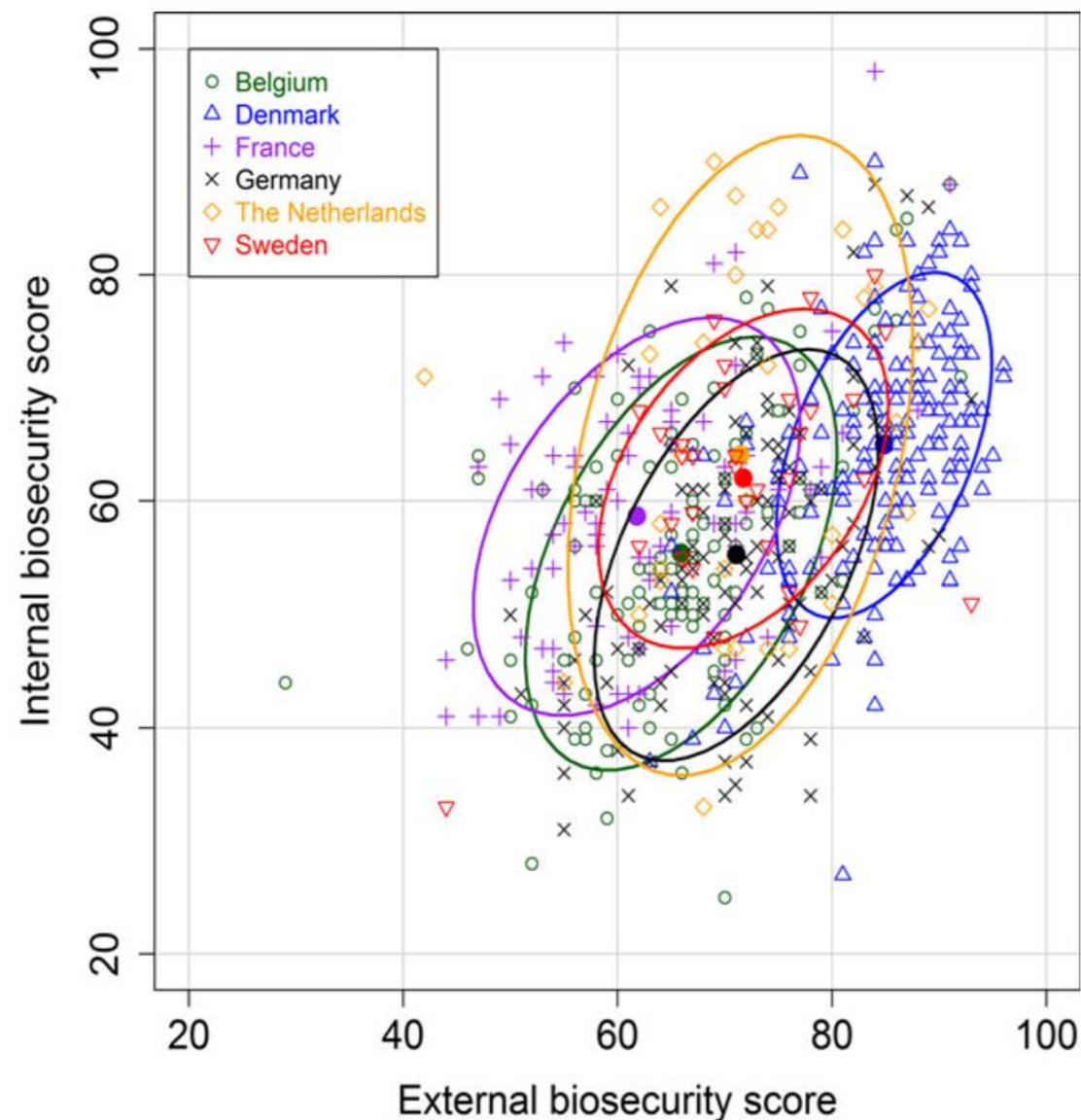
Amanda Brinch Kruse<sup>1\*</sup>, Leonardo Victor de Knecht<sup>1</sup>, Liza Rosenbaum Nielsen<sup>1</sup> and Lis Alban<sup>2</sup>

# Biosecurity in pig herds

Necessary to keep infections at bay

Assessment of external vs. internal biosecurity scores from Biocheck

- Obtained by interviewing pig farmers from Belgium, Denmark, France, Germany, The Netherlands and Sweden (Filippitzi et al., 2017)
- Not just of importance to keep AM use low, but also to keep out African Swine Fever!



Source: Filippitzi et al. (2017)

Detailed evaluation of biosecurity in a herd  
=> enables vet to undertake herd health advisory service

Fictive score for a Danish sow herd	Score	Mean score in 160 DK herds
<b>External biosecurity</b>		
Overall external score	89	86
Purchase of animals and semen	99	96
Transport, manure and dead animals	84	81
Feed, water and materials	87	84
Employees and visitors	95	92
Rodent and bird control	83	80
Location and environment	78	75
<b>Internal biosecurity</b>		
Overall internal score	58	67
Disease control	90	95
Farrowing unit	60	65
Nursery unit	35	62
Finishing unit	47	47
Measures between compartments	54	59

Low score for nursery unit may reflect extensive use of foster sows and multiple movements of piglets between litters – not healthy for the piglets!

Solution: Get advice from the vet on how to improve cross-fostering

# The role of feed

AM are put into feed

- Sometimes too much a result of an automatic decision

Today Spanish legislation allows only one kind of AM put into feed at a time

- AM use in Spain lowered by 68% from 2015-2017

Proper diagnostics needed regularly to ensure prudent use

- Do not solely look at the piglets – but also the sows

We have not looked sufficiently into the positive role of feed

- Effective measure to ensure high milk production in sows
- Effective against post-weaning diarrhea in weaners
  - Important, when zinc oxide will be phased out in the EU



## SECTOR LEVEL – Knowledge about on-farm infection status

Knowledge of infection status will enable farmer to buy in replacement animals with similar status

- Preferably through a contract with a single supplier only
- Targeted vaccination can then be applied – economic approach

Quarantene needed, when buying in new animals

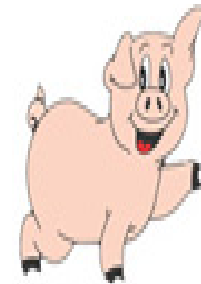
- Else infections may enter the herd unexpectedly
- Take care of the livestock trucks – assume they are all infected with dysentery!

Confidence in herd status requires blood testing at least annually

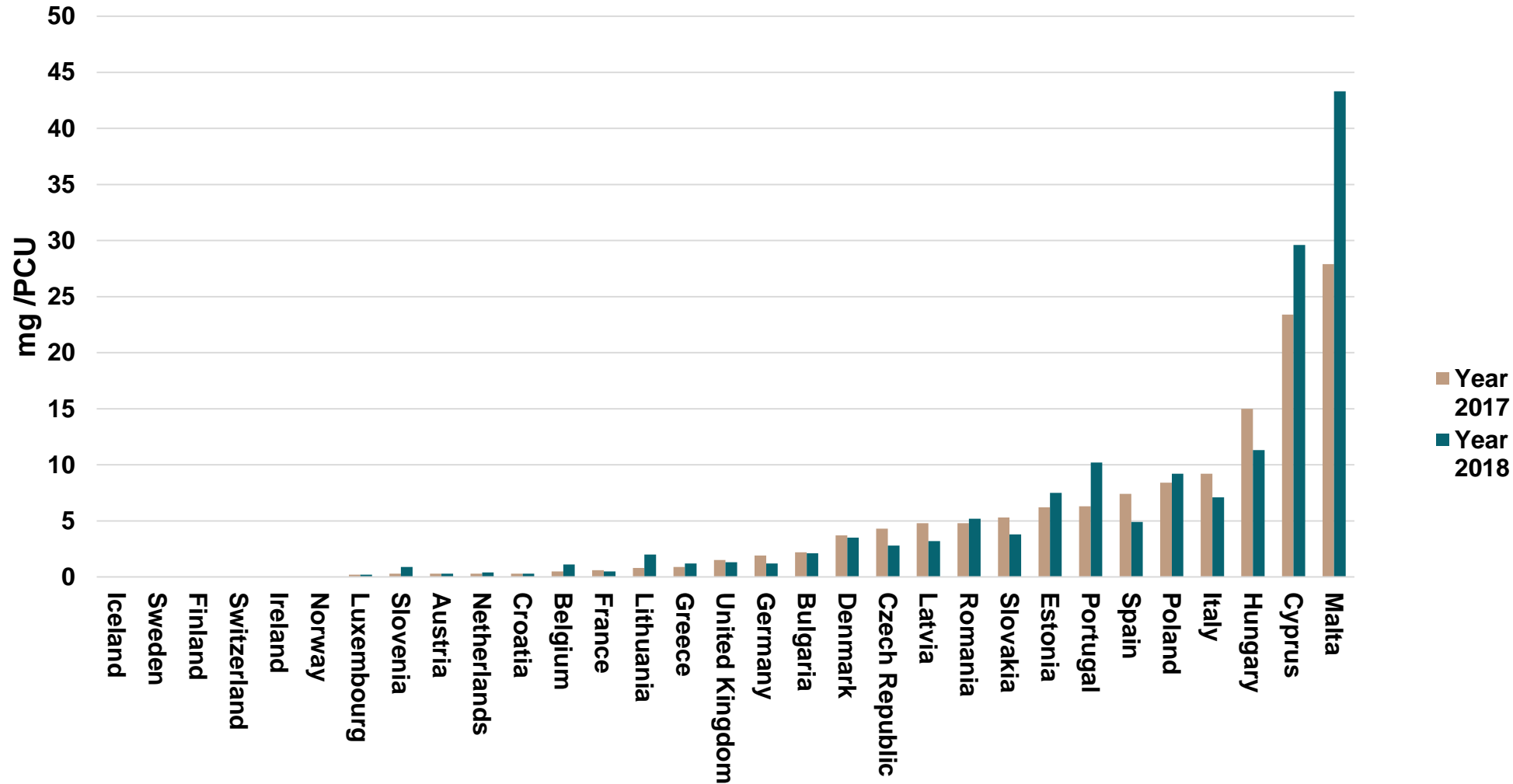
- And open access to results
- In place in the Danish SPF system

Eradication of the most important infections can be the next step

All these initiatives need to be made at the sector level



## Impact of eradication of infection on use of AM – dysentery as the example



Sales of pleuromutilins in 2018, expressed as mg/PCU Source: EMA, 2020

Huge difference  
in use of  
pleuromutilins  
between  
countries

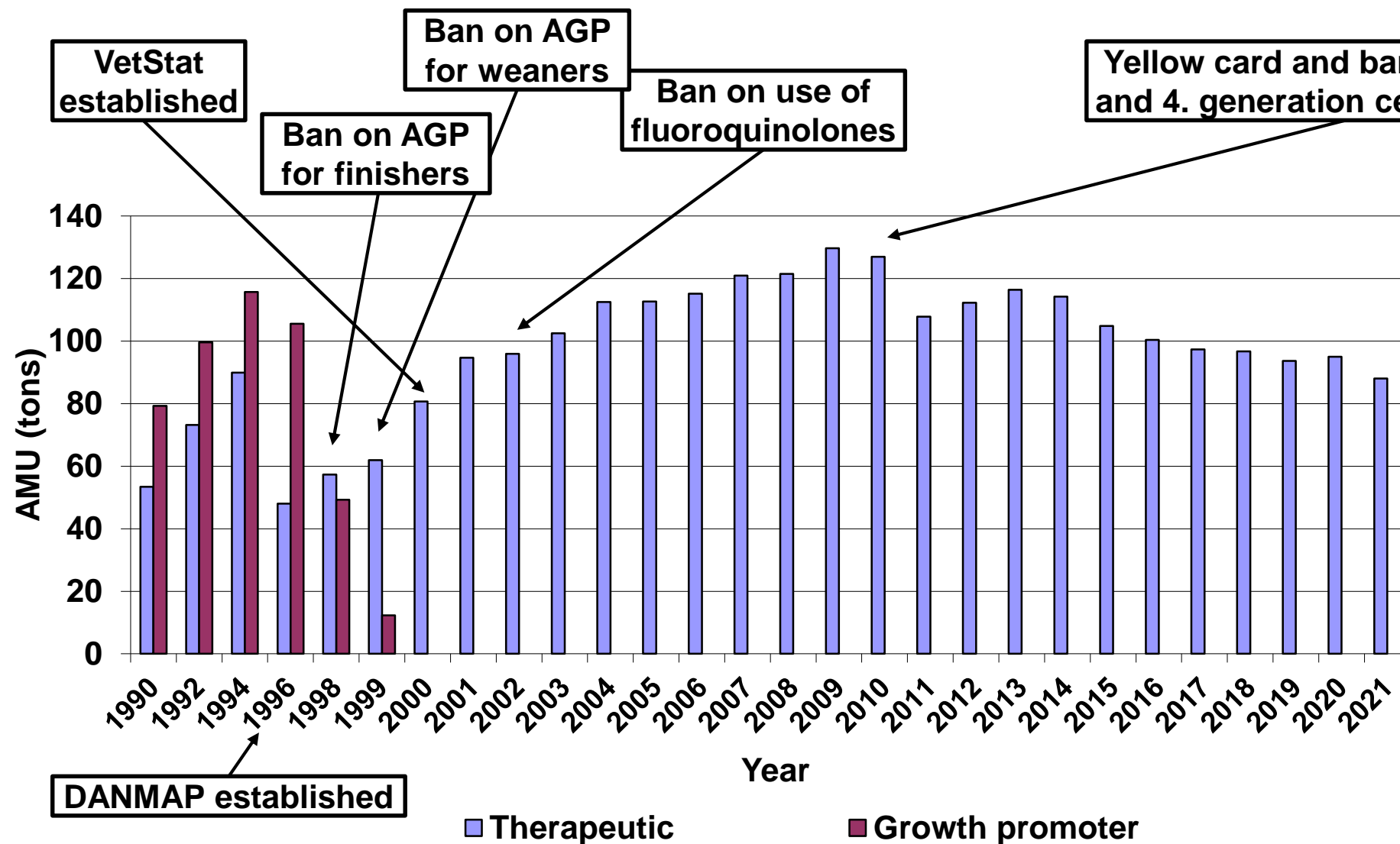
- May be related  
to presence of  
dysentery

- Pleuromutilin is  
the only way of  
treating  
dysentery

- Eradication  
feasible through  
public-private  
partnership

- Focus on  
livestock trucks!

# ACTIONS ON NATIONAL LEVEL – Equal conditions for all farmers



Examples of initiatives implemented in Denmark as well as amount of AM used in total in Danish livestock per year

# The Yellow Card Scheme



Adopted in July 2010 by Danish Veterinary and Food Administration

Makes use of data recordings

- AM consumption in the individual farm (VETSTAT)
- No. of animals in herd (Central Husbandry Register)
  - Divided into age groups

Restrictions imposed on pig farmers who used more than twice the average

- Divided into age groups

Implemented to eliminate very high use seen on individual farms

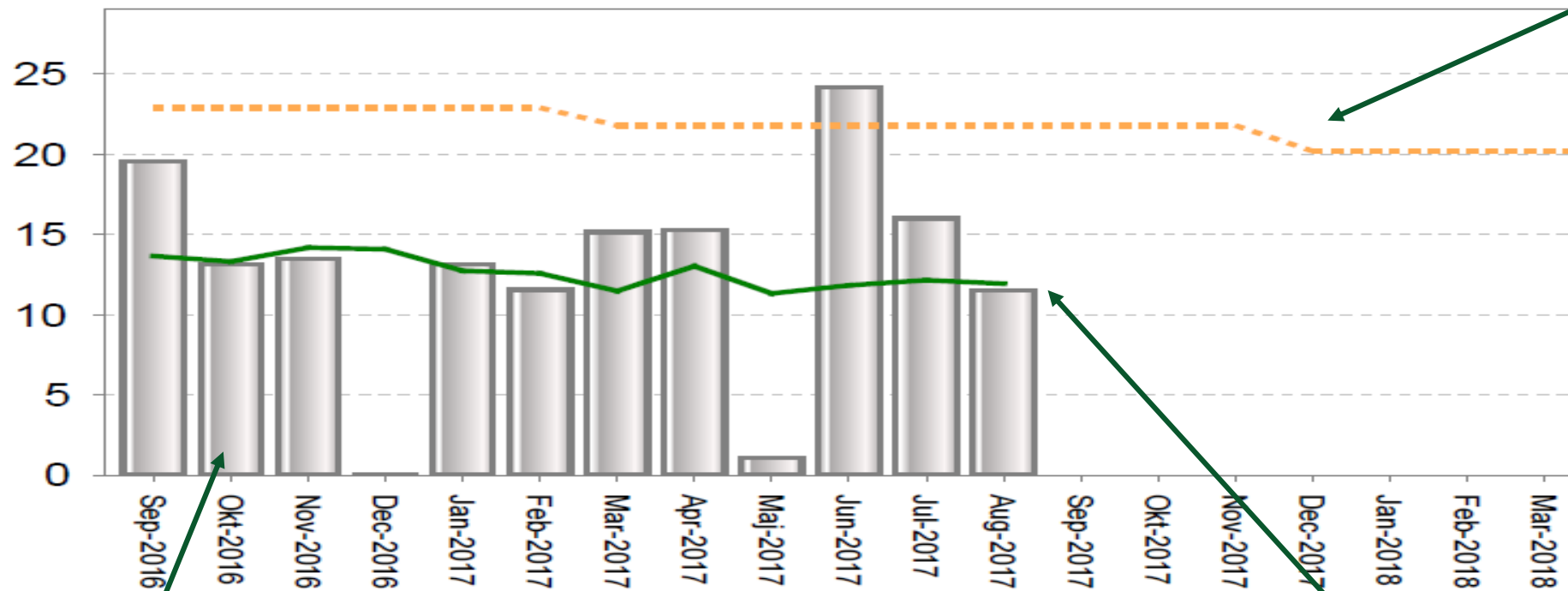
- Later, limits have been reduced further
  - Take care not to reduce too much!

Age group	Permit limits* initial (current)
<b>Sows and piglets</b>	<b>5.2 (3.2)</b>
<b>Weaners</b>	<b>28 (17.2)</b>
<b>Finishers</b>	<b>8 (4.4)</b>

\* Animal daily doses (ADD) per 100 animal days

# Evaluation of antimicrobial consumption in weaner herd

ADD/ 100 animal days



Official permit limit for age group was reduced by November 2017

Monthly consumption in ADD/100 animal days

Green line represents 9-month moving average consumption of antimicrobials for age group in herd

# Herd health contracts between farmer and vet

Danish vet are only allowed to profit up to 5% from sales of medicine

- Instead, vet and individual farmer make contracts about veterinary advisory service in the herd

Contracts introduced in 1995 - Became mandatory for large herds in 2010

- $\geq 300$  Sows,  $\geq 3,000$  Finishers and  $\geq 6,000$  Weaners
- Involves frequent visits
  - During visits vet gives advice with focus on disease prevention, production and responsible use of AM
  - Reports written after each visit
  - Quarterly report provides details about AMU and productivity

Together, farmer and vet decide on actions to initiate

- Focus on limiting need for treatment
  - Final decision and responsibility lies upon farmer



# Treatment guidelines and risk assessments

Needs to be based on both effect of treatment and risk of resistance

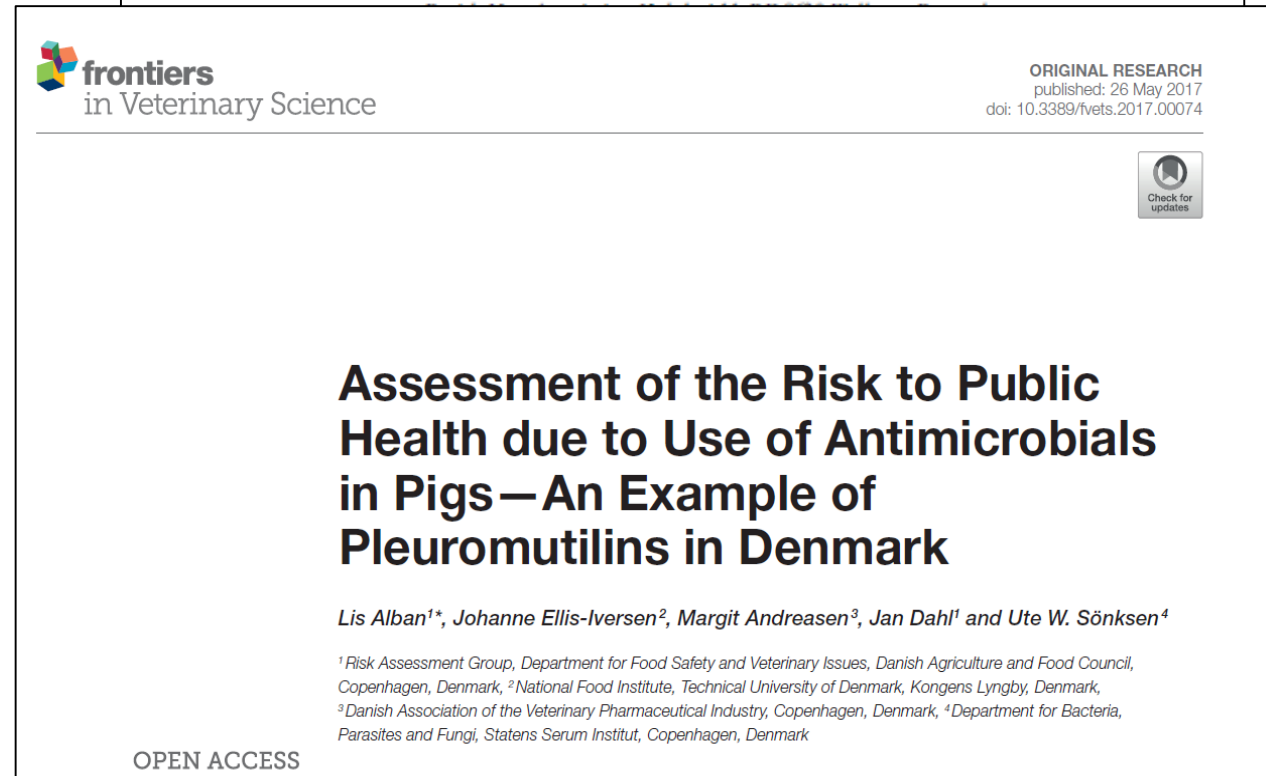
- Else, the vets will not comply with the guidelines

Risk of resistance should be based upon risk assessment

- European Medicines Agency (EMA) has developed guidelines for how to make risk assessment

DK experience using EMA guidelines:

- Possible, but cumbersome!



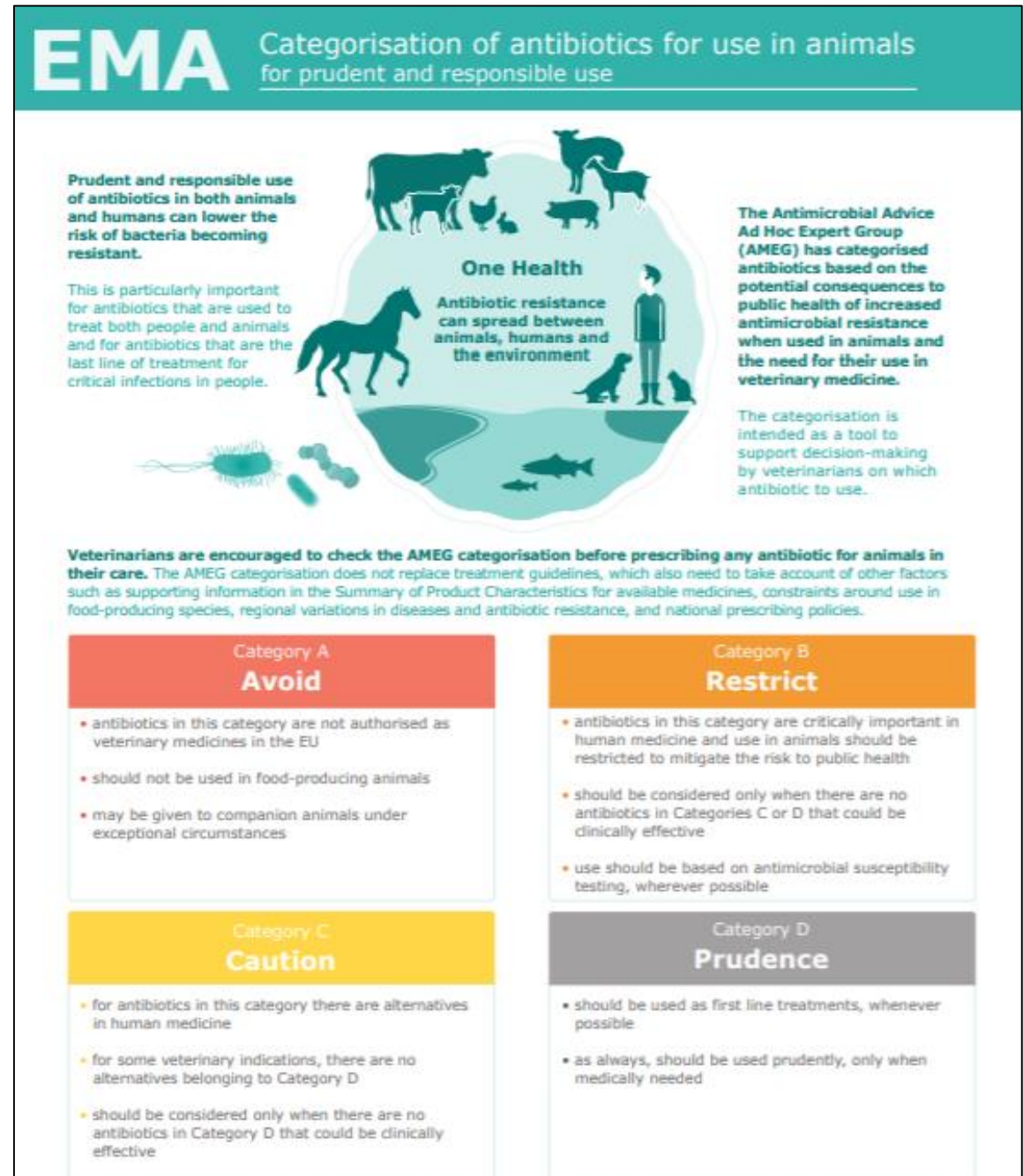
# Categorisation of AM

European Medicines Agency has just come out with a categorisation of AM

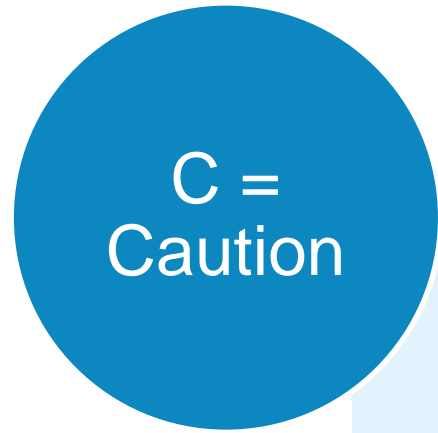
- Dividing AM into 4 groups:
  - A (avoid)
  - B (restrict)
  - C (caution)
  - D (prudence)

Route of administration also important

- Lowest risk: Local treatment of individual animal
- Highest risk: group treatment via feed, premix or water

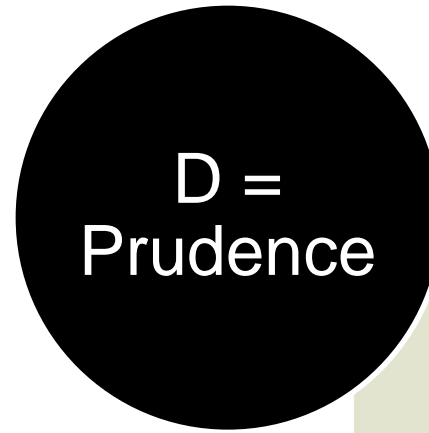


## Full agreement in categorisation between guidelines made by different parties cannot be expected



EMA: Macrolides

WHO is more conservative than EMA – because WHO does not differentiate between use in poultry and pigs



EMA: Tetracyclines

Danish authorities are more conservative than EMA

# Evaluation of monitoring for AM use and resistance

Necessary to evaluate monitoring programmes at regular intervals

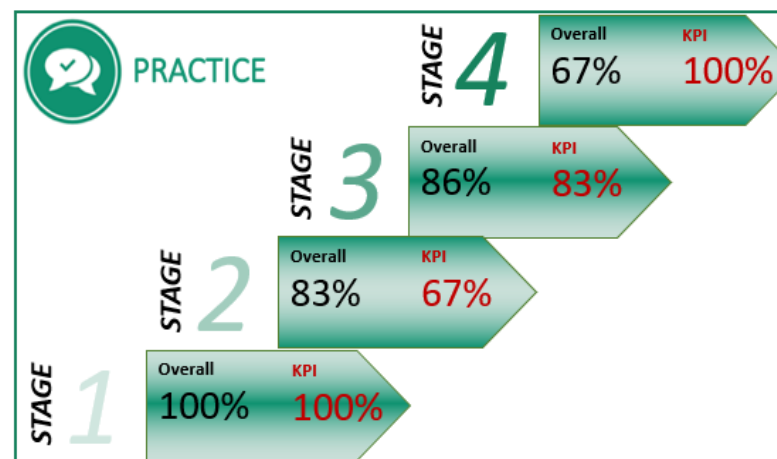
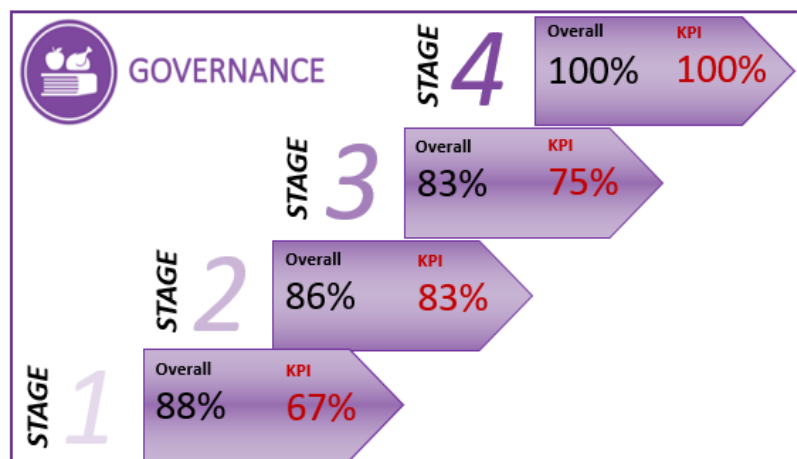
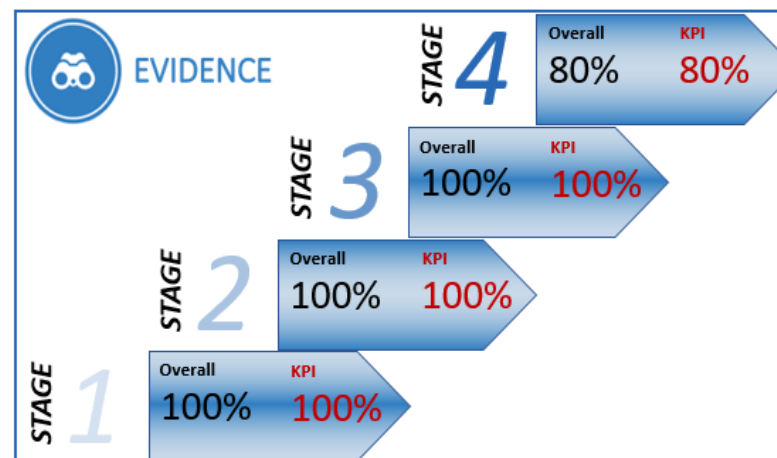
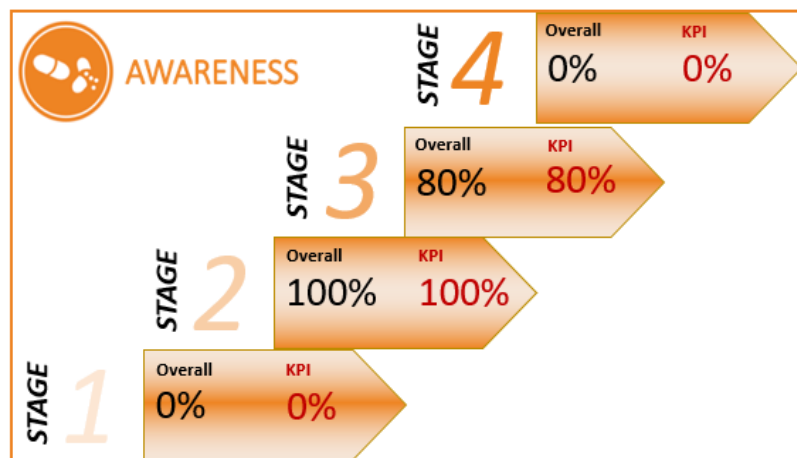
- To ensure that they provide value for money
- That the latest news/methodology is part of the programme

Different tools are in place to evaluate monitoring programmes

FAO's Progressive Management Pathway tool for AMR (AMR-PMP) is one example

- Can be used as a management tool to evaluate a country's National Action Plan for AMR
- Hereby, countries and individual sectors can evaluate their current status and document areas working well
- Structure is based on four focus areas:  
Awareness, Evidence, Governance & Practices

# An example of an output from use of FAO's AMR-PMP tool



# Summing up

To ensure a change, actions should be taken at different levels

- To understand what will work at which level, use Systems Thinking

Legislative frames should be set at national level

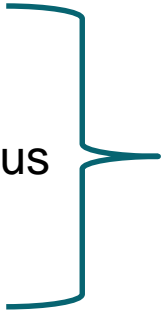
- Will ensure equal conditions for all producers

At sector level and preferably in a public-private partnership

- Eradication of disease e.g. dysentery or PRRS

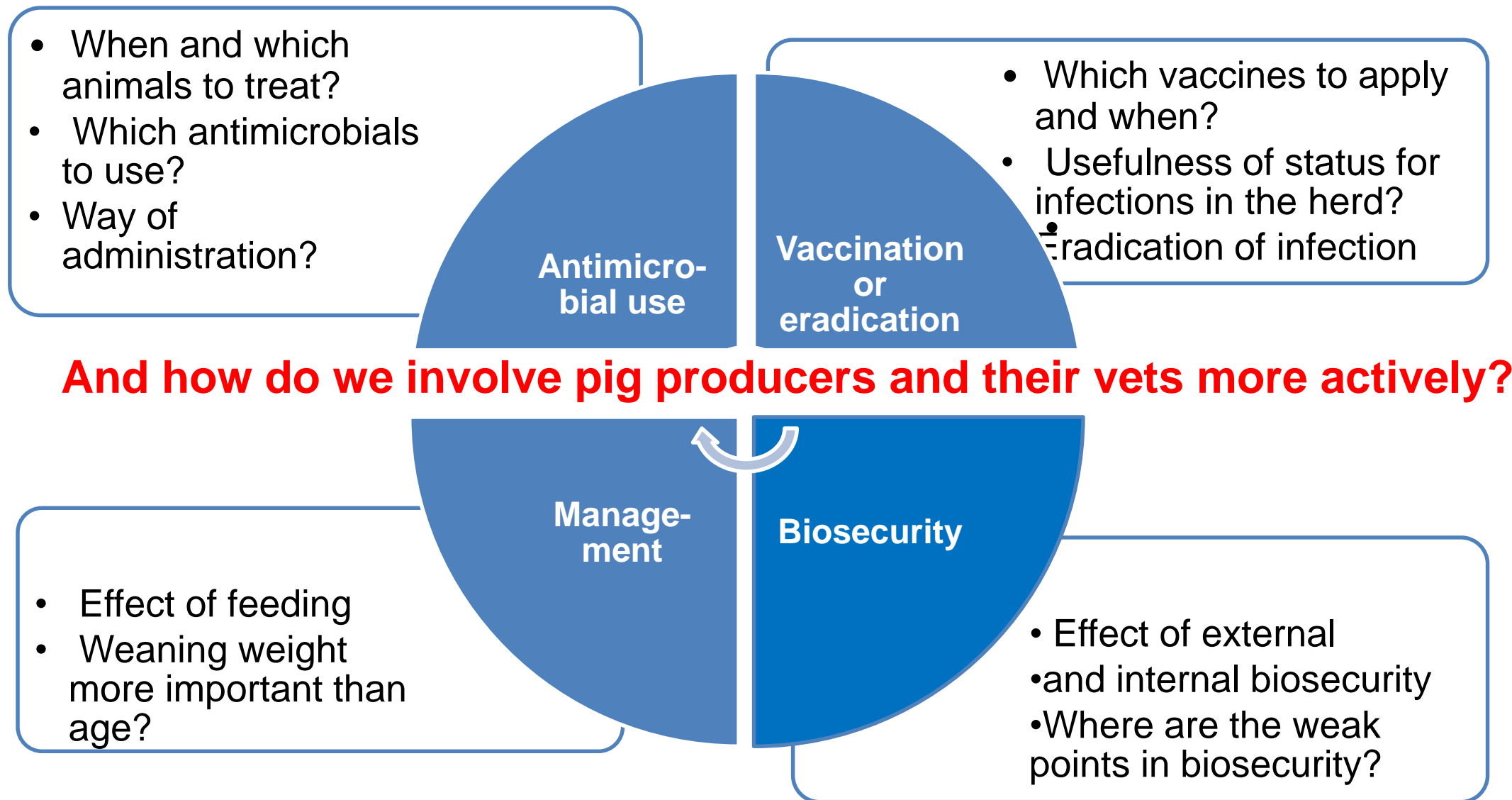
Measures to be taken by the individual farmer

- Biosecurity (also because of African Swine Fever)
- Targeted vaccination / knowledge about infection status
- Feed – we still have a lot to learn
- Easy access to own data + benchmarking?



Will ensure that the productivity of production can be maintained, while having prudent use of AM

## Challenge: How do we improve AMR stewardship further?



# Exercise

1. Where is your country located regarding mg antimicrobials per PCU on the ESVAC comparison figure? – please see European Medicines Agency (2021) in the reference list
2. Has there been a change in the location on the figure during the last 6 years?
3. Is monitoring for AMU in place in your country for the livestock species you have selected?
4. If yes, since which year
5. Is it a monitoring programme or a surveillance programme, where the latter means that actions are in place if use is above a certain threshold?
6. Is the use in the species subdivided into age groups? And if so, how many groups are there?
7. Are certain legal veterinary antimicrobials prohibited or limited in use for the species of interest?
8. Which requirements or actions are set at the livestock producer level?
9. Is AMU by prescription only?
10. Are veterinarians earning parts of their income on selling antimicrobials?
11. Which actions have been taken at the sectorial level?
12. Which are set at the national level?
13. What are three most important barriers against reduction in AMU in your country? – these should be divided into underlying structures and mental models
14. Which 6 actions do you think should be put in place at individual, sectorial and national level, respectively, to effectively reduce the AMU in the species of interest? – again having in mind the underlying structures and mental models
15. For each of the 6 actions, please insert them in a x-y-coordinate system, where x is impact and y is feasibility including costs.

## Suggestion:

Q1-Q12 fill in for your own country (1 hour)

Q13-Q15 provide general answers for the group (1 hour)

Focus presentation for Wednesday on addressing Q13-Q15 (0.5 hour)