Impact of biosecurity on the reduction of antibiotic treatments in pigs

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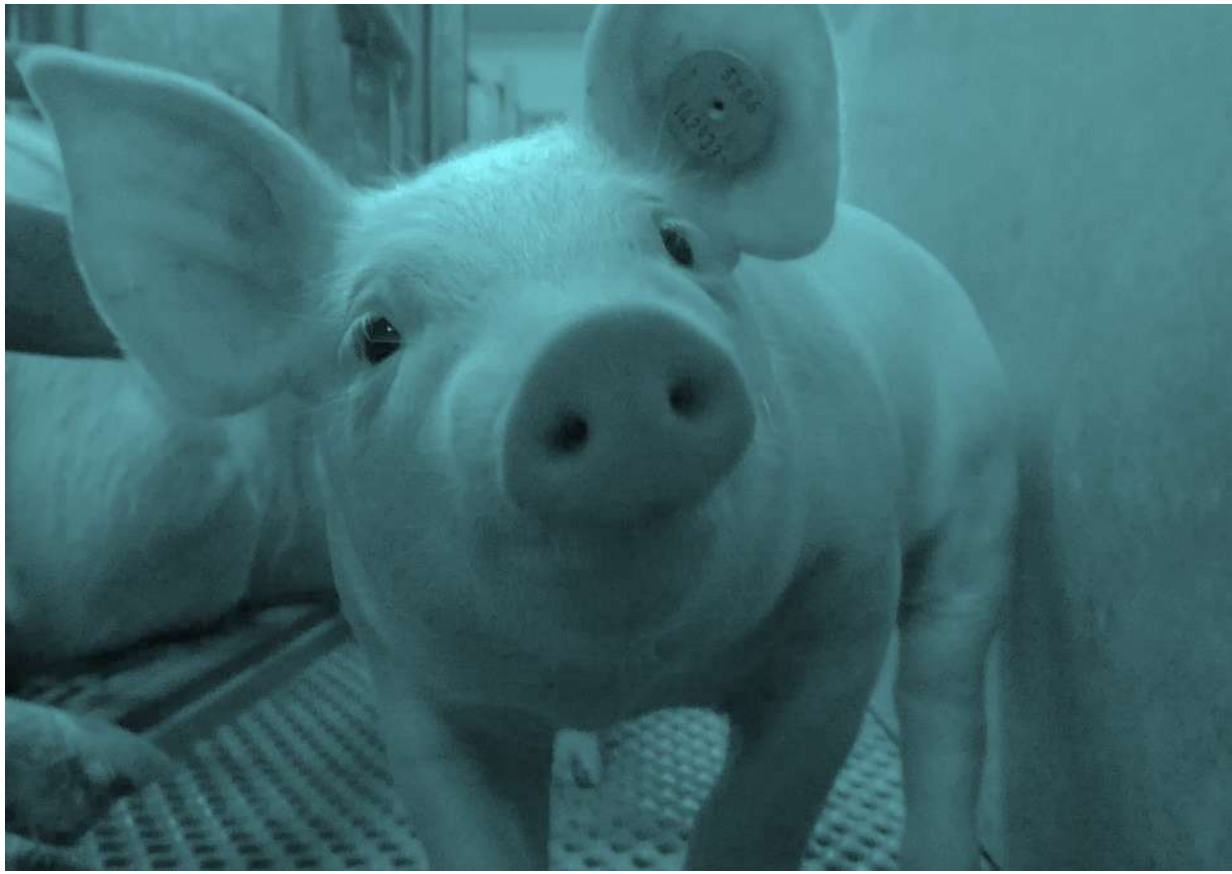
30 March 2023 – SIPAS – Pescantina (IT)

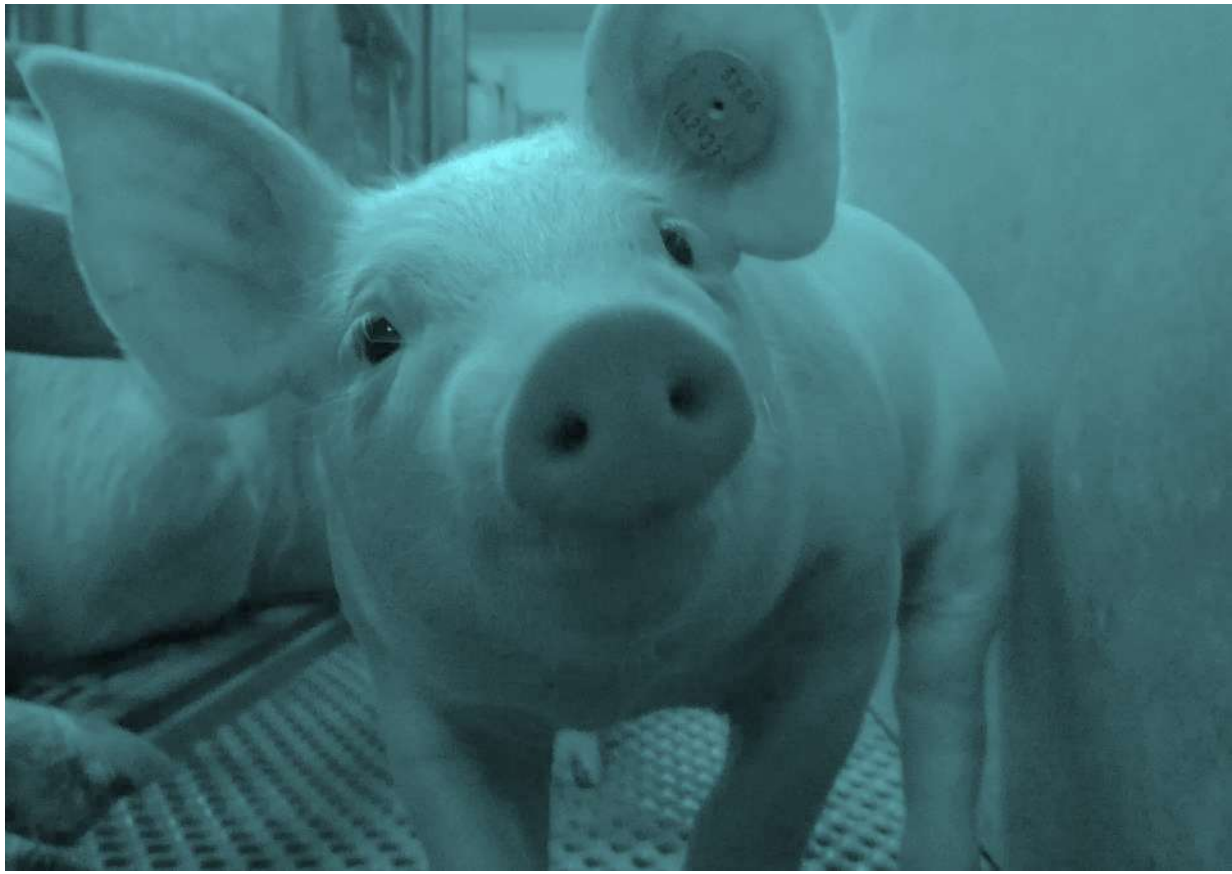
GHENT UNIVERSITY

CONTENT

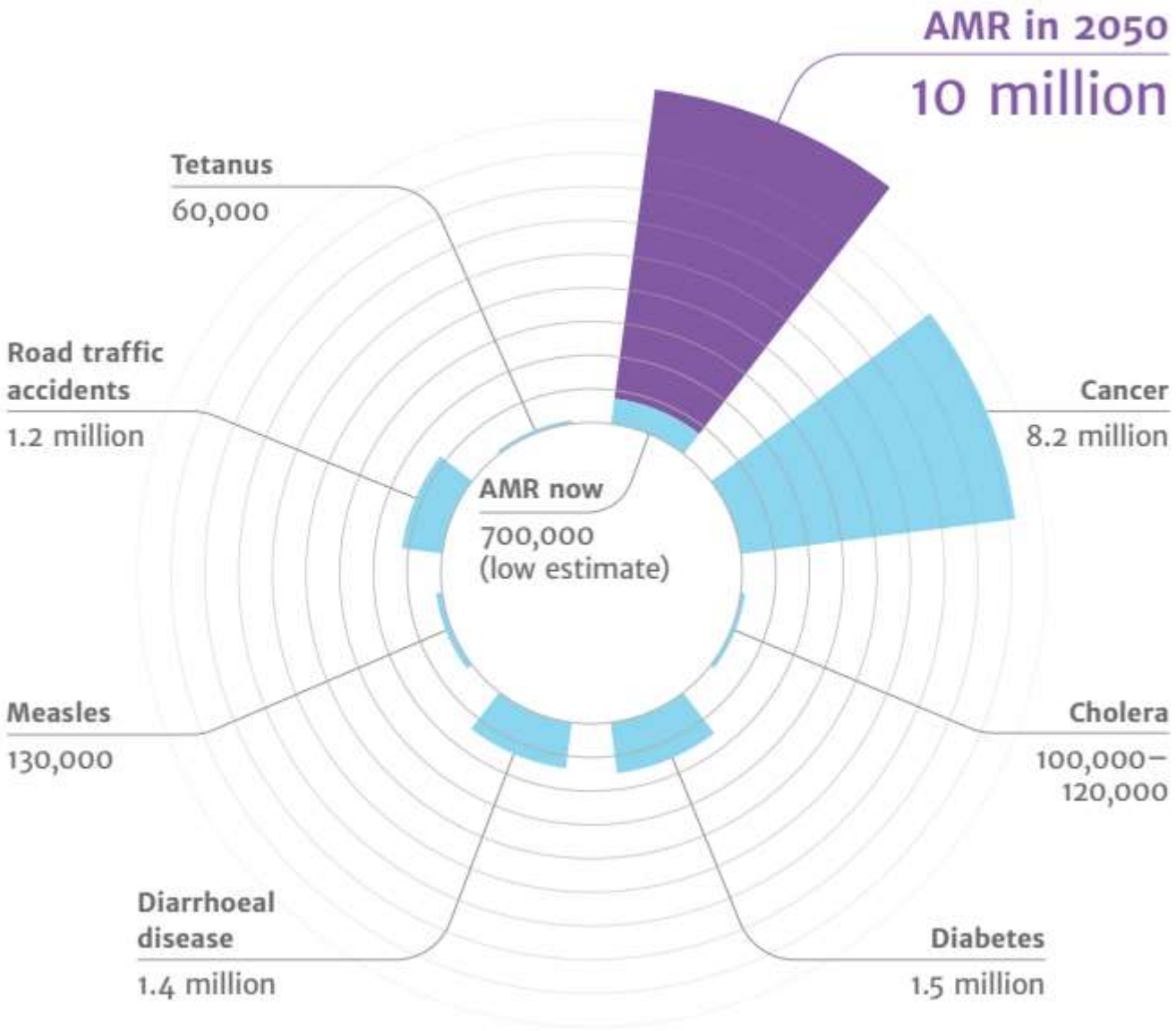
1. Antibiotic use in pig production
2. Biosecurity
3. Coaching
4. Study results
5. Extra information – references

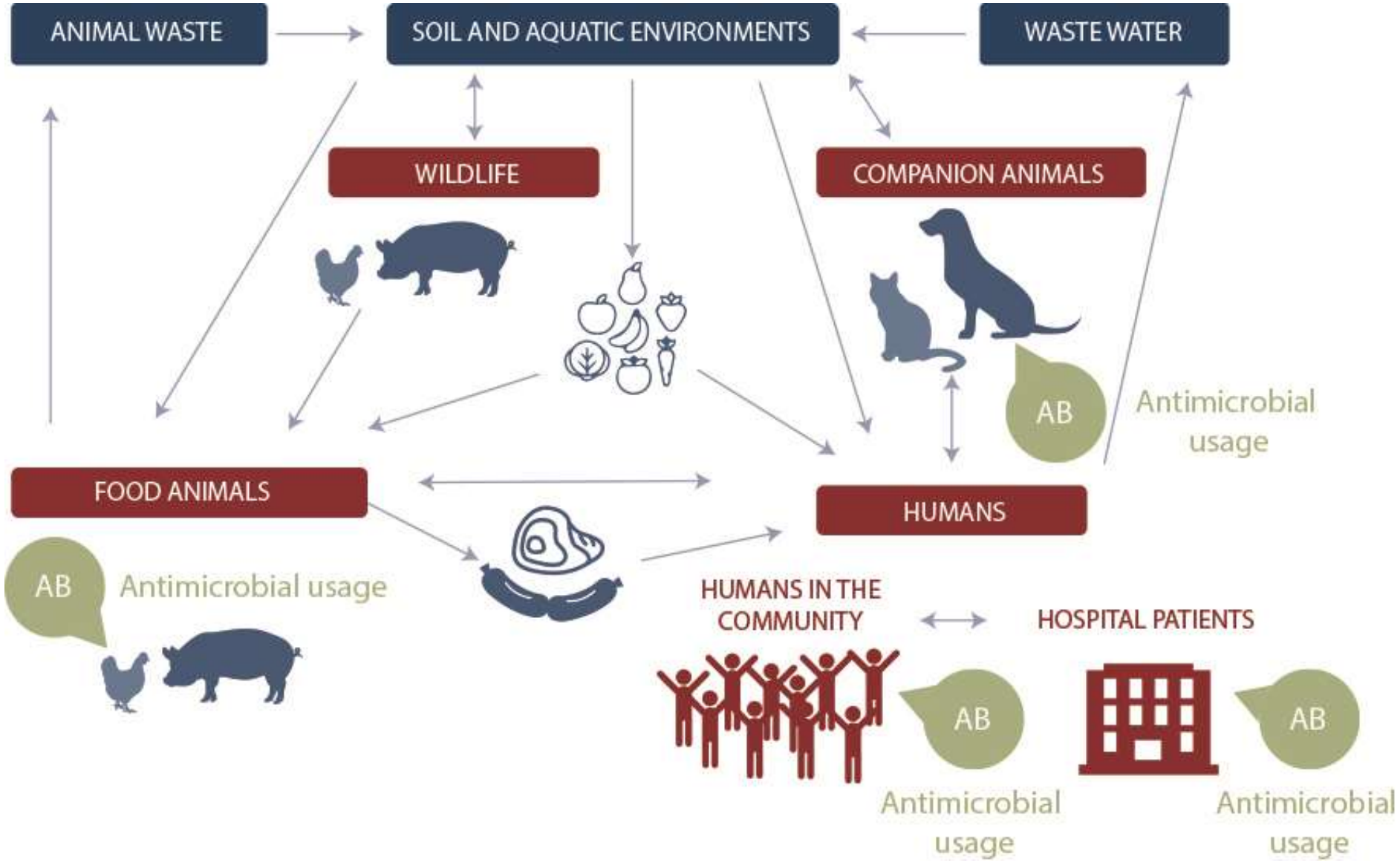


1. Antibiotic use in pig production

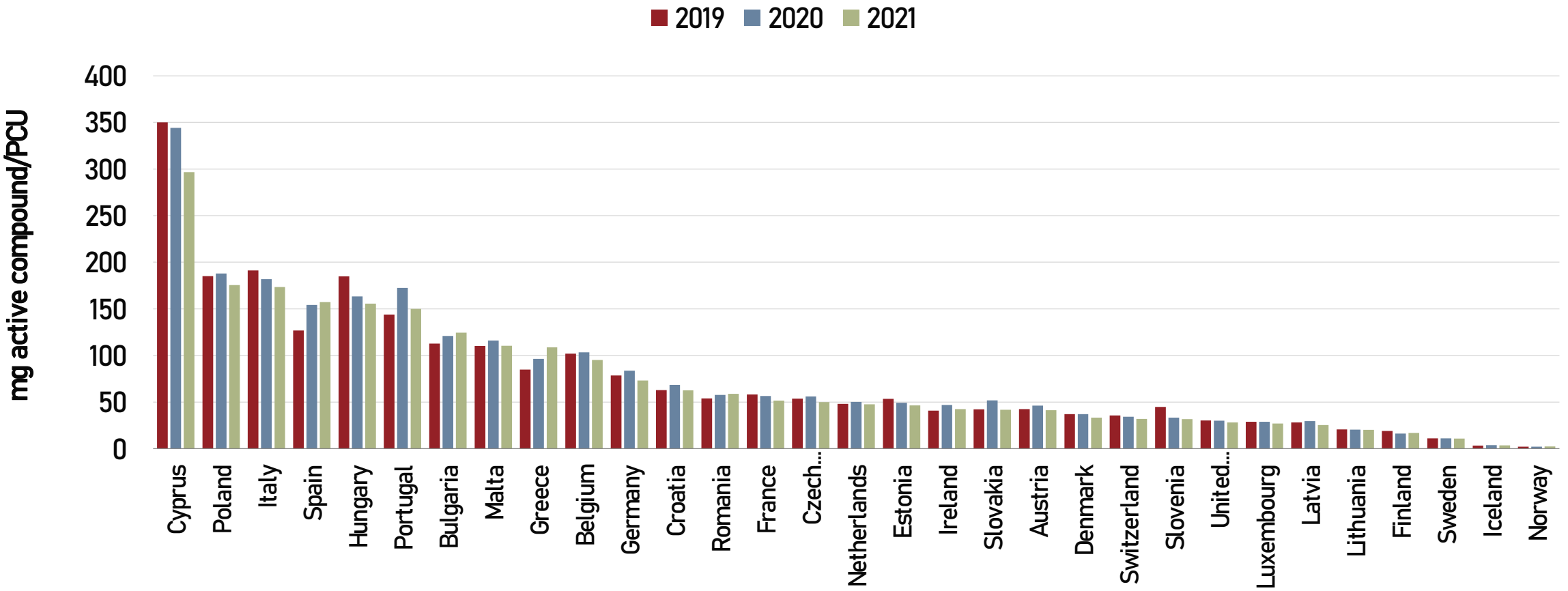



ANTIMICROBIAL RESISTANCE
Antimicrobial resistance
can affect anyone, at any age,
in any country
#AntimicrobialResistance
World Health Organization


AMR in 2050
10 million
Tetanus
60,000
Road traffic accidents
1.2 million
AMR now
700,000
(low estimate)
Cancer
8.2 million
Measles
130,000
Cholera
100,000–120,000
Diarrhoeal disease
1.4 million
Diabetes
1.5 million

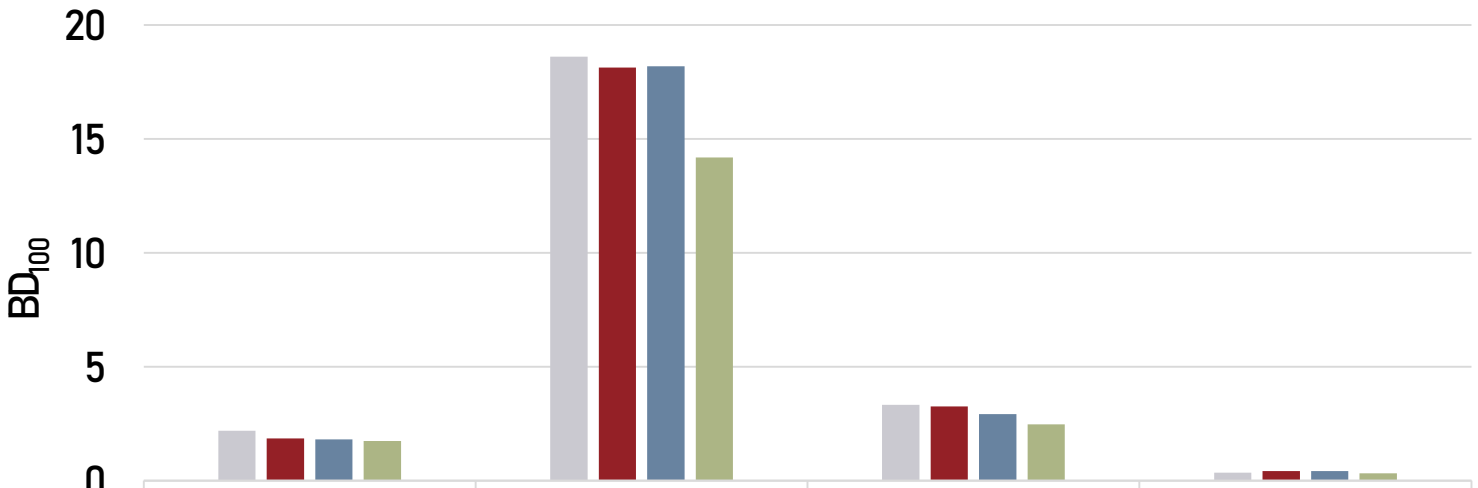

ANIMAL WASTE
SOIL AND AQUATIC ENVIRONMENTS
WASTE WATER
WILDLIFE
COMPANION ANIMALS
AB
Antimicrobial usage
FOOD ANIMALS
HUMANS
AB
Antimicrobial usage
HUMANS IN THE COMMUNITY
HOSPITAL PATIENTS
AB
AB
Antimicrobial usage
Antimicrobial usage

Antibiotic use in Europe (ESVAC, 2022)



Antibiotic use in Belgium (BelVet-SAC, 2022)

Evolution of median BD_{100} per pig category from 2018 to 2021



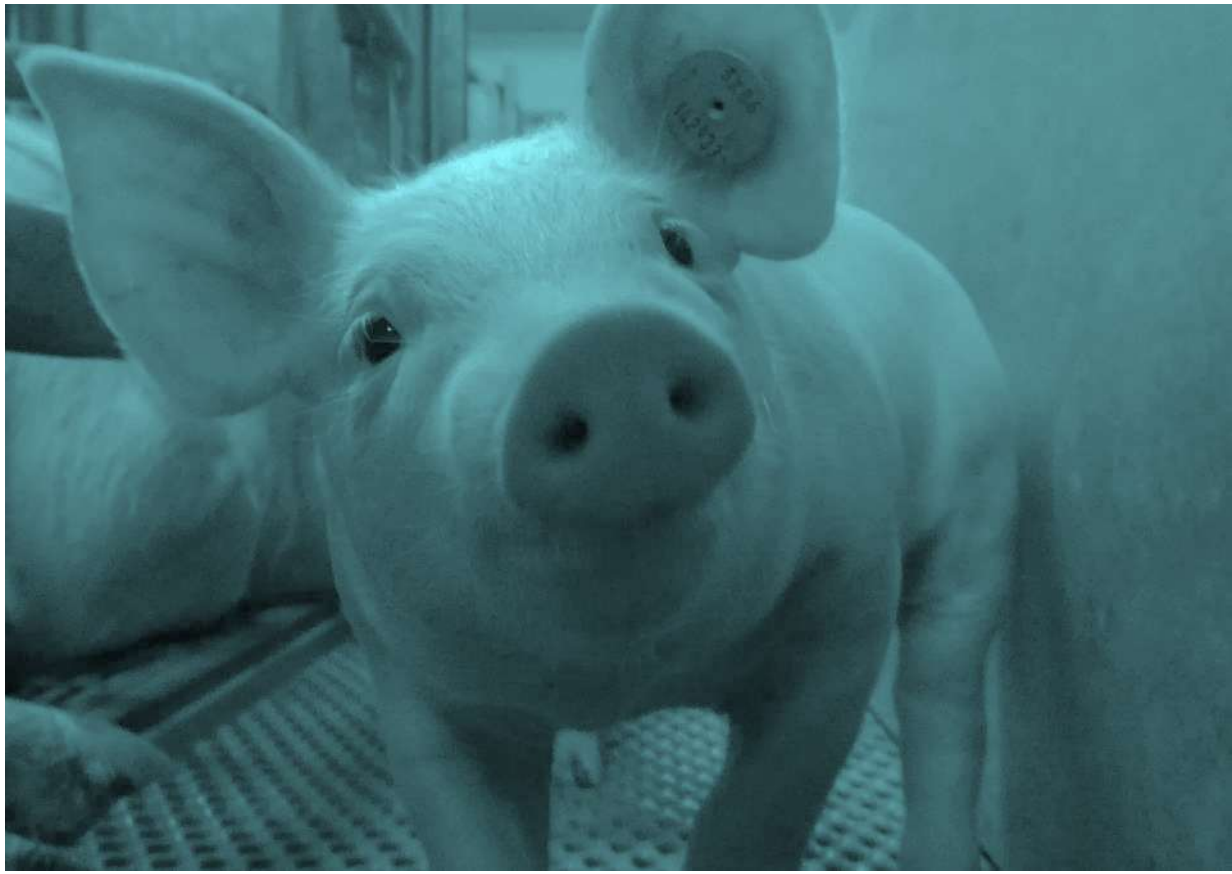
	suckling piglets	nursery pigs	fattening pigs	breeders
2018	2,19	18,61	3,32	0,35
2019	1,85	18,13	3,25	0,42
2020	1,81	18,18	2,92	0,42
2021	1,73	14,18	2,47	0,32
	- 21 %	- 24 %	- 26 %	- 9 %

Alternatives for antibiotic use

1. Biosecurity 
2. Vaccination 
3. Zinc oxide

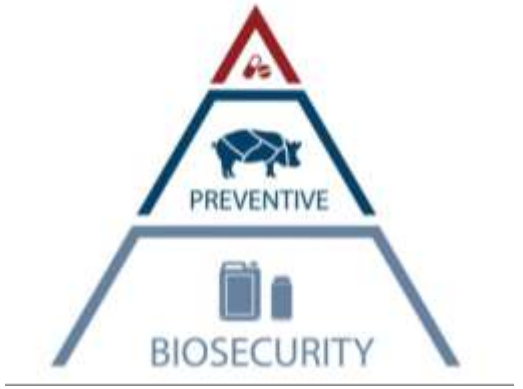
4. Feed quality 
5. Diagnostics 

2. Biosecurity



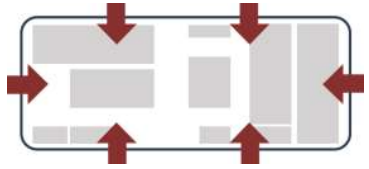
Biosecurity

- is (should be) the basis of any disease control program

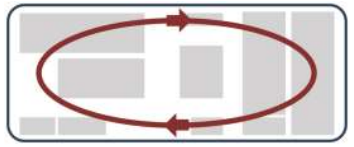


- measures to minimize the risk of introduction and spread of pathogens on a farm

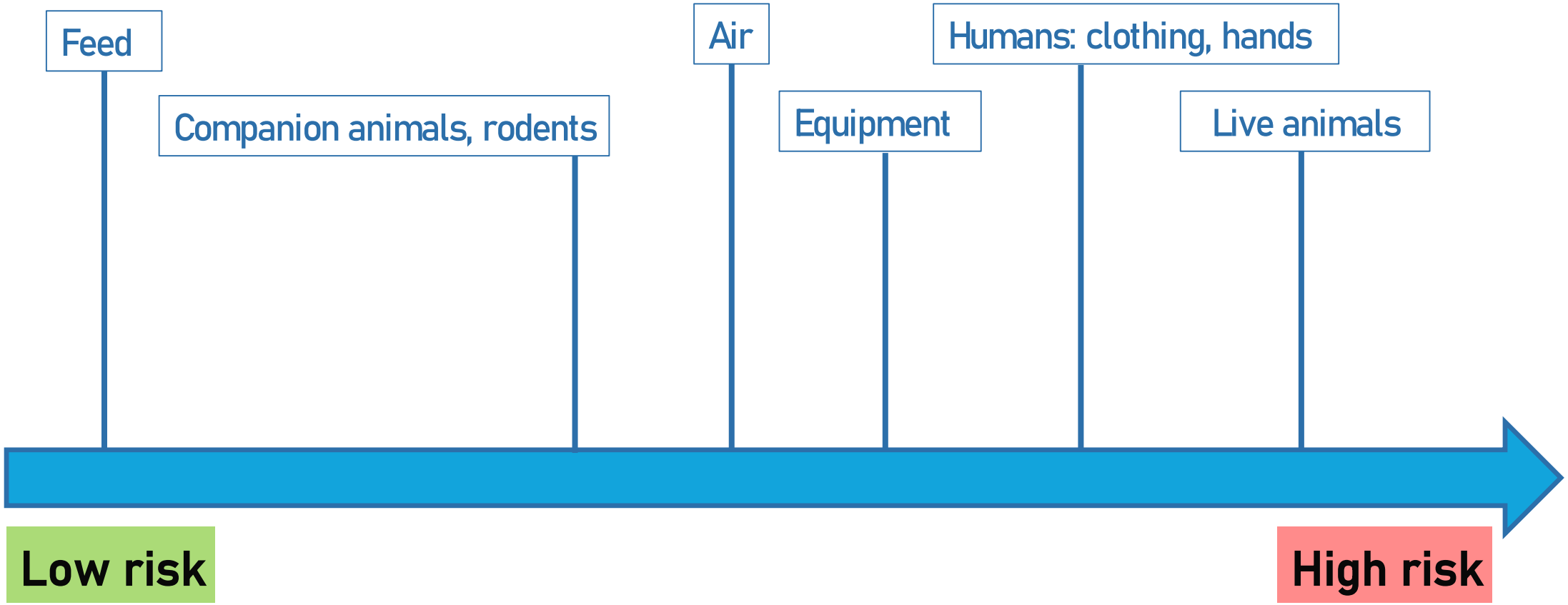
external biosecurity



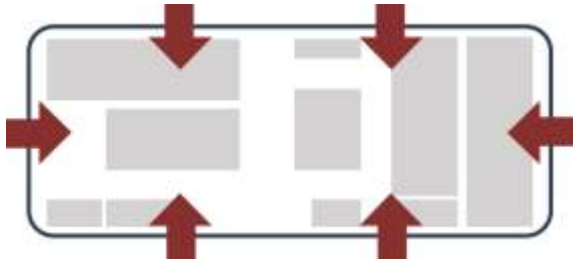
internal biosecurity



Routes of disease transmission



External biosecurity



A. Purchasing policy

B. Animal transport, removal of manure/carcasses

C. Supply of feed, water and equipment

D. Access of personnel and visitors

E. Vermin and bird control

F. Location and environment

A. Purchasing policy

- Purchase of **breeding pigs**

  - 1/1
  - Health status (vaccination? SPF?)
  - Transport vehicle
  - Frequency?
  - Quarantine
    - All-in/all-out
    - ≥ 6 weeks
    - separate dressing room

- Purchase of **piglets**
  - 1/1
  - Health status (vaccination?)
  - Transport vehicle
  - Frequency?

- Purchase of **semen**
  - Health status

B. Animal transport, removal of manure/carcasses

- Transport of **animals**
  - Truck: empty, C&D
  - Driver can not enter stables
  - Animals can not return in the stables
  - Loading bay

B. Animal transport, removal of manure/carcasses

- Removal of **manure**
  - Dirty road
  - Farm-specific discharge pipes
- Removal of **dead animals**
  - Rendering company → public road
  - C&D after very pick up
  - Closed (~~vermin~~)
  - Cooled (smell + frequency of visit)
  - Disposable gloves / wash hands

C. Supply of feed, water and equipment

- **Feed** supply
  - Dirty road
  - Driver can not enter the stables
  - ~~Swill feeding~~
- **Water** supply
  - Analysis of drinking water
    - 1 time per year
    - source + end of drinking line
- Supply of **equipment**
  - Avoid introduction
  - UV-light, alcohol?

D. Access of personnel and visitors

- Check in
- Pig-free period
- Dressing room
- Farm-specific clothing and shoes
- Washing hands / shower

E. Vermin and bird control

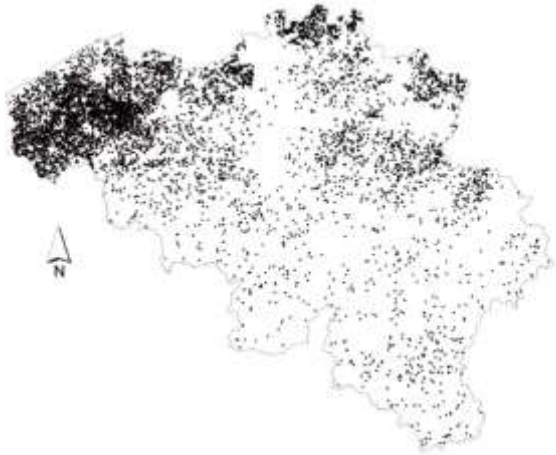
- **Rodents**
  - Outside paved and clean
  - Pest control program?

- **Companion animals**

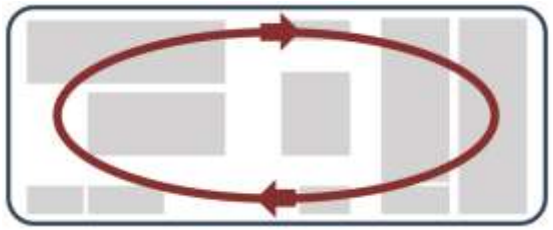
- **Birds**
  - Grids before air inlets

F. Location and environment

- Density of pigs (low / high)
- Other pig farms, manure
- Animal transport (slaughterhouse?)
- Wild boar (fencing?)



Internal biosecurity



A. Disease management

B. Farrowing and suckling period

C. Nursery unit

D. Fattening unit

E. Compartments, working lines, equipment

F. Cleaning and disinfection

A. Disease management

- Protocol for vaccinations + treatments

- Health status of the farm

- Hospital pen / euthanasia

B. Farrowing and suckling period

- Washing sows (before they go to the farrowing unit)

- Cross-fostering piglets (1 x, < 4 days)

- Equipment to treat piglets (C&D)

- Castration (2 blades, disinfectant)

C. Nursery unit

- All-in/all-out
- Keep litters/groups together
- Do not return piglets to a younger age group
- Stocking density
- Extra dressing room

Gemiddeld diergewicht (kg)	Vereiste oppervlakte EU, waaronder België (in m²) per dier	Vereiste oppervlakte in Nederland (in m²) per dier	Optimale oppervlakte (in m²) per dier (Dewulf et al., 2007)
	RL 18 december 2008	*Besluit houders van dieren, 5 juni 2014*	*Dewulf et al., 2007*
< 10 kg	0,15	tot 15 kg: 0,20	0,17
10 tot 20 kg	0,20	15 tot 30 kg: 0,30	0,27
20 tot 30 kg	0,30	-	0,35

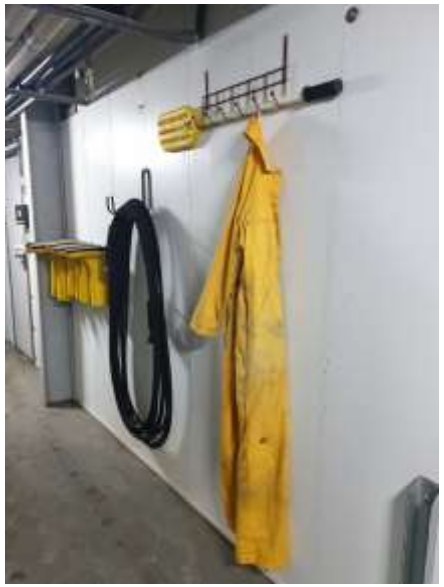
D. Fattening unit

- All-in/all-out
- Keep groups/ages together
- Do not return pigs to a younger age group
- Stocking density

Gemiddeld diergewicht (kg)	Vereiste oppervlakte EU, waaronder België (in m²) per dier	Vereiste oppervlakte in Nederland (in m²) per dier	Optimale oppervlakte (in m²) per dier (Dewulf et al., 2007)
	RL 18 december 2008	*Besluit houders van dieren, 5 juni 2014*	*Dewulf et al., 2007*
< 10 kg	0,15	tot 15 kg: 0,20	0,17
10 tot 20 kg	0,20	15 tot 30 kg: 0,30	0,27
20 tot 30 kg	0,30	-	0,35
30 tot 50 kg	0,40	0,50	0,49
50 tot 85 kg	0,55	0,65	0,70
85 tot 110 kg	0,65	0,80	0,83
> 110 kg	1,00	1,00	

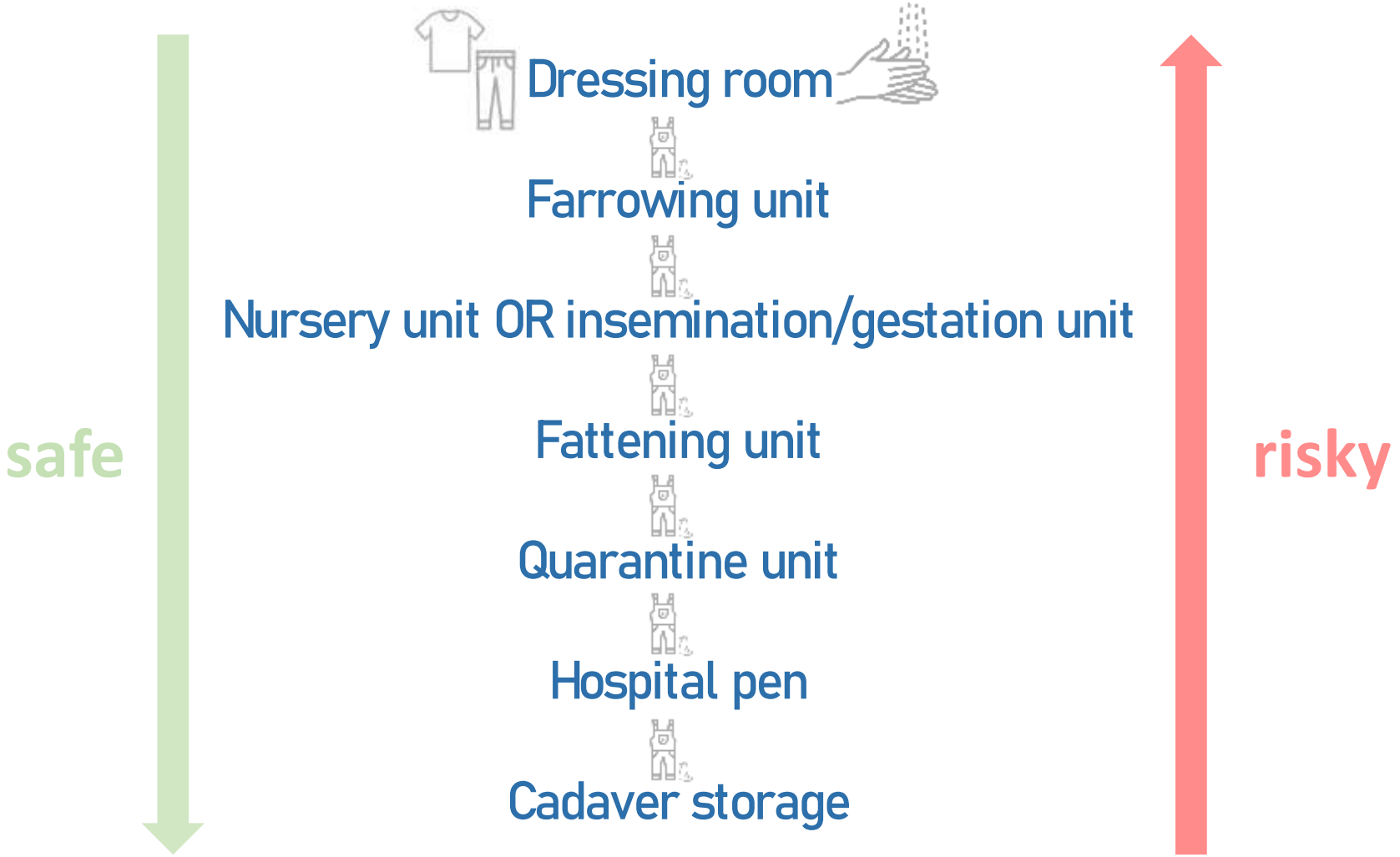
E. Compartments, working lines, equipment

- **Measures between compartments**
  - Clothing/shoes per animal group
  - Wash/disinfect hands
  - Boot washers



E. Compartments, working lines, equipment

- **Working lines**
  - Young → old
  - Healthy → sick



E. Compartments, working lines, equipment

FACULTY OF VETERINARY MEDICINE
accredited by EAEVE

pigChamp pro europa

ADA

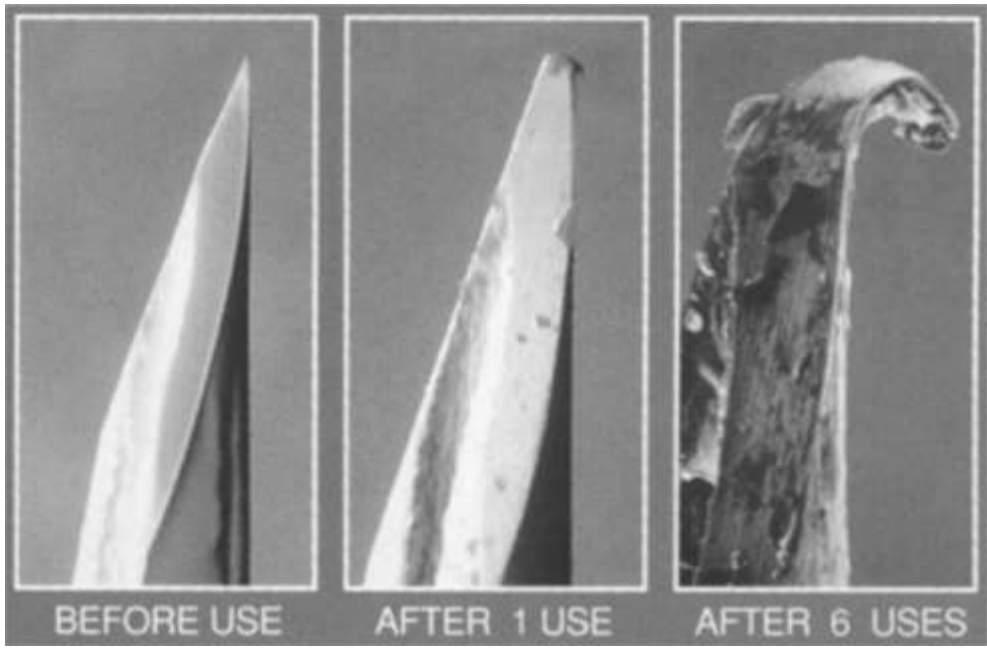
MSD Animal Health

E. Compartments, working lines, equipment

To: / From:	Dressing	Farrowing	Gestation	Nursery	Fattening	Quarantine	Cadaver
Dressing	safe	safe	safe	safe	safe	safe	safe
Farrowing	safe	safe	safe	safe	safe	safe	safe
Gestation	safe	risky	safe	safe	safe	safe	safe
Nursery	safe	risky	risky	safe	safe	safe	safe
Fattening	safe	risky	risky	risky	safe	safe	safe
Quarantine	safe	risky	risky	risky	risky	risky	safe
Cadaver	safe	risky	risky	risky	risky	risky	safe

E. Compartments, working lines, equipment

- Use of **equipment**
  - Cleaning and disinfection of material
  - Different colors
  - Do not exchange equipment between farms
  - Syringes and needles
    - Animal categories
    - Replace the needle!

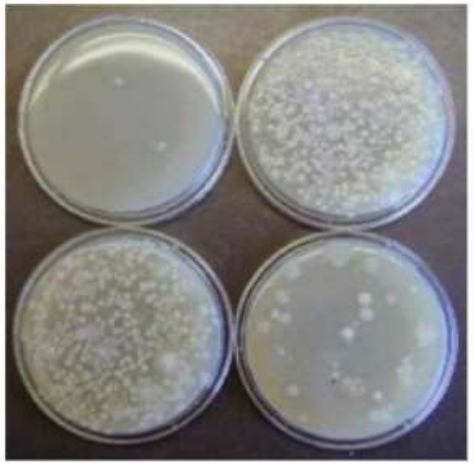


F. Cleaning and disinfection

1. Dry cleaning
2. Wet cleaning + soaking
3. High pressure
4. Drying of the stable
5. Disinfection
6. Drying of the stable
7. Testing efficacy

F. Cleaning and disinfection

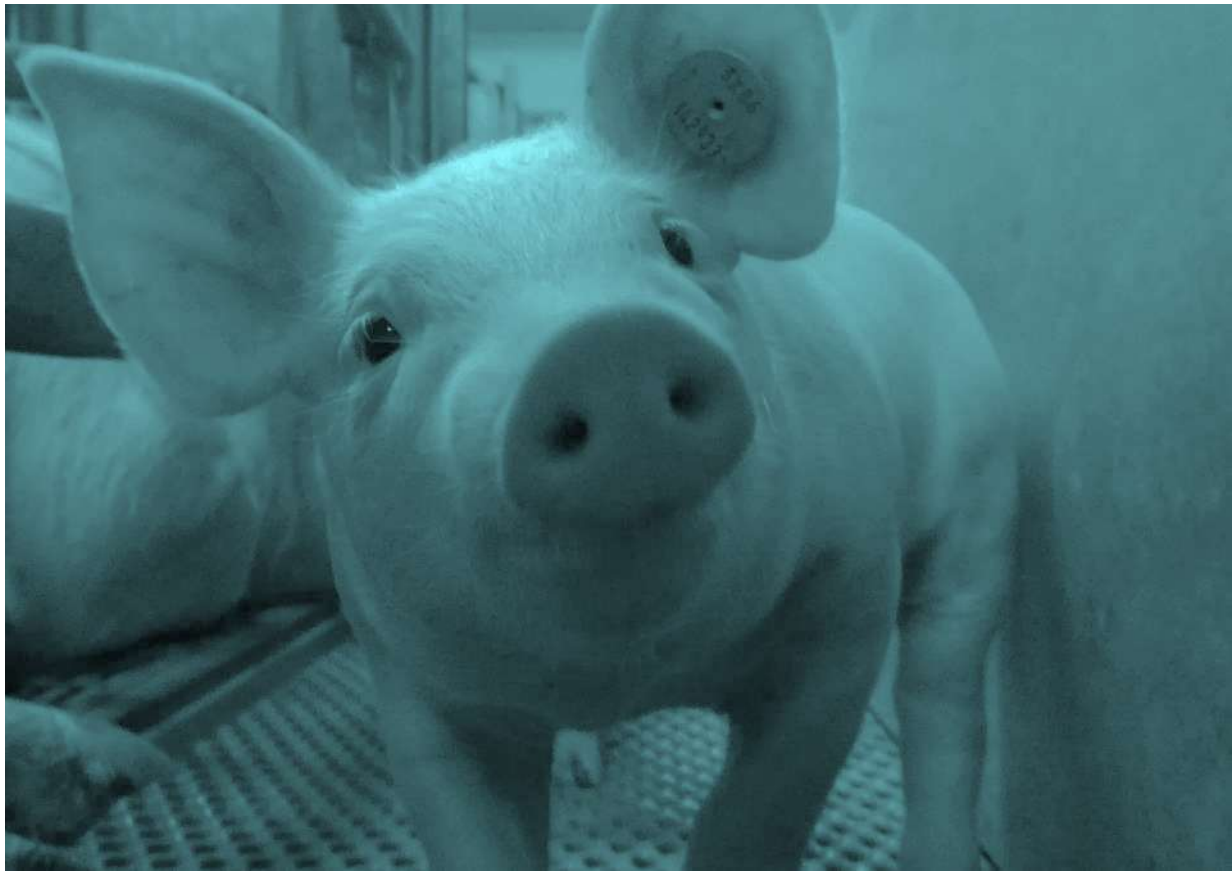
- Hygienogram
  - Testing of efficacy



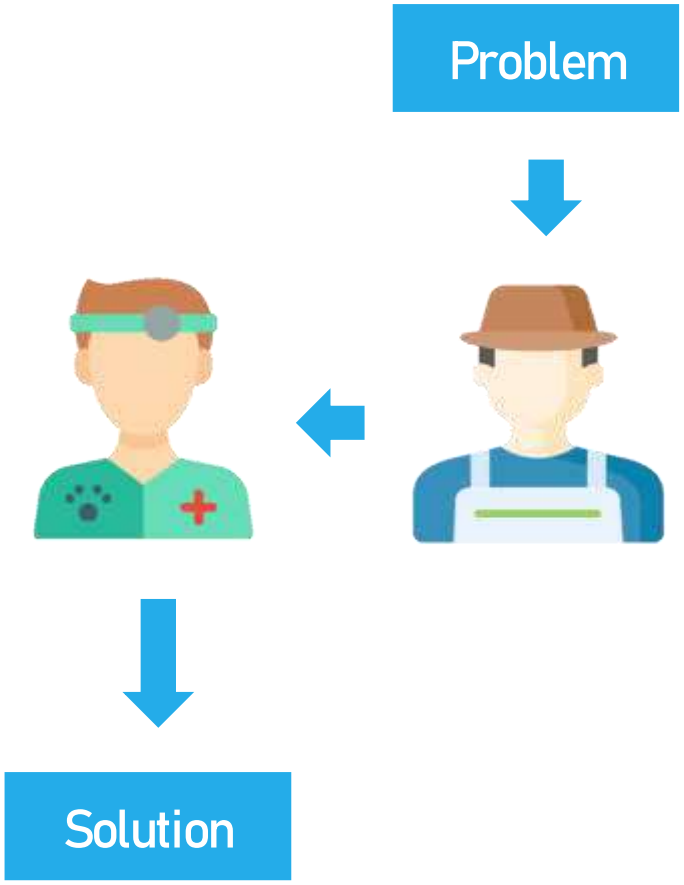
score	cfu/plate	interpretation
0	0	perfect
1	1 – 40	very good
2	41 – 120	good
3	121 – 400	average
4	> 400	poor
5	innumerable	very poor

average score should be less than 2

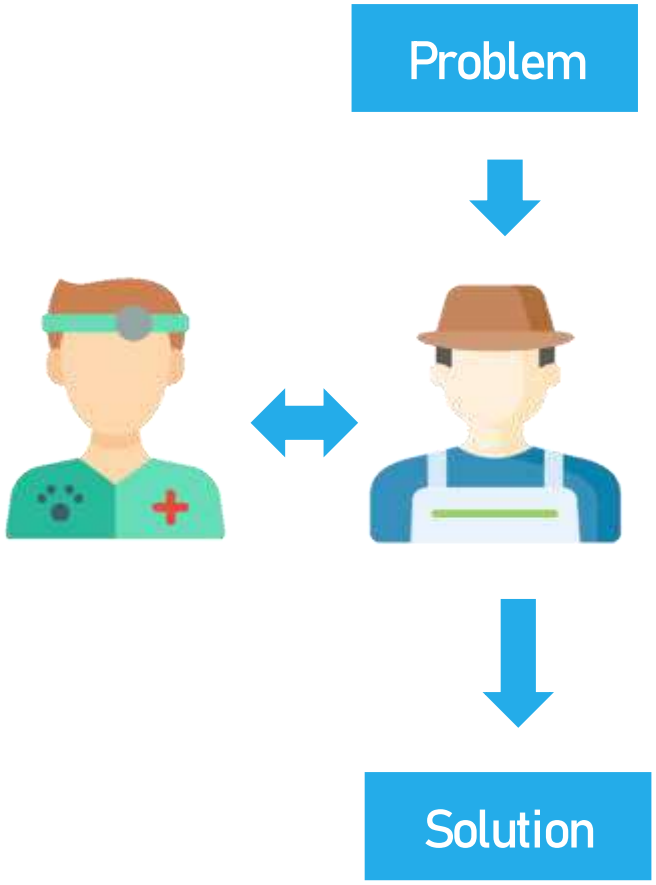
3. Coaching



ADVISING



COACHING



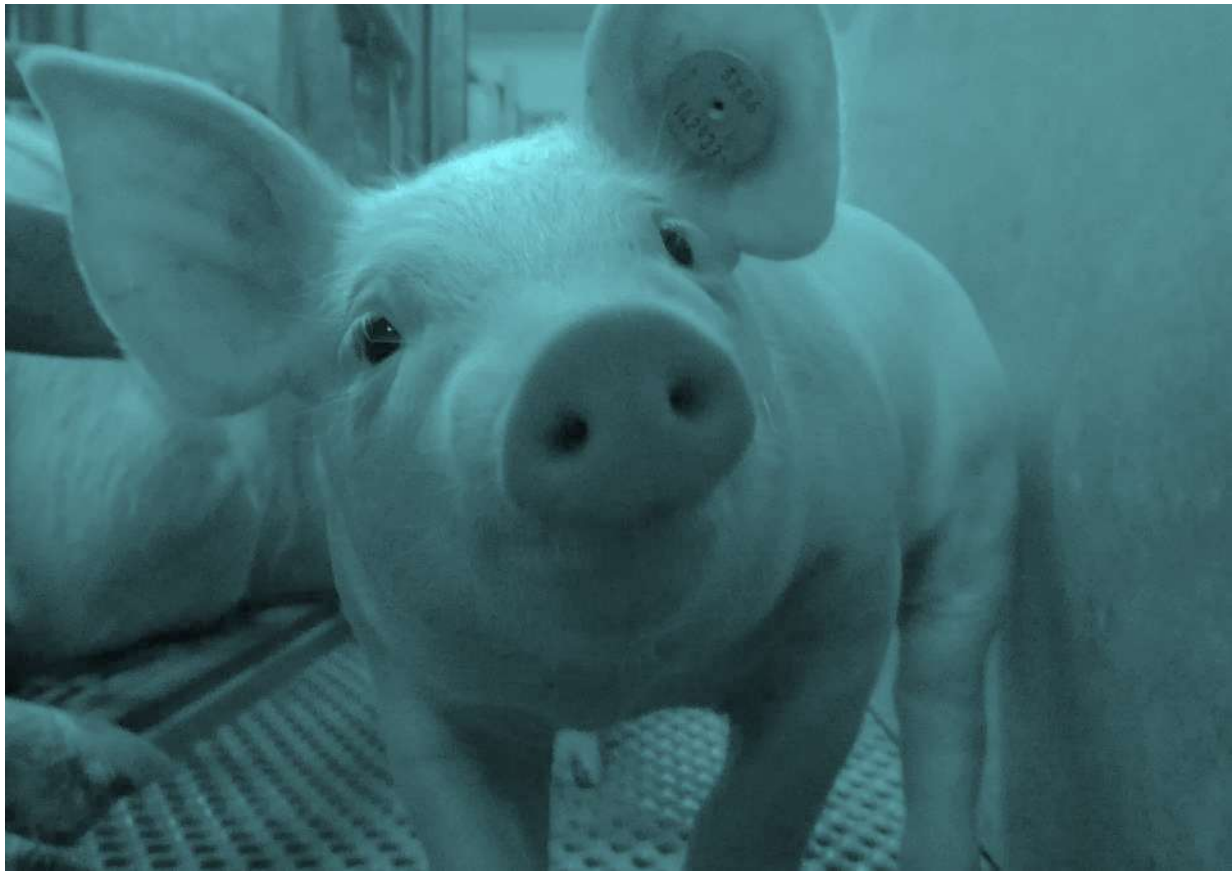
Caekebeke, 2021 (PhD thesis)

ADKAR

Livestock-adapted ADKAR®

Houben et al., 2020 (VDT)

4. Study results



Biosecurity

Health

Rose et al., 2003
Fablet et al., 2006
Ribbens et al., 2008
Corregé et al., 2009
Baptista et al., 2010
Laanen et al., 2013
Postma et al., 2016
Rathkjen & Dall, 2017
Maes et al., 2008
Gotter et al., 2012

Production

Dors et al., 2013
Nevrkla et al., 2014
Postma et al., 2016
Laanen et al., 2013
Maes et al., 2004
Postma et al., 2017
Corregé et al., 2011

AMU

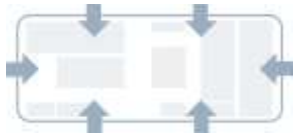
Lannou et al., 2012
Laanen et al., 2013
Collineau et al. 2014
Fertner et al., 2015
Postma et al., 2016
Collineau et al., 2017
Dohmen et al., 2017
Dupont et al., 2017
Postma et al., 2017
Corregé & Hémonic, 2018
Raasch et al., 2018
Raasch et al., 2020
Stygar et al., 2020

Economics

Corregé et al., 2011
Corregé et al., 2012
Postma et al., 2017
Rojo-Gimeno & Postma et al., 2016
Collineau et al., 2017

Author et al., year

Title of the study

	Country
	Farm
	Antimicrobial use
	External biosecurity
	Internal biosecurity

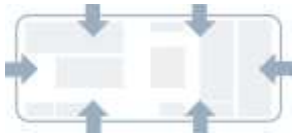
Lannou et al., 2012

Antibiotics in pig farming: use patterns and relationship with farming practices

France

56 farrow-to-finish herds

Lower AMU on farm with different biosecurity measures

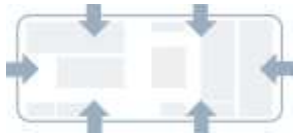


Disinfection of loading area, quarantine > 6 weeks

AI/AO in nursery and fattening, working lines, solid pen parturition

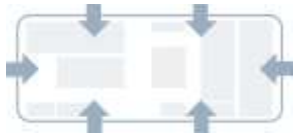
Laanen et al., 2013

Relationship between biosecurity and production/antimicrobial treatment characteristics

	Belgium
	95 farrow-to-finish herds
	Higher internal biosecurity → lower antibiotic treatment incidences
	/
	Disease management, farrowing and suckling period

Collineau et al., 2014

Study of the link between biosecurity level and antibiotic use in pig farms

	France
	60 farrow-to-finish herds
	Higher external biosecurity → lower AMU in sows and nursery pigs Higher internal biosecurity → lower AMU in suckling piglets
	/
	/

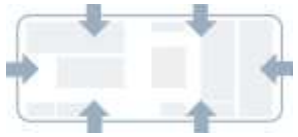
Fertner et al., 2015

Weaner production with low antimicrobial usage: a descriptive study

Denmark

Nursery pig farms

AMU lower than national median

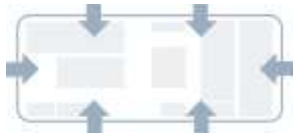


Purchasing piglets from one origin farm

AI/AO, proper cleaning

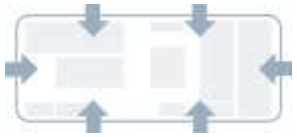
Postma et al., 2016

Evaluation of the relationship between the biosecurity status, production parameters, herd characteristics and antimicrobial usage in farrow-to-finish pig production in four EU countries

	Belgium, France, Germany, Sweden
	227 farrow-to-finish herds
	Higher external biosecurity → lower AMU from birth until slaughter
	/
	/

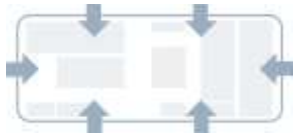
Dohmen et al., 2017

Risk factors for ESBL-producing Escherichia coli on pig farms

	The Netherlands
	36 multiplier pig farms (with or without fatteners)
	Lower probabilities of ESBL *E coli*
	Presence of a dressing room, professional rodent control
	/

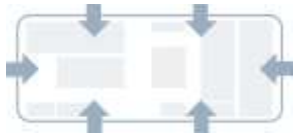
Dupont et al., 2017

Antimicrobial reduction measures applied in Danish pig herds

	Denmark
	179 farmers (202 herds); 58 veterinarians (140 herds)
	Yellow Card Scheme → AMU↓ ≥ 10 %
	/
	AI/AO, cleaning

Postma et al., 2017

Reducing antimicrobial usage in pig production without jeopardizing production parameters

	Belgium
	61 farrow-to-finish herds
	Biosecurity, herd management, AM stewardship → AMU↓ 52 % (birth – slaughter), 32 % (sows)
	/
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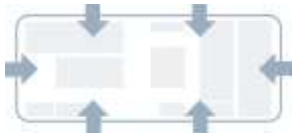
Raasch et al., 2018

Association between AMU, biosecurity, and farm performance in German farrow-to-finish farms

Germany

60 farrow-to-finish herds

Low external biosecurity → high AMU from birth until slaughter

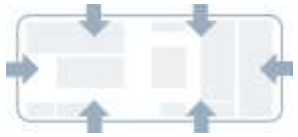


Access check of visitors and farm staff

Cleaning and disinfection

Raasch et al., 2020

Effectiveness of alternative measures to reduce AMU in pig production in four European countries

	Belgium, France, Germany, Sweden
	68 farrow-to-finish herds
	AMU↓ 37 % (suckling piglets), 54 % (nursery pigs)
	/
	/

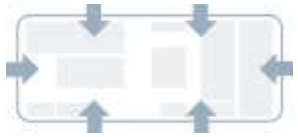
Stygar et al., 2020

High biosecurity and welfare standards in fattening pig farms are associated with reduced AMU

Finland

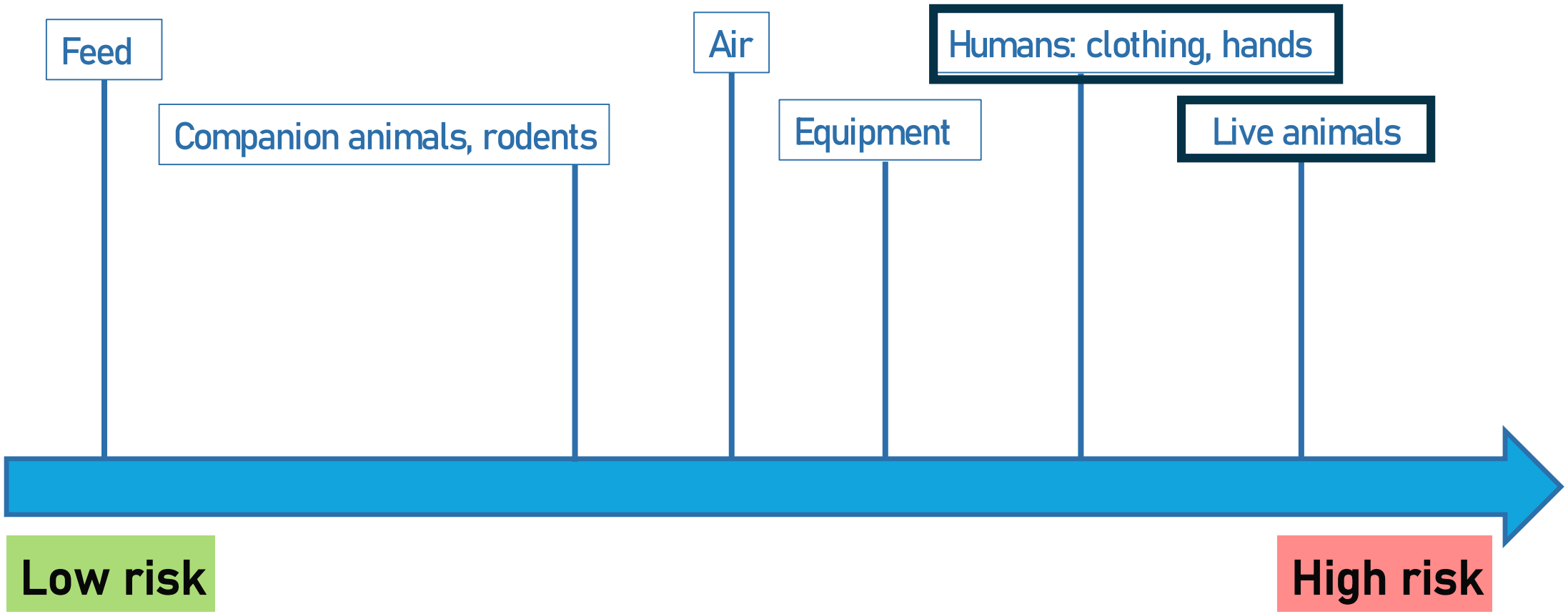
406 fattening pig farms

Flaws in biosecurity → increased AMU



Drinking equipment

Stocking density, cleaning


Feed
Companion animals, rodents
Air
Equipment
Humans: clothing, hands
Live animals
Low risk
High risk

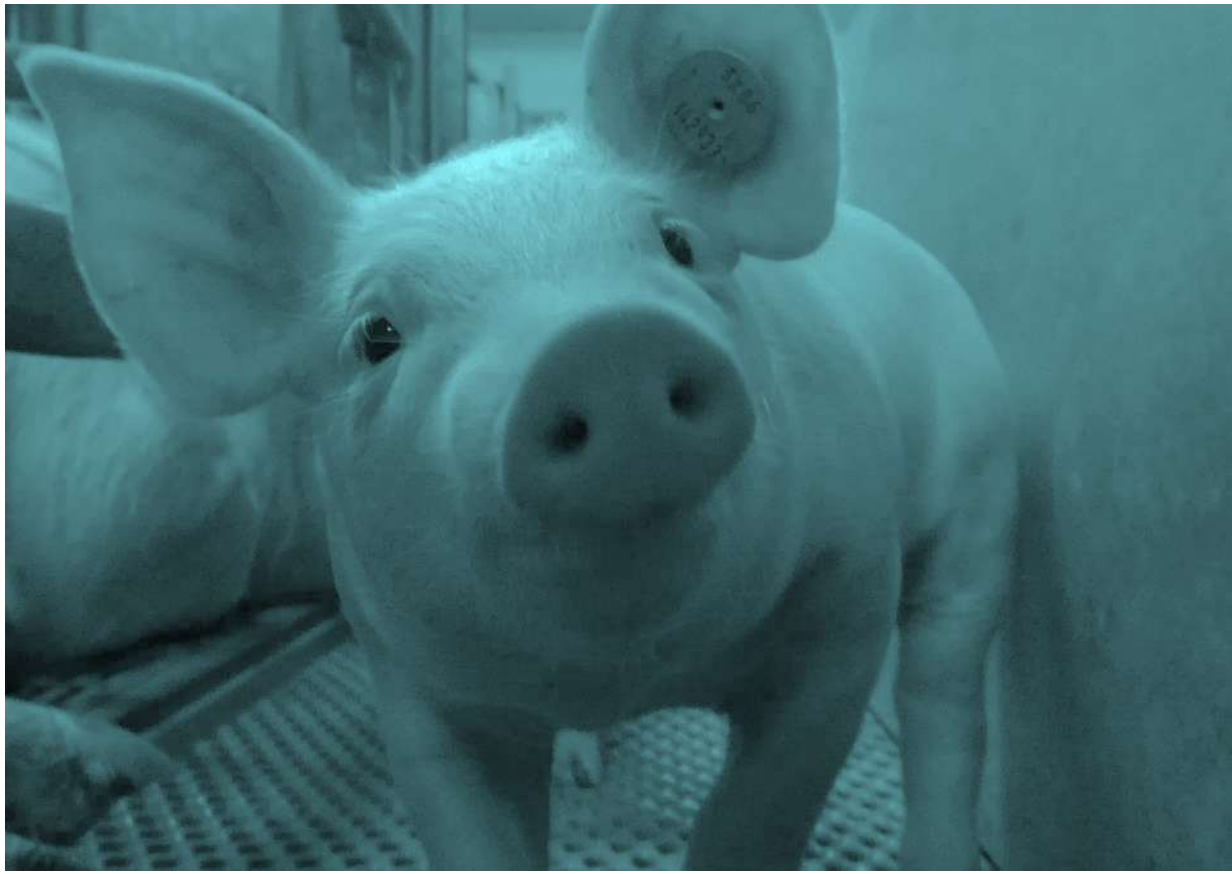
Humans

- Farm specific clothing/boots
- Washing hands
- Working lines

Live animals

- Purchasing of animals
- Disease management
- No mixing of animals (AI/AO)
- Compartments
- Working lines
- Cleaning & disinfection

5. Extra information – references



Articles


Bernaerdt et al. Porcine Health Management (2021) 7:25
https://doi.org/10.1186/s40813-021-00205-2

Porcine Health Management

RESEARCH Open Access

Purchasing policy, quarantine and acclimation practices of breeding gilts in Belgian pig farms

Elise Bernaerdt[1*], Jeroen Dewulf[2], Robin Verhulst[1], Caroline Bonckaert[3] and Dominiek Maes[1]


animals

MDPI

Article

Determining the Characteristics of Farms That Raise Pigs without Antibiotics

Elise Bernaerdt [1,*], Dominiek Maes [1], Tommy Van Limbergen [2], Merel Postma [3] and Jeroen Dewulf [3]

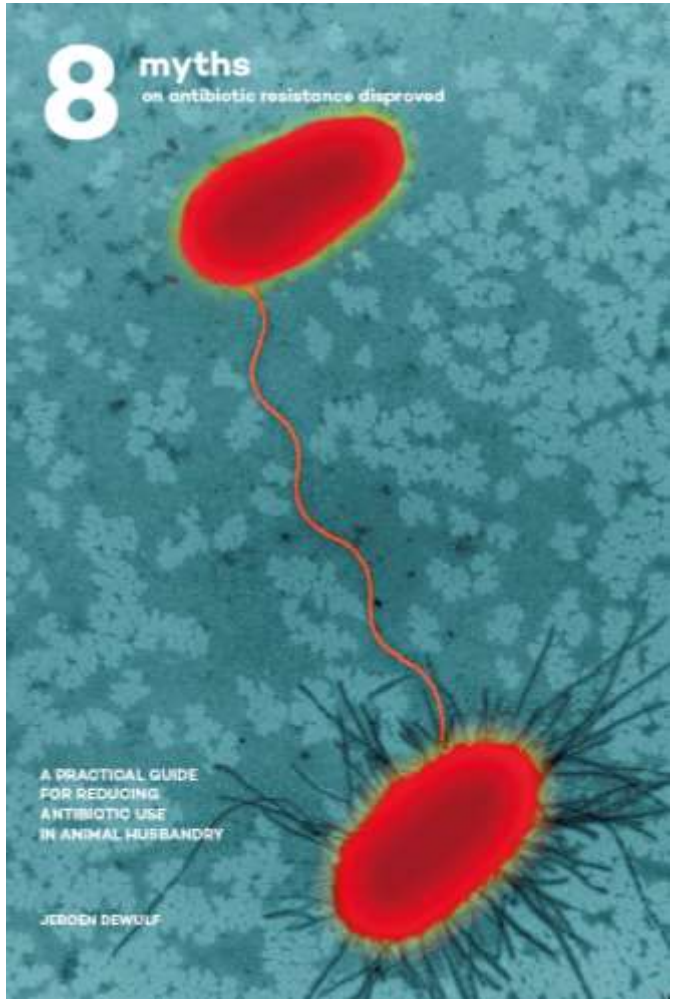

Research Article

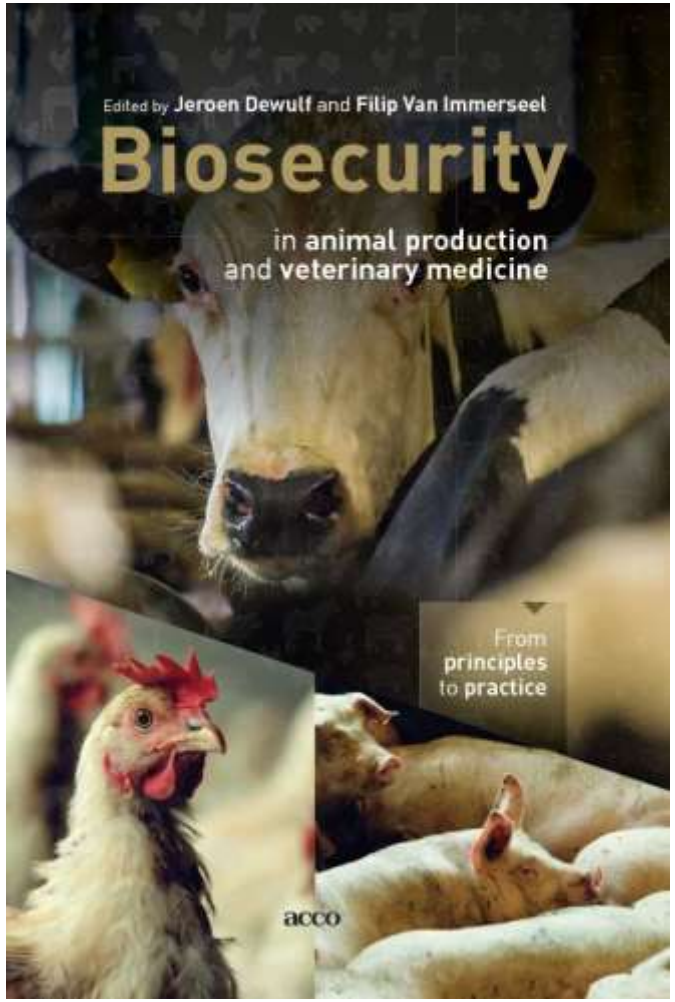
Accepted for publication

Optimizing internal biosecurity on pig farms by assessing movements of farm staff

Elise Bernaerdt, Inmaculada Díaz, Carlos Piñeiro, Miquel Collell, and 2 more

Books


8 myths
on antibiotic resistance disproved
A PRACTICAL GUIDE FOR REDUCING ANTIBIOTIC USE IN ANIMAL HUSBANDRY
JEROEN DEWULF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From principles to practice
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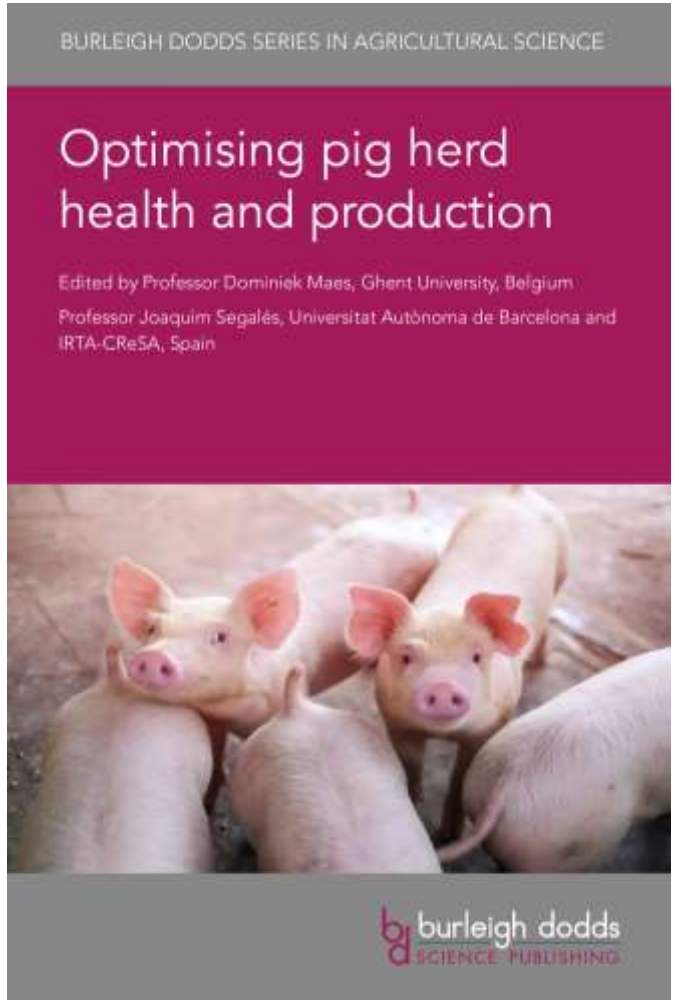
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Professor Joaquim Segalés, Universitat Autònoma de Barcelona and IRTA-CReSA, Spain
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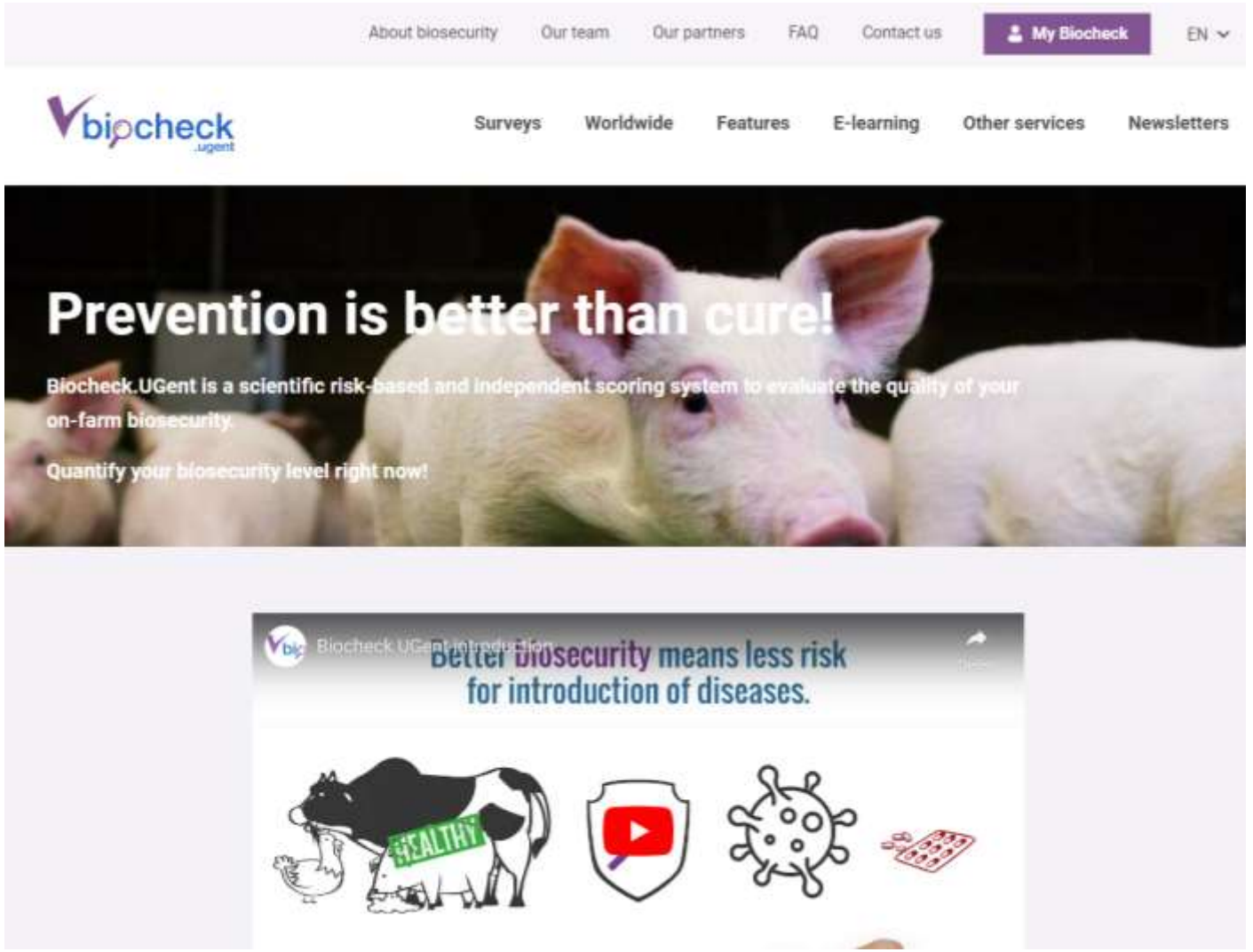

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Postma et al.	2016	Animal	The biosecurity status and its associations with production and management characteristics
Rathkjen & Dall	2017	Act. Vet. Scand.	Control and eradication of PRRSV using an MLV-2 vaccine: an area elimination study
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Maes et al.	2004	J. Vet. Med.	Risk factors for mortality in grow-finishing pigs in Belgium
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Postma et al.	2017	Zoon. & Publ. Health	Reducing antimicrobial usage in pig production without jeopardizing production parameters
Rojo-Gimeno et al.	2016	Prev. Vet. Med.	Farm-economic analysis of reducing AMU whilst adopting improved management strategies
Collineau et al.	2017	Prev. Vet. Med.	Herd-specific interventions to reduce AMU without jeopardising economic performance