Biosecurity in cattle production:
from theory to practice and back

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

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Biosecurity ?

BIOSECURITY

=

The combination of all measures taken to reduce the risk of **introduction** and **spread** of infectious diseases at farm level, troughout the region, country or even worldwide.

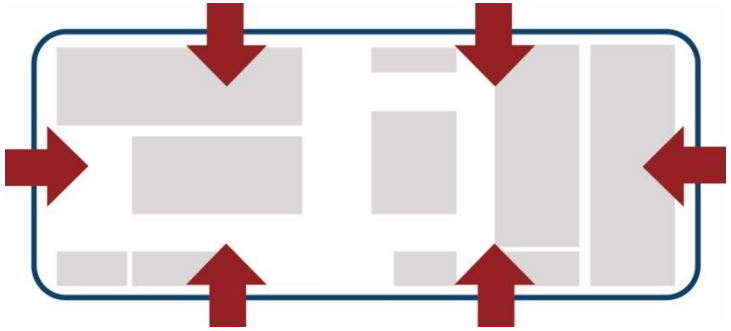
'*assessing risk and implementing measures to decrease that risk and to safeguard and improve health status on a farm*'

Biosecurity ?

EXTERNAL BIOSECURITY

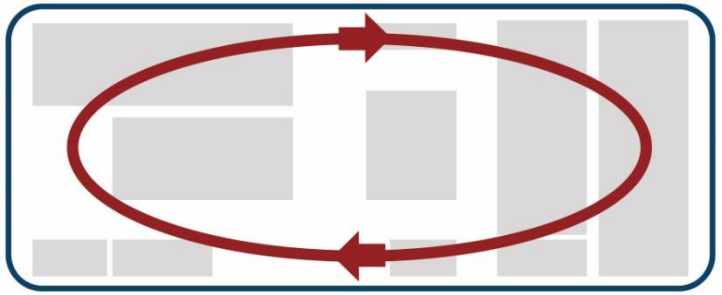
= Reduce introduction

- endemic diseases
- ”exotic” diseases



INTERNAL BIOSECURITY

= reduce spread



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Why biosecurity?

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

Why biosecurity?

- Better biosecurity ⟷ less disease
  - Better production results
    - reproduction
    - growth
    - feed conversion
    - uniformity
  - Less antimicrobial use
  - Higher prices when selling the animals

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Why biosecurity?

- Beter biosecurity ⟷ less disease
  - Eradication programs ↑
    - Free / Obliged *(e.g. BVD)*
  - Risk of exotic diseases
  - Public health, animal welfare, public opinion ('sustainable meat production')
  - Legislation

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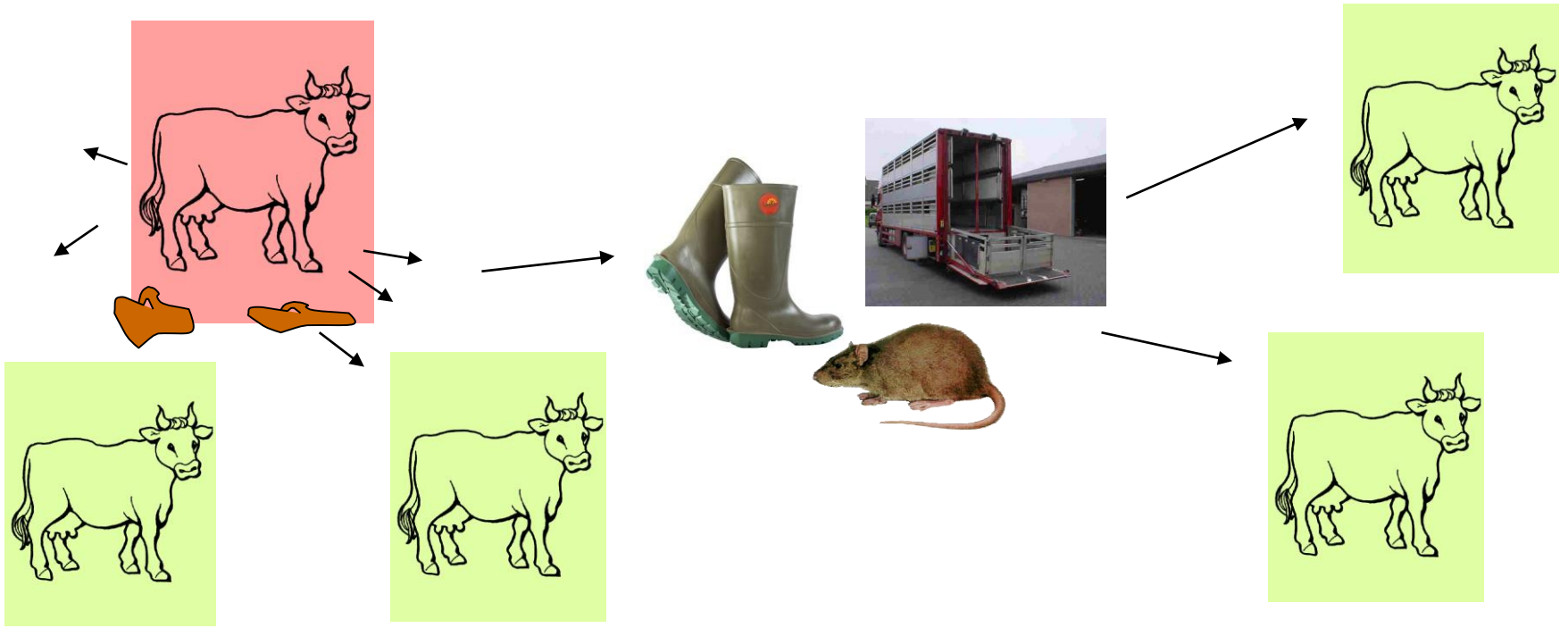
Principles of biosecurity

1) Separation of infected and susceptible animals

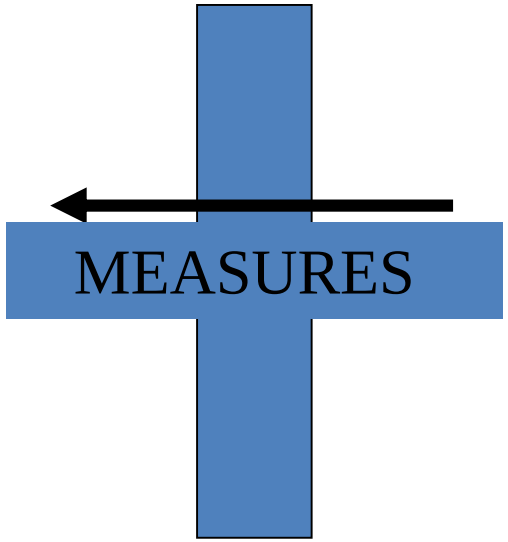
→ avoid both direct and indirect contact!

(all-in/all-out, working lines, hospital pen, …)



Principles of biosecurity

CLEAN
(susceptible animals)



DIRTY
(direct and indirect
sources of infection)

- Dependent upon herd situation (status, type,…)
- Perform well and consequent

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Table 1. Overview of transmission pathways for epidemic and endemic cattle diseases of relevance for Belgium.

Disease	Species affected and asymptomatic carriers				Direct contact			Indirect contact												References
														Ingestion		Inhalation				
	Zoonotic	Other reservoirs	Asymptomatic carriers	Wildlife reservoir	Animal to animal	Transplacental	Venereal	General	People	Animals	Rodents	Fomites	Syringes/needles	Feed	Water	General	Droplet	Aerosol	Soil / Manure	Vector	
Anaplasmosis		Mammals, birds	X	X		X		X					X							X	[1-4]
Anthrax	X	Mammals, birds	X		X			X				X		X	X	X			X	X	[5, 6]
Aujeszky's Disease		Pigs, sheep, dogs, cats, rodents,....	X	X	X	X	X	X				X			X	X		X	X		[4, 7]
Babesiosis (bovine)	X	Buffalos, deer	X	X																X	[4]
Bluetongue		Ruminants, carnivores	X	X	X	X	X	X					X							X	[4, 7, 8]
Botulism	X	Most animals	X	X	X			X	X	X	X	X	X	X	X	X		X	X		[9-19]
Bovine enzootic leucosis			X		X	X		X					X							X	[20-23]
Bovine herpesvirus 4		Ruminants	X				X							X	X	X					[24]
Bovine respiratory disease[a]		Ruminants	X	X	X			X	X	X	X	X		X	X	X	X	X			[25-123]
Bovine Spongiform Encephalopathy	X	Sheep, goats	X	X		X								X							[4, 7, 124, 125]
Bovine Viral Diarrhoea			X		X	X	X	X	X	X	X	X		X		X		X	X		[48, 65, 126-137]

Table 1. Overview of transmission pathways for epidemic and endemic cattle diseases of relevance for Belgium.

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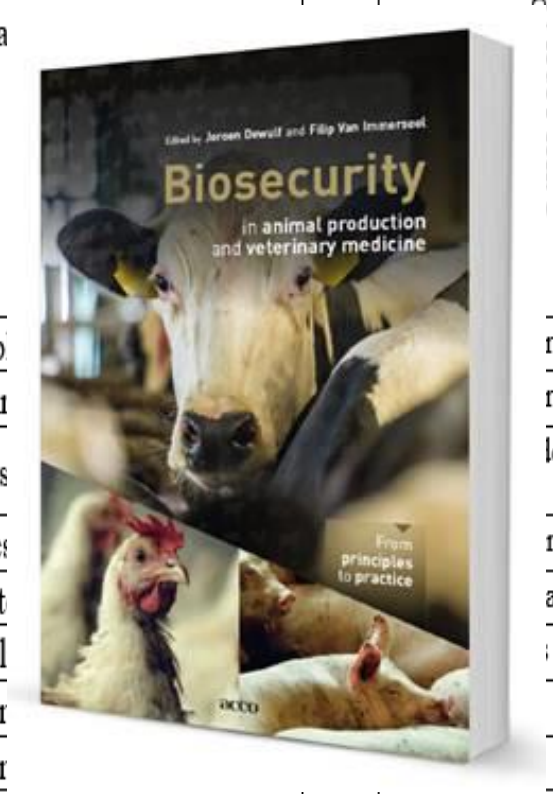
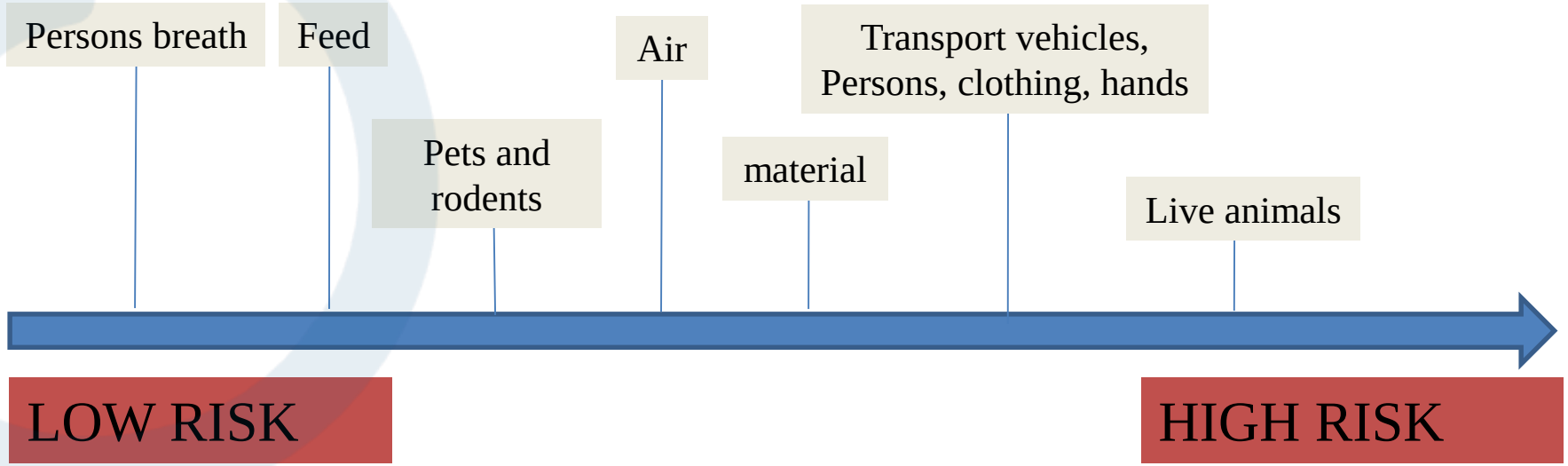
														Feed	Water	General	Droplet	Aerosol			
Anap		rds																			
Anthr		rds																			
Aujes		logs,																			
Babes		r																			
Bluet		arnivores	X	X	X	X	X	X					X							X	[4, 7, 8]
Botul			X	X	X			X	X	X	X	X	X	X	X	X		X	X		[9-19]
Bovir			X		X	X		X					X							X	[20-23]
Bovir			X				X							X	X	X					[24]
Bovine respiratory disease[a]		Ruminants	X	X	X			X	X	X	X	X		X	X	X	X	X			[25-123]
Bovine Spongiform Encephalopathy	X	Sheep, goats	X	X		X								X							[4, 7, 124, 125]
Bovine Viral Diarrhoea			X		X	X	X	X	X	X	X	X		X		X		X	X		[48, 65, 126-137]



Biosecurity in animal practice and Veterinary Medicine., 2018

Principles of biosecurity

2) Not every transmission route is equally important



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Principles of biosecurity

3) Reduction of the general infection pressure

→ breaking the infection cycle, reducing the burden on the immune system↓

(cleaning, disinfection and empty period, vaccination, …)

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Principles of biosecurity

Where is biosecurity most important

A. Large herds
B. Small herds
C. Independant of herd size

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Principles of biosecurity

4) Size matters

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Principles of biosecurity

Assume: risk of disease introduction on your herd through feed delivery is 1 out of 1000 and the feed delivery truck comes weekly, what is the annual risk?

A. +/- 0,5%

B. +/- 5%

C. +/- 50%

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Principles of biosecurity

5) Frequency matters

- ‘Thousand times a small chance becomes a large chance’
  - Risk transmission route (p)
  - **Frequency transmission route (n)**
- $P = 1 – (1-p)^n$
  - p= 0.1% (1 out of 1000)
  - n= 52 (e.g. weekly)
    - **5,06%**= $1 – (1-0.001)^{52}$

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Preventive Veterinary Medicine 117 (2014) 129–139

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

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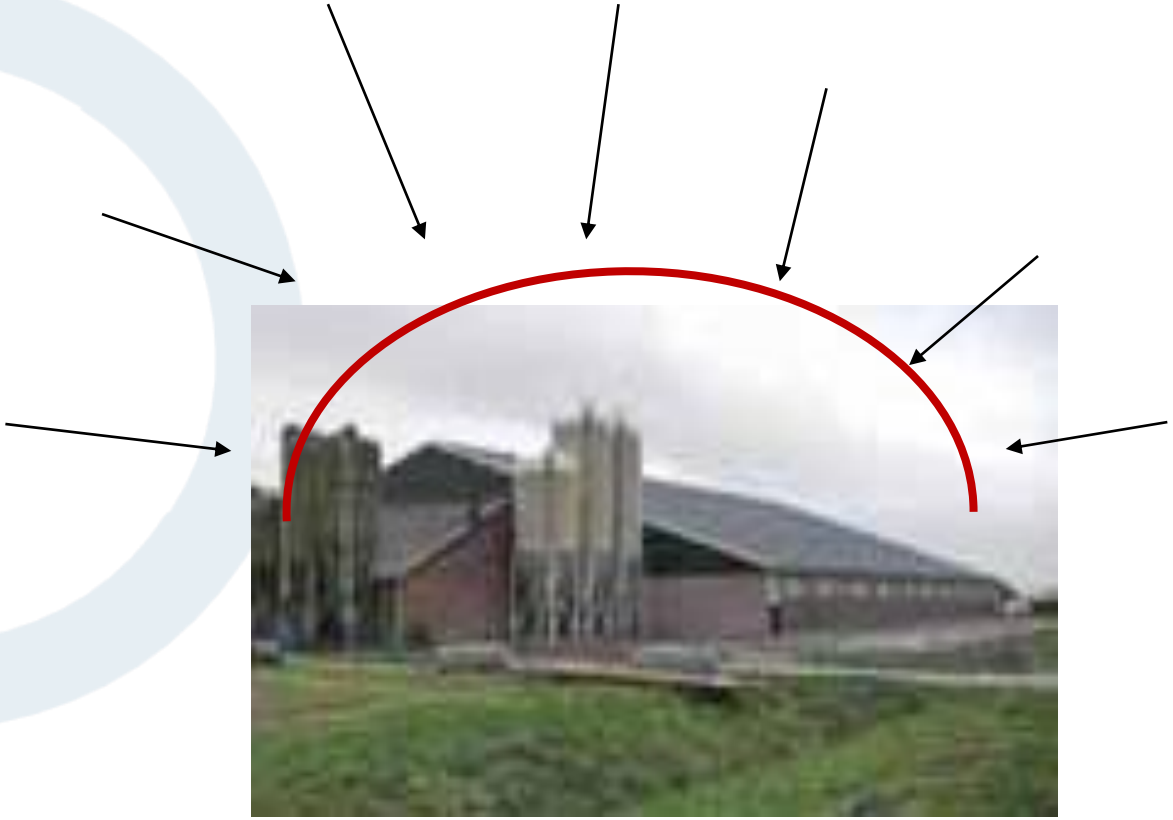
Steven Sarrazin [a,*], Ann Brigitte Cay [b], Jozef Laureyns [a], Jeroen Dewulf [a]

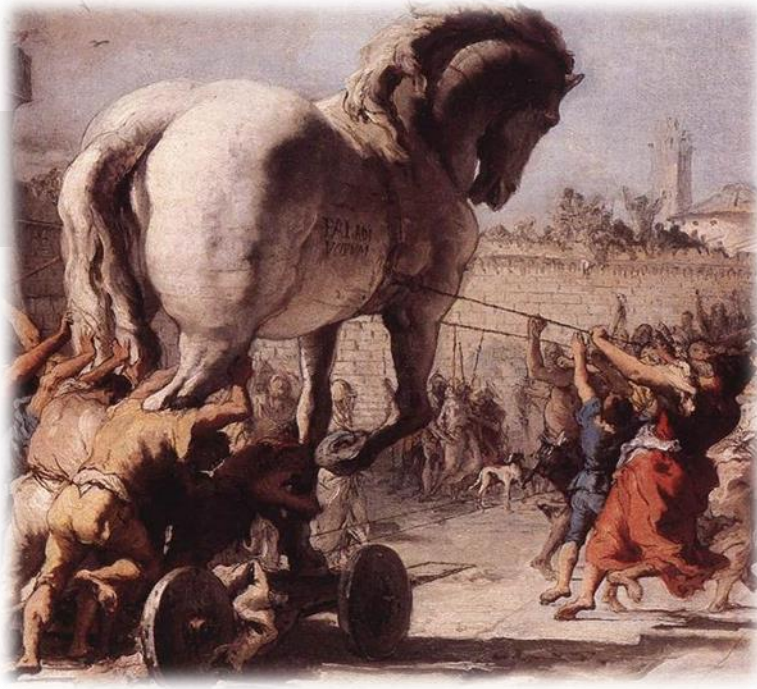
[a] *Veterinary Epidemiology Unit, Department of Reproduction, Obstetrics and Herd Health, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium*

[b] *Enzootic and (re)emerging Viral Diseases, Veterinary and Agrochemical Research Centre, Groeselenbergstraat 99, 1180 Brussels, Belgium*

External biosecurity



Purchase of animals



- Buy as little as possible (!! Veal calve!!)
- Buy from the same source
- Take the sanitary status of the farm of origin in consideration
- Use quarantine

Purchase of animals

- Quarantine

Purchase of animals

- Quarantine
  - Separate air volume
  - Separate clothing and footwear
  - Hand washing
  - AIAO
  - Cleaning & disinfection
  - Time required for diagnosis (>21 days)
    - Clinical
    - Lab

Quarantine

Exhibitions

- Be careful with exhibitions
- Through quarantine after return

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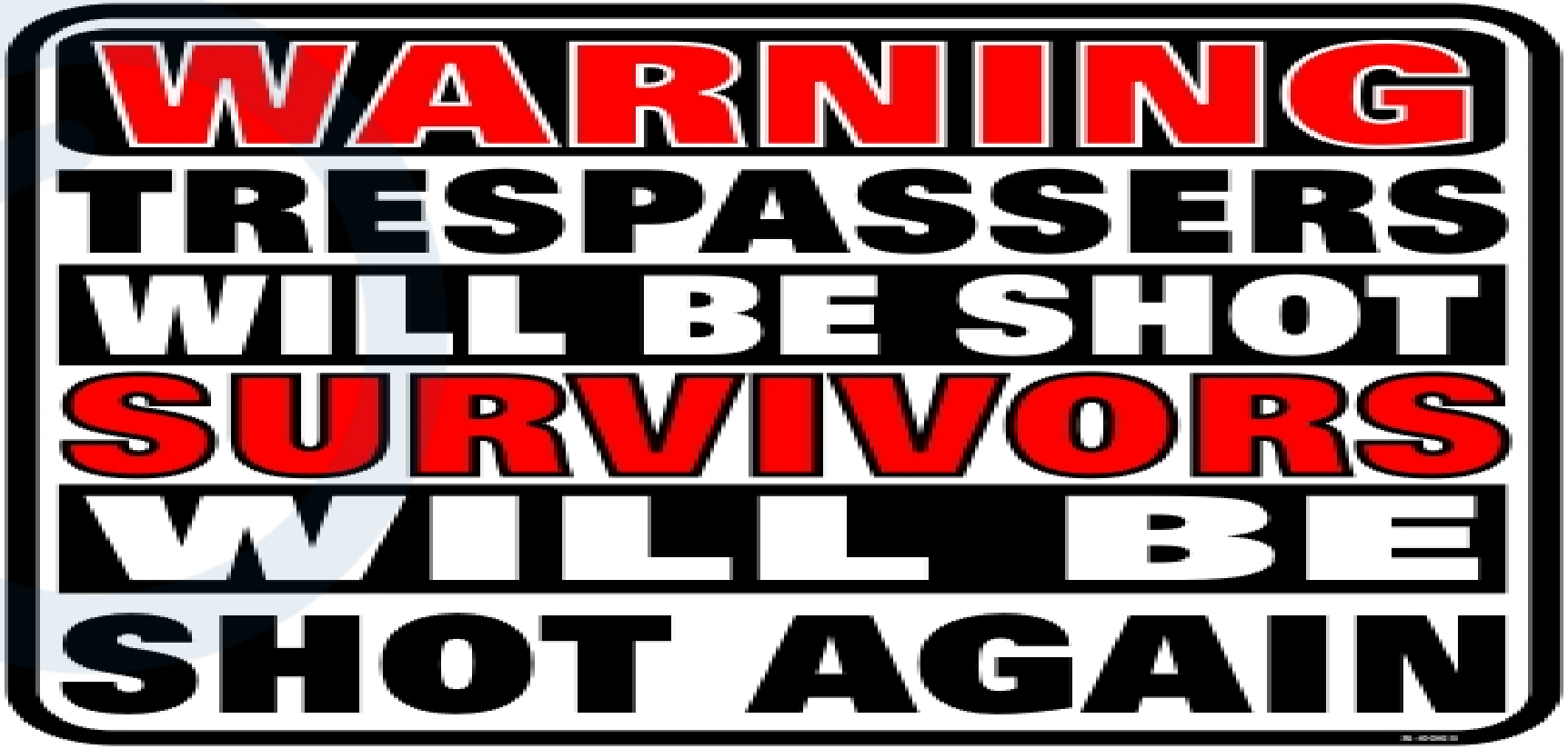
Entrance control

Entrance control



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Entrance control

“Announce upon arrival”

77%

“Direct entrance to the satbles”

77%

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Visitors

Veterinarian **every 6 days** (up to 260 times a year)

Inseminator **every 6 days** (up to 208 times a year)

Livestock dealer **weakly** (up to 208 times a year)

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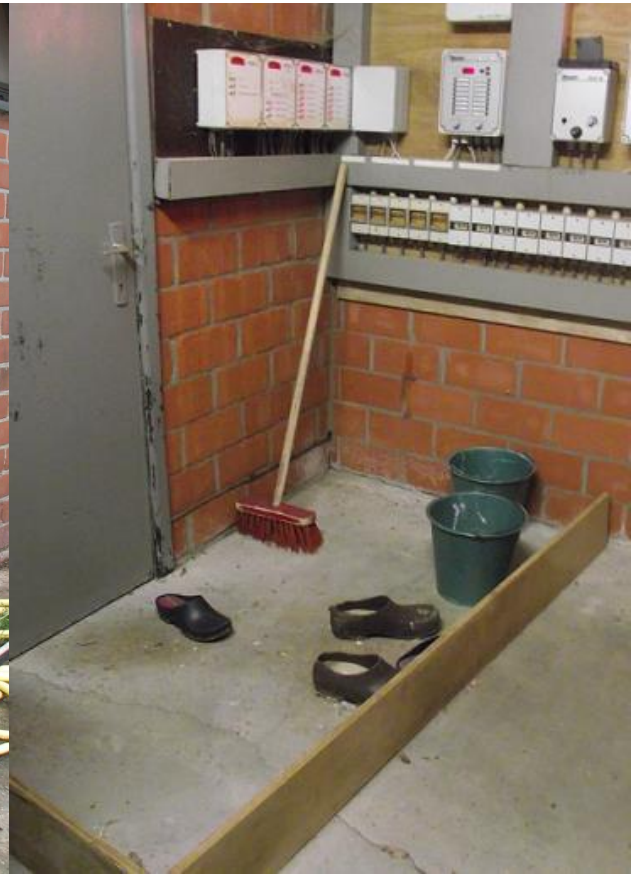
Entrance control



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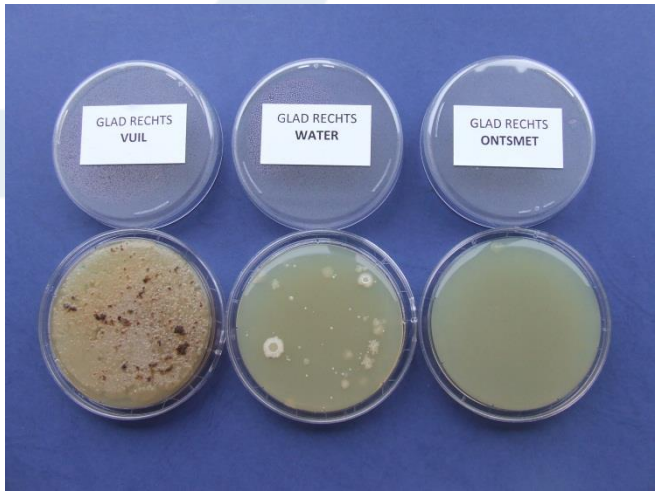
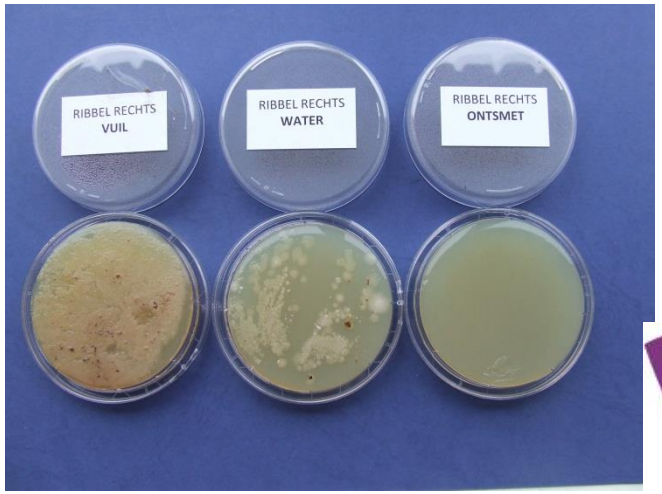
Footware and clothing





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Who washes his/her hands at herd visit

1. Always at entry
2. Always at exit
3. Always at entry and exit
4. never

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Hand washing

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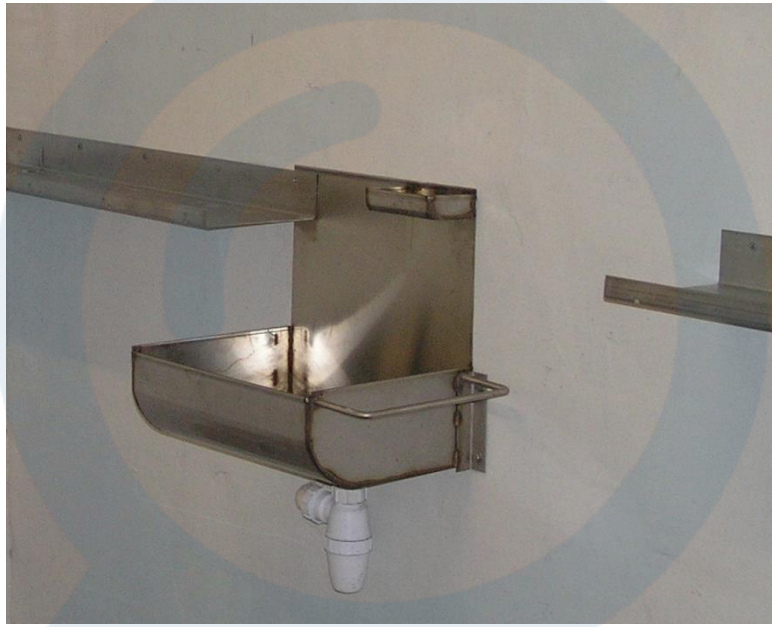
Hand washing



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Entrance control

- Common mistakes:
  - No use of farm footwear / clothing
  - Vehicles in the stables
  - Improper use of disinfection baths

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Vehicles

- Avoid unnecessary contact between vehicles and livestock.
- Thoroughly clean and disinfect all vehicles before every use.
- Livestock must only be transported in vehicles that have been cleansed and disinfected.
- Avoid sharing trailers and other machinery.
- If contractors must be used, inspect for cleanliness and disinfection.

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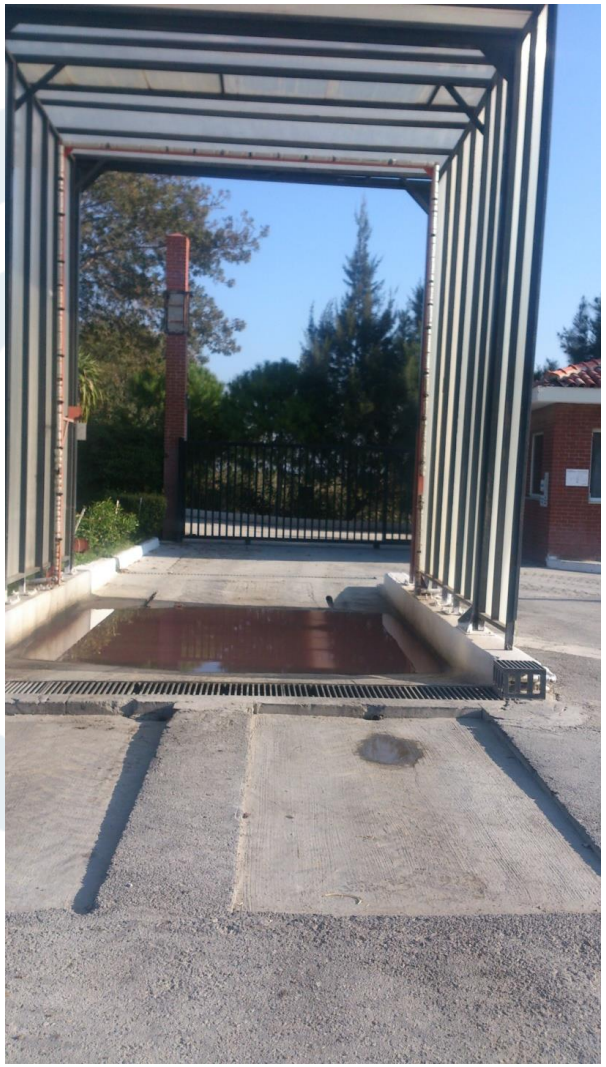
Vehicles



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Supply of feed, water and goods

- Hygiene measures
- Control of drinking water

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Supply of feed, water and goods

- Hygiene measures
- Control of drinking water

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Storage of cadavers

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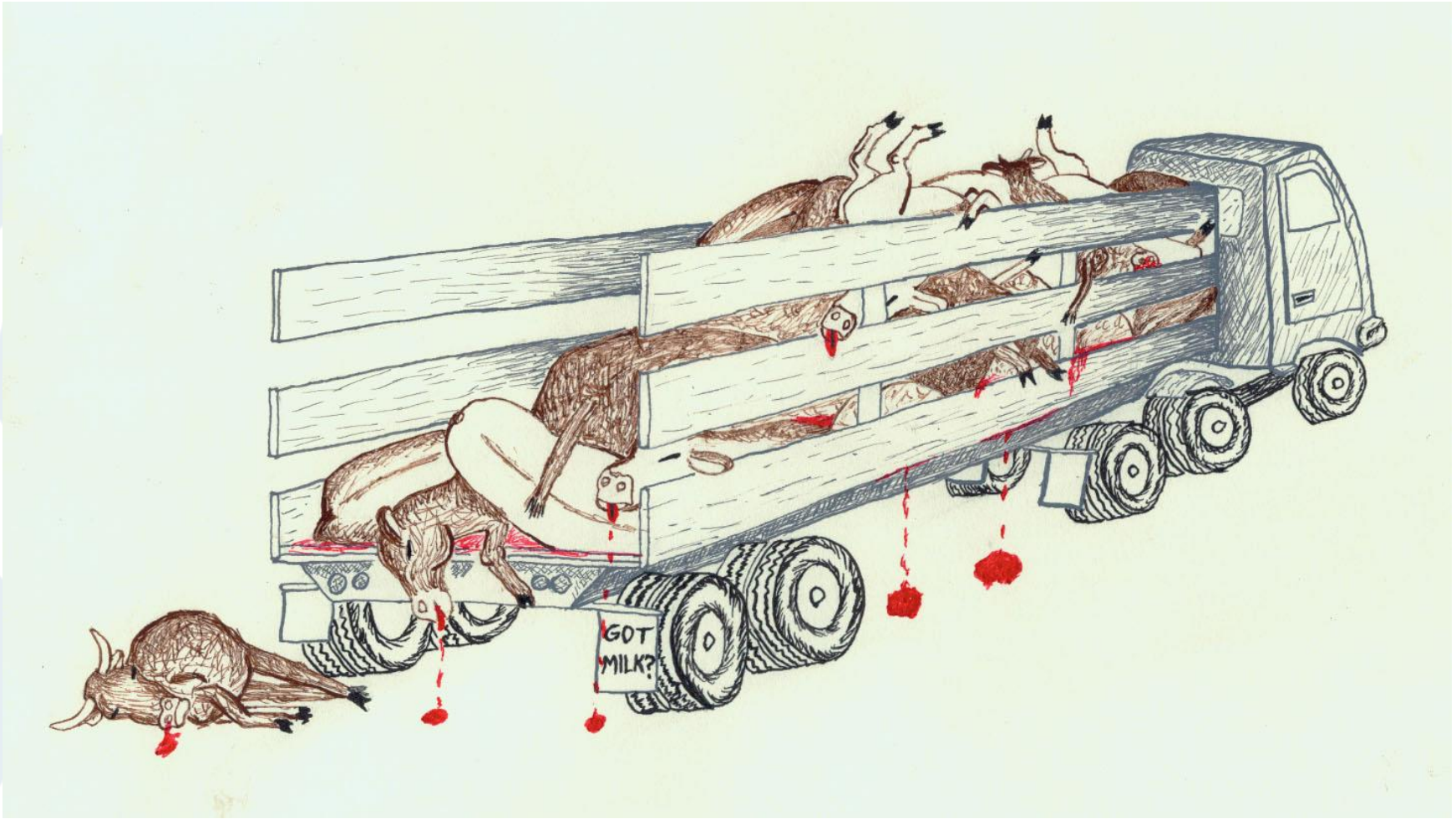
Rendering company



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Vermin and bird control

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Virmin and bird control

- Avoid shelter for rats close to the stables

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Virmin and bird control

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Vermin and bird control

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Pasture contact

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Pasture contact

- Avoid nose-to-nose contact with neighbouring stock.
- Farm boundaries should be secure, and be checked regularly. There should be at least a 3-meter gap between neighbouring livestock.
- If common grazing is used, livestock should be isolated for 21 days upon return.

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Internal biosecurity

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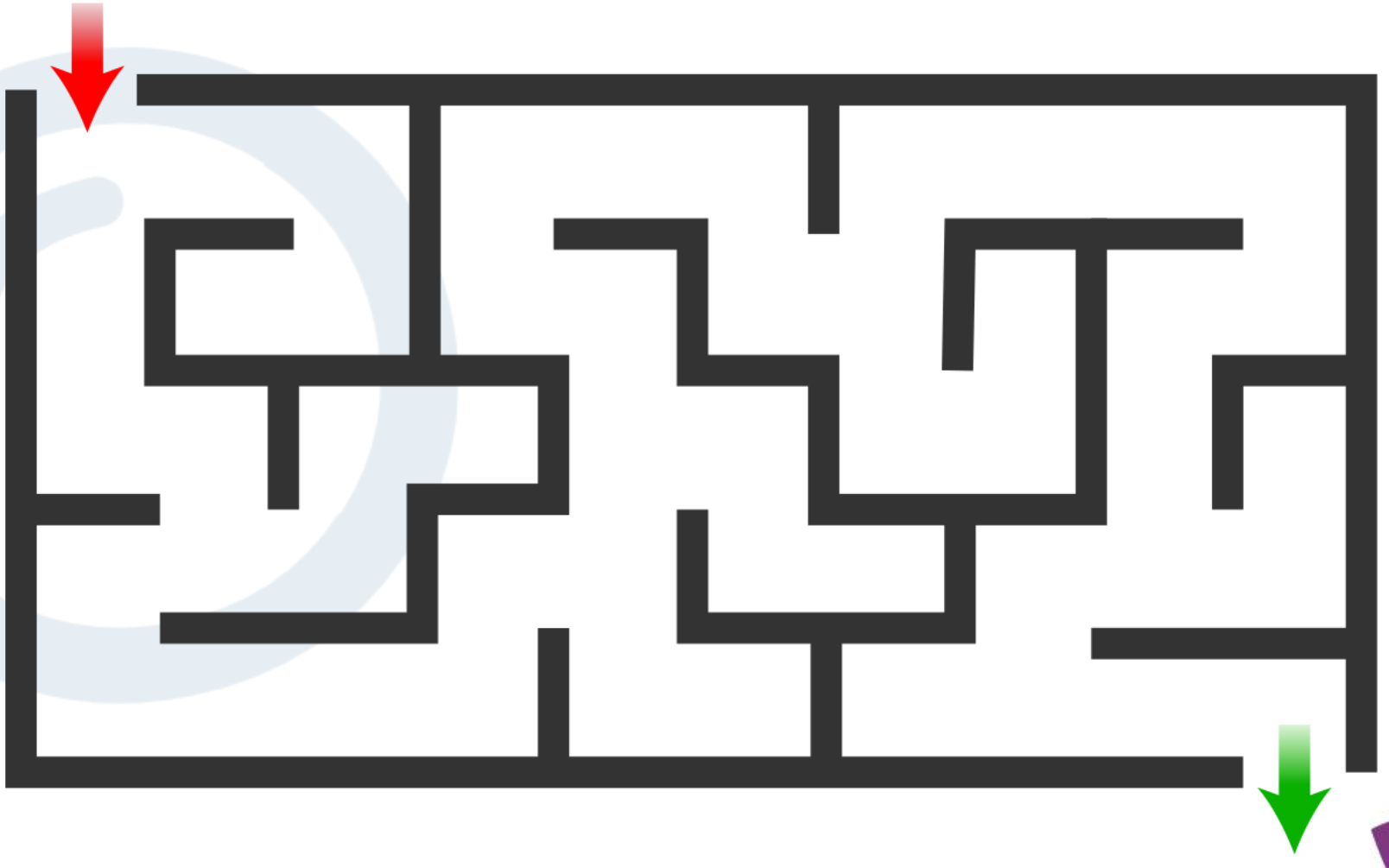
Working lines: from young to old



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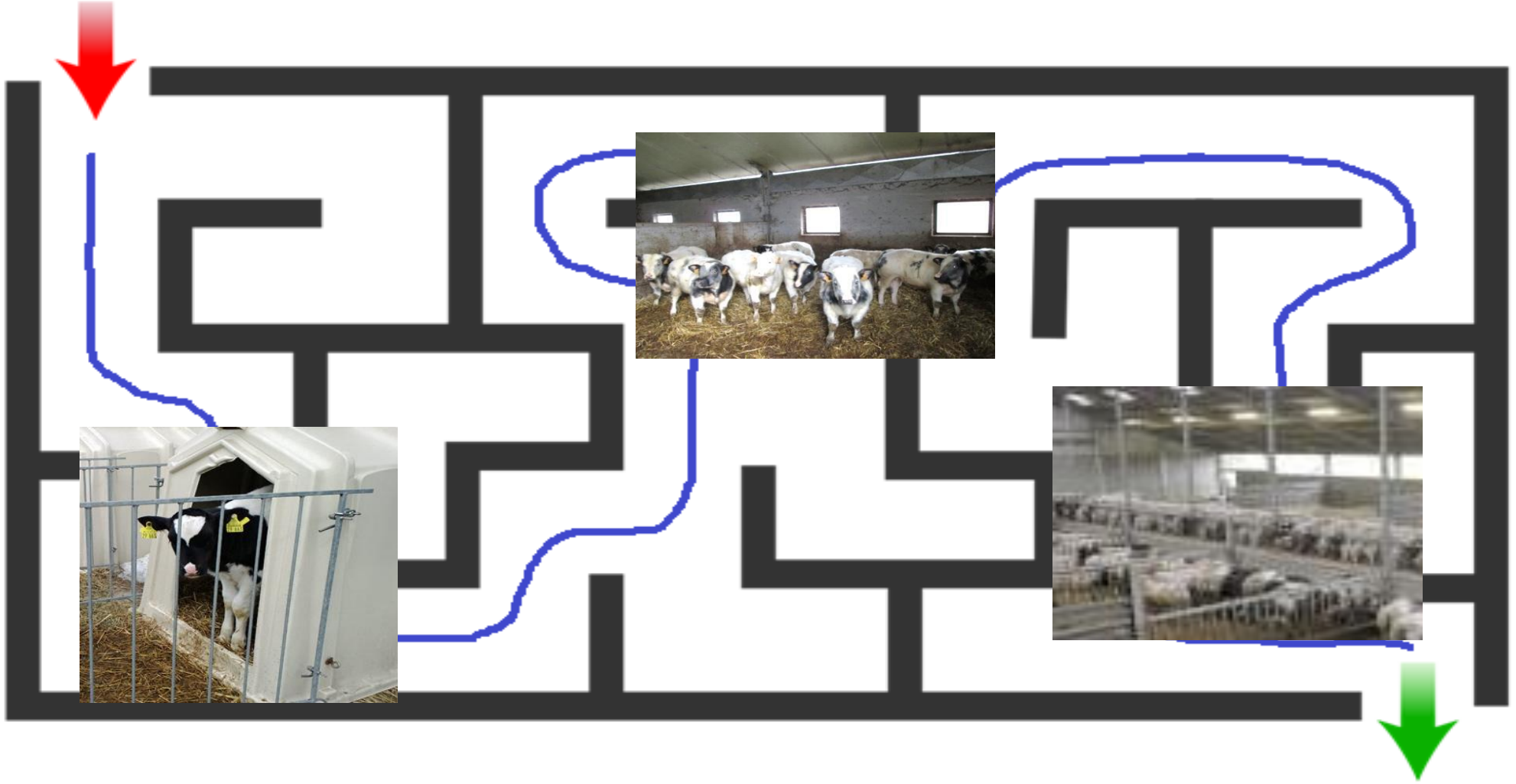
Working lines: from young to old



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Separate age groups

- 0-2 months
- 2-6 months
- 6 months – 2 year
- > 2 year

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Compartments and material

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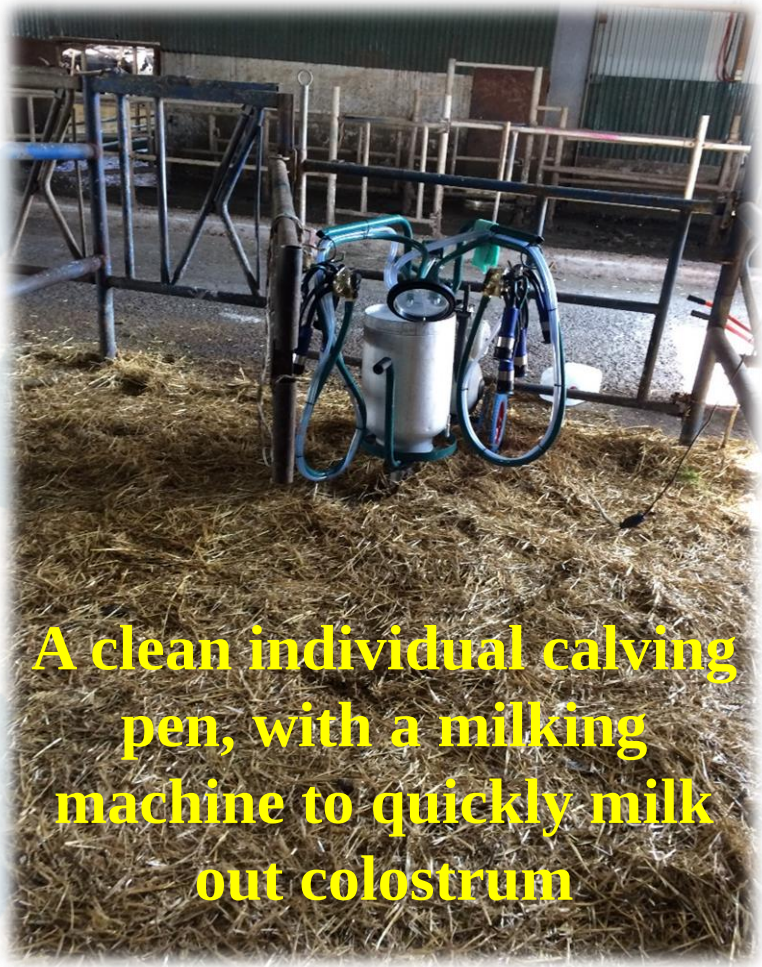
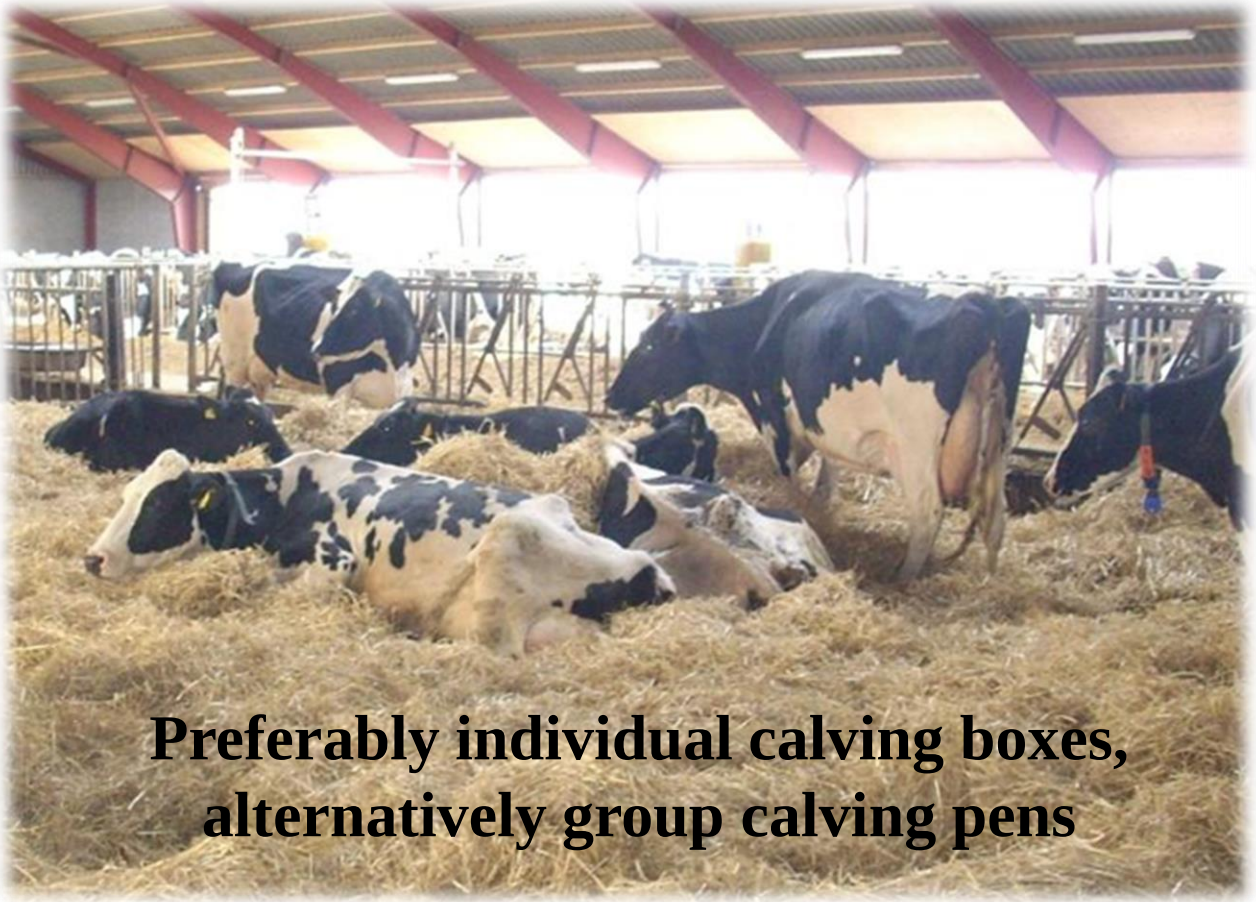
Calving management

- Calving box
  - Fully separated
  - Not used as hospital pen
  - Separate booths
  - Hand washing
  - Cleaning & disinfection

Calving management



A clean individual calving pen, with a milking machine to quickly milk out colostrum



Preferably individual calving boxes, alternatively group calving pens

Foto: Dr. Catharina Berge

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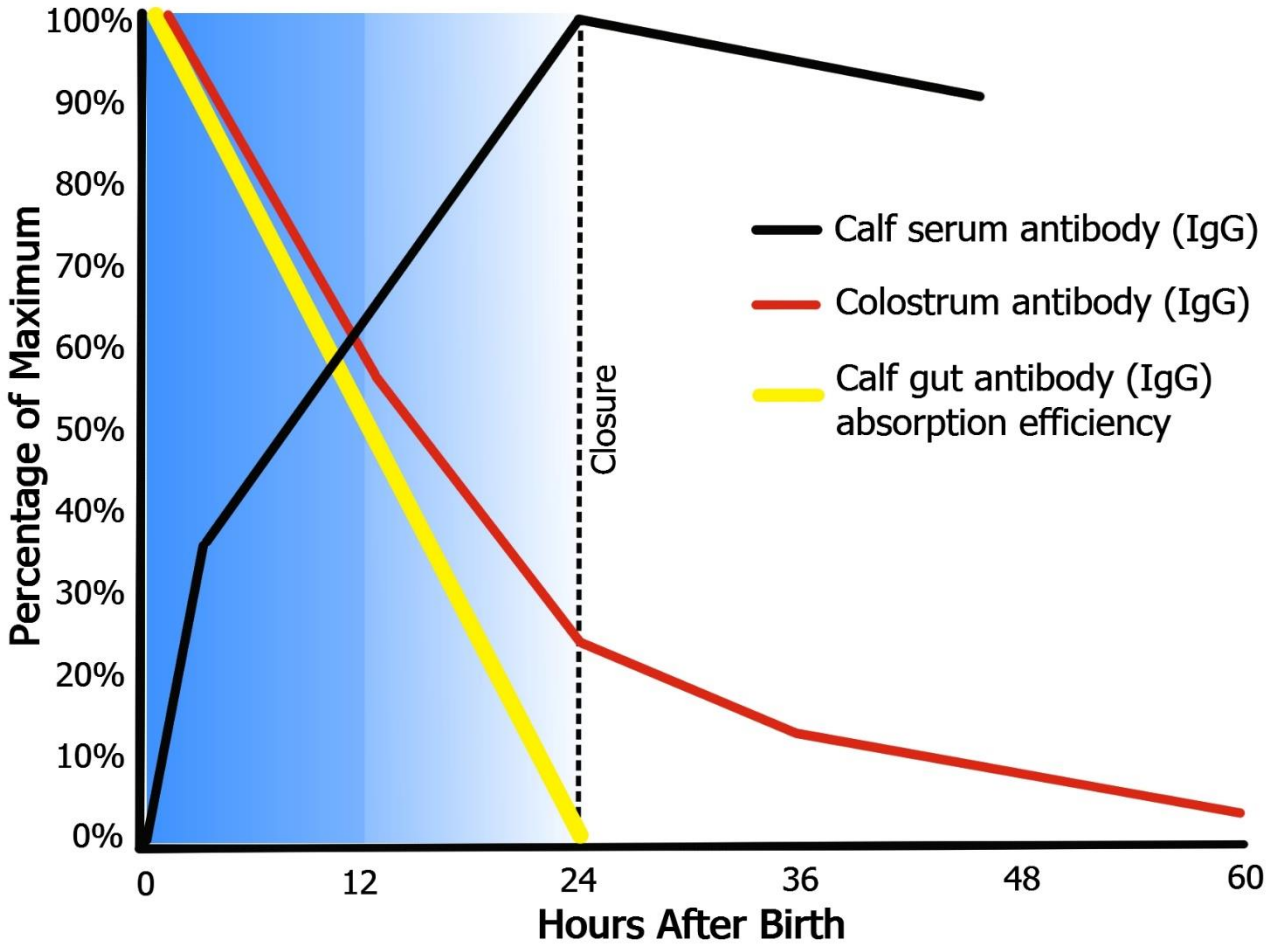
Colostrum



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Calf rearing

- Calf needs to land in a dry clean spot

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Calf rearing

- Separate housing

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Calf rearing

- hygiene of milk buckets

Foto: Dr. Catharina Berge

Calf rearing

- hygiene of milk buckets

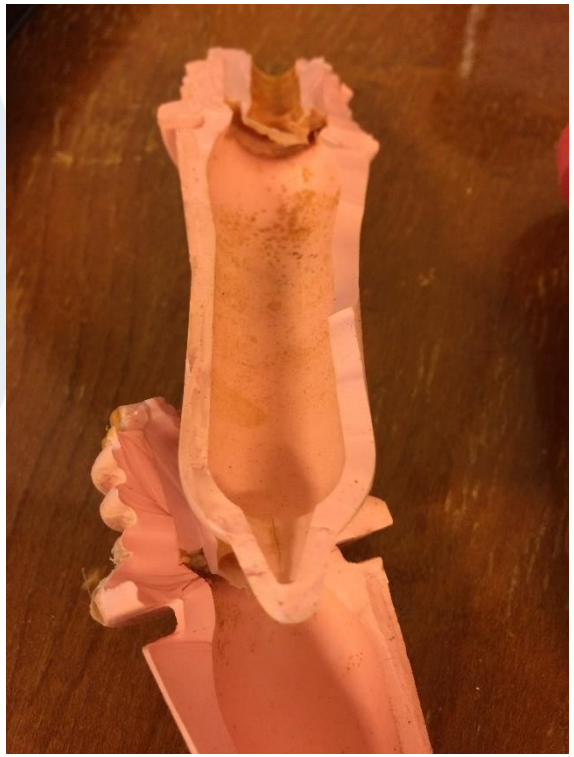

Foto: Dr. Catharina Berge

Calf rearing

- hygiene of milk buckets

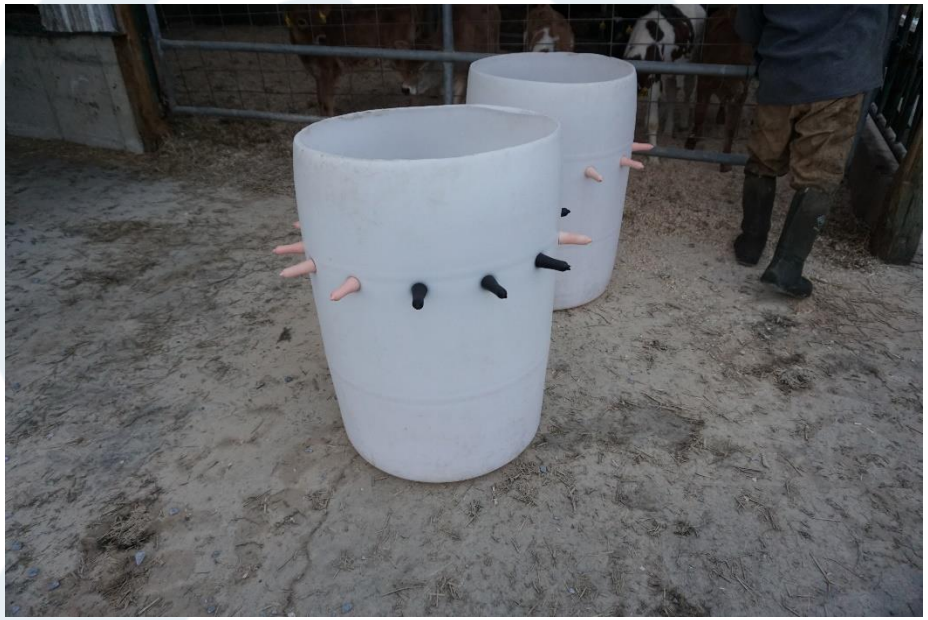

Foto: Dr. Catharina Berge

Pets

- Avoid pets in the stables

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Pets

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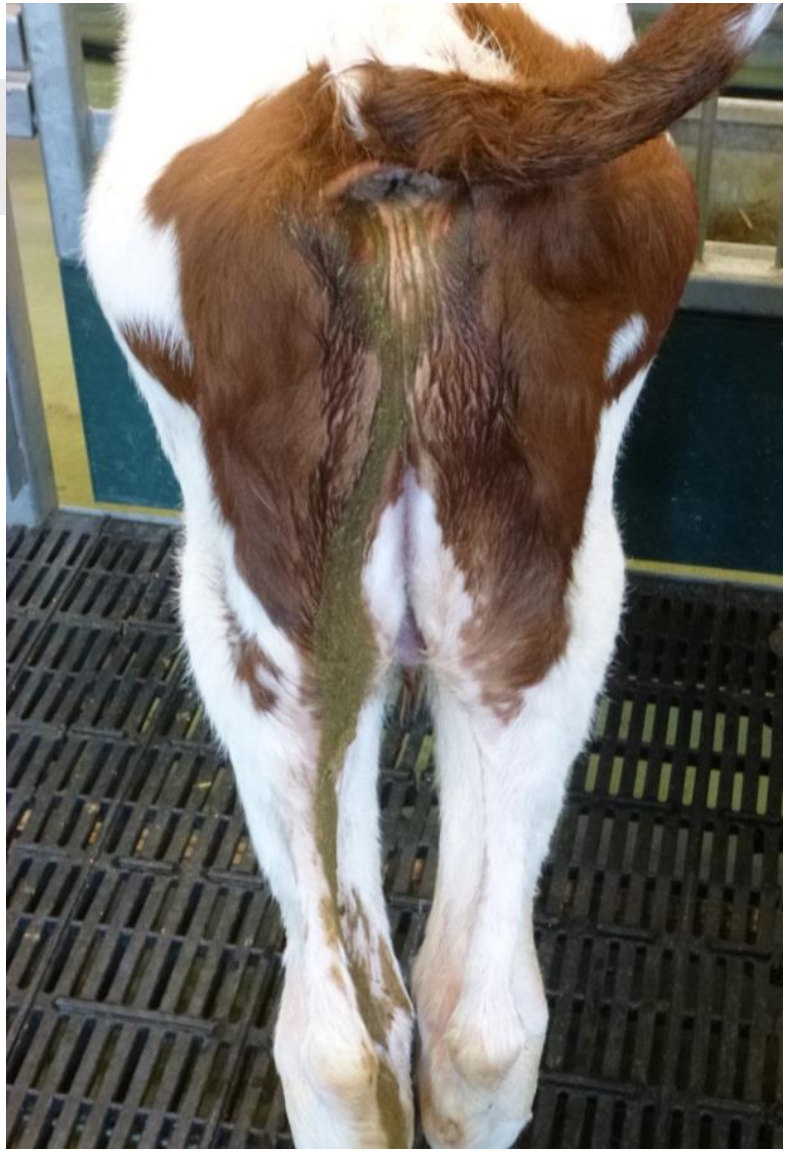
Hospital pen

- Fully separated
- Separate clothing and footwear
- Hand washing
- Cleaning and disinfection
- Own material



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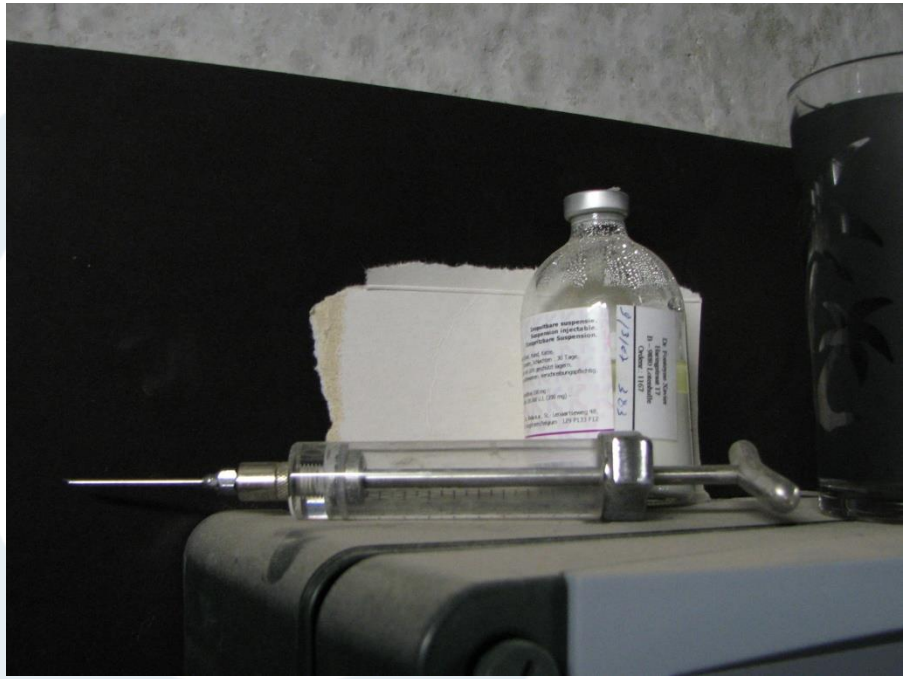
Medicines and needles



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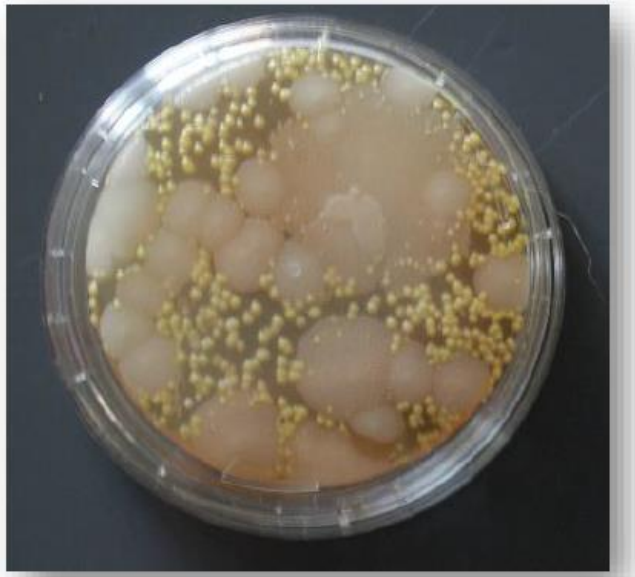
Medicines and needles

MATERIAAL & METHODEN

- 5 nieuwe vaccinatie spuiten
- 79 gebruikte vaccinatie spuiten (BE 51, NL 28)
- Spuiten doorspoelen met 5 ml *aqua ad iniectabilia* (solvent Gestavet 600®)
- Uitplaten DGZ Vlaanderen → Kiemtelling 37°C & gisten/schimmel telling (KVE/ml)

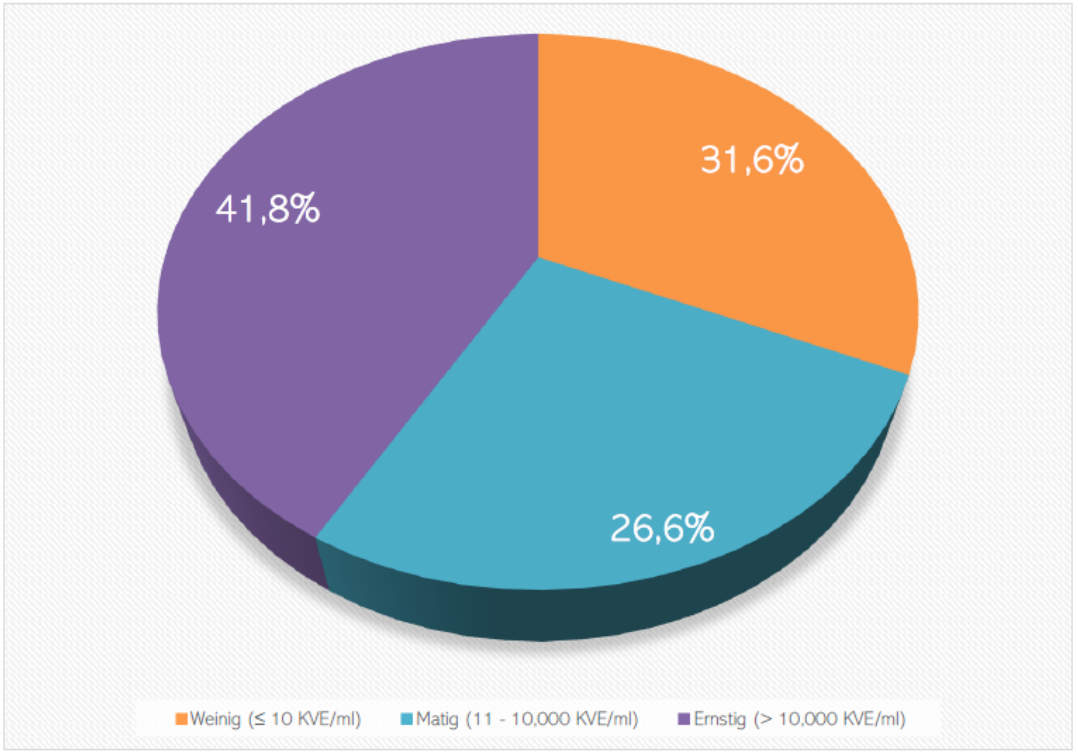


Bron: Annelies Michiels

Medicines and needles

RESULTATEN

- 5 nieuwe spuiten : 1, 0, 1, 0, 1 KVE/ml kiemtelling
- Gemiddelde kiemtelling 79 spuiten: 45,289.0 (± 65,683.2) KVE/ml



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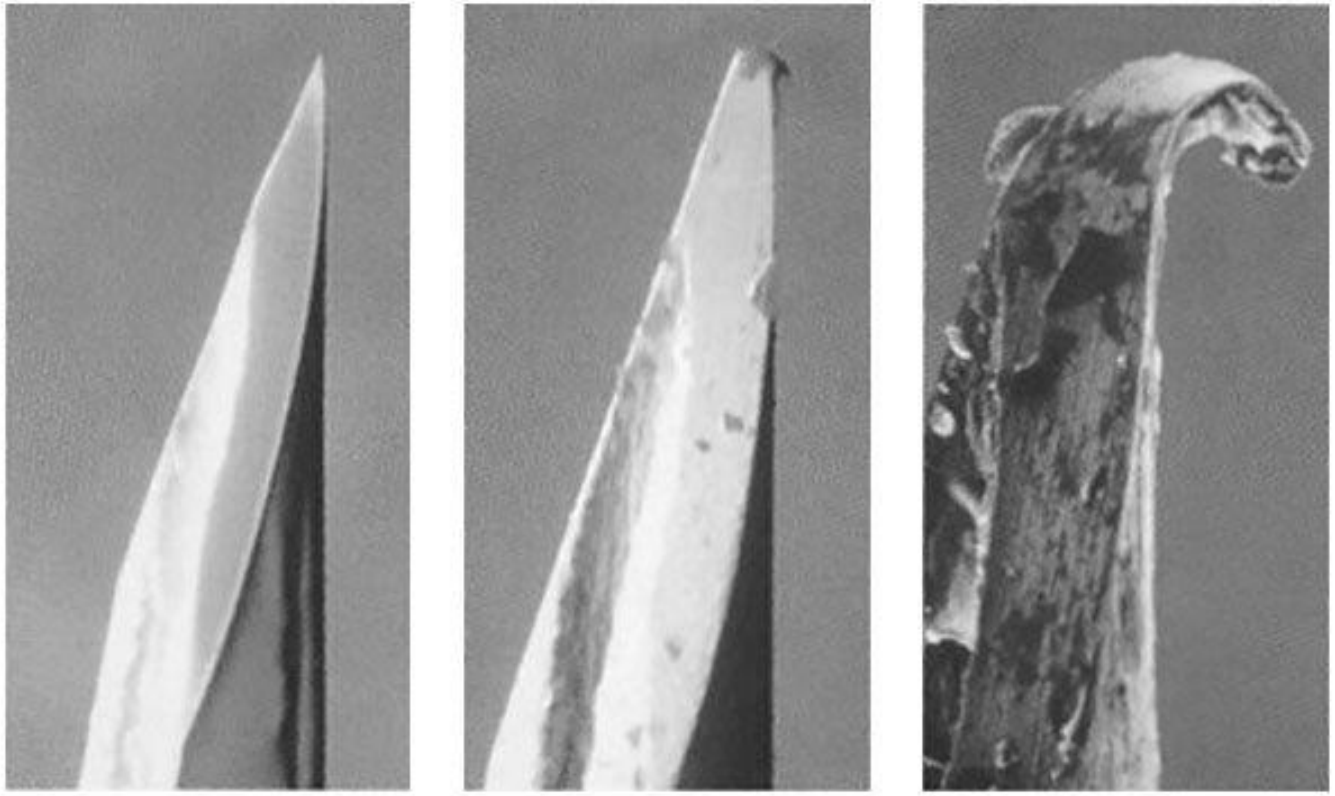
Medicines and needles



https://www.pig333.com/articles/drugs-and-needle-sticks-present-unintended-health-hazards_12915/

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Milking parlour & waiting zone

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Cleaning and disinfection

1. dry cleaning and removal of all organic material

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Cleaning and disinfection

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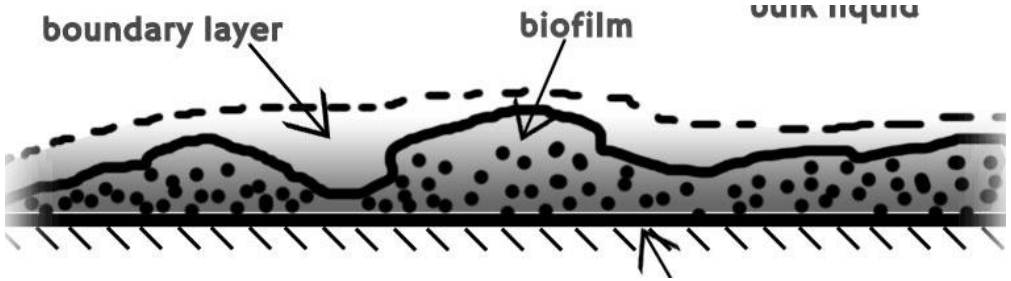
Cleaning and disinfection

2. soaking of all surfaces to loosen all remaining organic material

Cleaning and disinfection

2. soaking of all surfaces to loosen all remaining organic material



Cleaning and disinfection

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Cleaning and disinfection

3. high pressure cleaning with water to remove all dirt

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Cleaning and disinfection

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Cleaning and disinfection

4. drying of the stable to avoid dilution of the disinfectant

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Cleaning and disinfection

5. disinfection of all surfaces

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Cleaning and disinfection

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Cleaning and disinfection

6. drying of all surfaces after disinfection

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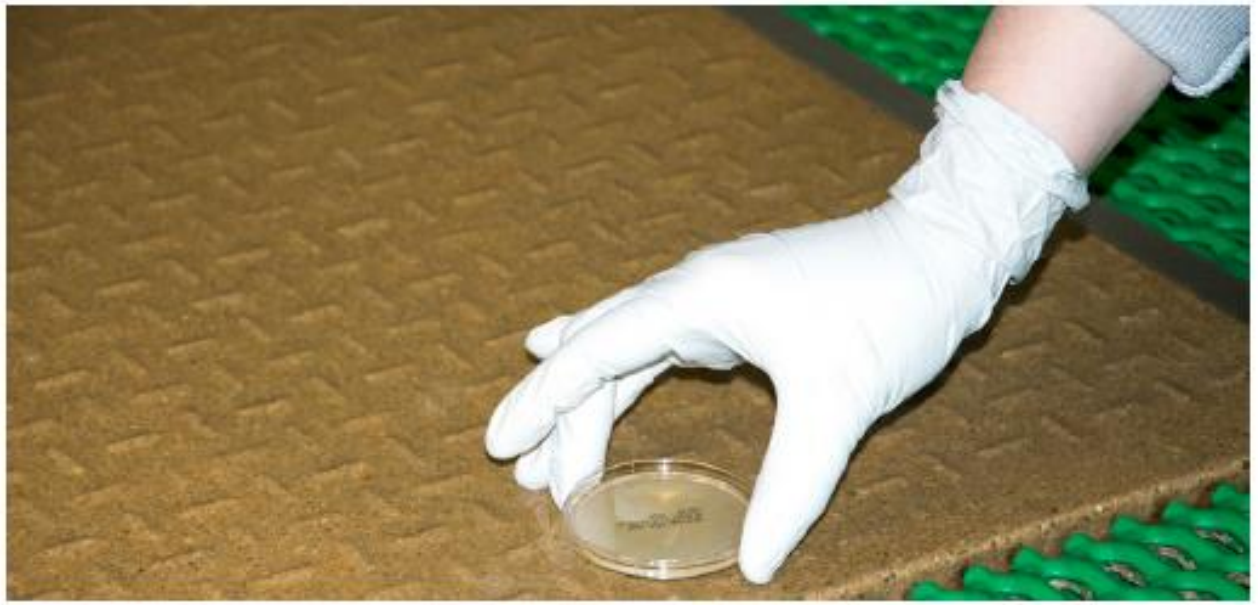
Cleaning and disinfection

7. Testing of efficacity



Score	KVE per plaat
0	0
1	1-40
2	41-120
3	121-400
4	> 400
4	ontelbaar

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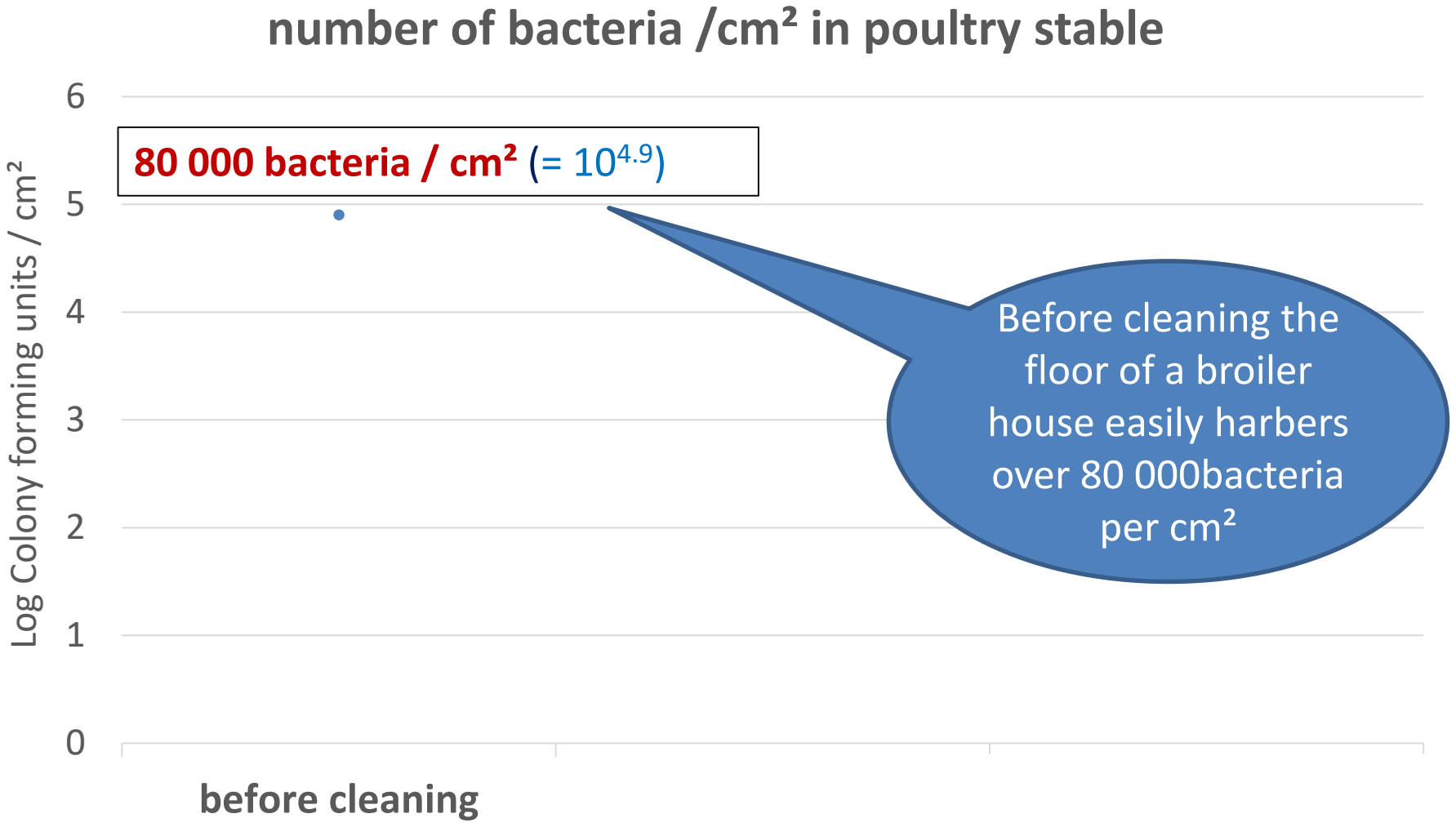
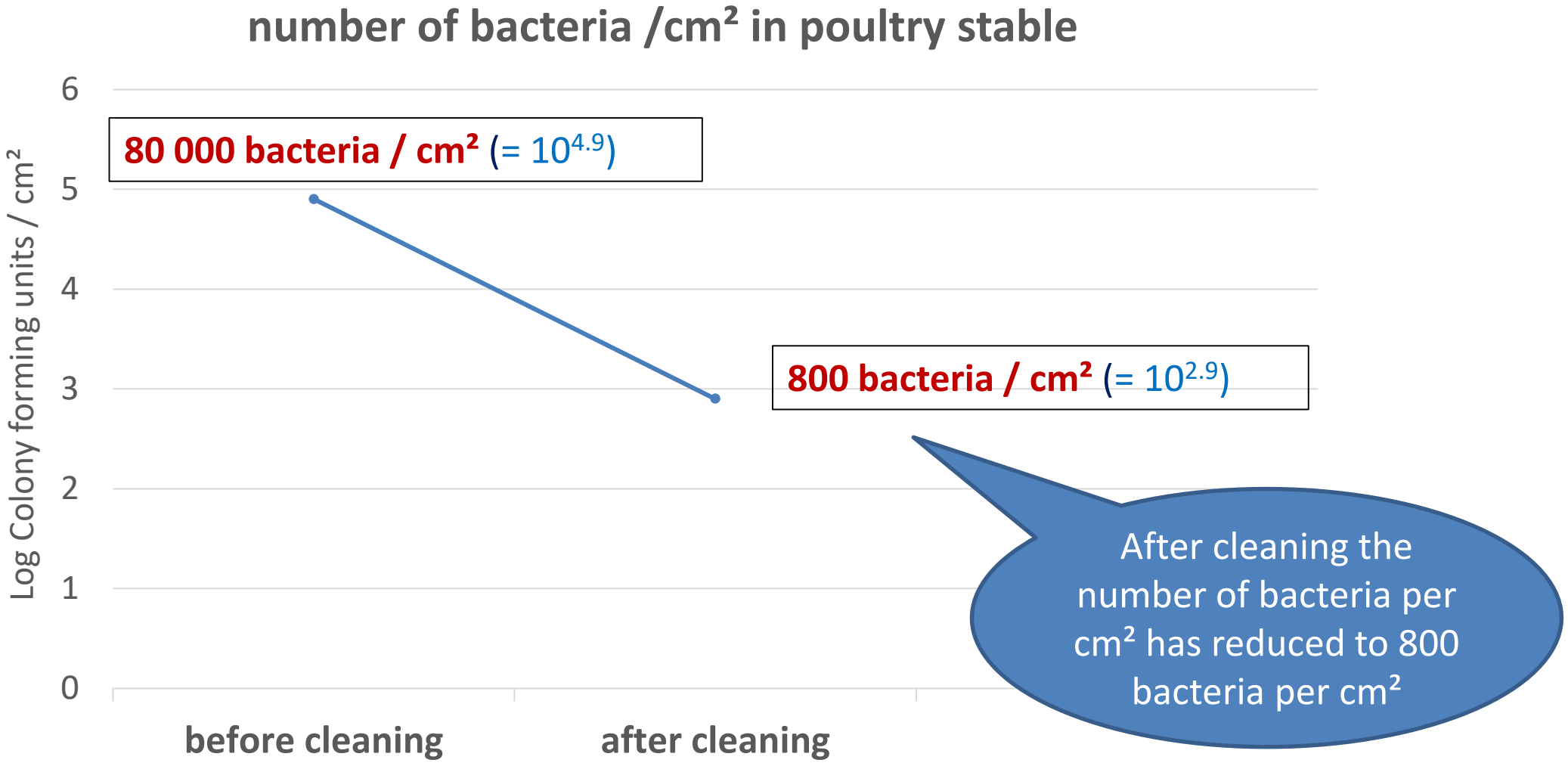
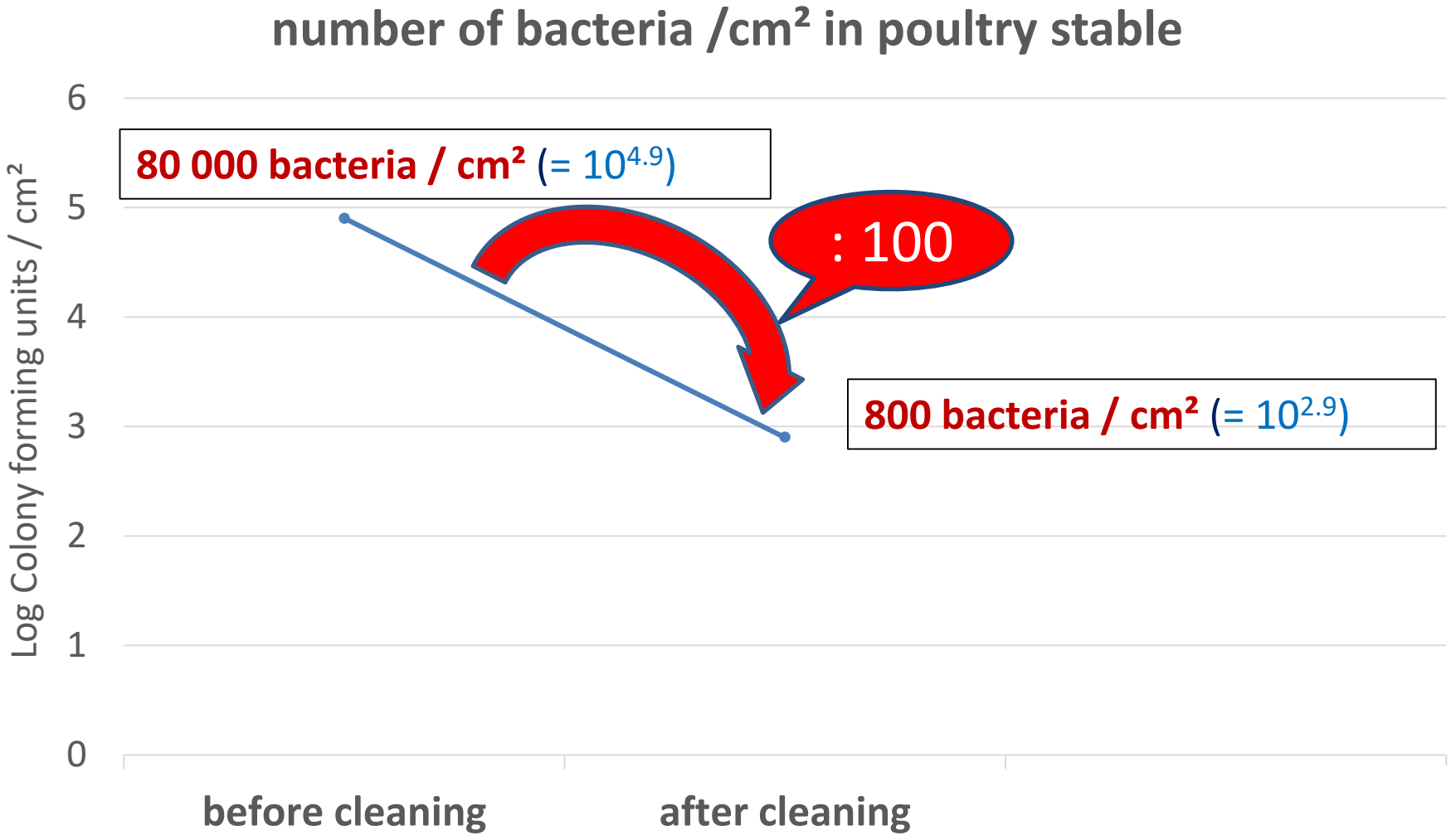


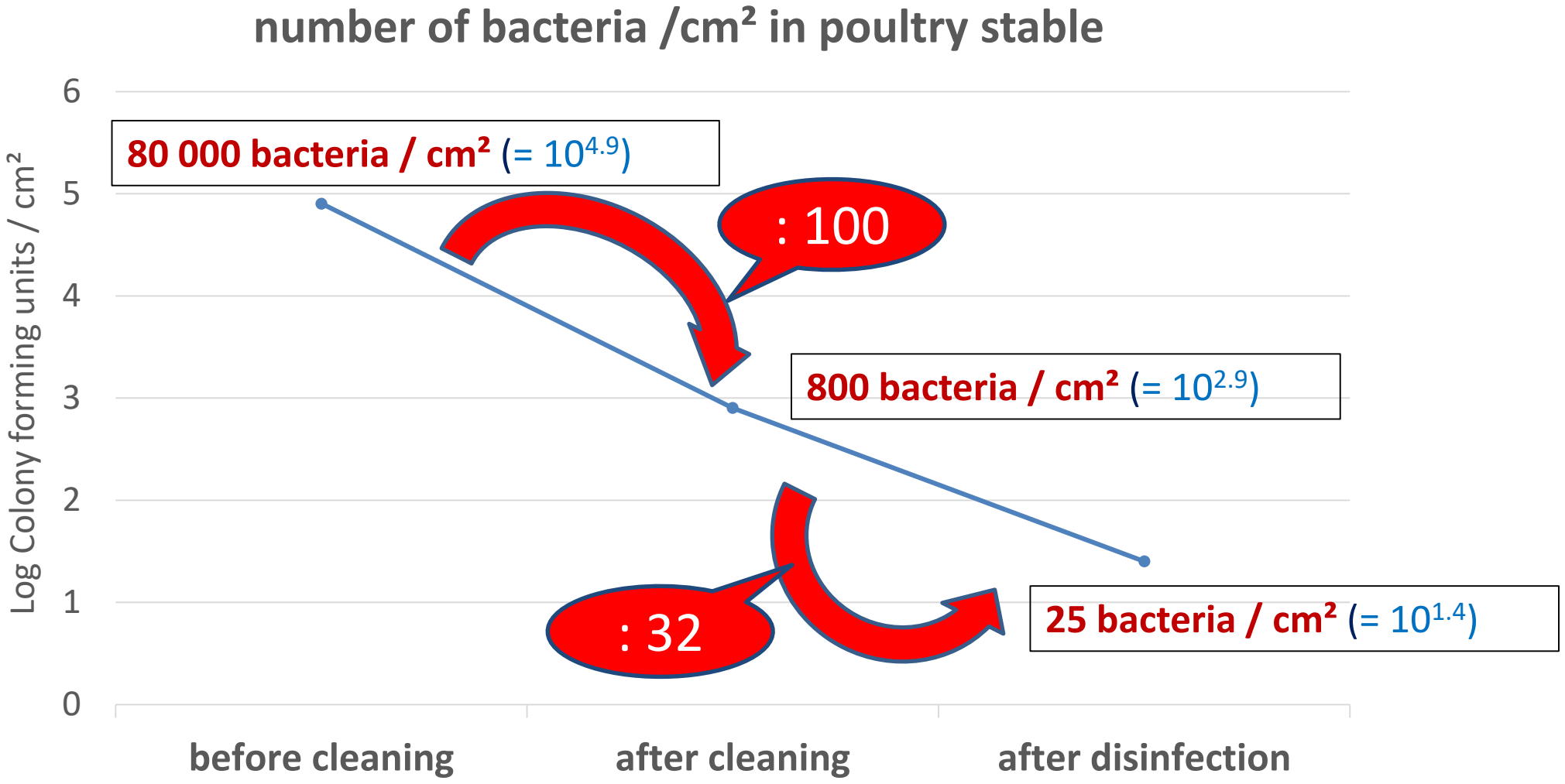
Luyckx et al. 2015



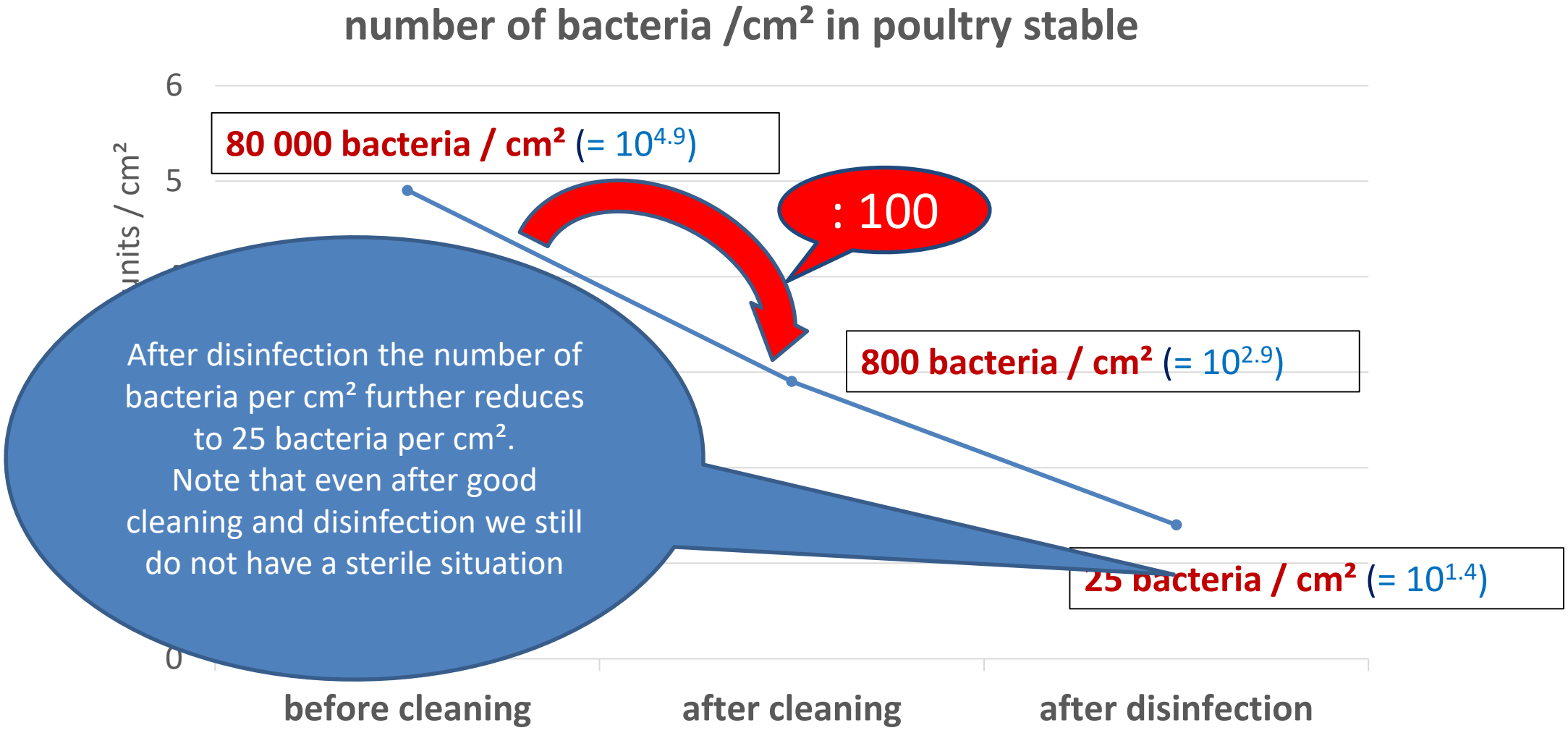
Luyckx et al. 2015



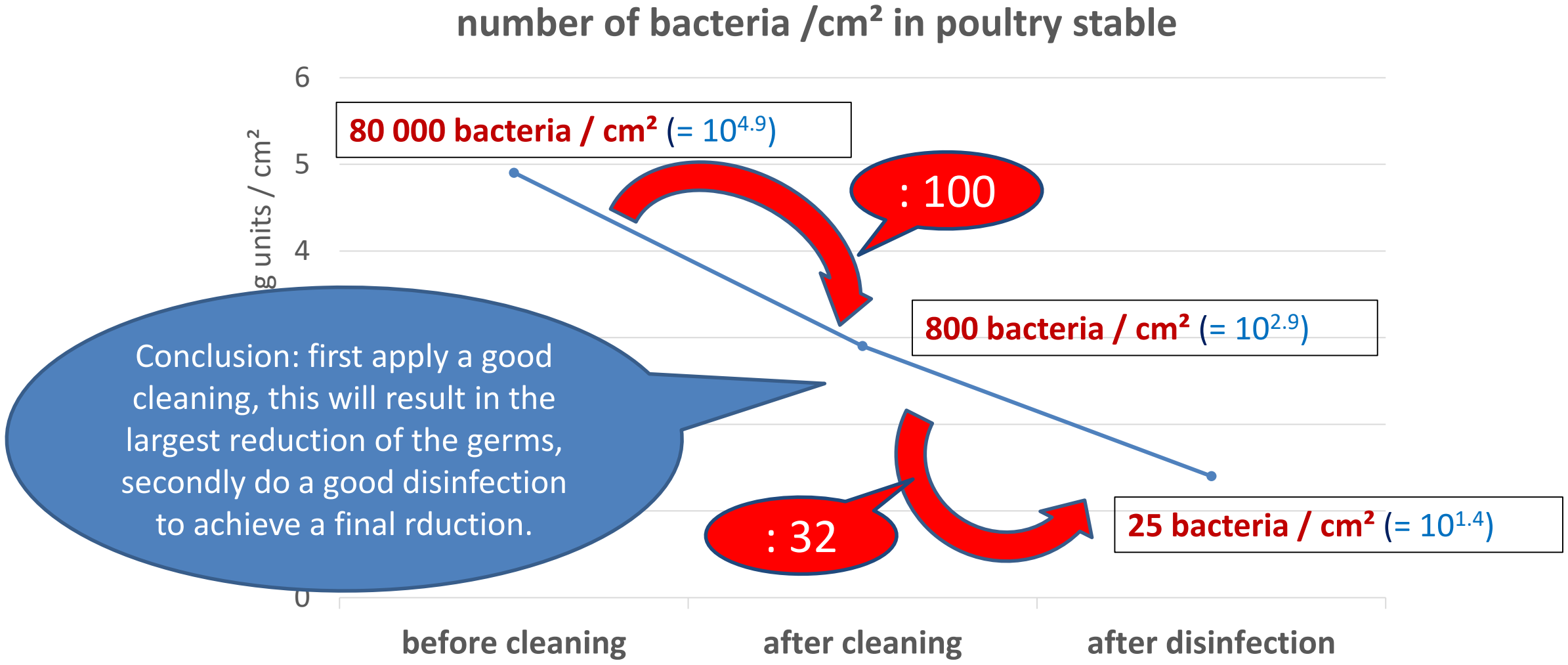
Luyckx et al. 2015



Luyckx et al. 2015



Luyckx et al. 2015



Luyckx et al. 2015

Who is responsible for biosecurity

A. farmer
B. veterinarian
C. Herd advisor
D. Government

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Biosecurity is a joint venture…

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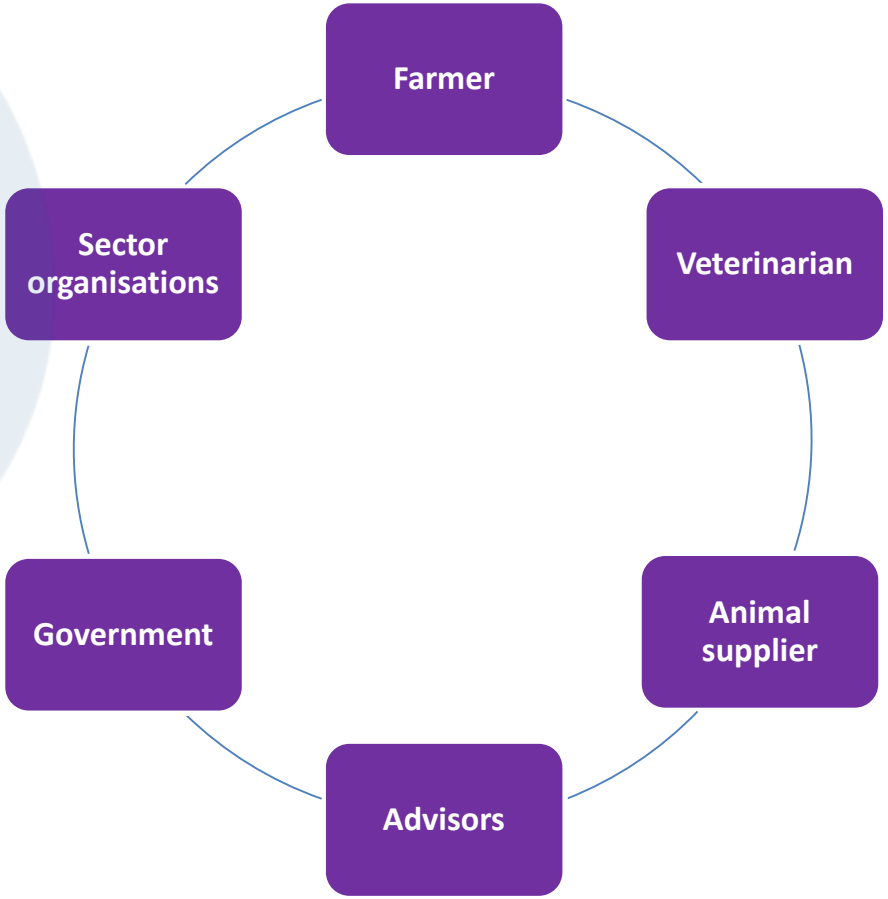
Biosecurity is a joint venture…
…often threatened by lack of time



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- **DÉPARTEMENT** REPRODUCTION, OBSTÉTRIQUE ET SANTÉ DES TROUPEAUX
- UNITÉ ÉPIDÉMIOLOGIE

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Marche à suivre pour utiliser le site web Biocheck.UGent

Biosecurity = complex

- No protocol suitable for every herd
- Balance biosecurity – management
- Tool?

→ **Scoring System**

Biosecurity Scoring System

- **Quantification of biosecurity status**

  - Comparing of scores between different herds
  - Comparing of scores in time
  - Taking different risks into account

Risk based scoring system for biosecurity

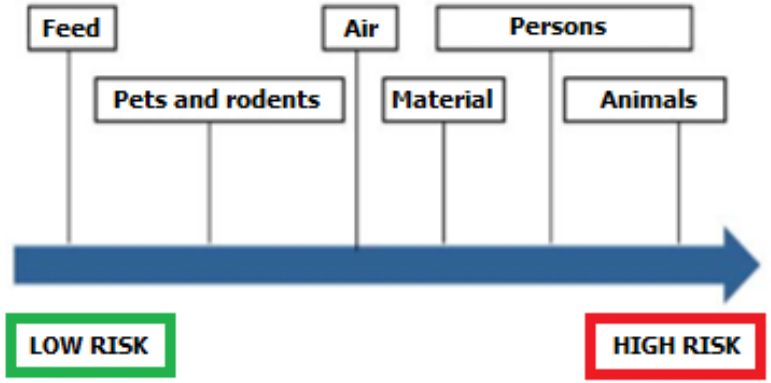

Figure 1: General arrangement of the transmission routes between farms according to their relative importance (adjusted from Boklund, 2008)

- **Weighted scores**
  - Based on scientific research
  - Risk for transmission: direct vs. indirect contact
  - Weight factor for each subcategory and each question
  - FREE TO USE

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How to use Biocheck.Ugent

1. Make appointment
2. Do a farm visit
3. Go trough the questionnaire (paper)
4. Fill in the online version at home
5. Generate advice
6. Follow up visit

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BIOCHECK.UGent, prevention is better than cure!

Welkom!

Biocheck.UGent is a risk-based scoring system to evaluate the quality of your on-farm biosecurity in an scientific and independent way.

Fill in the online **questionnaire** for free and receive valuable feedback about the biosecurity level of your farm. You get a summarizing and personal report with detailed results. These findings can help you to choose your own suitable biosecurity pathway.

Don't hesitate and get started to lift your farm to a higher biosecurity level!

Start the Biocheck.UGent! | How to use Biocheck.UGent?

Please fill in our Biocheck.UGent survey!

The Biocheck.UGent was filled in **13427** times around the world to evaluate the on-farm biosecurity level!

9394 # 3216 # 817

Biocheck.UGent considers the data provided by you, after this referred to as your data, as confidential information. Filling in this questionnaire gives implicit permission to the Faculty of Veterinary Medicine of Ghent University to use your data, analyzed anonymously, for scientific cause. All services offered can be used without disclosing personal information (e.g. name and address) by using anonymized data or aliases. Your data will be saved for 10 years and will never be shared without your permission.

This Biocheck.UGent questionnaire with associated scoring system and the website were developed by the unit for

In the spotlight

07-02-2018

"Biosecurity in animal production and veterinary medicine (from principles to practice)" now available for purchase!

20-11-2018

New presentation available about the Biocheck.UGent tool!

Agenda

JAN 22-23

Hands on biosecurity training
Merelbeke, Belgium

Start the Biocheck

Make your choice and click on the questionnaire you would like to fill in. The Biocheck questionnaire is available in different languages. You can choose your language immediately after your start.

In addition, some **practical hints** to fill in the Biocheck questionnaire in an efficient way:

- If you doubt about the relevance of a particular question or you just want some more explanations about the topic, you can click on *'More information about this question'.*
- You can decide to interrupt the questionnaire at any time and keep the provisional answers in order to proceed at a different time. Press the *'resume later'* button.
- Don't use the *'previous'* and *'next'* buttons of your own browser while completing the Biocheck. For this, there are buttons provided at the bottom of the page.
- The asterisk (*) denotes a mandatory field. This answers are needed to calculate your score. All the other questions are optional.
- You can choose to create an account on this website (before or after completing the questionnaire). It gives you the opportunity to save your personal report with results. This could be useful, for example, if you would like to compare the results of your farm over a certain period of time.

If you want more information about the scoring system, please visit about biocheck. Here the scoring system is explained in detail.

Please click on the following link to use the CID LINES automatic feed-back system: biocheck.cidlines.com

Good luck!

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Biocheck Pig

→ Start!

Also available in Dutch, Spanish, Chinese, Vietnamese, German, Norwegian and French

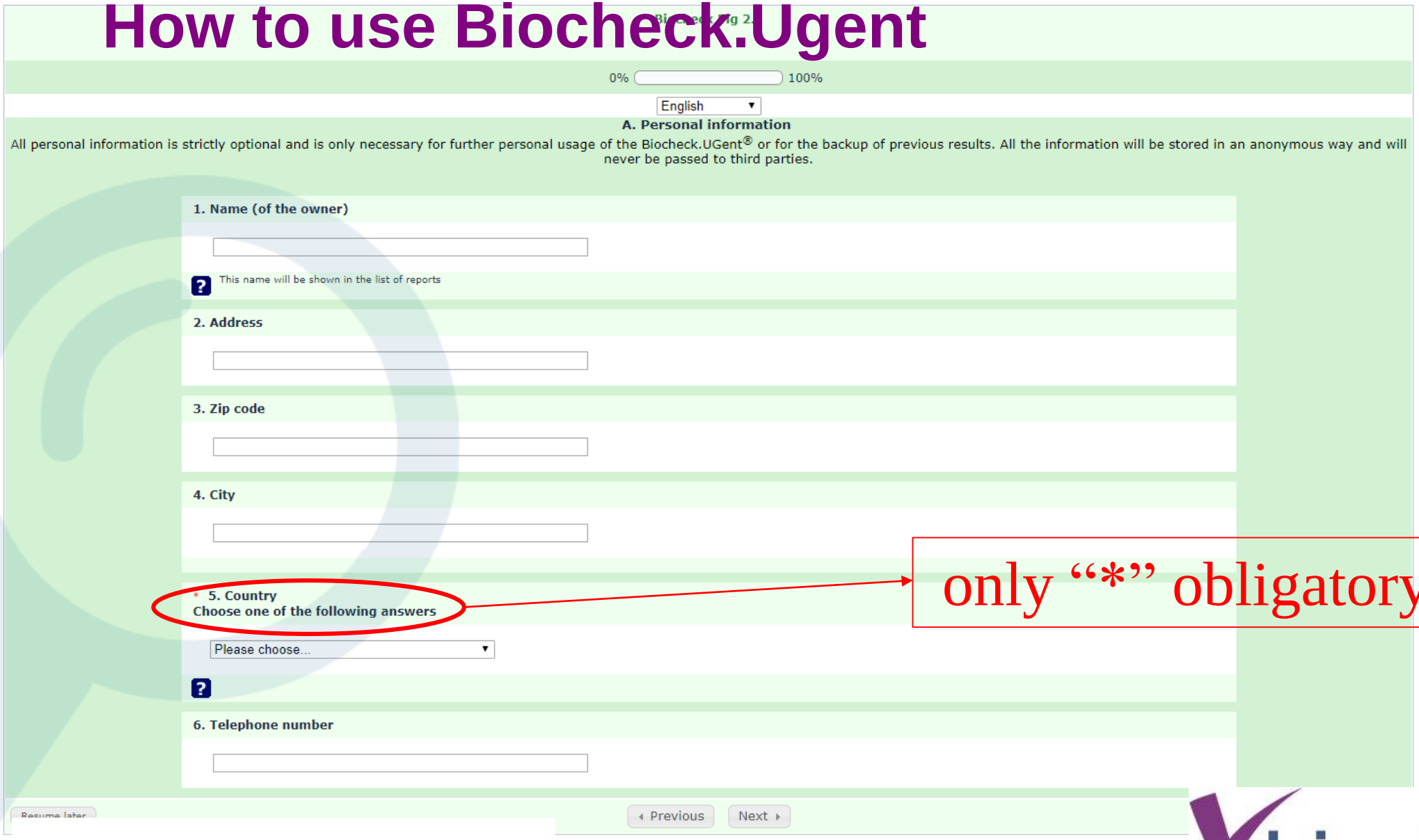
Biocheck Poultry

→ Start!

Biocheck Cattle

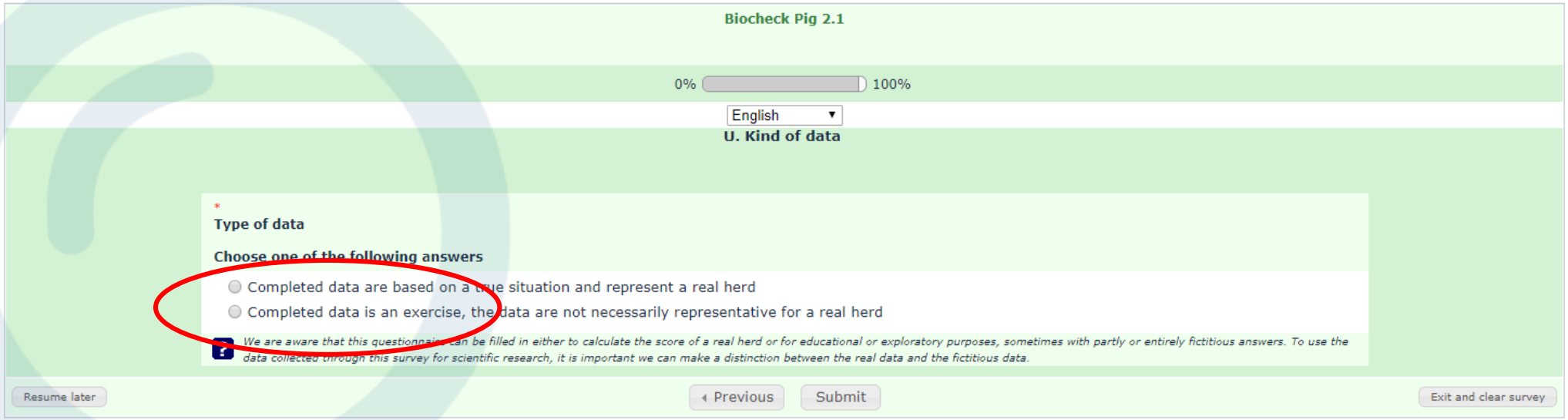
→ Start!

How to use Biocheck.Ugent



only “*” obligatory

How to use Biocheck.Ugent



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ID: 201/572376/b/1_1/F
Entry date: 2019-06-03 09:47:22
Identification:

BEEF

Nr	Description	Score	Country average	Global average
External biosecurity				
A	Purchase and reproduction	31 %	65 %	66 %
B	Transport and carcass removal	27 %	57 %	56 %
C	Feed and water	15 %	34 %	37 %
D	Personnel and visitors	32 %	55 %	55 %
E	Vermin control and other animals	41 %	53 %	54 %
	Subtotal External biosecurity:	***30 %***	***57 %***	***58 %***
Internal biosecurity				
A	Health management	5 %	32 %	32 %
B	Calving management	65 %	49 %	47 %
C	Calf management	39 %	38 %	38 %
D	Adult management	65 %	16 %	18 %
E	Working organization and materials	42 %	47 %	46 %
	Subtotal Internal biosecurity:	***36 %***	***37 %***	***37 %***
N/A = Not applicable	**Total:**	**33 %**	**47 %**	**48 %**

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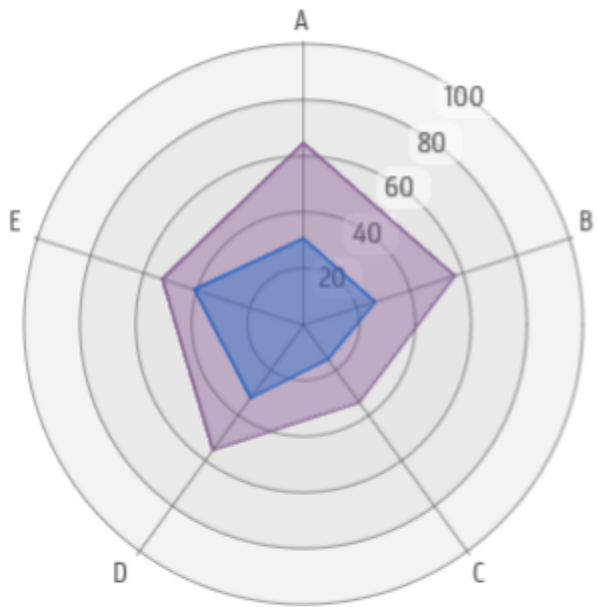
BIOCHECK.UGENT

ID: 201/572376/b/1_1/F
Entry date: 2019-06-03 09:47:22
Identification:

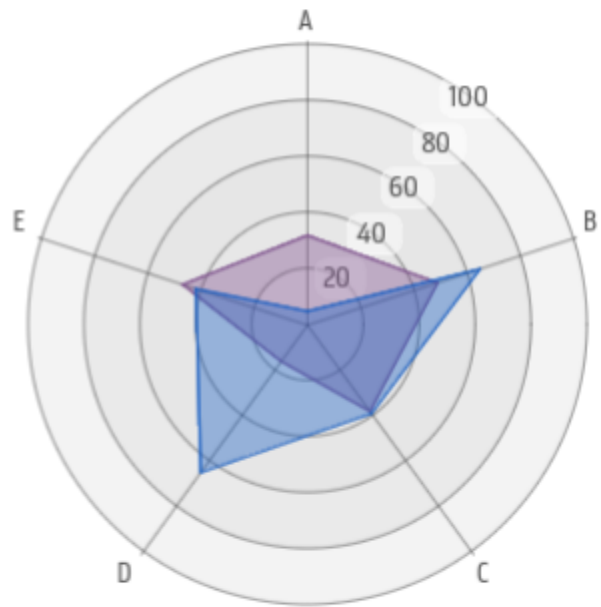
BEEF

These figures show **your results** graphically compared to the **average scores**. The bigger the blue area, the better your result. The letters of the axes correspond to the numbering in the report above.

External biosecurity



Internal biosecurity



% Score *% Average*

For more information about biosecurity on a beef cattle farm and how to improve this, you can always look at the extensive information available on the **Biocheck.UGent website** in the sections "about biocheck" and "downloads and links". You can also contact your veterinarian for advice on biosecurity measures on your farm.

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Log in

You can choose to create an account on this website (before or after completing the questionnaire). It gives you the opportunity to save your personal report with results. This could be useful, for example, if you would like to compare the results of your farm over a certain period of time.

Username (e-mail)

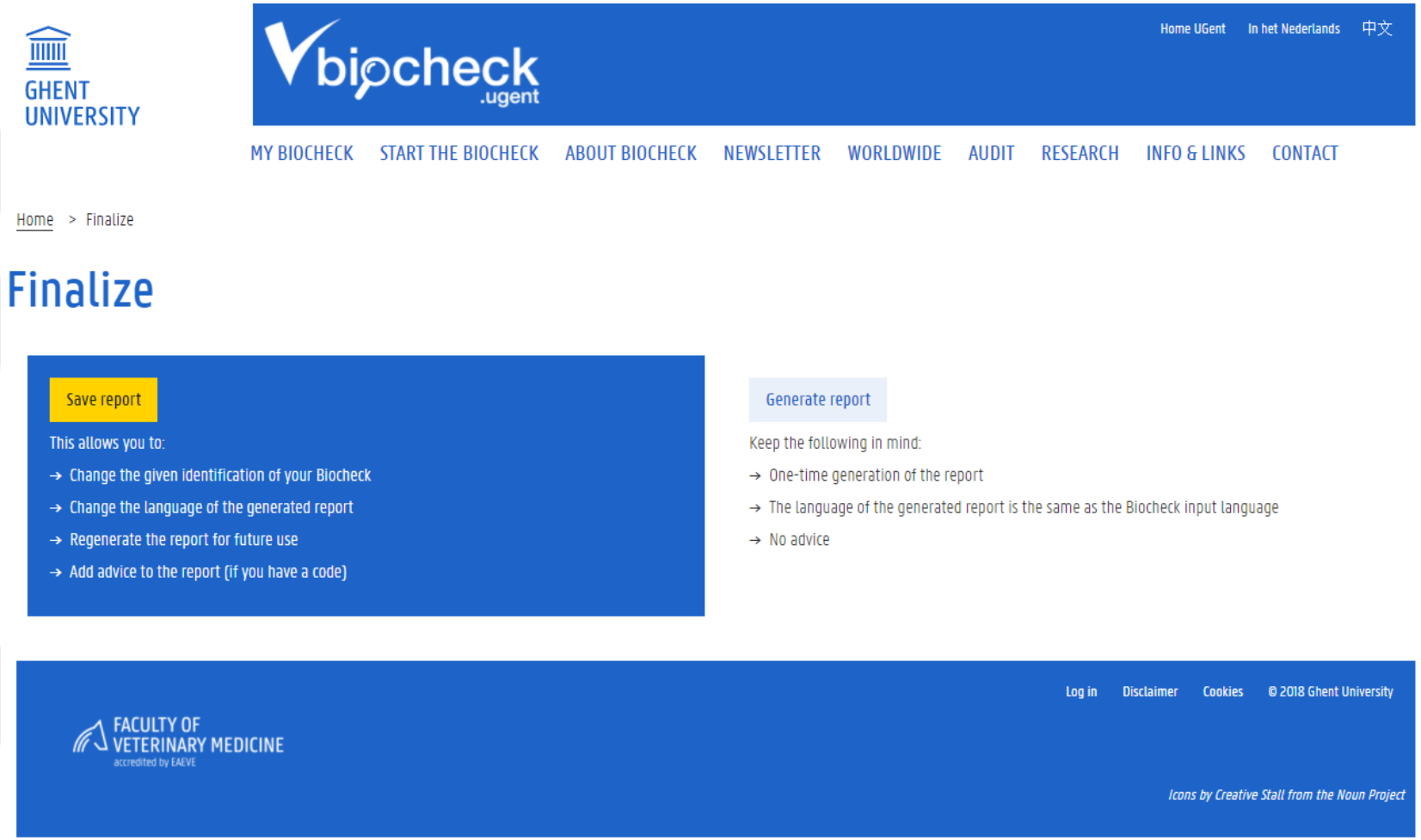
Password

Log in | Forgot password?

No account yet? Register now!

Register

How to use Biocheck.Ugent



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Scientific articles & documents

Publications about BIOCHECK

- An online risk-based biosecurity scoring system for pig farms
- Biocheck.UGent: A quantitative tool to measure biosecurity at broiler farms and the relationship with technical performances and antimicrobial use
- Bioveiligheid op varkensbedrijven: ontwikkeling van een online scoresysteem en de resultaten van de eerste 99 deelnemende bedrijven

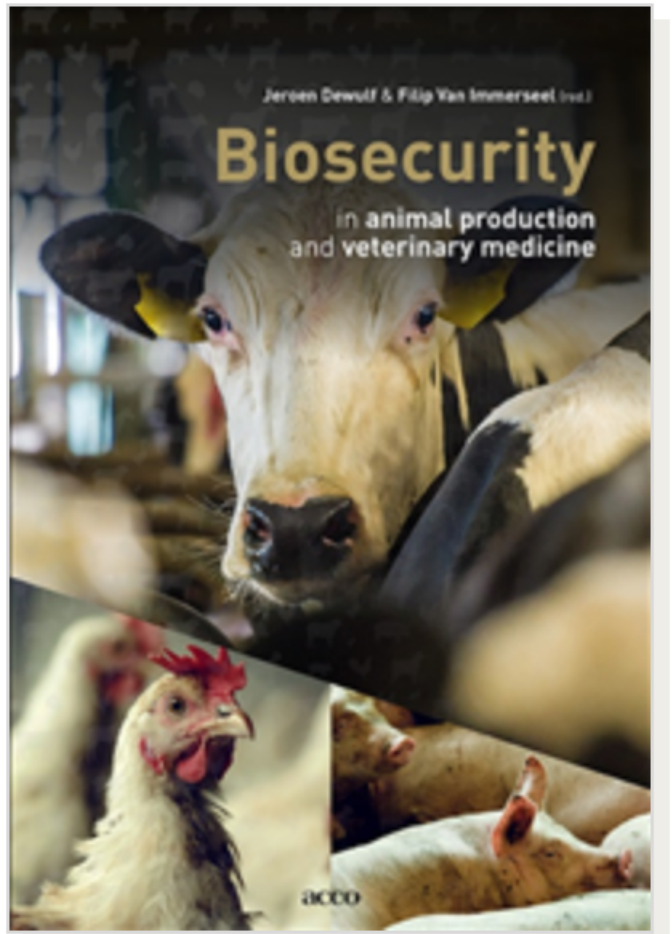
Publications with the BIOCHECK as a tool to determine quantitatively the on-farm biosecurity

- A survey on biosecurity and management practices in Belgian pig herds
- Antimicrobial use in Swedish farrow-to-finish pig herds is related to farmer characteristics
- Biosecurity level and health management practices in 60 Swedish farrow-to-finish herds
- 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
- Farm-economic analysis of reducing antimicrobial use whilst adopting good management strategies on farrow-to-finish pig farm
- Pig, cattle and poultry farmers with a known interest in research have comparable perspectives on disease prevention and on-farm biosecurity
- Reducing Antimicrobial Usage in Pig Production without Jeopardizing Production Parameters
- Relationship between biosecurity and production/antimicrobial treatment characteristics in pig herds.
- Review of transmission routes of 24 infectious diseases preventable by biosecurity measures and comparison of the implementation of these measures in pig herds in six European countries.
- The biosecurity status and its associations with the production and management characteristics in farrow-to-finish pig herds
- Vurdering af smittebeskyttelse I 140 danske svinebesaetninger (Assessment of biosecurity in 140 Danish pig herds).

Check, Improve, Reduce

A SIMPLE AND EFFECTIVE APPROACH

Herd specific advice



Inhoudsopgave

Proefhoofdstuk

Biosecurity in animal production and veterinary medicine

From principles to practice

Door Jeroen Dewulf , Filip Van Immerseel

Boek

Globally, the way the animal production industry copes with infectious diseases is changing. The (excessive) use of antimicrobials is under debate and it is becoming standard practice to implement thorough biosecurity plans on farms to prevent the entry and spread

“An ounce of prevention,
is worth a pound of cure”

- *Benjamin Franklin* -

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Jeroen Dewulf

VETERINARY EPIDEMIOLOGY

E Jeroen.dewulf@ugent.be
T +32 9 264 75 43
M +32 476 49 70 40

www.ugent.be

- Ghent University
@jkdewulf
jkdewulf