CONSUMPTION OF ANTIBIOTICS IN AUSTRIAN CATTLE PRODUCTION

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1 Introduction

Legal basis: Law to monitor zoonosis ***(Zoonosengesetz)***

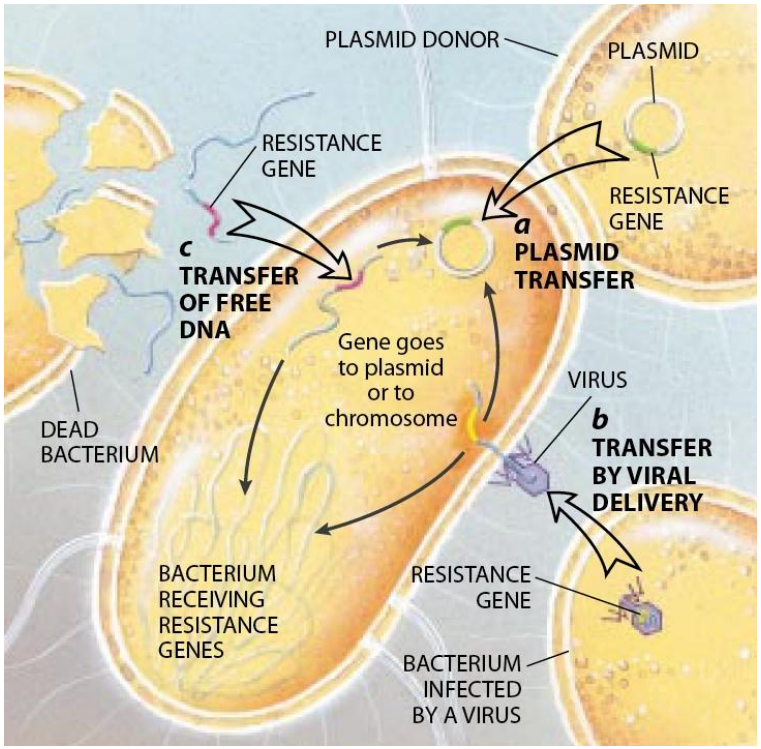
Assignment by the Austrian Ministry of Health to the Austrian Agency for Health and Food Safety (04-02-2009):

„Development of methods to measure and monitor the quantity of antimicrobials applied or dispensed by veterinarians to livestock in Austria"

Cooperating partners:

- Institut for Pharmacology VetMedUni Vienna
- Austrian Poultry Health Service
- Practising veterinarians

Antimicrobial



Resistence

Consumption of antibiotics

Topics

1 Introduction

2 Material and Methods

- 2.1 Data recording and collection
- 2.2 Estimating the consumption of antibiotics

3 Results

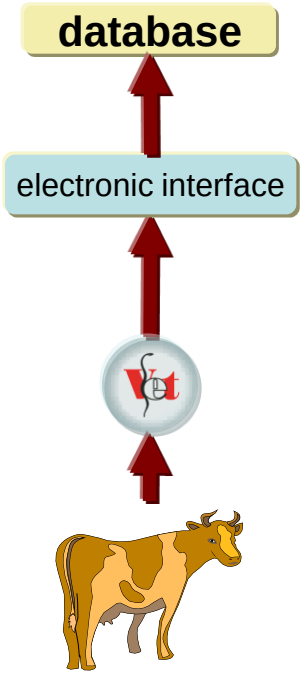
- 3.1 Consumption in cattle and dairy cattle production
- 3.2 Consumption of critically important antimicrobials

4 Conclusion

2 Material and Methods

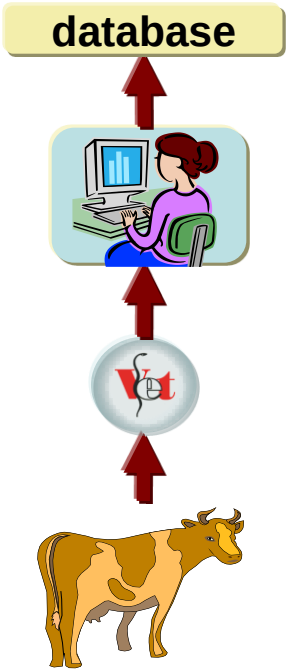
2.1 Data recording and collection

- **electronic data recording**



data refers to 4 – 27 months
from January 2008 to March 2010

- **on-site data recording**



data refers to 4 months
from July 2008 to June 2009

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2 Material and Methods

2.1 Data recording and collection

- **electronic interface**


Arzneimittelanwendungs-, Arzneimittelabgabe- und Arzneimittelrückgabebeleg

documentation requirements based on law

Data recording of usage of antibiotic drugs by veterinarians

interface:

	VARIABLE	OBLIGATORY	FORMAT	EXAMPLE
1	SPECIES	yes	text	pig
2	IDENTIFICATION NUMBER ANIMAL	yes*	text	040000123456789 * only in cattle
3	IDENTIFICATION NUMBER BARN	yes**	text	barn-, box-, animal-ID; A01 ** in pigs and poultry
4	HEADS TREATED	yes	text	1
5	DATE OF TREATMENT / DISPENSION	yes	DD.MM.YYYY	01.04.2006
6	CODE OF DIAGNOSIS CATTLE	yes *	text	43 * only in cattle
7	DIAGNOSIS / INDICATION OF USE PIG OR POULTRY	yes **	text	diarrhoea ** in pigs and poultry
8	INDICATION OF USE	no	text	Dry off
9	AFTERTREATMENT	no	text	yes = 1, no = 0
10	IDENTIFICATION NUMBER FARM	yes	text	3198936
11	IDENTIFICATION NUMBER VET	yes	text	EDE002
12	MARKETING AUTHORISATION NUMBER	yes	text	800431
13	AMOUNT OF DRUG USED	yes	numerical	20,5
14	PRODUCT PACKAGE CODE	no	text	CH0027
15	APPLIED / DISPENSED	yes	numerical	1 = drug use, 2 = drug dispensing
16	COURSE DURATION	no	numerical	to be given in days

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2 Material and Methods

2.1 Data recording and collection

- **List of antimicrobial drugs recorded**

Groups of antimicrobial agents	ATCvet codes
Antimicrobial agents for intestinal use	QA
Antimicrobial agents for dermatological use	QD
Antimicrobial agents for intrauterine use	QG
Antimicrobial agents for systemic use	QJ01
Antimicrobial agents for intramammary use	QJ51
Antiparasitic agents, insecticides and repellents	QP

2 Material and Methods

2.1 Data recording and collection

- **Measured values**

variable	unit	description of variable
Amount of active ingredient	gram (g)	Amount of active ingredient used given in gram (g).
Prescribed Daily Dose (PDD)	milligram / kg BW / day (mg/kg/day)	Maximum dose of the active ingredient recommended by the manufacturer adjusted by a factor of 0.8 given for each veterinary product in milligram per kilogram bodyweight (BW) per day.
n PDD / LU	n / LU	Number of prescribed daily doses per livestock unit (LU); one LU is consistent with approx. 500 kilogram of bodyweight.

2 Material and Methods

2.1 Estimating the consumption of antibiotics

• Amendments / corrections

- **(1) Assumed number of working days / year:**

$factor_{year, vet}$ = assumed working days / $working\ days_{year, vet}$

$n\ PDD_{year, vet}$ = $n\ PDD\ used_{vet, species}$ * $factor_{year, vet}$

- **(2) Liveweight units produced (population at risk):**

$number\ of\ animals_{treated}$ * $LU^{(1)}$ * $turnovers_{year}$ = $LU_{year, treated}$

- **(3) Proportion of untreated herds (total population at risk):**

$factor_{population}$ = 100 / % treated population in the total population

$n\ PDD/LU_{year, total} = n\ PDD_{year} / LU_{year, treated}$ * $factor_{population}$

Amendments / corrections			
	min	**mlv**	**max**
working days	240	300	360
turn overs	1	1	1
% population treated	65	80	95

(1) Reference date census for cattle

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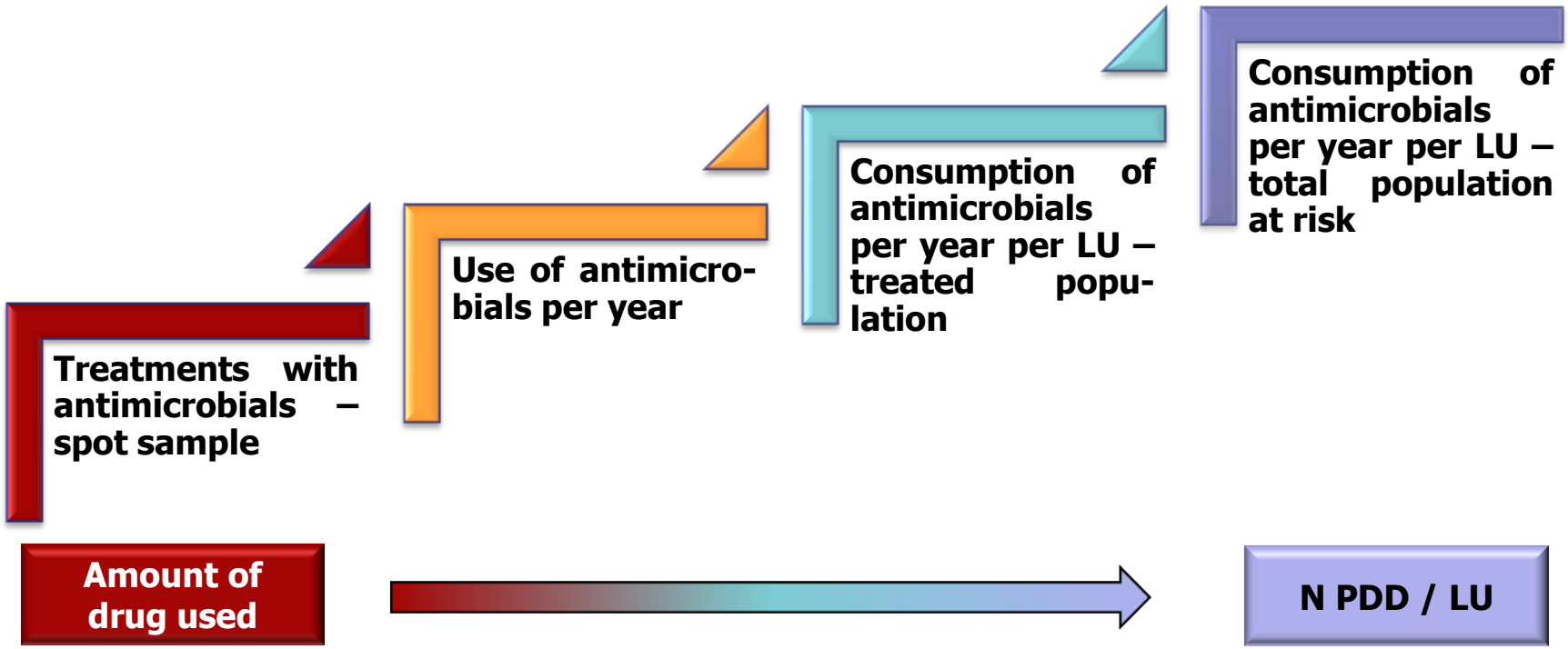
2 Material and Methods

2.1 Estimating the consumption of antibiotics

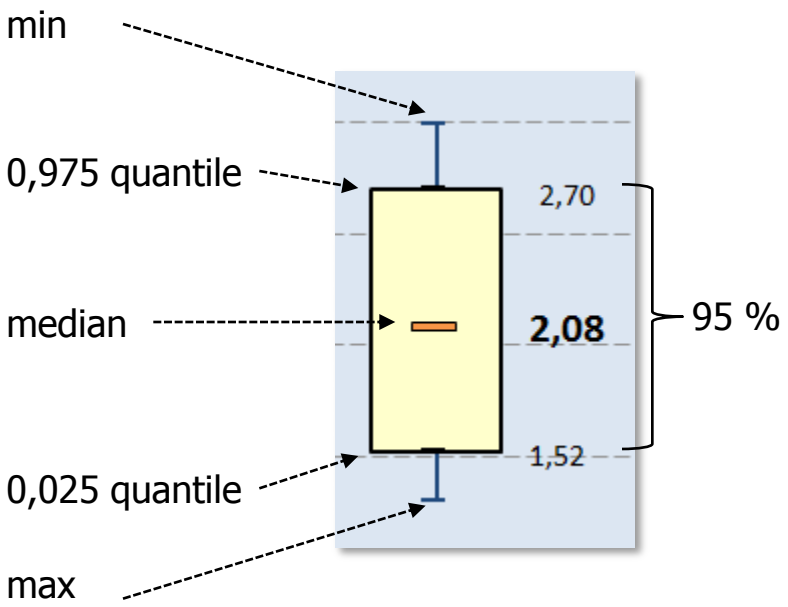


2 Material and Methods

2.1 Estimating the consumption of antibiotics

Variation of n PDD / LU

- Estimates of minimal values (min), maximum values (max) and most likely values (mlv)
- Construction of a Beta-PERT probability distribution for
  - working days
  - liveweight units produced
  - proportion of untreated herds
- Calculation of variation by Monte Carlo Simulation (N = 9.999)
- Variation is quantified by calculating 0,025 and 0,975 quantiles



3 Results

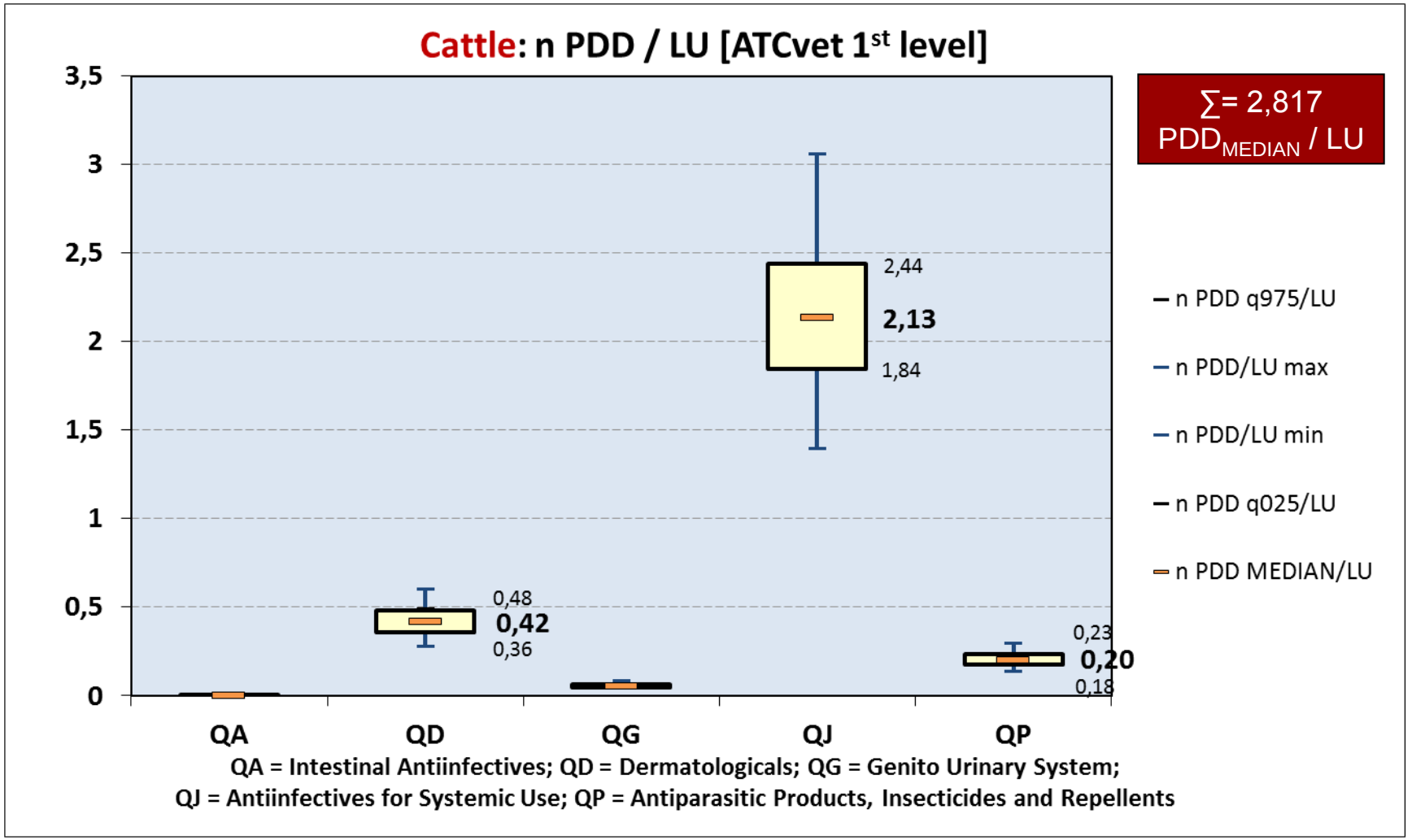
3.1 Consumption in cattle production

Species / use	Data recordings[1]	Active substance	Active substance (gram) / LU			N PDD / LU		
		gram	q025	median	q975	q025	median	q975
Cattle total	20.233	**2.185,667**	14.3	**19.7**	26.0	2.11	**2.82**	3.61
Dairy cattle[2]	8.234	**89,782**	2.5	**3.3**	4.2	1.28	**1.69**	2.13

[1]Records of diagnoses and prescriptions from **10 veterinary practices**
[2]Herds under **performance recording**

SAMPLE NOT REPRESENTATIVE

3 Results



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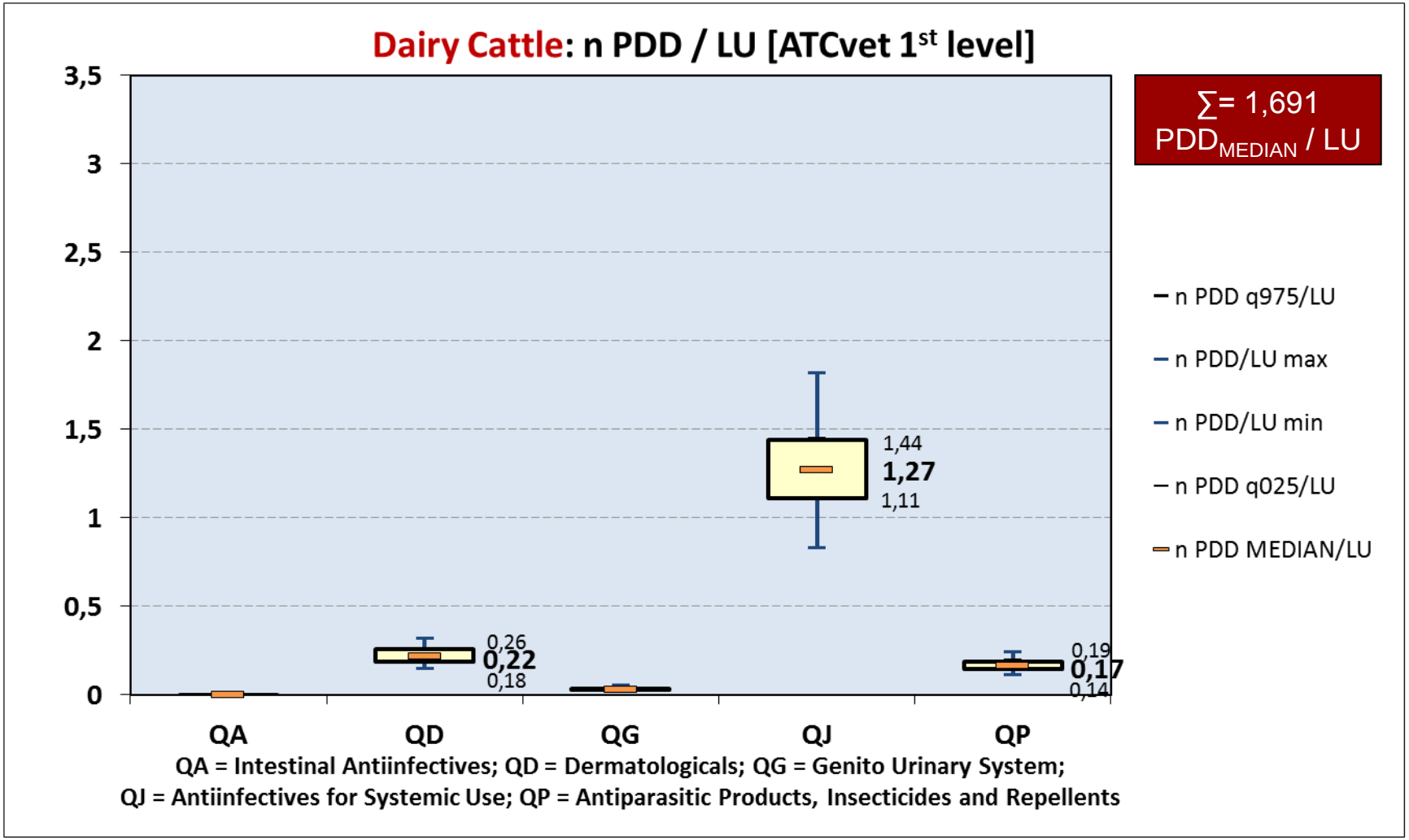
3 Results



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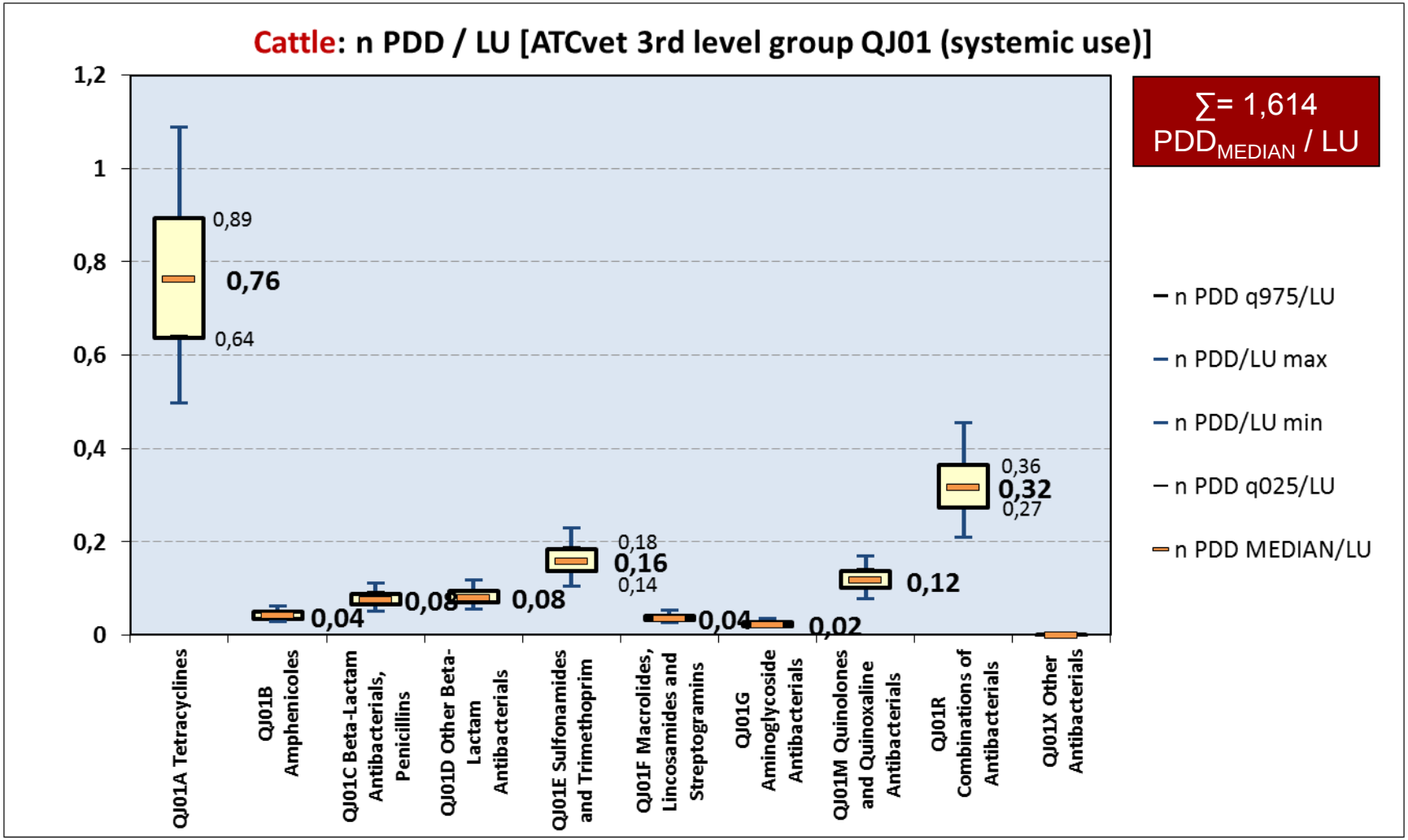
3 Results



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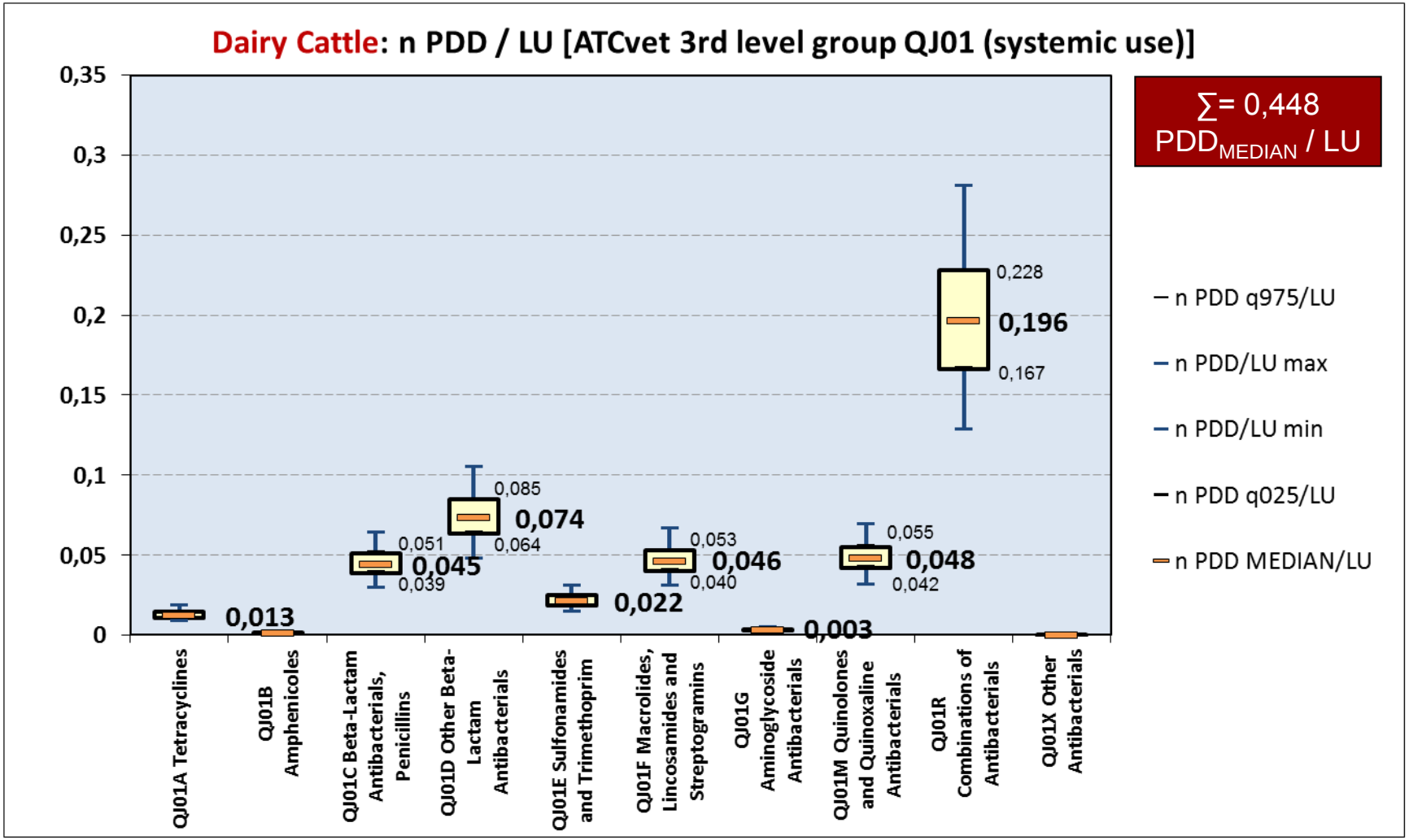
3 Results



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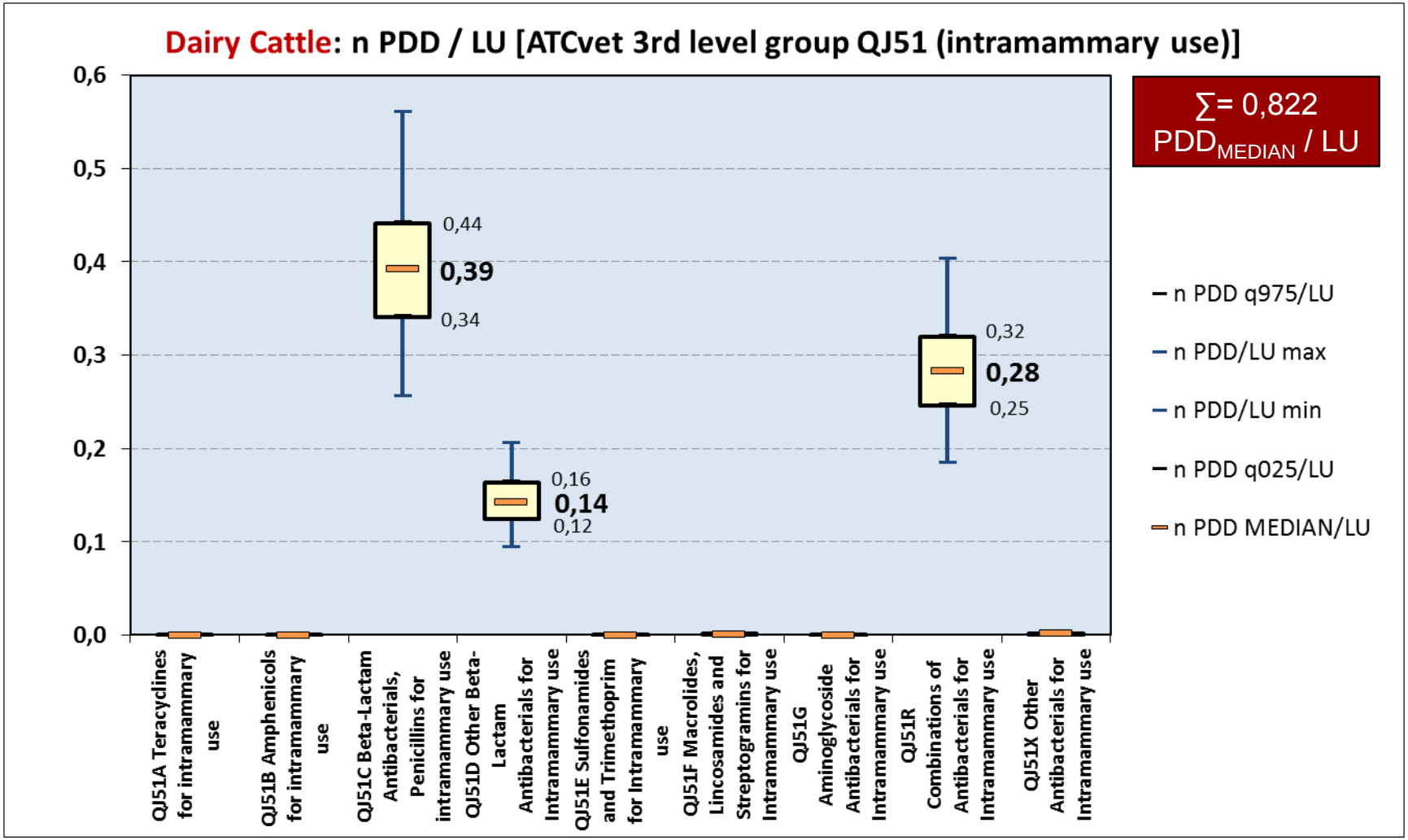
3 Results



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Austrian Health Monitoring in Cattle

Code set of diagnoses (main groups)

diseases of calves 11 - 17	**diseases of the claw and other diseases of the legs** 61 - 69
diseases of the digestive tract 21 - 29	**diseases of the respiratory tract** 71 - 73
metabolic diseases 31 - 35	**cardiavascular diseases, diseases of the blood, diseases of the urinary tract** 81 - 87
infertility and disorders associated with parturition 41 - 49	**diseases of the central nervous system, diseases of the skin, infections** 91 - 96
udder diseases 51 - 55	**other diseases** 00 - 03

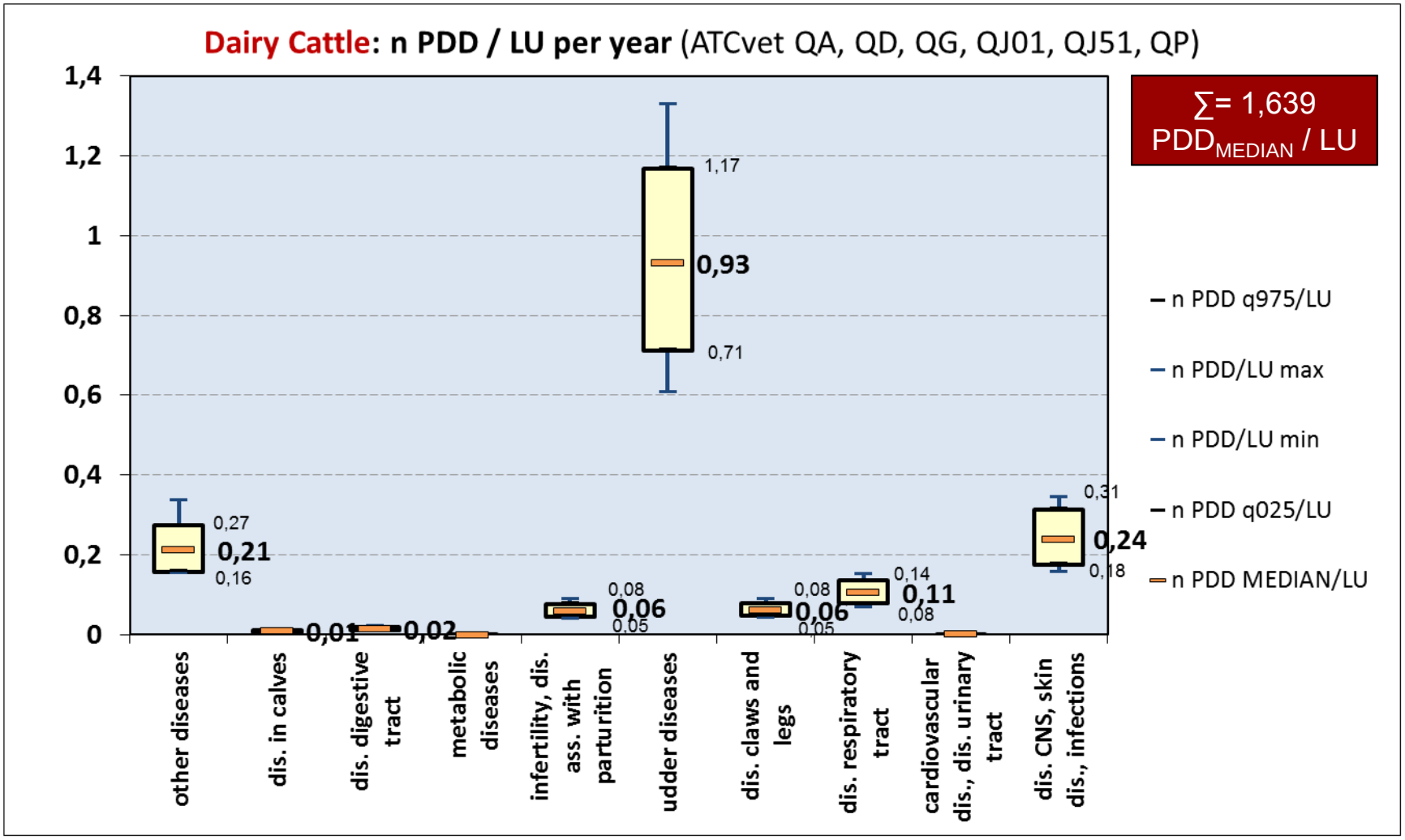
Only clinical diagnoses

10 groups

64 keys

covering approx. 700 diagnoses (synonymical list)

3 Results



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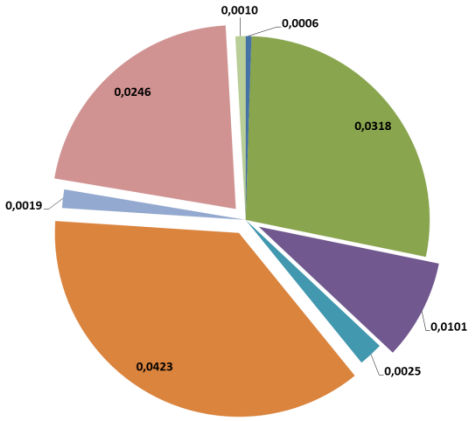
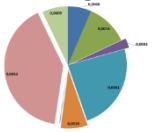
n PDD/LU Median (ATCvet QJ01 and QJ51)

Dairy Cattle

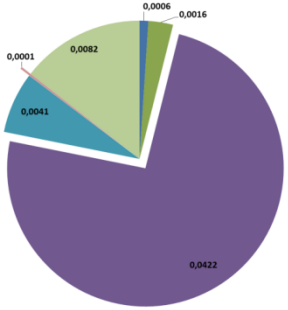
udder diseases, systemic use



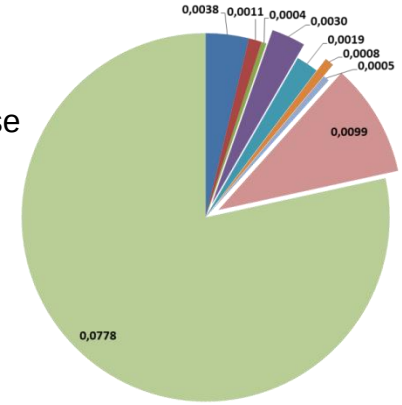
dis. of digestive tract, systemic use



dis. of claws, legs, systemic use

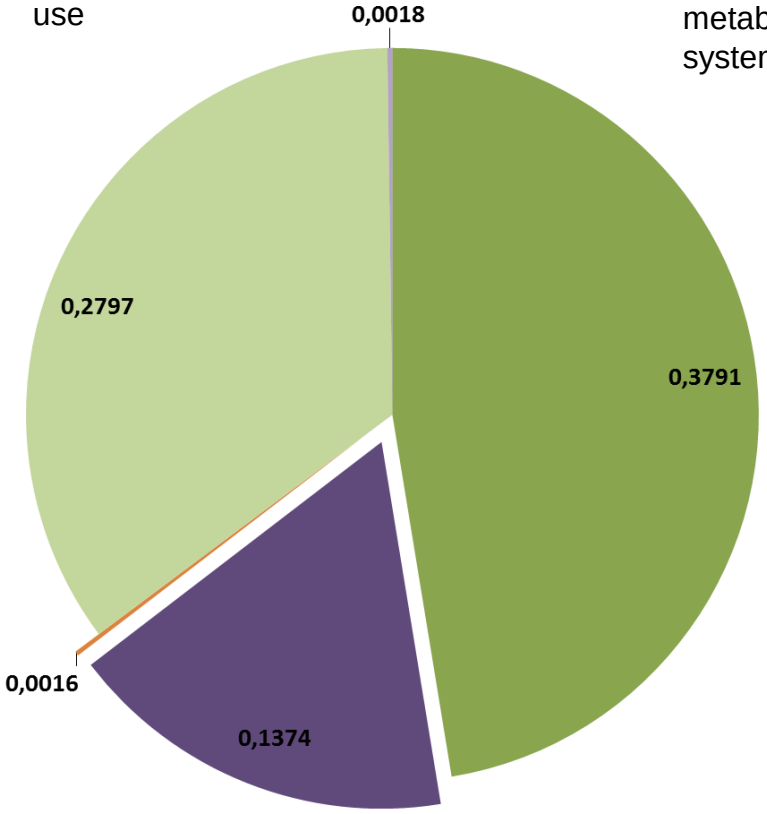


dis. respiratory tract, systemic use



dis. in calves, systemic use

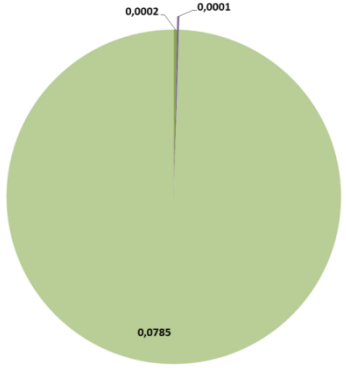
udder diseases, intramammary use



metabolic dis., systemic use

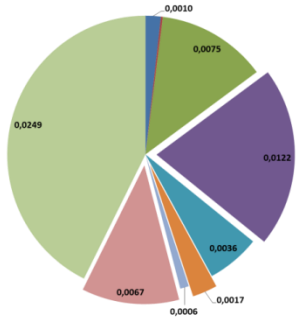
cardiavascular, urinary tract dis., systemic use

dis. CNS, skin, infections, systemic use



infertility, dis. ass. with parturition, systemic use

other diseases, systemic use



- Tetracyclines
- Amphenicoles
- Beta-Lactam Antibacterials, Penicillins
- Other Beta-Lactam Antibacterials
- Sulfonamides and Trimethoprim
- Macrolides, Lincosamides and Streptogramins
- Aminoglycoside Antibacterials
- Quinolones and Quinoxaline Antibacterials
- Combinations of Antibacterials
- Other Antibacterials

3 Results

3.2 Consumption of critically important antimicrobials

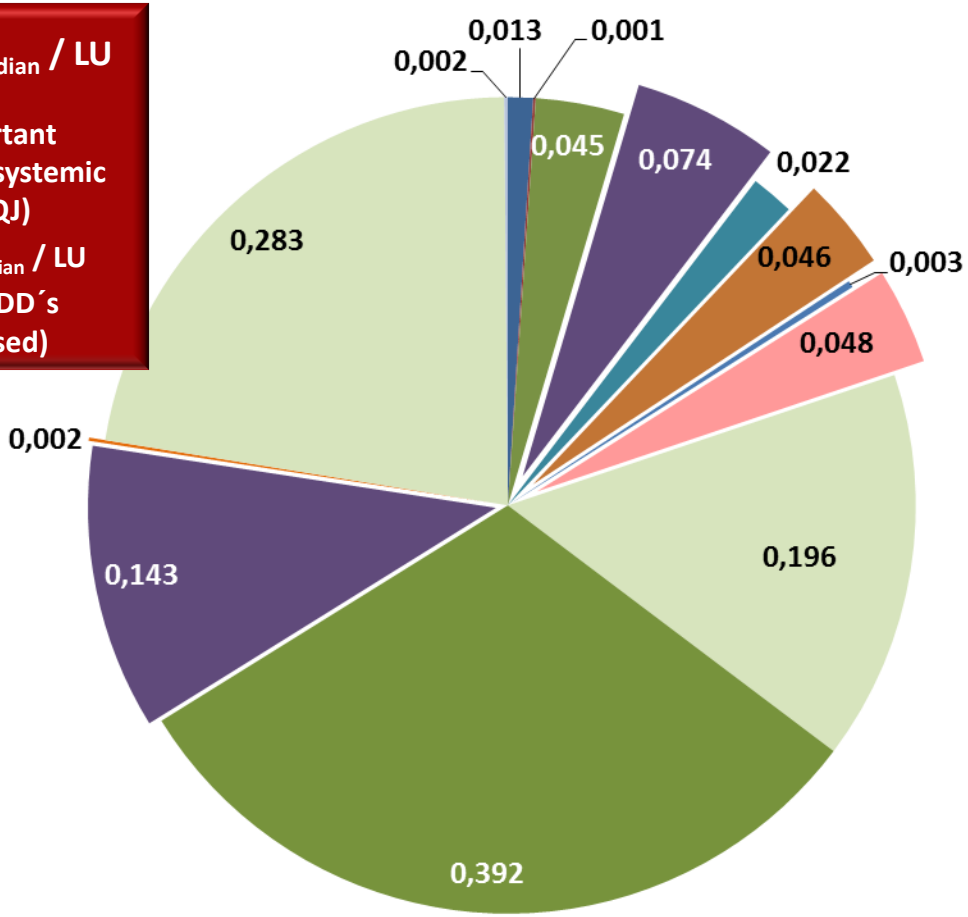
Dairy Cattle: n PDD_{median} / LU [ATCvet 2nd level group QJ (systemic use)]

∑ = 1.271 PDD_{median} / LU

Critically important antimicrobials for systemic use (ATCvet QJ)

∑ = 0.313 PDD_{median} / LU

(24.7 % of all PDD´s systemically used)



- QJ01A Tetracyclines
- QJ01B Amphenicoles
- QJ01C Beta-Lactam Antibacterials, Penicillins
- **QJ01D Other Beta-Lactam Antibacterials**
- QJ01E Sulfonamides and Trimethoprim
- **QJ01F Macrolides, Lincosamides and Streptogramins**
- QJ01G Aminoglycoside Antibacterials
- **QJ01M Quinolones and Quinoxaline Antibacterials**
- QJ01R Combinations of Antibacterials
- QJ01X Other Antibacterials
- QJ51A Teracyclines for intramammary use
- QJ51B Amphenicols for intramammary use
- QJ51C Beta-Lactam Antibacterials, Penicillins for intramammary use
- **QJ51D Other Beta-Lactam Antibacterials for Intramammary use**
- QJ51E Sulfonamides and Trimethoprim for Intramammary use
- **QJ51F Macrolides, Lincosamides and Streptogramins for Intramammary use**
- QJ51G Aminoglycoside Antibacterials for Intramammary use
- QJ51R Combinations of Antibacterials for Intramammary use

4 Conclusion

Estimating the consumption of antimicrobials using treatment and prescription data of veterinary practices („Bottom-up"):

Advantages:

- Use of spot test data;
- Calculation of used antimicrobials by simulation techniques;
- Linkage to species;
- Linkage to diagnosis and indication;
- Treatment intensity pertaining to the total population at risk;
- Comparison of treatment intensity between different species by using livestock units.

Drawbacks:

- Error of estimate;
- Need for random sample (bias);
- Complexity of computation.

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ACKNOWLEDGEMENT

We thank the practicing veterinarians willing to provide their treatment and health recordings for the described project.

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Thank you for your attention!