LANDESAMT FÜR UMWELT,
LANDWIRTSCHAFT
UND GEOLOGIE

Freistaat
SACHSEN

Screening of Veterinary Antibiotics in Saxony

Studies from the “livestock house into the plant“

Screening of Veterinary Antibiotics in Saxony

Outline

- **Project goal**
- **Project structure**
- **Materials and methods**
- **Results**
- **Conclusive summary**

Our goal

- **Screening of veterinary antibiotics in the environment.**
- Determination of the **antibiotic burden** in slurry manure / fermentation residues, soils, plants and surface waters.
- At the same time, **collection of data** on the **usage of antibiotics** in livestock, **animal health**, and **husbandry conditions** in the studied farms

Our goal

- Insight into **usage amounts** and **distribution pathways of antibiotics** from livestock into the environment through application of slurry manure and fermentation residues.

  The screening set-up is a multi-stage design covering both

  - lab-scale lysimeter tests and
  - outdoor tests in the field.

- Description of the **impact** of the animal species and husbandry system on the usage of antibiotics.

Project structure

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Indoor studies (livestock house)	Outdoor studies (environment)	Lysimeters	Biochemical analysis
Antibiotic usage data collection Husbandry analyses Husbandry conditions Animal hygiene Investigation of resistance to ESBL + MRSA	Analysis for antibiotic residues: Slurry manure / fermentation residues Soil (depth of 0-20 cm) Surface water Plants	Analysis for antibiotic residues: Pilot study without AB Main study with AB Samples: Water, soil, plant	Impact on microfauna in soils: OECD 216-217, OECD 216 Soil Microorganisms: “Nitrogen Transformation Test” OECD 217 Soil Microorganisms: “Carbon Transformation Test” DIN ISO 14240-1 Substrate-induced respiration method

Data linkage, evaluation and feedback

Materials and methods

Indoor studies (livestock)

Checklists with the following categories were used for data collection In order to come up with a general assessment of the situation in the farms:

- Production branch,
- Number of livestock,
- Husbandry system,
- Level of performance,
- Epidemic status, as well as abatement measures,
- Vaccination regime
- Incidence rates of diagnoses.

Materials and methods

Indoor studies (livestock)

Animal needs index (TGI) according to Sundrum mod. according to Müller (Clinic for Cloven-Hoofed Animals of the Free University of Berlin)

- Locomotion
- Feed intake
- Resting behaviour
- Comfort behaviour
- Hygiene
- Social interaction
- Stockmanship

Materials and methods

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Indoor studies (livestock)

Hygiene analysis

- Cleaning and disinfection
- Feed and water hygiene
- Carcass disposal, by-products, disinfestation
- General epidemic prophylaxis
- Management, planning, organisation of the workflows
- Housing climate and climate control
- Buildung and process hygiene
- Quarantine, insertion, isolation
- Transport hygiene
- Insemination and birth hygiene

Materials and methods

Indoor studies (livestock)

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MRSA (Methicillin-resistent Staphylococcus aureus) +

ESBL (Extended-Spectrum Beta-Lactamase)

sock swabs

pooled dust

pooled faeces

farm manure

Materials and methods

Indoor studies (livestock)

43 farms or farm divisions

- 27 cattle farms
  - 26 dairy farms
  - 1 heifer barn

- 16 pig farms
  - 9 breeding farms or farm divisions
  - 7 fattening farms or farm divisions

Results

Livestock data

Farms	Farm size	Level of performance
Dairy cattle	200–1500 head of milk cows	8500 – 11300 kg of milk/cow x year
Heifer barn	200 head of calves and young cattle	
Pig breeding	140 – 1230 head of productive sows	23.5 – 32 piglets/sow x year
Pig fattening	1200 – 14100 head of pigs	750 – 935 g of gain in weight per day of life

Results

Livestock data

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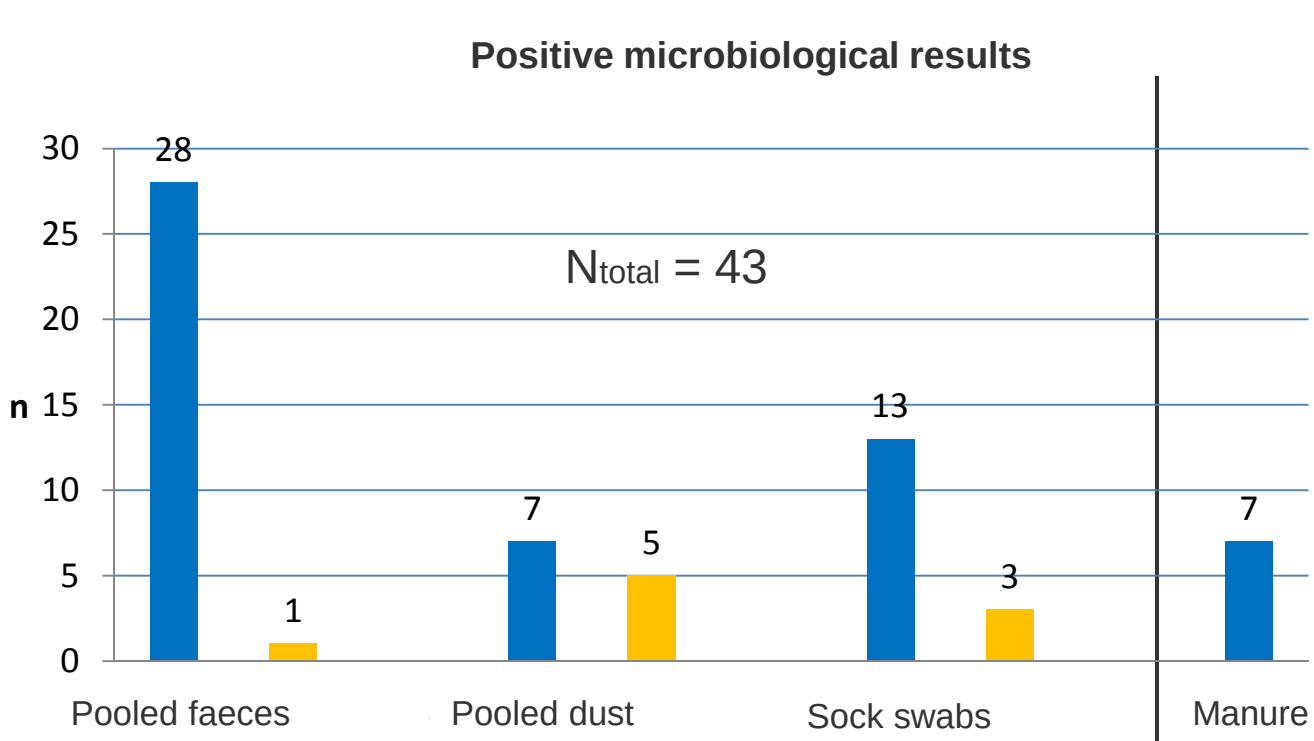

Ntotal = 20

Positive:

- ESBL in faeces samples: 65%
- MRSA: 14 % of the farms
- ESBL in slurry manure: 29%

Results
Livestock data

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Tierärztlicher Arzneimittel-Anwendungs- und Abgabebeleg (Nachweis)

Name und Praxisanschrift des [illegible]
Tel. 034296/72846 u. 0171-4027167

Name und Anschrift des Tierhalters: Schweinemast / Schweinezucht

Nr. K- [illegible]
Fortlaufende Belegnr. des T[illegible]s im Jahr

Anzahl, Art und Identität der Tiere	Diagnose*	Arzneimittelbezeichnung	Abgabemenge*	Anwendungsmenge	Chargenbezeichnung*	Dosierung pro Tier und Tag*	[illegible]	[illegible]ung*	Zeitpunkt der Anwendung*	Wartezeit:
28.08.12										
Mastschwein	Atypisch.	[illegible]	1x 100ml		0494-52	[illegible]	[illegible]	2		18 V
Mastschwein	Atg.	Streptocarb	2x 100ml		72[illegible]	[illegible]/50kg	i.m.	2		45 [illegible]
31.08.12										
Mastschwein	Atg.	Streptoca[illegible]			1224276	2ml/50kg	i.m.	2		45 [illegible]
Mastschwein	Fieber	M[illegible]	[illegible]100ml		00712	10ml	i.m.	1		12 V
Mastschwein (Vorrat)	Atypisch[illegible]	[illegible]	4x 100ml		A105A82	1ml/10kg	i.m.	1		9
39 [illegible]	[illegible]	Coli 6C	39 ID					1		–
23 "		Parvovac	23 ID					1		–
24 "		P.AR-T	24 ID					1		–

* Angabe n[illegible] erforderlich

Saugferkel		Naxcel	100ml	0D4DX	0,4ml	i.m.	1		77
Ferkel	Kastration	Metacam	2x 50ml	D20814-606	0,4ml/5kg	i.m.	1		5

Ggf. weitere Behandlungsanweisungen an den Tierhalter:

28.08.12 / 31.08.12
Anwendungs-/Abgabedatum
Dieser Beleg ist mindestens 5 Jahre aufzuheben

Original: Tierhalter
Durchschlag: Tierarzt

Unterschrift des Tierarztes oder seines Beauftragten

Herausgeber: opt Akademie G[illegible]

Still in progress, a trickier thing to do !

Results

Livestock data

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Antibiotic Usage Data

In collaboration with

VETIDATA

Results

Livestock data

- Total Animal Needs Index 200 (ANI) of the dairy farms -ANI: The maximal possible score was 200. The hightest score in one animal group was 174 points, the lowest score is 72 points for another animal group in another farm.

- Animal Needs Indices (ANI) for hygiene: The maximal value for hygiene is 24 points, the highest score was 21 points in an animal group of one farm. The lowest value was 6 points of an animal group of another farm.

- Total hygiene indicators of the 16 pig farms: The basis is a 100-point score. In all farms the values show low fluctuations between 70 and 90 points. The maximum value with 91 pints was found for a breeding farm. The lowest value with 91 pints was found for a farm specialized on fattening.

Project structure

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Data linkage, evaluation and feedback

Materials and methods

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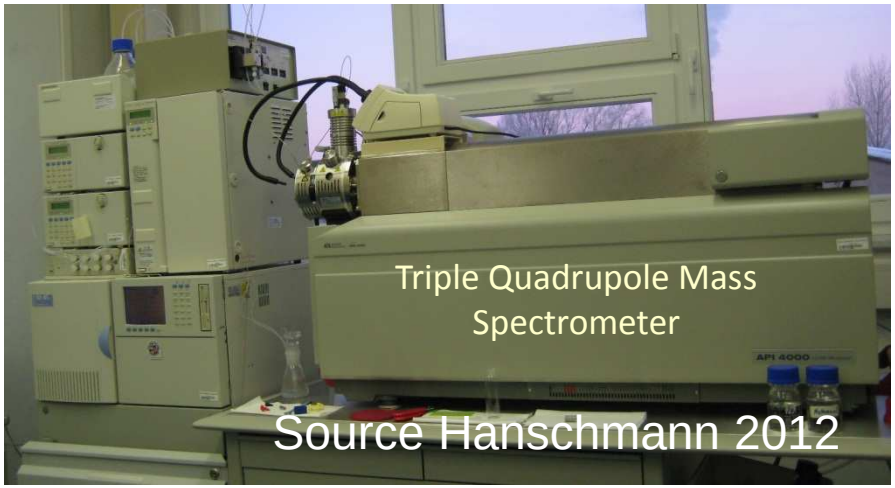
Analytical methods

- The manure and fermentation residue samples were analysed for the occurrence of antibiotics in the SAXON STATE ENTERPRISE FOR ENVIRONMENT AND AGRICULTURE in

  Waldheimer Strasse 219 Haus 4 01683 Nossen
  Tel.: +49 35242 632-6210 | Fax: +49 35242 632-6099
  gudrun.hanschmann@smul.sachsen.de

- using the HPLC-MS/MS system
  High-Performance Liquid Chromatography-Tandem Mass Spectrometry



Materials and methods

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Analytical methods

- The soil samples were analysed in Food GmbH Jena Analytik-Consulting Drlaweg 2.07743 Jena Telephone +49(0) 3641 -3096340. Fax: +49(0) 3641 -3096338 info@food-jena.de www.food-jena,de

- The impact of antibiotics on the microbial biomass of the soil was analysed at BioChem Agrar GMBH.

BioChem Agrar GmbH
Herrn Dr. Winkler
Kupferstr. 6
04827 Machern, OT Gerichshain

Materials and methods

Outdoor studies (environment)

- Analysis of active substances of the various substance groups in manures, soils and waters :

  9 sulfonamides, 4 ß-lactams, 4 tetracyclines, 6 macrolides,
  4 fluoroquinolones, 3 amphenicoles, tiamulin, trimethoprim

Limits of quantification in each of the media:

- Farm manure: < 10-40 µg/kg of fresh mass (FM)
- Soil: < 10 µg/kg of original substance (OS)
- Water: < 20 ng/L

Materials and methods

Outdoor studies (environment)

- Sample of slurry manure or fermentation residue to be applied to the selected field plots
- Analysis for antibiotic residues, ESBL`s und MRSA

Materials and methods

Outdoor studies (environment)

- First soil sample prior to the application of the manure or fermentation residue -- second soil sample 14 days after manure application
- Where necessary, a sample of surface water
- Cold storage of the material until the analysis is performed

Project structure

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Data linkage, evaluation and feedback

Tests in lysimeters

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Materials and methods

Foto: Dr. j. Pößneck, LfULG

Materials and methods

Tests in the lysimeters

- Test variants I: no manure,
- Tests variants II: mineral fertilisation
- Test variants III: 2, 3, 4 L of spiked manure/m²
- Active substances added to the manure, 30 mg/kg FM:

  Ampicillin, Cefquinome, Chlortetracycline, Enrofloxacin, Dihydrostreptomycin, Erythromycin, Trimethoprim

Results

Tests in the lysimeters

- Out of the active substances mixed to the manures, only chlortetracycline was retrieved in the tests.
- In the soil, we also detected sulfadiazine and oxytetracycline, which were already present in the manure slurry used in application.
- None of the active substances added to the manure or detected in the sample was found in the lysimeter water.
- No antibiotics were detected in summer wheat, neither in grain, nor in straw.

Tests in the lab: DIN ISO 14240-1

The lab-scale test methods are described in the
OECD GUIDELINE FOR THE TESTING OF CHEMICALS.

Foto: Dr. j. Pößneck, LfULG
BioChem Agrar GMBH

Conclusive summary

Livestock sub-project

- 27 cattle farms and 16 pig farms were classified by **size and performance categories**.
- **Animal Needs Indices** and **hygiene analyses** were scored in the cattle and pig farms.
- **Animal health parameters** were recorded.
- **ESBL and/or MRSA** were detected in **77 %** of the farms or farm divisions.
- **Antibiotic usage data collection** in the farms started.


We thank you for your attention.
136