

The AACTING-network (www.aacting.org) presents:

**DESCRIPTION OF EXISTING MONITORING SYSTEMS FOR COLLECTION,
ANALYSIS, BENCHMARKING AND REPORTING OF FARM-LEVEL
VETERINARY ANTIMICROBIAL USAGE**

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ABBREVIATION LIST

AGES	Austrian Agency for Health and Food Safety
AMU	Antimicrobial us(ag)e
ANSES	French Agency for Food, Environmental and Occupational Health & Safety
AWE	Association Wallonne des Eleveurs
BVL	Bundesamt für Verbraucherschutz und Lebensmittelsicherheit
CIPARS	Canadian Integrated Program for Antimicrobial Resistance Surveillance
DDDA	Defined Daily Dose for animals
DCDA	Defined Course Dose for animals
DDDvet	Defined Daily Dose for animals defined by EMA in the scope of the ESVAC project
DCDvet	Defined Course Dose for animals defined by EMA in the scope of the ESVAC project
EMA	European Medicines Agency
IDELE	Institut de l'élevage
IFIP	French Institute for pig and pork Industry
IFTA	Index of Frequency of Treatments with Antibiotics
IZSLER	Itituto Zooprofilattico Sperimentale della Lombardia e Dell'Emilia Romagna
PCU	Population Correction Unit
SDa	Netherlands Veterinary Medicines Institute
TF	Treatment frequency
UDD	Used Daily Dose
UCD	Used Course Dose
VMD	Veterinary Medicines Directorate
VMP	Veterinary medicinal product
ZnO	Zinc Oxide

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AUSTRIA

➤ PHAROS

– General

The PHAROS database in Austria is operated by the Austrian Agency for Health and Food Safety (AGES). The provision of data is regulated by the law ‘Veterinär-Antibiotika-Mengenströme-Verordnung’ BGBl. II Nr. 83/2014. Due to its statutory nature, it is relevant to 100% of the farms in the following animal sectors:

- a) Pigs
- b) Cattle
- c) Broilers
- d) Laying hens
- e) Turkeys
- f) Goats
- g) Sheep

– Data collection

Animal (sub)categories: The main animal categories (pigs, cattle, poultry, goat, sheep), the farm id and the farm type has to be reported. Further animal subcategories can then be determined via livestock data of each holding. For poultry, data are collected at batch level.

Input: The role of vets is to provide the amount of AMU dispensed to the farm or batch. Farmers can voluntarily provide health data of poultry and dairy cattle. In addition to data from vets and farmers, AGES receives data to calculate the Austrian AMU indicator, based on the livestock of each holding. The additional data sources are: Agrarmarkt Austria Marketing database, the Veterinary Information System database and the Poultry Health Data.

– Analysis

Analysis at farm level is done using the dose-based unit of measurement DDDvet as defined by EMA¹. The denominator is calculated from the number of animals, estimated national values for the animal weight at treatment and the number of sold/slaughtered animals for each animal category on the holding. The indicator (n DDDvet/kg/year) is then calculated from the dispensed AMU (in DDDvet) and divided by the denominator.

¹ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

– **Benchmarking and reporting**

Benchmark systems for vets and pig holders are implemented in the PHAROS data base. Vets can download their individual reports. Farm level results are distributed via the Austrian animal health service to interested farmers.

A general report is published once a year on the AGES website. Furthermore, the results are discussed at the meeting of the chief veterinary officers of the federal provinces and are also presented at the annual antibiotic awareness day and at the annual meeting of the pharmaceutical industry and wholesalers.

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➤ **POULTRY HEALTH DATA (PHD)**

– **General**

The PHD database is run by Austrian Poultry Health Service (QGV – Qualitätsgeflügelvereinigung). The QGV is a federation of poultry producers and veterinarians and comprises the major part of the Austrian poultry production in the branches broiler and turkey fattening, parental herds and laying hens but also young cockerels, ducks and geese. The PHD database (initialized 2008) comprises extensive information of almost all poultry farms and their flocks. In the PHD all vaccinations and prescriptions of antimicrobials have to be recorded by the responsible veterinarian.

– **Data collection**

Animal (sub)categories: The main categories for analysis are broiler and turkey fattening, parental herds and laying hens.

Input: Data on flocks like number of animals and hatching date are entered by the authorized people from the production sector. The responsible vets have to provide all information about antimicrobial prescriptions like the flock ID, date of prescription, name of the drug, substance class and the used amount.

– **Analysis**

AGES receives every year the whole data of all antimicrobial prescriptions for broilers and turkeys, parental herds and laying hens. This data is combined with the EMA information on animal drugs such that the effectively administered amount of active ingredient can be calculated for every antimicrobial prescription. Special subgroup analysis for WHO's Highest Priority Critically Important Antimicrobials (HPCIA) is also done. Additionally, flocks from organic farms are analysed separately.

For benchmarking broilers and fattening turkeys (see below) also the produced amount of poultry is considered. Therefore, the amount of administered active ingredients is divided by the amount of produced poultry by using standard weights. But also the mean number of antimicrobial treatments of all herds of a production type as well as the number of treated and untreated herds are calculated.

– **Benchmarking and reporting**

Every year AGES writes a report where all important statistical measures of antimicrobial usage in the Austrian poultry production for the main poultry categories are displayed. Additionally, so called outlier farms are identified. These are farms with a high usage of antimicrobials compared to their production amount.

Since December 2017 a benchmarking system for broiler and turkey farms has been established. Every farm has access to its personal statistical figures about antimicrobial usage over the different years. In

some of the figures also mean values of all farms of the same production type are included to enable an assessment of the own farm in respect of the other farms. AGES is currently working on extending the benchmarking system to laying hens.

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BELGIUM

➤ AB REGISTER

– General

AB Register is an online platform established by Belpork, the owner of the Belgian pig meat quality label Certus. It covers approx. 65% of Belgian pig farms and 80% of Belgian pork production. Halfway 2017, AB Register expanded with poultry, including turkeys, with support of the Belgian quality label Belplume, covering 95% of chicken production in Belgium. In 2018, also Flemish dairy cattle was included, with all Flemish farms following the IKM/QFL/QMK quality scheme being obliged to register their AMU. The data collection system AB Register is since 2018 managed by 'AB Register vzw', with representatives from Belpork vzw, Belplume vzw and IKM Vlaanderen vzw.

– Data collection

Animal (sub)categories: In pigs: sows/boars, finishers, weaners and sucklers. In poultry: laying hens, broilers, laying dams, broiler dams, breeding laying dams, breeding broiler dams, breeding layers and turkeys. In dairy cattle: calves 0-3 months, calves 3-8 months, young stock 8-24 months, adult dairy cattle, other cattle.

Input: The system requires the providers of the antimicrobials to do the registrations; in pigs this can be vets, feed mills or pharmacists; in poultry this can be veterinarians or pharmacists and in dairy cattle only vets are allowed to register the AMU. Farmers have the authority and the responsibility to check the validity of the registrations. Mistakes should be notified to the provider, who can make changes to a limited number of input fields. The animal occupation numbers of pigs and cattle are obtained from governmental databases (pigs: quarterly capacity numbers; cattle: yearly average occupation numbers). In poultry, an additional role is foreseen for the hatcheries, who are responsible for providing data about the flocks set up on the farms (start date, number of animals set up, pen number). Data input can be automatic (through xml or uploading Excel sheets) or manual. For pigs, additionally data on the usage of zinc oxide (ZnO), authorised for prevention of diarrhoea in weaners, need to be registered.

– Analysis

The dose-based unit of measurement $DDDA_{bel}$ (defined for Belgium at product-level) is used in the calculation of the indicator BD_{100} (treatment days per 100 days). To calculate the (kg) pigs at risk of treatment, standard weights of the pig subcategories proposed by EMA² are used. Standard weights

² http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

for cattle categories are agreed with the sector. A BD_{100} per month is calculated for pigs and cattle, based upon which a yearly average BD_{100} is calculated per weight category. In poultry a BD_{100} is calculated per flock, using standard weights agreed with the sector. Per animal category present at the farm, an average BD_{100} per pen and per farm is calculated as an average over all rounds (terminated + still running) in a preceding period of one year.

– **Benchmarking**

In pigs, benchmarking based on the average BD_{100} (and reporting of the results) is done four times a year, in poultry two times and in dairy cattle once a year. Consequently, it is done per weight category. A ‘fixed benchmarking’ methodology is applied in pigs and poultry, with the results of each farm being compared with two threshold values (attention and action BD_{100}) per weight category that are ‘fixed’, currently until 2023 as part of sector-specific reduction paths (<https://amcra.be/nl/visie-2024/>). In dairy cattle, ‘dynamic benchmarking’ is applied: two thresholds are set as well, but these are recalculated upon every benchmarking, and represent the median (P50) and 90th percentile (P90) of the benchmark population. The benchmark population is constituted of Flemish (AB Register) and Walloon (see BIGAME) dairy cattle farms that harbour the respective categories and have data of sufficient quality.

In addition, the type of antimicrobials used is benchmarked. Three colour codes of antimicrobials are distinguished: yellow, orange and red, the latter including the 3rd/4th gen. cephalosporins and the (fluoro)quinolones. The percentage of each antimicrobial class and each colour code in the total AMU in each weight category is compared to the mean percentages over all farms.

Additionally, use of ZnO and colistin is benchmarked in pigs, use of ‘red molecules’ in poultry and use of intramammary products in dairy cattle.

– **Reporting**

In pigs, results are communicated to the farms four times a year, in poultry twice a year and in cattle once a year through an individual report (with the results of all weight categories present at the farm) made available in the AB Register portal as a pdf. Farmers can opt to share their reports with all vets delivering antimicrobials to their farm. The report is also made directly available for the herd veterinarian.

– **Contact**

helpdesk@abregister.be

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➤ **BIGAME**

– **General**

BIGAME is an online platform developed by ARSIA asbl and AWE that aims to collect and integrate various animal health related information at farm level, including data on AMU. Though being principally available to all Belgian farmers, its primary target are Walloon dairy and beef cattle farmers. It's generally a voluntary system, but its use for registration of AMU by Walloon dairy cattle farmers is obliged in the IKM/QFL/QMK quality scheme.

– **Data collection**

Animal (sub)categories: Pigs: sows, finishers, gilts, weaners and sucklers; poultry: laying hens, broilers; veal calves; cattle: calves 0-8 months, young stock 8-24 months, adult cattle.

Input: Input is done by the veterinarian. Data input can be automatic (through xml) or manual. The animal occupation numbers used in the calculation of the indicator are obtained from the governmental database SANITEL. The system allows to link AMU to an individual animal in the farm.

– **Analysis**

For Walloon dairy cattle, the dose-based unit of measurement $DDDA_{bel}$ (defined for Belgium at product-level) is used in the calculation of the indicator BD_{100} (treatment days per 100 days). To calculate the kg animals at risk of treatment, standard weights agreed with the sector are used. A BD_{100} per month is calculated for cattle, based upon which a yearly average BD_{100} is calculated per weight category.

– **Benchmarking**

For Walloon dairy cattle, benchmarking (and reporting) is done once a year, based on the average BD_{100} . Consequently, it is done per weight category. 'Dynamic benchmarking' is applied: two thresholds are set, recalculated upon every benchmarking and representing the median (P50) and 90th percentile (P90) of the benchmark population. The Flemish (see AB Register) and Walloon cattle farms that harbour the respective categories and have data of sufficient quality are included in the benchmark population.

In addition, the type of antimicrobials used is benchmarked. Three colour codes of antimicrobials are distinguished: yellow, orange and red, the latter including the 3rd/4th gen. cephalosporins and the fluoroquinolones. The percentage of each antimicrobial class and each colour code in the total AMU in each weight category is compared to the mean percentages over all farms. Also the use of intramammary products is benchmarked to the average of all farms.

– **Reporting**

Results are communicated to the farms as individual benchmarking reports once a year. The reports are available through the online portal. Farmers can opt to share their reports with all vets delivering antimicrobials to their farm.

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➤ SANITEL-MED

– **General**

The Sanitel-Med system is owned and financed by the Belgian Federal Agency for Medicines and Health Products (FAMHP) and operational since mid-2016; legal obligation (RD 2017/20207) to use it commenced early 2017, and accounts for pig farms, veal calf farms, broiler farms and laying hens. In addition to the sectors obliged to register their AMU, the dairy and beef sector can use it voluntarily.

– **Data collection**

Animal (sub)categories: Pigs: sows, finishers, gilts, weaners and sucklers; veal calves; broilers and laying hens; in cattle: calves 0-8 months, young stock 8-24 months, adult cattle.

Input: The veterinarians are legally obliged to report AMU: they have to register what they prescribe, deliver at the farms or dispense to the animals. There are four data-lock points for veterinarians: 15 April, 15 July, 15 October, 15 January. The farmers can check and validate the registrations but can also wait for automatic validation at the farmer's data-lock points (30 April, 31 July, 31 October, 31 January). The farmers can change the quantity antimicrobials registered or can refuse the registrations. Changing data after the data lock points is possible by contacting the Sanitel-Med helpdesk. Data input can be automatic (through xml) or manual.

Sanitel-Med is linked to SANITEL, a database used for epidemiological surveillance and owned by the Belgian Federal Agency for the Safety of the Food Chain. From SANITEL, the farm capacity numbers of pigs and poultry are extracted to be used in the analysis of the AMU. For veal calves, monthly occupation numbers are obtained from SANITEL as well, by taking the average of the number of calves present at day 2, 11 and 21 of the month and day 2 of the consecutive month.

In pigs the usage of ZnO, authorised for prevention of diarrhoea in weaners, needs to be registered.

– **Analysis**

For benchmarking at farm-level, the dose-based unit of measurement $DDDA_{bel}$ (defined for Belgium at product-level) is used in the calculation of the indicator BD_{100} (treatment days per 100 days). To calculate the (kg) pigs and poultry at risk of treatment, standard weights proposed by EMA³ are used (+ 2 kg for laying hens, agreed with the sector). Standard weights for veal are agreed with the sector. A BD_{100} per month is calculated, based upon which a yearly average BD_{100} is calculated per species and category (pigs and poultry). Farm-level results are also used for comparing sectors, assessing evolutions of AMU, and cross-check with national sales data. Therefore, the $BD_{100-species}$ is calculated,

³ http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

with the denominator corresponding to the average yearly number of pigs, broilers and veal calves per year and the numerator being the total number of DDDA_{bel} used per species per year.

– **Benchmarking**

Benchmarking (and reporting) at farm-level is done twice a year for pigs and poultry (per category) and veal calves, based on the average BD₁₀₀. A ‘fixed benchmarking’ methodology is applied, with the results of each farm being compared with two threshold values (attention and action BD₁₀₀) per weight category that are ‘fixed’ currently until 2023 as part of sector-specific reduction paths (<https://amcra.be/nl/visie-2024/>).

In addition, the type of antimicrobials used is benchmarked. Three colour codes of antimicrobials are distinguished: yellow, orange and red, the latter including the 3rd/4th gen. cephalosporins and the (fluoro)quinolones. The percentage of each antimicrobial class and each colour code in the total AMU in each weight category is compared to the mean percentages over all farms.

In pigs, use of premix is also benchmarked.

For benchmarking veterinarians, a contract score is calculated as a score out of 100 representing the ratio of animal-category-units, of farms where the vet is the responsible vet, that have green (low zone), yellow (medium = attention zone) or red (high = action zone) AMU. Based on the distribution of the scores of all veterinarian-animal species combinations, two threshold values are defined (the median and P90), dividing the vets in green, yellow and red vets.

– **Reporting**

Farmers can access their benchmarking report 2x/year through the Sanitel-Med interface. Reports are made mutually available for the farmers and their responsible vets. Sector results are presented since 2019 in the yearly BelVet-SAC report.

Veterinarians can access their benchmarking report 1x/year through the Sanitel-Med interface.

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➤ **SGS-BVK VEAL CALVES**

– **General**

The SGS-BVK veal calves system has been developed by SGS at the request of 'Beroepsvereniging voor de Belgische Kalfsvleessector vzw (BVK vzw)' for monitoring the antimicrobial usage in Belgian veal calves. It has been tested since 2015 and is operational since 2017, including approx. 95% of the Belgian veal industry.

– **Data collection**

Animal (sub)categories: Four production types are distinguished: all-in all-out milk, all-in all-out double muscled Belgian blue, all-in all-out crossbreds, and starters.

Input: Input is done by the veterinarian, per batch of animals set-up. In addition to registering the antimicrobials used also the number of animals set up needs to be provided. This number of animals is cross-checked with the information available in the SANITEL database of the Belgian Federal Agency for the Safety of the Food Chain.

– **Analysis**

AMU is calculated as the BD_{100} per batch. Different estimated standard weights at treatment are used per production type to calculate the kg calves at risk.

– **Benchmarking**

Per quarter, the results are compared of all batches from a certain production type that have finished off in that quarter. Thresholds are set on the P50 and P90 of the distribution of all batches in a quarter (high users: above the P90).

– **Reporting**

Farmers receive the benchmarking results of their respective batches through the integrations they are part of and the vets associated with the integrations; high users are expected to reduce their AMU.

CANADA

➤ CIPARS

– General

The Public Health Agency of Canada coordinates the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS). CIPARS monitors AMU in humans, animals, and crops, as well as AMR in select bacteria from humans, animals, and food. CIPARS has active surveillance of AMU on volunteer sentinel farms for grower-finisher pigs, broiler chickens, and turkeys. Farm-level surveillance started in 2006 for grower-finisher pigs and expanded in 2013 to broiler chickens and turkeys (with subsequent additional regional expansion). Data and sample collection is underway on feedlot beef and dairy farms marking the beginning of ongoing surveillance in these sectors.

– Data collection

For CIPARS, AMU data are collected from a sample of farms using a questionnaire. The number of farms sampled each year is approximately 90-100 for pigs, 140 for chickens, and 100 for turkeys. The denominator represents the number of animals at risk for a single grow out period of the production stage covered by the questionnaire. In addition to quantitative AMU data, CIPARS collects extensive contextual information about the farms, including information about vaccinations, biosecurity, and other routine farm management practices.

Selection criteria:

Given the limitations on the sample size of farms, inclusion/exclusion criteria were applied to ensure representativeness and internal validity of the data.

Swine: For inclusion, herds must be Canadian Quality Assurance (CQA® – a HACCP-based on-farm food safety certification program) validated, produce more than 2000 market pigs per year, and be representative of the characteristics and geographic distribution of herds in the veterinarian's swine practice. Exclusion criteria include 1) being regarded as organic, 2) animals having been fed edible residual material or 3) the animals were raised on pasture.

Broiler chickens: The inclusion criteria involve being 'Safe, Safer, Safest™' compliant and a quota-holding broiler operation. Selected flocks are reflective of the veterinarian's practice profile, representative of hatcheries supplying chicks, and representative of feed mills supplying feeds in the province/region. Exclusion criteria include being a pasture, backyard or small-sized farm.

Turkeys: Inclusion and exclusion criteria are similar to those for broiler chickens with the modification that enrolled farms comply with Turkey Farmers of Canada's On-farm Food Safety Program®.

Animal (sub)categories:

AMU information for pigs is collected from the grower-finisher production stage. For poultry, the data are collected from the broiler/grow out stage, but the questionnaire also requests information (if known) about AMU at the hatchery-level. For turkeys, data are collected from the different weight categories (broilers, light and heavy hens and light and heavy toms) for the grow-out period.

Input:

Data are manually provided to CIPARS by the veterinarians who administer the questionnaire to the producers. The data are entered into a customized database. The database incorporates automated data validity checks to identify erroneous data or data entry errors; in the case of erroneous data, the veterinarians are contacted for clarification.

– **Analysis**

Analysis is conducted using count-based, weight-based and dose-based units of measurement and indicators. Both Canadian and EMA⁴ standards for the average daily dose are used, though primary reporting is using the Canadian standards. The animal weights to determine the kg animal at risk of treatment are from EMA⁵ or specific to Canada, based on input from the Canadian industry.

– **Benchmarking and reporting**

Benchmarking: CIPARS currently does not conduct farm-level benchmarking.

Reporting: Annual results are communicated to the farm industries and veterinarians. CIPARS hosts a multi-commodity stakeholder webinar during the Global Antibiotic Awareness Week each year. When emerging issues are identified, CIPARS communicates these findings via surveillance bulletins and/or *ad hoc* meetings with relevant industry sectors, veterinary groups and government agencies. CIPARS also presents findings at local, national, and international fora and publishes select findings in peer-reviewed journals.

⁴ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

⁵ http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

– Stewardship

CIPARS farm-level surveillance indicated that a change in antimicrobial use policy on broiler chicken farms across Canada appears to be having the desired goal of reducing use of critically important antimicrobials, in particular the use of 3rd generation cephalosporins (Figure 1). Similarly, industry lead initiatives in the swine production have resulted in decreasing trends in the frequency and quantity of antimicrobials used since 2014.

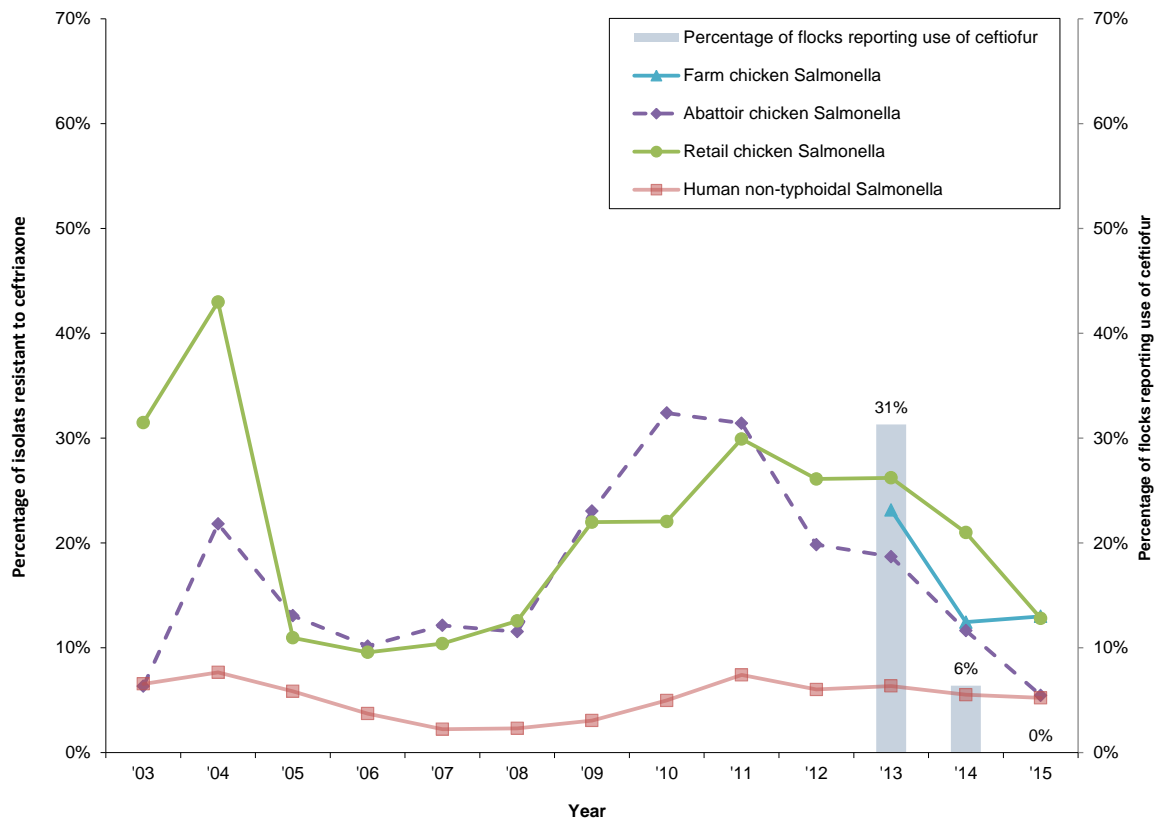


Figure 1. Reduction in reported use of ceftiofur on farm and changing resistance to ceftriaxone in non-typhoidal Salmonella from humans and chicken sources, Canada 2003–2015.

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➤ FISHERIES AND OCEANS CANADA

– **General**

Fisheries and Oceans Canada collect data from 100% of all licenced freshwater and marine aquaculture operations in Canada. Only finfish facilities use antibiotics as part of their day-to-day operations.

– **Data collection**

The data include all authorized antimicrobials as prescribed by licenced veterinarians. Currently, only four antimicrobials are prescribed for use in aquaculture in Canada. Data collection began in 2016; 2016 and 2017 data are currently available.

– **Analysis**

No analysis is currently applied to the data collected.

– **Benchmarking and reporting**

Benchmarking: The data are available on a per site basis, though formal benchmarking activities are not underway.

Reporting: The data are publicly available on a per site basis:

<https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383>

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CZECH REPUBLIC

➤ DLN CATTLE

– General

The Czech Veterinary Research Institute financed by the Ministry of Agriculture is the administrator of the Register of treatment and indications, of which a pilot project in dairy cattle has started in January 2017. All Czech dairy cattle herds can participate on a voluntary base.

– Data collection

Animal (sub)categories: Three weight categories are distinguished: calves, heifers and dairy cows.

Input: Through an online database. Farmers as well as vets can log in and are identified as such. The system has been updated with an interface that allows the uploading of data important for farmers and the farm/health status of the herd management [genetics, productivity, diagnosis, veterinary medicinal products used (VMPs), withdrawal periods].

– Analysis, benchmarking and reporting

The antimicrobial use is quantified as well as the use of other VMPs at farm level. A benchmarking item has been introduced. Raw use data at farm level are provided through the online tool. Trainings of vets/farmers to spread the system were organised in 2017/18. Summarizing results are also presented through workshops and seminars. VMPs used are linked to indications (international code ICAR). Cross checking is possible with invoices system (sales data in national database provided by wholesalers).

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➤ Q VET – PIGS

– **General**

Private subjects project – selected pig farms (2016, 2017).

– **Data collection**

Animal (sub)categories: Three weight categories are distinguished: weaners, finishers, sows.

Input: Through an online database. Responsible person nominated in farm can log in.

– **Analysis**

The dose-based unit of measurement ADD (animal daily dose; defined per product at the active substance level) is used to calculate the indicator ADD per 100 animals per day. Statistics comparing to previous period (e.g. one year).

– **Benchmarking and reporting**

One threshold value is defined per each category (weaners, finishers, sows), to which the average ADD/100 animals/day calculated over the time frame is referenced. Same system as used in DK for pigs. Reports are available for the owners of the farm/individual husbandries in the holding. Benchmarking comparisons (with others farms) is done anonymously (using codes).

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DENMARK

➤ VETSTAT

– General

The Danish VetStat database was established in 2000. It is owned and managed by the Danish Veterinary and Food Administration agency of the Ministry of Environment and Food of Denmark. VetStat was among the first data collection systems to become operational in retrieving detailed data on sales of prescribed drug for animals, hence product packages specific. Data comprises all animals, although the detailing level of production animals is considerably higher, with data at farm level, than the equivalent data for horses and pets.

– Data collection

Animal (sub)categories: of pigs: breeding animals (sows, boars, gilts and sucklers), weaners (< 30 kg) and finishers; of cattle: cows, bulls, heifers and steers > 24 months, calves < 12 months and youngster between 12 and 24 months; of sheep/goats: animals < or > 12 months; and of poultry: broilers, layers and breeding stock.

Input: Pharmacies and feed-mills are obliged to report sold amount of drugs for all animal species, while vets report the amount of drugs used for production animals in veterinary practice. Livestock owners do not provide data, however, they are obliged to register the specific usage of prescribed drugs and store these registrations for five years in the farm. For standardization of antimicrobial usage at farm level, the needed number of animals can be obtained from the Central Husbandry Register and represent average capacity numbers.

– Analysis

The dose-based unit of measurement ADD (animal daily dose; defined per product at the active substance level) is used to calculate the indicator ADD per 100 animals per day. Recently, weighted ADD values have been established, in order to discourage the use of certain types of antimicrobials and encourage the use of others. The kg animal at risk of treatment is determined using standard weights defined nationally. The use for companion animals is calculated based on the sales of veterinarian products from pharmacies to veterinarians.

– Benchmarking

Benchmarking is currently applied to pigs and cattle. One threshold value is defined per weight category, above which the average ADD/100 animals/day calculated over the last nine months (time frame) may not pass to prevent inhibitory measures becoming in force. This is for pigs referred to as

the 'yellow card initiative'. For cattle a similar system is in place. In contrast to pigs, no sanctions are currently in place for cattle, because the threshold values for this species are a guideline rather than a sanctioning tool. As the system is online available, farms can follow their position relative to the threshold at any time – hence, there is no defined frequency for the benchmarking.

– **Reporting**

VetStat has an interface for vets with graphs and data, as well as an internet based presentation to farmers. Vets can however apply own benchmarking programmes, the results of which however are secondary to those of the official methodology and results.

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FINLAND

➤ NASEVA

– General

NASEVA is a centralized health care Register for Finnish cattle herds run by Animal Health ETT, containing 83 % of cattle herds and 92 % of bovine animals. The official cattle register is available for health services via interface. Data on antimicrobial usage can be registered voluntarily since 2010.

– Data collection

Animal (sub)categories: Data collection is done by ID in all cattle groups and categories.

Input: Farmers and vets have equal roles in data collection: provide the amount of medicines they give to the animals; 71 % of the data in NASEVA originate from farmers and 39 % from veterinarians.

– Analysis, benchmarking and reporting

Benchmarking of farms is currently being developed.

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➤ SIKAVA

– **General**

SIKAVA is an online health classification register for Finnish pig farms run by Animal Health ETT. Data on antimicrobial usage can voluntarily be registered since 2008. This has become obligatory since 2016 for 95% of Finnish pig farms.

– **Data collection**

Animal (sub)categories: Four weight categories are distinguished: sows, finishers, weaners and sucklers.

Input: Farmers and vets have equal roles in data collection: provide the amount of medicines they give to the animals. Yet, virtually 100% of the data in SIKAVA originate from farmers. From 2021 on however, the data will come from the antibiotics sold to the farms by the herd vet.

– **Analysis, benchmarking and reporting**

Benchmarking of farms is currently being developed. The unit will be DDDvet by EMA and will be calculated for farms every three months for each age group.

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➤ ANIMAL HEALTH ETT (POULTRY)

– **General**

Animal Health ETT (poultry) manually collects data about antimicrobial usage on Finnish poultry farms. The voluntary system, operational since 2007 and laying hens since 2018, includes broilers and turkeys covering >99% of the poultry meat production in Finland as well as laying hen units producing eggs for egg packaging companies.

– **Data collection**

Animal (sub)categories: Data are collected for broilers and broiler parents, and turkeys and turkey parents. Data on broiler grandparents has been collected until 2016. For laying hens and their parents/grandparents data has been collected since 2018.

Input: In Finland nearly all poultry farms have a production contract with a slaughterhouse company, which delivers the chicks to the farm and takes the poultry back to slaughter. These companies and their vets are responsible for reporting the antimicrobial treatment data to Animal Health ETT. The data is collected per flock on a yearly basis, in Excel tables. For laying hens and their parents/grandparents the veterinarians are asked to report the medications direct to ETT (Web survey).

Recorded data include the treated number of flocks, the indication for use, which antibiotics are used and the amount that has been used (since 2008, kg of active ingredient). Since 2013 also the treated kg poultry, the used dosage (mg/kg) and the days of treatment are recorded.

– **Analysis, benchmarking and reporting**

Results are analysed as the indication-based yearly number of treated flocks per total number of flocks. Farms are currently not being benchmarked.

The results are reported on the [website](#) of Animal Health ETT (in Finnish, Swedish and English), as well as to the [Finnish Food Authority](#) and the [Finnish Medicines Agency](#).

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FRANCE

➤ CLIPP

– General

CLIPP is the French professional Rabbit Council, which has established a plan for the reduction of antimicrobial use in rabbits. Part of this plan was to install an indicator to follow-up the antimicrobial use in rabbit farms. A sample representing about 75% of French rabbit farms voluntarily report data since 2011 in the frame of the technical-economic data collection performed by the French applied research and development institute (ITAVI) and supported by governmental funds.

– Data collection

Data are collected at the batch level (e.g. n = 4152 batches from 587 farms in 2018).

Animal (sub)categories: Two are distinguished: mother rabbits and fattening rabbits.

Input: Info on the treatments [in the form of the calculated Index of Frequency of Treatments with Antibiotics (IFTA)] can be provided by vets, farmers as well as technicians. As no animal population is used for standardisation of the usage, no animal numbers need to be reported for the analysis.

– Analysis

Treatments are directly converted to the IFTA, an indicator developed in collaboration with the French National Institute for Agricultural Research (INRA) and based on counts of actual number of treatment days reported in relation to the rearing period length in days.

– Benchmarking and reporting

Collective references are calculated at the national and production organisation level and are made available for professionals. Individual farm results can be compared to these references.

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➤ **GVET**

– **General**

GVET is a voluntary, computerised register for all the treatments in pig farms. It is active since early 2017, and is run by the French Institute for pig and pork Industry (IFIP) in cooperation with The French Agency for Veterinary Medicinal Products, the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) and Isagri, a private software company.

– **Data collection**

Animal (sub)categories: Four weight categories are distinguished: sows, fatteners, weaners and sucklers.

Input: Farmers give the input about antibiotic treatments thanks to drop-down lists available in the software: they select the veterinary drug among a standardized list where all medicines are linked with a unique identifier, which allows to know its strength and thus to calculate the weight of active ingredient. Then, farmers either validate the pre-set dosage (according to SPC) or register the actual dosage with one of the pre-set units (g/animal or g/100 kg of body weight for example). There are also pre-defined lists for the other characteristics of the treatment (dates of administration, duration, reasons of treatment, number of treated animals...). All the input about the denominator is already registered in the same software and in the national database for other purposes: either in the GTE (the technical-economic results of the farm) or in the GTTT (Technical management for breeding herds, where sows are individually identified and linked with their physiological stage and reproductive performances). Thus, this automatic link between different databases (GVET, GTE and GTTT) simplifies the work of the farmers and allows to perform technical, economic and epidemiological impact studies for the measures applied under AMU stewardship.

Vets are supposed to bring technical support to the farmers.

– **Analysis**

Different indicators are calculated once a year:

- For the farmers, results are expressed in ‘number of treatment days’ and ‘number of treatments’ per animal per weight group, two count-based indicators using the number of treatment days, the number of treated animals and the population at risk.
- For national and European purposes (e.g. ESVAC project), the systems also allow to use dose-based units of measurement (UDD, UCD, DDD and DCD; DDDvet, DCDvet). They are used to calculate two indicators: the number of daily doses per animal and

the number of course doses per animal. The weights at treatment of the animals are national standard values, with plans to replace this with real weights at treatment.

- **Benchmarking**

Benchmarking will be performed when a sample of farms deemed large enough to be representative has participated in GVET. Meanwhile, farmers can follow their own evolution of AMU over time. Thus, they can see the impact on AMU of the implementation of a vaccine or biosecurity for example

- **Reporting**

Farmers securely access their results on an online interface of IFIP (GT-Direct) which already allows them to consult and analyse their technical and economical results.

- **Contact**

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➤ INAPORC

– **General**

The INAPORC panel is a random voluntary sample of 160 pig farms (approx. 1% of the total number in France). The simple random sampling started in 2010 and has been renewed in 2013 and in 2016. Sampling is performed in the exhaustive national swine database of identification, BDPORC, of which are selected farms inside mainland France with > 49 sows, and farms with < than 50 sows but with > 99 places in post-weaning and/or fattening units. The representativeness of the sample is confirmed post hoc (Chi²) through confrontation of the farms characteristics (production orientation, geographic distribution, membership to a production structure and number of sows) to those in the national agricultural census. The collection, analysis and communication is managed by IFIP, ANSES and stakeholders representatives.

– **Data collection**

Animal (sub)categories: Four weight categories are distinguished: sows, fatteners, weaners and sucklers.

Input: This is the responsibility of the IFIP staff, based on data provided by vets, feed mills and farmers. Data collection is manual.

Vets and feed mills, designated by the farmers, provide the detailed list of VMPs containing antimicrobials having been sold to each farmer over the reference year [the complete products' name, presentation, concentration and quantities dispensed; for medicated feed: volume (tons), active substance(s) and proportion (in ppm)].

Farmers provide data allowing to estimate animal at risk of being treated (number of sows, number of sold/bought piglets/pigs at each weight group). For each antimicrobial they bought, farmers also describe, during a phone call, their antimicrobial usage pattern [the weight group treated and the indications of treatment (digestive, respiratory...)].

– **Analysis**

The system uses dose-based units of measurement (DDD and DCD based on national SPC; DDDvet, DCDvet from EMA⁶). They are used to calculate two indicators: the number of daily doses per animal and the number of course doses per animal. The weights at treatment of the animals are national, standard values (250 kg for a sow, 2 kg for a suckling piglet, 15 kg for a weaner and 50 kg for a fatterer).

⁶ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

- **Benchmarking**

The farms participating in the INAPORC Panel can compare their own results to overall reference values (= average AMU of each third of the sample). This is purely meant as feedback and bears no consequences for the farmers.

- **Reporting**

Each farmer receives his own results at the end of the study, in the form of a table where he can compare his results to the national reference.

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➤ **PERMANENT OBSERVATORY OF ANTIBIOTICS IN VEAL CALF FARMS**

– **General**

The monitoring has started in 2016 involving a panel of volunteer farmers (n = 40 in 2017) and is run by the French livestock institute (IDELE) in cooperation with ANSES.

– **Data collection**

Animal (sub)categories: fattening veal calves < 6 months from specialized farms.

Input: For each farm, the veterinary records and the farm health register are analysed by IDELE and ANSES.

The veterinarian has to provide the antimicrobial product sold and the number of units sold for each batch. The farmer has to provide, for each antimicrobial treatment, the number of treated animals, the antimicrobial name, the start date of treatment, the daily dosage, administration frequency and duration of treatment, and the intention of treatment.

The farmers provide the number of animals, their entrance weight in the farm and their particular breed.

– **Analysis**

For each batch, the number of antimicrobial treatments per calf, the number of antimicrobial treatment days per calf, the total quantity of active ingredient per calf and the Animal Level of Exposure to Antimicrobials (ALEA, obtained by dividing the number of course doses by the biomass of the animal population potentially treated) are calculated.

– **Benchmarking**

No benchmarking is performed up to now.

– **Reporting**

Each veterinarian and each farmer receive their own results.

– **Contact**

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➤ REFA²VI

– **General**

RefA²vi is the ‘Réseau professionnel de Références sur les usages d’Antibiotiques en élevage Avicole’ or the ‘professional reference network on antibiotic usage in poultry production’. It is a partial coverage system managed by both ANVOL (French interprofessional body of the poultry production), which is responsible for the data collection, and ITAVI (French poultry, fish and rabbit technical institute), which is in charge of calculations of references and of communication. Following a pilot phase, data collection started in 2019, retrospectively collecting 2018 data. All poultry species are covered – broilers and turkeys being especially focused on (+ ducks, guinea fowl).

– **Data collection**

Animal (sub)categories: categories considered are based on production types and rearing characteristics rather than age.

Input: Data are collected from production organisations. They transmit production data (e.g. flocks size, weight slaughtered) and antimicrobial usage data, entered in their own databases either by veterinarians (prescriptions or deliveries) or farmers, twice a year. ANVOL anonymises and aggregates the data before sending to ITAVI.

– **Analysis**

Two ways for quantification are considered: based on treatments administration or on packages delivered.

Unit of measurement: AMU is expressed as a number of DDD or DCD making use of national DDD and DCD values (made publicly available by the French Agency for Veterinary Medicinal Products (ANMV)).

Indicators: number of DDD and DCD are reported to the amount of kilograms slaughtered.

– **Benchmarking**

No benchmarking method. Each production organisation can access to the results calculated for its farms and compare results to the references from the whole dataset.

– **Reporting**

Results are made publicly available on the ITAVI website.

– **Contact**

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GERMANY

➤ HIT

– General

There is a legal requirement to report antimicrobial use in livestock in Germany to a central database. The HIT database is owned by the Bavarian Ministry for the Food Chain, Agriculture and Forestry, with results published by the 'Bundesamt für Verbraucherschutz und Lebensmittelsicherheit' (BVL). It is active since July 1st 2014. The system does not cover 100% of the sectors, as selective criteria are applied: only farms with > 250 piglets / > 250 fatteners / > 20 beef calves / > 20 beef cattle / > 10.000 broilers / > 1000 fattening turkeys are included.

– Data collection

Animal (sub)categories: Both in pigs and cattle two categories are distinguished: respectively piglets ≤ 30 kg and fatteners > 30 kg, and fattening calves ≤ 8 months and fattening cattle > 8 months.

Input: Vets and farmers have equal roles in data input: they need to provide the number of treated animals, number of treatment days and the antimicrobial product used. If the vet reports, the farmer has to confirm that antimicrobials have been applied as reported. In addition, farmers need to provide the information to calculate the number of animal days at risk for treatment.

– Analysis

No dose- or weight-based unit of measurement is used in analysis. The indicator 'treatment frequency' (TF) is count-based, using the number of treatment days, the number of treated animals, the number of different products administered and the population at risk. Consequently, the analysis does not require the use of animal weights at treatment.

– Benchmarking

Farmers are compared to national benchmark values of TF – separate for each animal species and production group. The median value and the upper quartile are calculated and used for categorising farms. Calculation is performed twice a year, for a period of six months each.

– Reporting

The national values are published by BVL. Each farmer receives the half-year values and is obliged to compare their results with the national values.

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➤ QS

– **General**

The QS system exists since 2012 and is run by Qualität und Sicherheit GmbH, a sectoral quality system for various food products. Data collection covers ca. 95% of German broiler, veal, and pork production, and also includes turkeys and ducks.

– **Data collection**

Animal (sub)categories: Three weight categories/animal subtypes are distinguished among pigs: sows + sucklers, fatteners and weaners. Turkeys are subdivided into starters, fatteners and combination farms that keep both age groups.

Input: Vets need to provide the number of treated animals, number of treatment days and the antimicrobial product used, whereas farmers need to provide the number of pig places per farm and, specifically for poultry, data on production location. For poultry, the farmer needs to provide data allowing the assessment of the animal population for each cycle.

– **Analysis**

As in HIT, no dose- or weight-based unit of measurement is used in analysis but a count-based indicator similar to the 'treatment frequency' is calculated, called the 'therapy index', hence neither requiring the use of animal weights at treatment. In addition to the farm-level result in total, a separate therapy index for fluoroquinolones and 3rd/4th generation cephalosporins is calculated.

– **Benchmarking**

Benchmarking is done every three months, for a period of six months (= time-frame). All QS-adhering farms having the respective weight category are included in the reference population. The median and upper quartile are calculated as reference values.

– **Reporting**

Farmers are informed quarterly on their therapy index and the distribution of therapy indexes in the respective animal group.

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➤ VETCAB-S

– **General**

The VetCAB study (Veterinary Consumption of Antibiotics) is a research project executed by the University of Veterinary Medicine (Hannover) and sponsored by the German Federal Institute for Risk Assessment (Berlin) which is carried out to describe the use of antibiotics in farm animals in Germany. The project started as a feasibility study in 2007 and was continued in 2011 as pilot project in a cross-sectional approach. Based on this cross-sectional data since 2013, the VetCAB-Sentinel project runs as a longitudinal study with ongoing participant recruitment and data collection. Its results are used in order to generate and test research hypotheses and to provide scientific input for changes in legal regulation.

Aim of the study is to evaluate how often livestock animals are treated with antibiotics during a defined time period, using the treatment frequency (TF) i.e. # treated animals x # treatment days / # animals per farm. Furthermore, it is investigated, if regions or farm sizes differ regarding antibiotic usage or which substances are used most frequently.

– **Data collection**

Animal (sub)categories:

- **Pigs:** sows, finishers, weaners and sucklers
- **Poultry:** broilers
- **Cattle:** dairy cows, beef cattle and fattening calves

Input: Participating veterinarians and farmers voluntarily provide information about consumption of antibiotics on farm level by official application and delivery forms, which are transferred into a database. For the latter, the number of treated animals, number of treatment days, name and amount of the antimicrobial product used, the route of application and the indication are collected. In 2021 more than 300,000 records for pigs, cattle and poultry of the years 2013 to 2020 were included into the database .

– **Analysis**

As in HIT and QS, a count-based indicator is calculated, called the ‘treatment frequency’, which has a similar outcome as a treatment incidence based on UDD. This does not require the use of animal weights at treatment.

– **Benchmarking**

Seen the aim of the work, benchmarking is not applied.

– **Reporting**

Farmers and vets receive results of own animals as a confidential report as well as overall results. Results of the project as well as methodological issues are reported via scientific publication. For details click here: <https://ibei.tiho-hannover.de/vetcab/pages/41>.

– **More information**

<https://ibei.tiho-hannover.de/vetcab/>

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– **References**

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➤ VETCAB-ID

– **General**

VetCAB-ID (Veterinary Consumption of Antibiotics – International Documentation) is a project that enables veterinarians, farmers, scientists and interested parties to collect data on antimicrobial usage in animals in different countries. It is conducted by the University of Veterinary Medicine Hannover (Stiftung Tierärztliche Hochschule Hannover, TiHo), Germany. More specifically, the Department of Biometry, Epidemiology and Information Processing (IBEI) is the project leader in its function as WHO Collaborating Centre for Research and Training for Health at the Human-Animal-Environment Interface (WHO-CC HAEI).

The aim of VetCAB-ID is to provide interested parties access to a database which they may use for collecting data on the use of antibiotics. It shall allow gathering data to monitor what kind of animal has received a particular antibiotic within a certain period. Based on their entries, participants can monitor their own use of antibiotics as well as compare their status within their domain. If allowed by the national data owner, selected scientists have access to the database, too. They may assess pseudonymized data. Scientific assessment refers to comparison or benchmarking in this respect, how often animals across countries, regions or farms were treated with antibiotics on average.

The VetCAB-ID data base was launched in November 2018 with two signed partners from Chile. At present, contracts with partners from Pakistan and Zambia are in preparation.

Other countries or additional domains within countries can join. Eligible partners being universities, research institutes, governmental bodies or veterinary authorities.

– **Data collection**

Animal (sub)categories: All farm animals of any age/weight category. When of interest, additional categories may added .

Input: In order to participate in the project, a partner should be able to capture data on antimicrobial use in a given domain within their country. A domain is by definition of the participant a region, a group of farmers and others. For a first trial, a data set of an animal population of choice is needed (e.g. usage data for fattening pigs in some farms during on a temporal basis). In general, the vet is the most reliable source of information; data are mainly collected and reported by vets. The farmers should agree on AMU data reporting of their herd(s). Furthermore, a list of the antibiotics used most often in the country in the respective animal population is required, containing certain information on each drug.

– **Analysis**

As in VetCAB-S, the count-based indicator ‘treatment frequency’ can be calculated. This uses a weight assumed by the veterinarian at the day of treatment, and the number of animals or number of stable places.

- **Benchmarking**

Benchmarking is not a priority in the VetCAB-ID project, although the system could help countries to build up a benchmarking based on the collected information.

- **Communication strategy**

Participation in the project is possible for everyone. The project was/is introduced at different conferences, and there is a website (www.vetcab-id.de). First results from Chile were presented in September 2019.

- **Contact**

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IRELAND

➤ TEAGASC AMU CALCULATOR (PIGS) / UCD AMU POULTRY DATABASE (BROILERS)

– General

The system for pigs covers data for 2016 and the system for broilers covers data from February 2017 and will be completed in February 2019. Both are part of a project funded by the Department of Agriculture Food and the Marine (DAFM) and the data is being used to establish the DAFM National AMU database on AMU to be launched for pigs in November 2019 as part of the iNAP (Irish National Action Plan). The system for pigs is owned by the Irish Agriculture and Food Development Authority. This pilot covers approx. 80 pig farms and 133 poultry farms (out of approx. 280 of each country-wide).

– Data collection

Animal (sub)categories: All weight categories for pigs are distinguished when collecting data but not reporting. Data from pig farms is available from the productive performance recording system ran by teagasc eProfit Monitor. Poultry categories are not differentiated.

Input: Research personnel and advisors perform data collection. Data on use is obtained from farmers records on drugs delivered (with assistance from veterinary practices and feed mills). Information is available separately for in-feed, oral and injectable antibiotics. For chickens, data is provided by veterinarians as per flock including the reason for use.

– Analysis, benchmarking and reporting

AMU in pigs is processed into the weight-based indicators mg and mg/kg but is available in different units for benchmarking with other countries including DDD and DCD as outlined in ESVAC documents. Pig farmers are benchmarked but no thresholds are established. Benchmarking is based on total use and also critically important antimicrobials separately. The pig farm-level results are then discussed with the farmers. All pig farmers in the database received an individual report and a benchmarking report for their farms combined with information in production, biosecurity and slaughter house findings. Data has been further analysed combined with operational data to identify risk factors for high use.

Poultry data is only used internally for decision making.

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➤ NATIONAL AMU DATABASE FOR PIGS

– **General**

Ireland's new national AMU database for pigs is launched in November 2019 by the Department of Agriculture, Food and the Marine (DAFM). Under Bord Bia's Farm Quality Assurance standards for pigs, all pig herd owners who slaughter more than 200 pigs per year will be required to submit their antibiotic usage information to DAFM.

– **Data collection**

Animal (sub)categories: Piglet, weaner-grower, finisher or breeding pig.

Input: Herd keepers are required to submit, on a quarterly basis, the usage information on all antibiotics used in-feed, orally by routes other than in-feed as well as injectables. This is obtained either from their own usage records and/or from data on medicated feed delivered (for example from feed mills).

– **Analysis, benchmarking and reporting**

The data will be presented as the overall annual amount of antibiotic active ingredient used (in kg or tonnes) as well as the overall amount of critically important antibiotics (CIAs) used on farm. This is then compared with the population at risk of treatment to create a mg/kg usage figure. The EMA PCU guidelines will be followed, assigning a weight of 65 kg for slaughter pigs and 240 kg for sows.

It is envisaged that once enough data has been gathered this will allow DAFM to establish an average figure for AMU on Irish pig farms and use this information to compare AMU between similar sized farms in the same production category and feed this information back to the farmers themselves.

Data collected will be used to produce an anonymised aggregated antibiotic usage figure for Irish pigs in line with ESVAC requirements. Farmers will receive a report detailing antibiotic usage levels on their own farm for each active substance used as well as an overall figure in mg/kg of pig meat produced.

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ITALY

➤ CLASSYFARM

– General

The ClassyFarm system, developed by the Istituto Zooprofilattico Sperimentale della Lombardia e Dell'Emilia Romagna (IZSLER), is owned by the Italian Ministry of Health. It started as a sample/survey system for pigs in 2014 and later it was opened up to dairy (2016) and poultry farms (2018), trials on beef farms have been made as well. During such phase, for pig and dairy cattle, AMU data was collected retrospectively on a convenience sample of 250-450 farms. For broilers and turkeys, data on 2015-2018 AMU has been collected for more than 80% of Italian poultry production. During 2019 the Italian electronic prescription system became fully operational, AMU data collected with such system is sent to the ClassyFarm database for further processing. Since tracking of AMU at age group-level is still being perfected, an additional indicator has been developed (DDDAit/biomass) that compares consumptions to the entire biomass of animals reared on a farm. The DDDAit/biomass indicator covers almost entirely the Italian production of pigs, dairy cattle, turkeys and broilers.

– Data collection

Animal (sub)categories: For AMU at age-group level, the distinguished weight categories in pigs are sows/boars, finishers, weaners and sucklers; in dairy cattle cows, heifers and calves are distinguished and in poultry broilers, turkeys and laying hens. For DDDAit/biomass, the AMU denominator is calculated by summing all the weights of the age groups present in a herd.

Input: For AMU at age-group level, data come from the Italian electronic prescription system (numerator) and the Italian Veterinary Database (denominator) or, when such data are incomplete, it can also be submitted by the IZLER staff, with assistance of vets, farmers or supply chain and company managers. For DDDAit/biomass, all the data came from the Italian electronic prescription system and the Italian Veterinary Database.

– Analysis

For AMU at age-group level, the dose-based unit of measurement DDDAit is used to calculate the number DDDAit per animal per period (which can be a semester or a year = the time-frame). Each active ingredient is considered as a single treatment, whether it is part of a combination product or not, with the exception of intramammary and intrauterine antimicrobials. The main indicator is DDDAit per animal per year; other indicators, such as AMU per semester may be provided as additional information. For finishers and the cattle subcategories, weights at treatment are standard estimations

set on national level. For the other weight categories, EMA⁷ weights are used. For DDDAit/biomass, a similar analysis is performed but without tracking AMU, within the same farm, broken down by age group.

– **Benchmarking**

A farm's AMU is compared to the median of all farms either at age group-level or at herd-level, depending on the indicator, and is also classified according to its quartile. Furthermore, other comparisons are available such as with medians at different geographical levels (i.e.; national, regional, metropolitan area) or at user level (i.e.; the median of all the farms a user is authorised to view). Usage of quinolones, 3rd and 4th generation cephalosporins and colistin are highlighted in red, macrolides in orange. AMU at age-group level was developed for antimicrobial stewardship while DDDAit/biomass is used to guide the selection of farms for pharmacosurveillance purposes. The 2020 was the first year fully covered by the Italian electronic prescription system, data and methodologies are currently under review and shall be refined in the next few years.

– **Reporting**

Farmers, vets and farmer groups/associations receive written reports and an oral presentation. Farm reports, which summarise up to three years of AMU, can be downloaded from interactive dashboards available for authorised users (veterinarians, public health managers, etc.). The first national report on AMU is currently under development.

– **More information and contact**

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⁷ http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

THE NETHERLANDS

➤ MARAN

The MARAN collection of herd-level AMU by the Wageningen University started in 2004 for samples of pig, cattle and broiler farms. In 2012 however, this system was replaced with the sectoral databases, overviewed by the Netherlands Veterinary Medicines Institute (SDa).

➤ SECTOR QUALITY SYSTEMS AND SDA

– General

Several quality assurance systems have sectoral databases in which sector-specific AMU data is collected. The quality systems are run by the respective sector organisations. The SDA, financed partially by governmental sources and private sources, receives the totality of the sectoral AMU. Each quality system has its own analysis, benchmarking and communication system. However, they all have to apply to the analysis and benchmarking criteria as established by the SDA. SDA also receives the sales data from FIDIN, the branch organization for veterinary pharmacy products. SDA reports on an annual basis on trends in sales and usage data. The SDA performs analysis on the combined data of consumption and animal numbers delivered to SDA by the sectors. All systems together cover 100% of AMU in the targeted sectors. In addition to this, SDA also monitors the AMU in sheep, goats, mink, horses and pets by regular surveys.

– Data collection

Animal (sub)categories: in pigs, by age categories: sows + piglets, fatteners + gilts, weaners; in calves, by farm types: white veal, red veal start-up, red veal fattening, red veal combi; in cattle, by gender and age category: dairy cows, suckler cows, bulls for meat, rearing animals; in rabbits: doe + kits, growing does, fattening rabbits.

Input: amount of antibiotics prescribed needs to be provided by the vets. The quality systems provide the average number of animals present over a period of a year, collected annually by inspection visits, or by using the compulsory 'Identification & Registration System (I&R)' for registration of animals.

– Analysis

Data is analysed using the nationally defined dose-based unit of measurement DDDA, established at product level. From this UM, the indicator 'animal daily doses per year' is calculated per animal category. The weights at treatment are estimated and nationally defined. In broilers and turkey weight curves are applied since 2017 to estimate the weight at treatment. For all-in-all-out veal farms, a DDDA per animal group is calculated next to animal daily doses per year. Growth curves are applied to

estimate weight at treatment for the DDDA per animal group calculation, a standardized weight is used for the daily doses per year.

For vets, the DDDA per vet and the veterinary benchmark indicator are calculated – see below.

– **Benchmarking**

Benchmarking for overall AMU is done for farms as well as vets. The basis for the farm is the #DDDA/year. This is presented to the farmers through the online interfaces of the different systems. SDa itself does not provide benchmarking reports for vets or farmers but instead outlines the national criteria based on the farm-level results.

In general, the benchmarking is developed according to the principle that there are two threshold values (warning and action), that define three zones. The thresholds are defined by the SDa and depend on the animal and category. If a party finds itself in the action zone, the action that needs to be performed and the possible penalties depend on the sector.

Vets are benchmarked on a specific indicator calculated for that purpose: the Veterinary Benchmark Indicator (VBI). This is based on the DDDA/year of the farms they have a 1-1 relationship with divided by the action benchmark value for the particular type of farm, leading to the relative prescription ratio for each farm. Depending on the number of farms in the action zone and the degree of exceeding the action threshold, the VBI will increase. It reflects the likelihood the vet has a farm in the action zone.

The benchmark values for critical antimicrobials (fluoroquinolones and 3rd and 4th gen. cephalosporins) are 0. These antimicrobials can only be used after sensitivity testing of infectious strains. SDa follows the proposed benchmark value for colistin as proposed by the European Medicine Agency (EMA).

The benchmarking system will undergo several changes at the end of 2017, early 2018.

– **Reporting**

SDa produces an annual report, published on the [SDa website](#), with information on:

- trends in antimicrobial sales data and AMU sector-specific data;
- distribution of farms and vets over the different benchmark categories;
- use of critical antimicrobials.

Farmers and vets have online access to the results.

– **More information and contact**

The Netherlands Veterinary Medicines Institute (SDa) [website](#) or info@autoriteitdiergeenmiddelen.nl

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NORWAY

➤ VETREG

– General

VetReg was established for farmed fish in 2011 and for terrestrial animals in 2012. The VetReg database is owned by the Norwegian Food Safety Authority. Reporting to VetReg is mandatory by legislation and applies to veterinarians, pharmacies and feed mills. Veterinarians and feed mills are required to report all prescriptions for food producing animal species (including horses). Reporting prescriptions for companion and fur animals to VetReg is voluntary. Pharmacies are obligated to report all dispensed prescriptions, including those for use in the veterinarians' own practice.

– Data collection

Animal (sub)categories: Data are collected at individual animal level for dairy cattle and at herd level for other food producing animals. For farmed fish also production stage has to be reported.

Input: The veterinarians report their antibiotic usage in amounts (ml, g etc.) of antimicrobial VMP administered to the animal or handed out to the farmer, the pharmacies report number of packages of antibiotic VMP dispensed to animal owners, and the feed mills reports amounts (kg) antibiotics prescribed. In Norway, feed mills only dispense medicated feed for use in farmed fish. As pharmacies report all antibiotic VMPs sold to veterinarians to VetReg, this allows for assessing if the veterinarians are compliant with the legal requirement of reporting to VetReg. Farmers have no role in the data collection for VetReg.

– Analysis, benchmarking and reporting

Unit of measurement (numerator) to express the usage is currently mg but it is planned to also use DDDvet and DCDvet values from EMA⁸. Indicator for benchmarking has not yet been decided on and thus benchmarking has not yet been implemented as a tool for antibiotic stewardship.

– Contacts

Norwegian Food Safety Authority:

Solfrid.Amdal@mattilsynet.no; Ole-Herman.Tronerud@mattilsynet.no

Norwegian Veterinary Institute: kari.grave@vetinst.no; kari.helgesen@vetinst.no

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⁸ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

SPAIN

➤ NATIONAL DATABASE OF VETERINARY ANTIBIOTIC PRESCRIPTIONS

– General

In the context of the Spanish National Plan against Antibiotic Resistance, the Spanish Ministry of Agriculture, Fisheries and Food has defined a policy for the development of a database, for collecting data on consumption of antibiotics in Spain, PRESVET, and having started at the beginning of 2019. Veterinarians have the legal obligation to provide information on all the antibiotic prescriptions made for production animals in Spain.

– Data collection

Animal (sub)categories: Only the species (food producing animals) needs to be provided. PRESVET is connected with other national databases that record the data of all farms in Spain. From the farm code provided by veterinarians (see below), the animal categories and type of production on farms can be established for purpose of data analysis. Data up to 150 different categories of animals are stored in the database. So it is possible to distinguish among dairy farms, fattening and meat farms in all species.

Input: Vets are responsible for declaring every month the veterinary antibiotic prescriptions. They have to report the number of packages prescribed if the medicinal product is a pharmaceutical form, and in case of medicated feed, the medicated feed amount in kg has to be reported as well as premix dosage. Other data are required to be communicated as well in both cases: the farm code, the animal species, the region, date of prescription, type of medicinal product, national code and if the prescription is ordinary or an exceptional one.

– Analysis

Mg/PCU is the unit of measure for antibiotic use. With the information provided of number of packages in pharmaceutical forms and the national code of medicinal products, PRESVET calculates the amount of mg in each prescription. In medicated feed prescriptions the amount of mg is calculated with the kg of feed, the premix dosage and the national code provided in each prescription. The unit of PCU is calculated with ESVAC weights and with the category and number of animals in each farm. PRESVET can provide monthly consumption reports for each farm.

– Benchmarking and reporting

Benchmarking and reporting are currently not planned.

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➤ ANTIBIOTIC REDUCTION PROGRAMS

– General

The Spanish National Plan against Antibiotic Resistance in collaboration with Spanish animal industry and taking into account all the antecedents related to the consumption of antibiotics in some food producing animals sectors, has created six programs aiming to Reduce the Use of Antibiotics in pigs, rabbits, poultry, bovines, sheep and goats.

These programs summarize the following points:

- a) The main objective of the Program is to reduce the consumption of antibiotics. The reduction is established in sections and depending on the species.
- b) The specialized veterinarians and farmers are voluntarily adhered to the program.
- c) The consumption data is being declared every six months by a web-application.

– Data collection

Animal (sub)categories: Pigs, rabbits, poultry, bovines, sheep and goats of the farms that belong to the programs.

Input: Vets will be responsible for every six months declaring the veterinary antibiotic consumption by a web-application.

– Analysis, benchmarking and reporting

AMU will be calculated as mg/PCU. Benchmarking and reporting are done every six months and a report is published with the comparison in time, by antibiotic and animal species.

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SWEDEN

➤ SWEDISH BOARD OF AGRICULTURE (SBA)

– General

The Swedish 'Djursjukdata DAWA' is owned by the Swedish Board of Agriculture (SBA). It is the oldest data collection system of antimicrobial use at farm level. A computer-based system was gradually introduced from 1982 and was launched at a national level January 1, 1984. The system was introduced through a general agreement between the government and the Federation of Swedish Farmers. The system was first introduced on a test basis in one county already in 1971, and in a second country from 1977. It covers 100% of farm animals and horses.

– Data collection

Animal (sub)categories: In pigs: adults, fatteners, weaners, sucklers; in cattle: calves less than 2 months, calves 2-6 months, calves over 6 months, adults; in horses: foals < 4 months, foals 4-12 months, 1-3 years, adults; in sheep/goats: lambs < 2months, 2-5 months; 5-12 months; > 1 year; in poultry: broilers (or corresponding), pullets, laying hens, other breeding animals.

Input: It is mandatory for vets to provide treatment data. Record keeping at the farm is mandatory for farmers but they do not provide any data.

– Analysis, benchmarking and reporting

Data are not further analysed at farm level in general. However, Växa Sverige, the Swedish Dairy Association, extracts data from the SBA for dairy farms affiliated to Växa which is reported yearly. No benchmarking of results is however performed.

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➤ SWEDISH POULTRY MEAT ASSOCIATION

– **General**

From 2011, the Swedish Poultry Meat Association (SPMA) requests their members to report all treatments of broilers, parents and grandparents as part of the Poultry health control programme. It covers > 95% of the commercial poultry meat production.

– **Data collection**

Animal (sub)categories: differentiation between grandparents, parents and production animals is made. Producers are responsible for submitting antibiotic use data. Vets are obliged to report to the SBA. The number of flocks treated is recorded.

– **Analysis, Benchmarking and reporting**

Indication based AMU is reported as the number of treated flocks per total number of flocks. Farm-level benchmarking is not performed because of very low treatment incidence but data are reported to the SBA and to the National Veterinary Institute (SVA) and summary data are published in the yearly report Swedres-Svarm, accessible at:

(<http://www.sva.se/om-sva/publikationer/antibiotikaresistens?lid=32744>).

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SWITZERLAND

➤ IS-ABV

– General

The Swiss system for monitoring prescription based veterinary-level antimicrobial prescription is planned to be implemented in two phases: a) on the 1st of January 2019 group therapies became mandatory to report; b) on the 1st of October 2019 individual therapies became included in the system. The IS-ABV system will be managed by the Federal Food Safety and Veterinary Office and will cover AMU in all animal species and 100% of animals.

– Data collection

Animal (sub)categories: in pigs: sows/boars, fatteners, weaners, sucklers; in beef cows: veal calves, breeding beef; dairy cows, others (such as yak, buffalo); in chickens: laying hens, broilers; turkeys; goats; sheep; rabbits; horses; in pets: cats, dogs, other pets.

Input: The data collection is the responsibility of the vets, based on their prescriptions.

– Analysis, benchmarking and reporting

Benchmarking and reporting is in development and planned for implementation in 2020. The benchmarking system will be based on the animal treatment index (a count-based indicator). Other analyses are foreseen using dose-based indicators, namely the prescribed daily dose and the treatment intensity.

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➤ SUISSANO AND SAFETY +

– **General**

Both projects have been jointly established by the organizations SUISAG and Qualiporc, service centres for pig producers in Switzerland, in collaboration with their affiliated porcine sanitary services. Preliminary and pilot studies took place in the years 2014 and 2015-2017 (SUISSANO only). The start of the systems was in April 1st, 2018. The herd coverage in Switzerland is estimated to be at 80 to 90% in 2021 (30% in 2018).

– **Data collection**

Animal (sub)categories: Piglets, weaners, fattening pigs, gestating sows and lactating sows.

Input: Producers/Farmers are responsible for submitting treatment data via electronic treatment journal. Data submitted are age group, number of animals treated, weight of animals treated, duration of treatment, amount of product, number of pigs housed on farm, indication for treatment and mortality in all age groups excl. sows.

– **Analysis**

DCDvet⁹/animal/year; DCD_{CH}^{10,11}/animal/year; proportion of pigs treated/year (animal treatment index (ATI)). Only the ATI is reported to farmers (quarterly). Treatments with less desirable products, such as those containing High Priority Critically Important Antimicrobials or triple combinations of antimicrobials are multiplied with factor four, resp. five. Trends in mortality are monitored groups in order to avoid negative effects of any reduction of antimicrobial usage.

– **Benchmarking and reporting**

The benchmark will be set in autumn 2019. Thresholds as well as factors concerning critical ingredients and products will be determined by stakeholders (farmer, veterinarians, government, and university) in corporate action. The ATI is reported to the farmers quarterly. Farms showing an ATI above the threshold in three consecutive quarters will get support and special advice to improve farm management and reduce AMU. Farms that do not cooperate are excluded from the program.

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⁹ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

¹⁰ https://www.vetpharm.uzh.ch/suppl/Echtermann_et_al_S1.pdf

¹¹ <https://doi.org/10.5167/uzh-162623>

UK

➤ BPC-AS

– General

The British Poultry Council (BPC) run an antibiotic stewardship (AS) scheme that covers 90% of the meat poultry (chicken, turkey and duck) industries. As part of this scheme, antibiotic usage is collated on an annual basis and aggregate data published in the BPC annual report and the UK Veterinary Antimicrobial Resistance, Sales and Surveillance (VARSS) report.

– Data collection

Animal (sub)categories: No subcategories in the three animal species are distinguished.

Input: Producers have been asked to submit quarterly (chickens) or annual (turkeys and duck) AMU data in the form of an aggregate spreadsheet. This may be from farm records, but in some cases the data comes from the vet. BPC then collate the data.

– Analysis

The data is presented as the overall annual amount of antibiotic active ingredient used (in tonnes), which includes breeders and producers. For the producers, this is then compared with the population at risk of treatment to create a mg/kg usage figure.

BPC calculates the population at risk of treatment by using annual slaughter numbers. The EMA PCU guidelines¹⁰ are followed for broilers (1 kg per slaughtered broiler) and turkeys (6.5 kg per slaughter turkey). For ducks, where there are no ESVAC weights assigned, a weight of 1.75 kg has been used.

– Benchmarking and reporting

No farm level benchmarking is carried out as part of this scheme.

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➤ eMB-PIGS

– **General**

The electronic Medicine Book for pigs is managed by the Animal and Horticultural Development Board – Pigs (AHDB-Pigs) – in conjunction with key industry players through an industry steering group, and with support from VMD.

It was launched in April 2016, and data for 2016 covers 62% of UK pig production. In the future, the amount of antibiotic usage data being added are set to increase as the use of eMB is now a requirement by the farm assurance schemes Quality Meat Scotland (QMS) and, as of 11th November 2017, Red Tractor.

– **Data collection**

Animal (sub)categories: When collecting data, producers are asked to specify whether it has been given to a piglet, weaner-grower, finisher or breeding pig.

Input: Producers are responsible for uploading antibiotic data annually (as a minimum) or every quarter. This is obtained either from their own usage records and/or from data on drugs delivered (for example from veterinary practices).

– **Analysis**

The data is presented as the overall annual amount of antibiotic active ingredient used (in tonnes). This is then compared with the population at risk of treatment to create a mg/kg usage figure. The EMA PCU guidelines¹¹ are followed, assigning a weight of 65 kg for slaughter pigs and 240 kg for livestock sows.

– **Benchmarking**

Farms are not yet benchmarked. Benchmarking farms is planned for the beginning of 2018. The benchmarking metric is still being finalised, but will be calculated using a mg/kg measure based on the average number of sows and the number of animals leaving the farm for either slaughter or fattening.

– **Reporting**

Producers can see and download reports on their farm/ farm group's usage data directly from eMB-pigs. With permission, this data is also available to their veterinary surgeon.

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➤ **SAVSNET**

– **General**

SAVSNET, short for Small Animal Veterinary Surveillance Network, was established in 2008 as an initiative from the British Small Animal Veterinary Association and the University of Liverpool. Currently, it is solely run by the latter, with funding from the Biotechnology and Biological Sciences Research Council (BBSRC). Its purpose is to harness electronic health and environmental data for rapid and actionable research and surveillance, with ‘antimicrobial resistance’ and ‘infection and zoonosis’ two of the research priorities. It is a voluntary, ‘continuous’ system, collecting practice data (animals visiting + diagnostic samples) from currently approx. 10% of UK vet practices based on convenience. Veterinary practices are contacted by SAVSNET to ask if they want to take part.

– **Data collection**

Animal (sub)categories: Companion animals including dogs, cats, rabbits, small rodents, avians, amphibians and reptiles; all age/weight categories.

Input: In the SAVSNET-Vet module of SAVSNET, data are collected near-real-time from animal’s electronic health records when they are seen at participating veterinary practices for a consultation. Owners can opt out on a consult-by-consult basis by simply telling their veterinary surgeon or nurse in the consultation. Electronic health record data is automatically extracted from the animal’s health record and submitted to SAVSNET through a window that appears at the end of each consultation, and includes age, sex, breed, neuter status and also treatments, the latter being the source for the antimicrobial usage data (often including dosage levels). Also weight history of the animals is often included (weight + date recorded). In addition, the veterinary surgeon or nurse is asked to choose a main reason (syndrome) for the animal to be brought to the veterinary practice.

– **Analysis**

As dosage data are not mandatory, these data are not currently used. Outputs are currently presence or absence of prescription. Also use related to specific syndromes is looked at.

– **Benchmarking and reporting**

Veterinary practices are benchmarked in comparison to other anonymised practices. No limits / targets are applied. Practices can consult their results through the secure online portal.

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